SACRAMENTO REGIONAL

8-HOUR OZONE ATTAINMENT AND

REASONABLE FURTHER PROGRESS PLAN

APPENDICES

(2013 SIP REVISIONS)

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Appendix A: Emissions Inventory

The 2002, 2014, 2017, and 2018 emission inventories are presented in various formats and details in this appendix.

Appendix A1 contains the on-road motor vehicle ROG and NO_X emissions, vehicle population and activity Burden data generated using EMFAC2011 and transportation activity forecast data from the 2013/2016 MTIP[1]. It does not include CARB adjustments for recently adopted controls through January 2012. The list of adjustments is presented in Table A5-2.

Appendix A2 (available separately in electronic file format) contains the estimated VOC and NO_X stationary, area-wide and off-road forecast summaries by EIC emission categories for the Sacramento Federal Nonattainment Area in CEPAM: NORCAL 2012 PM2.5 SIP Baseline Emission Projections, Section a1 – Emission Projections With External Adjustments. It includes adopted controls through mid-2011. It also includes some ERCs but not the entire 4 tons per day VOC and 3 tons per day NO_X added to the planning inventory. It does not include newly identified VOC emission sources: Heritage Dairy (0.1 tpd) and Jepson Prairie Composting (4.1 tpd). It also does not include reductions from PCAPCD Rule 242 - IC Engines, and Rule 243 - Polyester Resin/Plastic Product Manufacturing. ERC correction and these additional emissions and reductions are added to the inventory as external adjustments as shown in Table A5-1.

Appendix A3 (available separately in electronic file format) contains the growth and control data used for emission forecasting stationary and area-wide sources in CARB's SIP planning projections model, CEPAM.

Appendix A4 (available separately in electronic file format) contains the summary of In-Use off-road equipment emissions, horsepower, population and activity data for the Sacramento Federal Nonattainment Area using data outputs from the 2011 In-Use Off-Road Equipment model. Also available in electronic format are other off-road motor vehicles category specific methods and inventory models from CARB's website, http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles. For those off-road emissions categories not updated with new methods and data, such as lawn and garden equipment, data outputs from OFFROAD2007 (available in electronic format) are used. These offroad emissions do not include CARB and district adjustments for recently adopted controls through January 2012. The list of adjustments is presented in Appendix A5.

Appendix A5 contains recent emission inventory adjustments by the air districts and CARB. Unlike the VOC and NO_X inventories presented in Chapter 5, Table 5-2 and

[1] Final 2013/16 Metropolitan Transportation Improvement Program (MTIP), Amendment #1 to the MTP/SCS 2035, and Air Quality Conformity Analysis. (August 16, 2012), FHWA approval December 14, 2012.

Table 5-3, respectively, the inventories presented in Appendices A1 and A2 do not include CARB and district adjustments in Tables A5-1 and A5-2. District inventory adjustments for reductions from unaccounted district rules through mid-2011, for emission source additions, and for ERC correction are shown in Table A5-1. CARB inventory adjustments for recently adopted controls through January 2012 are presented in Table A5-2. CARB off-road adjustment factors, which are incorporated into CEPAM – Emission Projections With External Adjustments, are available separately in electronic file format.

Appendix A6 contains a summary description and inventory of VOC and NO_X emission reduction credits (ERCs) listed by the individual air districts. Included are: 1) unused ERCs issued for reductions that occurred prior to the 2002 base year, and 2) future bankable rice burning ERCs. The VOC and NO_X ERC totals were rounded up to 4 tons per day VOC and 3 tons per day NO_X and added to the emission inventory forecast years in Chapter 5, Table 5-2 and Table 5-3, respectively.

Appendix A7 contains the 2019 VOC and NO_X emissions by stationary, area-wide, on-road motor vehicles and other mobile sources major source categories.

Appendix A8 contains Tables 5-4 and 5-5 of "Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan" (2011 SIP Revision, November 10, 2011).

Appendix A1: On-Road Motor Vehicle Emissions Inventory

Appendix A1 contains the 2002, 2014, 2017, and 2018 on-road motor vehicle summer planning VOC and NO_X inventories, vehicle population, VMT and trips for each EMFAC vehicle class category for the Sacramento federal nonattainment area. These updated motor vehicle emissions are based on ARB's EMFA2011 emission factor model and the latest planning assumptions from SACOG's 2013/2016 MTIP[2]. Emissions tables by county are available separately in electronic file format. It does not include CARB adjustments for recently adopted controls through January 2012. The list of adjustments is presented in Table A5-2.

[2] Final 2013/16 Metropolitan Transportation Improvement Program (MTIP), Amendment #1 to the MTP/SCS 2035, and Air Quality Conformity Analysis. (August 16, 2012), FHWA approval December 14, 2012.

Appendix A1: 2002 On-Road Motor Vehicle Emissions Inventory - Sacramento Federal Nonattainment Area Summary
Version : Emfac2011 (EMFAC 2011 Vehicle Categories)
Run Date : 2013/01/18
Scen Year: 2002
Season : Summer
Area : Sacramento Nonattainment Area [El Dorado (MC)+ Placer (SV & MC) + Sacramento + S. Sutter + Yolo + Solano (SV)]
Emissions: Tons Per Day

	LDA - GAS	LDA - DSL	LDT1 - GAS	LDT1 - DSL	LDT2 - GAS	LDT2 - DSL	MDV - GAS	MDV - DSL	LHDT1 - GAS	LHDT1 - DSL	LHDT2 - GAS	LHDT2 - DSL	MHDT - GAS	MHDT - DSL	HHDT - GAS	HHDT - DSL	OBUS - GAS	OBUS - DSL	SBUS - GAS	SBUS - DSL	UBUS - GAS	UBUS - DSL	MH - GAS	MH - DSL	MCY - GAS	ALL-TOT
Vehicles	654011	4320	126150	308	244156	261	125448	187	14427	8368	4553	5380	4936	17179	711	9358	611	700	286	802	243	509	12742	1361	33254	**1270259**
VMT/1000	25988	128	4782	8	10881	7	6189	6	696	426	188	272	155	916	30	1276	33	60	12	32	31	66	169	20	225	**52595**
Trips	4115754	25671	768765	1817	1547180	1525	804161	1104	214936	105264	67833	67679	98753	0	14235	0	27885	0	1142	0	973	2035	1275	136	66501	**7934624**
Reactive Organic Gas Emissions																										
Run Exh	6.91	0.02	2.89	0.00	3.04	0.00	1.82	0.00	0.59	0.13	0.36	0.08	0.32	0.70	0.19	1.36	0.02	0.06	0.06	0.03	0.07	0.06	0.26	0.01	0.86	**19.86**
Idle Exh	0	0	0	0	0	0	0	0	0.01	0.00	0.00	0.00	0.01	0.02	0	0.29	0.00	0.01	0.00	0.00	0	0	0	0	0	**0.33**
Start Ex	4.17	0	1.04	0	1.60	0	0.90	0	0.23	0	0.17	0	0.52	0	0.16	0	0.07	0	0.01	0	0.00	0	0.00	0	0.19	**9.04**
Total Ex	**11.08**	**0.02**	**3.93**	**0.00**	**4.64**	**0.00**	**2.72**	**0.00**	**0.83**	**0.13**	**0.53**	**0.08**	**0.84**	**0.72**	**0.35**	**1.65**	**0.09**	**0.07**	**0.07**	**0.04**	**0.08**	**0.06**	**0.26**	**0.01**	**1.05**	**29.23**
Diurnal	2.43	0	0.71	0	0.75	0	0.27	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.01	0	0.32	**4.49**
Hot Soak	2.26	0	0.70	0	0.71	0	0.25	0	0.05	0	0.05	0	0.11	0	0.02	0	0.00	0	0.00	0	0.00	0	0.00	0	0.17	**4.32**
Running	6.00	0	1.92	0	1.91	0	0.62	0	0.16	0	0.14	0	0.31	0	0.09	0	0.03	0	0.01	0	0.00	0	0.00	0	0.70	**11.89**
Resting	1.23	0	0.37	0	0.38	0	0.14	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.18	**2.31**
Total	22.99	0.02	7.62	0.00	8.39	0.00	4.00	0.00	1.04	0.13	0.72	0.08	1.27	0.72	0.46	1.65	0.12	0.07	0.08	0.04	0.08	0.06	0.27	0.01	2.42	**52.24**
Oxides of Nitrogen Emissions																										
Run Exh	15.42	0.19	5.24	0.01	10.14	0.01	6.43	0.01	0.86	3.11	0.25	2.03	0.62	12.70	0.44	28.69	0.10	1.11	0.06	0.45	0.11	1.38	0.44	0.26	0.30	**90.37**
Idle Exh	0	0	0	0	0	0	0	0	0.00	0.02	0.00	0.02	0.00	0.20	0	2.45	0.00	0.04	0.00	0.05	0	0	0	0	0	**2.79**
Start Ex	2.74	0	0.62	0	1.64	0	0.87	0	0.44	0	0.11	0	0.27	0	0.08	0	0.07	0	0.00	0	0.01	0	0.00	0	0.02	**6.87**
Total Ex	**18.16**	**0.19**	**5.86**	**0.01**	**11.78**	**0.01**	**7.30**	**0.01**	**1.30**	**3.14**	**0.36**	**2.05**	**0.89**	**12.90**	**0.51**	**31.14**	**0.17**	**1.15**	**0.06**	**0.50**	**0.12**	**1.38**	**0.44**	**0.26**	**0.32**	**100.02**

Source: EMFAC2011 (VMT based on EMFAC2011 Default for 2002); Download 1-18-2013 from CARB Website: http://www.arb.ca.gov/jpub/webapp//EMFAC2011WebApp/emsSelectionPage_1.jsp

Appendix A1: 2014 On-Road Motor Vehicle Emissions Inventory - Sacramento Federal Nonattainment Area Summary
Version : Emfac2011 (EMFAC 2011 Vehicle Categories)
Run Date : 2013/01/18
Scen Year: 2014
Season : Summer
Area : Sacramento Nonattainment Area [El Dorado (MC)+ Placer (SV & MC) + Sacramento + S. Sutter + Yolo + Solano (SV)]
Emissions: Tons Per Day

	LDA - GAS	LDA - DSL	LDT1 - GAS	LDT1 - DSL	LDT2 - GAS	LDT2 - DSL	MDV - GAS	MDV - DSL	LHDT1 - GAS	LHDT1 - DSL	LHDT2 - GAS	LHDT2 - DSL	MHDT - GAS	MHDT - DSL	HHDT - GAS	HHDT - DSL	OBUS - GAS	OBUS - DSL	SBUS - GAS	SBUS - DSL	UBUS - GAS	UBUS - DSL	MH - GAS	MH - DSL	MCY - GAS	ALL-TOT
Vehicles	750662	3250	110923	142	269564	125	241542	224	44142	32887	3477	7041	4040	18496	391	10588	1142	731	246	692	295	597	10576	2116	49958	**1563845**
VMT/1000	29586	118	4141	5	10790	5	9550	9	1869	1404	146	299	183	935	46	1495	58	58	10	26	37	77	142	28	434	**61449**
Trips	4733510	19304	676518	759	1696181	724	1511533	1307	657656	413674	51797	88566	80825		7820		52171		984		1178	2386	1058	212	99906	**10098068**
Reactive Organic Gas Emissions																										
Run Exh	1.42	0.01	0.53	0.00	0.65	0.00	0.99	0.00	0.52	0.40	0.03	0.08	0.07	0.30	0.05	0.51	0.01	0.02	0.02	0.01	0.04	0.04	0.04	0.01	1.29	**7.03**
Idle Exh	0	0	0	0	0	0	0	0	0.03	0.00	0.00	0.00	0.00	0.00	0	0.13	0.00	0.00	0.00	0.00	0	0	0	0	0	**0.17**
Start Ex	1.04	0	0.32	0	0.50	0	0.75	0	0.42	0	0.03	0	0.15		0.04		0.04		0.00		0.00	0	0.00	0	0.21	**3.51**
Total Ex	**2.46**	**0.01**	**0.86**	**0.00**	**1.15**	**0.00**	**1.74**	**0.00**	**0.97**	**0.40**	**0.06**	**0.08**	**0.23**	**0.30**	**0.09**	**0.64**	**0.06**	**0.02**	**0.03**	**0.01**	**0.04**	**0.04**	**0.04**	**0.01**	**1.50**	**10.73**
Diurnal	1.07	0	0.39	0	0.44	0	0.43	0	0.01	0	0.00	0	0.00		0.00		0.00		0.00		0.00	0	0.01	0	0.32	**2.66**
Hot Soak	1.08	0	0.33	0	0.44	0	0.42	0	0.11	0	0.01	0	0.03		0.01		0.00		0.00		0.00	0	0.00	0	0.10	**2.52**
Running	1.95	0	0.85	0	1.10	0	1.07	0	0.51	0	0.03	0	0.08		0.02		0.01		0.00		0.00	0	0.00	0	0.20	**5.83**
Resting	0.69	0	0.23	0	0.29	0	0.29	0	0.00	0	0.00	0	0.00		0.00		0.00		0.00		0.00	0	0.00	0	0.19	**1.68**
Total	7.24	0.01	2.65	0.00	3.41	0.00	3.95	0.00	1.59	0.40	0.11	0.08	0.34	0.30	0.11	0.64	0.07	0.02	0.03	0.01	0.04	0.04	0.05	0.01	2.32	**23.43**
Oxides of Nitrogen Emissions																										
Run Exh	3.82	0.08	1.29	0.00	2.53	0.00	3.85	0.00	1.01	6.46	0.06	1.27	0.24	5.65	0.23	12.30	0.07	0.54	0.03	0.28	0.09	0.93	0.14	0.23	0.51	**41.63**
Idle Exh	0	0	0	0	0	0	0	0	0.00	0.09	0.00	0.02	0.00	0.18	0	1.05	0.00	0.04	0.00	0.04	0	0	0	0	0	**1.42**
Start Ex	1.00	0	0.25	0	0.70	0	0.94	0	1.31	0	0.10	0	0.18		0.03		0.09		0.00		0.01	0	0.00	0	0.03	**4.63**
Total Ex	**4.82**	**0.08**	**1.54**	**0.00**	**3.24**	**0.00**	**4.79**	**0.00**	**2.32**	**6.55**	**0.16**	**1.29**	**0.42**	**5.83**	**0.26**	**13.35**	**0.17**	**0.58**	**0.03**	**0.32**	**0.10**	**0.93**	**0.14**	**0.23**	**0.54**	**47.70**

Source: ARB (Jon Taylor) e-mail (formally transmitted on December 5, 2012) providing 2014, 2017, 2018 on-road emissions based on VMT forecasts in SACOG's 2013/2016 MTIP provided by SACOG.

Appendix A1: 2017 On-Road Motor Vehicle Emissions Inventory - Sacramento Federal Nonattainment Area Summary
Version : Emfac2011 (EMFAC 2011 Vehicle Categories)
Run Date : 2013/01/18
Scen Year: 2017
Season : Summer
Area : Sacramento Nonattainment Area [El Dorado (MC)+ Placer (SV & MC) + Sacramento + S. Sutter + Yolo + Solano (SV)]
Emissions: Tons Per Day

	LDA - GAS	LDA - DSL	LDT1 - GAS	LDT1 - DSL	LDT2 - GAS	LDT2 - DSL	MDV - GAS	MDV - DSL	LHDT1 - GAS	LHDT1 - DSL	LHDT2 - GAS	LHDT2 - DSL	MHDT - GAS	MHDT - DSL	HHDT - GAS	HHDT - DSL	OBUS - GAS	OBUS - DSL	SBUS - GAS	SBUS - DSL	UBUS - GAS	UBUS - DSL	MH - GAS	MH - DSL	MCY - GAS	ALL-TOT
Vehicles	778401	3373	115026	147	279851	129	250460	232	45725	34102	3606	7309	4169	20330	380	11765	1186	801	251	721	299	608	10906	2190	51751	**1623719**
VMT/1000	30862	125	4324	5	11315	5	9791	9	1920	1440	150	303	199	1045	52	1704	57	63	11	26	38	78	148	28	453	**64152**
Trips	4920059	20491	702402	824	1762029	789	1555522	1386	681236	428961	53727	91942	83412		7612		54166		1004		1198	2432	1091	219	103492	**10473994**
Reactive Organic Gas Emissions																										
Run Exh	0.85	0.00	0.31	0.00	0.41	0.00	0.78	0.00	0.40	0.36	0.02	0.07	0.04	0.21	0.04	0.41	0.01	0.01	0.02	0.01	0.03	0.04	0.02	0.01	1.29	**5.35**
Idle Exh	0	0	0	0	0	0	0	0	0.03	0.00	0.00	0.00	0.00	0.00	0	0.17	0.00	0.00	0.00	0.00	0	0	0	0	0	**0.21**
Start Ex	0.67	0	0.23	0	0.34	0	0.62	0	0.37	0	0.02	0	0.10		0.02		0.03		0.00		0.00	0	0.00	0	0.21	**2.64**
Total Ex	**1.52**	**0.00**	**0.55**	**0.00**	**0.76**	**0.00**	**1.41**	**0.00**	**0.80**	**0.37**	**0.04**	**0.07**	**0.15**	**0.21**	**0.06**	**0.59**	**0.05**	**0.01**	**0.02**	**0.01**	**0.04**	**0.04**	**0.02**	**0.01**	**1.50**	**8.22**
Diurnal	0.75	0	0.33	0	0.37	0	0.43	0	0.01	0	0.00	0	0.00		0.00		0.00		0.00		0.00	0	0.00	0	0.32	**2.21**
Hot Soak	0.79	0	0.28	0	0.37	0	0.44	0	0.10	0	0.01	0	0.02		0.00		0.00		0.00		0.00	0	0.00	0	0.09	**2.10**
Running	1.45	0	0.72	0	0.92	0	1.10	0	0.51	0	0.03	0	0.05		0.01		0.01		0.00		0.00	0	0.00	0	0.17	**4.99**
Resting	0.51	0	0.19	0	0.25	0	0.30	0	0.00	0	0.00	0	0.00		0.00		0.00		0.00		0.00	0	0.00	0	0.19	**1.45**
Total	5.02	0.00	2.07	0.00	2.67	0.00	3.68	0.00	1.43	0.37	0.08	0.07	0.23	0.21	0.07	0.59	0.06	0.01	0.03	0.01	0.04	0.04	0.03	0.01	2.27	**18.98**
Oxides of Nitrogen Emissions																										
Run Exh	2.86	0.06	0.96	0.00	1.81	0.00	3.11	0.00	0.82	5.38	0.05	1.05	0.17	3.92	0.23	8.66	0.06	0.36	0.02	0.28	0.09	0.91	0.11	0.22	0.52	**31.64**
Idle Exh	0	0	0	0	0	0	0	0	0.00	0.10	0.00	0.02	0.00	0.16	0	1.27	0.00	0.03	0.00	0.04	0	0	0	0	0	**1.62**
Start Ex	0.68	0	0.20	0	0.50	0	0.78	0	1.27	0	0.09	0	0.15		0.03		0.09		0.00		0.01	0	0.00	0	0.03	**3.83**
Total Ex	**3.54**	**0.06**	**1.16**	**0.00**	**2.31**	**0.00**	**3.89**	**0.00**	**2.09**	**5.47**	**0.14**	**1.08**	**0.32**	**4.08**	**0.26**	**9.93**	**0.14**	**0.39**	**0.03**	**0.32**	**0.10**	**0.91**	**0.11**	**0.22**	**0.55**	**37.12**

Source: ARB (Jon Taylor) e-mail (formally transmitted on December 5, 2012) providing 2014, 2017, 2018 on-road emissions based on VMT forecasts in SACOG's 2013/2016 MTIP provided by SACOG.

Appendix A1: 2018 On-Road Motor Vehicle Emissions Inventory - Sacramento Federal Nonattainment Area Summary
Version : Emfac2011 (EMFAC 2011 Vehicle Categories)
Run Date : 2013/01/18
Scen Year: 2018
Season : Summer
Area : Sacramento Nonattainment Area [El Dorado (MC)+ Placer (SV & MC) + Sacramento + S. Sutter + Yolo + Solano (SV)]
Emissions: Tons Per Day

	LDA - GAS	LDA - DSL	LDT1 - GAS	LDT1 - DSL	LDT2 - GAS	LDT2 - DSL	MDV - GAS	MDV - DSL	LHDT1 - GAS	LHDT1 - DSL	LHDT2 - GAS	LHDT2 - DSL	MHDT - GAS	MHDT - DSL	HHDT - GAS	HHDT - DSL	OBUS - GAS	OBUS - DSL	SBUS - GAS	SBUS - DSL	UBUS - GAS	UBUS - DSL	MH - GAS	MH - DSL	MCY - GAS	ALL-TOT
Vehicles	784409	3399	115871	149	282080	131	252325	233	46047	34328	3637	7367	4199	20485	377	11904	1196	805	252	717	301	611	10973	2205	52191	**1636194**
VMT/1000	31123	126	4356	5	11426	5	9853	9	1932	1449	151	305	204	1060	54	1740	56	64	11	26	38	79	149	29	458	**64709**
Trips	4961476	20767	707705	842	1776589	806	1564013	1406	686027	431809	54185	92671	84020		7541		54615		1009		1203	2444	1098	221	104372	**10554817**
Reactive Organic Gas Emissions																										
Run Exh	0.71	0.00	0.26	0.00	0.35	0.00	0.72	0.00	0.36	0.34	0.01	0.07	0.04	0.19	0.03	0.41	0.01	0.01	0.02	0.00	0.03	0.04	0.02	0.01	1.29	**4.94**
Idle Exh	0	0	0	0	0	0	0	0	0.03	0.00	0.00	0.00	0.00	0.00	0	0.18	0.00	0.00	0.00	0.00	0	0	0	0	0	**0.22**
Start Ex	0.58	0	0.21	0	0.30	0	0.58	0	0.36	0	0.02	0	0.09		0.02		0.03		0.00		0.00	0	0.00	0	0.21	**2.40**
Total Ex	**1.29**	**0.00**	**0.47**	**0.00**	**0.66**	**0.00**	**1.30**	**0.00**	**0.74**	**0.35**	**0.04**	**0.07**	**0.13**	**0.20**	**0.05**	**0.59**	**0.04**	**0.01**	**0.02**	**0.00**	**0.04**	**0.04**	**0.02**	**0.01**	**1.50**	**7.57**
Diurnal	0.67	0	0.30	0	0.35	0	0.43	0	0.01	0	0.00	0	0.00		0.00		0.00		0.00		0.00	0	0.00	0	0.32	**2.09**
Hot Soak	0.71	0	0.26	0	0.35	0	0.44	0	0.10	0	0.01	0	0.01		0.00		0.00		0.00		0.00	0	0.00	0	0.09	**1.97**
Running	1.32	0	0.68	0	0.87	0	1.09	0	0.51	0	0.03	0	0.05		0.01		0.02		0.00		0.00	0	0.00	0	0.16	**4.73**
Resting	0.46	0	0.18	0	0.24	0	0.30	0	0.00	0	0.00	0	0.00		0.00		0.00		0.00		0.00	0	0.00	0	0.19	**1.38**
Total	4.43	0.00	1.90	0.00	2.47	0.00	3.56	0.00	1.37	0.35	0.08	0.07	0.19	0.20	0.06	0.59	0.06	0.01	0.03	0.00	0.04	0.04	0.03	0.01	2.26	**17.75**
Oxides of Nitrogen Emissions																										
Run Exh	2.62	0.06	0.88	0.00	1.63	0.00	2.89	0.00	0.76	5.01	0.04	0.98	0.15	3.50	0.23	7.87	0.05	0.32	0.02	0.25	0.09	0.89	0.10	0.21	0.52	**29.09**
Idle Exh	0	0	0	0	0	0	0	0	0.00	0.10	0.00	0.02	0.00	0.15	0	1.30	0.00	0.03	0.00	0.04	0	0	0	0	0	**1.65**
Start Ex	0.60	0	0.18	0	0.44	0	0.73	0	1.25	0	0.09	0	0.15		0.03		0.08		0.00		0.01	0	0.00	0	0.03	**3.59**
Total Ex	**3.23**	**0.06**	**1.06**	**0.00**	**2.07**	**0.00**	**3.61**	**0.00**	**2.01**	**5.11**	**0.14**	**1.00**	**0.30**	**3.66**	**0.26**	**9.17**	**0.13**	**0.35**	**0.03**	**0.29**	**0.10**	**0.89**	**0.10**	**0.21**	**0.56**	**34.34**

Source: ARB (Jon Taylor) e-mail (formally transmitted on December 5, 2012) providing 2014, 2017, 2018 on-road emissions based on VMT forecasts in SACOG's 2013/2016 MTIP provided by SACOG.

Appendix A5: Recent Emission Inventory Adjustments

Emission inventory adjustments presented in this appendix include recent changes by the air districts and CARB which are not reflected in Appendices A1 and A2. These emission changes are due to: 1) recently adopted control measures through January 2012 for mobile sources, 2) unaccounted adopted control measures through mid-2011 and additional emissions for stationary and area-wide sources, and 3) incorrect amount of planning ERCs in CEPAM inventory which is less than the amount of ERCs added to planning inventory. Tables A5-1 and A5-2 contain a summary of the district and CARB emission inventory adjustments, respectively. CARB off-road adjustment factors, which are incorporated into CEPAM – Emission Projections With External Adjustments, are available separately in electronic file format.

ERC Adjustments

The ERC adjustments in Table A5-1 are to account for the difference between the CEPAM ERCs in Appendix A2 and the 4 tons per day VOC and 3 tons per day NO_X ERCs added to the SIP plan. The amount of ERCs in CEPAM inventory (Appendix A2) is summarized below:

	VOC ERCs (in CEPAM), summer, tons per day				
	2011	2014	2017	2018	2019
SAC	2.13	2.14	2.15	2.16	2.17
YS	0.52	0.52	0.52	0.53	0.53
Placer	0.54	0.54	0.54	0.55	0.55
FR	0.06	0.06	0.06	0.06	0.06
Total SFNA VOC ERCs in CEPAM	3.26	3.26	3.28	3.29	3.30

	NO_X ERCs (in CEPAM), summer, tons per day				
	2011	2014	2017	2018	2019
SAC	1.20	1.19	1.15	1.15	1.14
YS	0.61	0.61	0.58	0.58	0.58
Placer	0.40	0.40	0.40	0.40	0.40
FR	0.07	0.07	0.06	0.06	0.06
Total SFNA NO_X ERCs in CEPAM	2.29	2.27	2.19	2.19	2.18

The CEPAM ERCs for each pollutant, air district and year are calculated by using ERC adjustment factors and annual and summer unadjusted inventories (stationary + areawide).

The equation for ERC adjustment Factor (pollutant, district, year) is:

A = ERC adjustment Factor (pollutant, district, year) = (B+C) / B

Where, B = AAI (pollutant, district, year) = annual average unadjusted emissions (stationary + areawide) by pollutant, district and year generated using CEPAM Section 1e (Version 1.02).
C = ERCs (pollutant, district) = annual average ERCs by pollutant and district used by CARB[3]

Annual Average ERCs (tons per day)
used in ERC Adjustment Factor Calculation

Air District	**NO_X**	**VOC**
El Dorado	0	0
Placer	0.54	0.62
Sacramento	1.60	2.47
Sutter	Use Cheryl Feather River ERC Adj Factor	Use Cheryl Feather River ERC Adj Factor
Yolo/Solano	0.60	0.58

The equation for CEPAM ERCs (pollutant, district, year) is:

D = CEPAM ERCs (pollutant, district, year) = (E*A) – E

Where, E = PI(pollutant, district, year) = summer planning unadjusted emissions (stationary + areawide) by pollutant, district and year generated using CEPAM Section 1e (Version 1.02).

Sample Calculation (for NOx, SMAQMD, 2018)

A = ERC adjustment Factor = (B+C) /B = (6.0445+1.6)/(6.0445) = 1.2647

D = CEPAM ERCs = (E*A) – E = (4.3293*1.2647)-4.3293 = 1.1460

[3] CARB. “Re: ERC External Adjustment” Message to Hao Quinn (SMAQMD) 29 August 2013, Email.

The amount ERC adjustments that need to be added to the CEPAM summer inventory (Appendix A2) so that the entire amount of 4 tpd VOC and 3 tpd NO_X ERCs is included in the SIP plan are presented below:

	ERCs, tons per day				
	2011	2014	2017	2018	2019
A. VOC ERC in CEPAM for SFNA	3.256	3.264	3.283	3.290	3.297
B. ERC in Plan (whole number)	4	4	4	4	4
C. VOC ERC Adjustment (Line B - Line A)	0.744	0.736	0.717	0.710	0.703
D. NOx ERC in CEPAM for SFNA	2.286	2.272	2.194	2.185	2.177
E. ERC in Plan (whole number)	3	3	3	3	3
F. NOx ERC Adjustment (Line E - Line D)	0.714	0.728	0.806	0.815	0.823

Table A5-1. District Emission Inventory Adjustments in Sacramento Nonattainment Area

District Rule/Category/Source	Adoption Year	Implement Year	VOC Emission Changes* (TPD)						
			2002	2008	2011	2014	2017	2018	2019
PCAPCD-243 Polyester Resin/Plastic Product Manufacturing	2003	2003		-0.177	-0.194	-0.210	-0.222	-0.228	-0.232
FRAQMD-3.20 Wood Products Coating	2005	2006		0.000	0.000	0.000	0.000	0.000	0.000
Added Heritage Dairy (Yolo-Solano)				0.105	0.105	0.105	0.105	0.105	0.105
Added Jepson Composting (Yolo-Solano)			4.110	4.110	4.110	4.110	4.110	4.110	4.110
VOC ERC Adjustment (added to Subcategory Mfg & Industrial)					0.744	0.736	0.717	0.710	0.703
Total District Adjustments			**4.110**	**4.037**	**4.765**	**4.740**	**4.709**	**4.697**	**4.686**

District Rule/Category/Source	Adoption Year	Implement Year	NO_X Emission Changes* (TPD)						
			2002	2008	2011	2014	2017	2018	2019
PCAPCD-242 IC Engines	2003	2003		-0.038	-0.033	-0.029	-0.026	-0.025	-0.024
NO_X ERC Adjustment (added to Subcategory Mfg & Industrial)					0.714	0.728	0.806	0.815	0.823
Total District Adjustments			**0**	**-0.038**	**0.680**	**0.699**	**0.779**	**0.789**	**0.799**

*These changes are included in Chapter 5, Table 5-2 and Table 5-3. These changes are not included in the detailed inventories contained in Appendix A2.

Table A5-2. CARB Emission Inventory Adjustments in Sacramento Nonattainment Area

CARB Rule/Category	VOC Emission Changes* (TPD)		
	2014	2017	2018
On-Road Emission Inventory			
RFG	-1.87	-1.47	-1.31
Prop 1B	0.00	0.00	0.00
Moyer	0.00	0.00	0.00
AB1493	-0.11	-0.21	-0.25
Smog Check	-0.64	-0.57	-0.55
ACC	0.00	-0.12	-0.15
Off-Road Emission Inventory			
Carl Moyer	-0.19	-0.03	-0.01
Summary	**-2.82**	**-2.40**	**-2.27**

CARB Rule/Category	NOx Emission Changes* (TPD)		
	2014	2017	2018
On-Road Emission Inventory			
RFG	0.00	0.00	0.00
Prop 1B	-1.70	0.00	0.00
Moyer	-0.08	-0.04	-0.05
AB1493	-0.01	-0.01	-0.01
Smog Check	-0.37	-0.37	-0.33
ACC	0.00	-0.18	-0.28
Off-Road Emission Inventory			
Carl Moyer	-1.64	-0.38	-0.42
Prop 1-B	-0.07	-0.07	-0.07
Summary	**-3.86**	**-1.05**	**-1.15**

*These changes, which include recently adopted control measures up to January 2012, are included in Chapter 5, Table 5-2 and Table 5-3. These changes are not included in the detailed inventories contained in Appendix A1 for on-road and Appendices A2 and A4 for off-road.

Appendix A6: Emission Reduction Credits (ERCs)

Unused ERCs Issued for Reductions That Occurred Prior to 2002 Base Year

Certain pollutant emission reductions due to equipment shutdown or voluntary control may be converted to emission reduction credits (ERCs) and registered with the air districts. These ERCs may then be used as "offsets" to compensate for an increase in emissions from a new or modified major emission source regulated by the air districts. Unused ERCs are considered as potential future emissions supplemental to the forecasted emissions inventory.

The amounts of unused ERCs from stationary sources that occurred prior to the 2002 base year are estimated at about 2.6 tons per day of VOC and 1.4 tons per day of NO_X and are summarized by air district in Table A6-1. They are included in the emissions forecasts to ensure the potential future use of these credits does not interfere with reasonable further progress and attainment goals.

Future Bankable Rice Burning Emission Reduction Credits

Emission credits from reduction in burning may not be used to comply with offset requirements at a new major stationary source or a major modification, unless they are included in an approved attainment demonstration plan.[4] Therefore, the impact of accounting for ERCs from reduction in rice straw burning and other agricultural burning credits are being included in this 8-hour ozone attainment and RFP demonstration plan.

California legislation in 1991 (known as the Connelly bill) required rice farmers to phase down rice field burning on an annual basis, beginning in 1992. A burn cap of 125,000 acres in the Sacramento Valley Air Basin was established, and growers with 400 acres or less were granted the option to burn their entire acreage once every four years. Since the rice burning reductions were mandated by state law, they would ordinarily not be "surplus" and eligible for banking. However, the Connelly bill included a special provision declaring that the reductions qualified for banking if they met the State and local banking rules.

Due to the special consideration in the Connelly bill, potential future rice burning ERCs could be issued for previous reductions that are eligible for banking. The amounts of future bankable rice burning ERCs for the Sacramento nonattainment area are estimated at about 0.9 tons per day of VOC and 1.0 tons per day of NO_X and are listed by air district in Table A6-2. They are included in the emissions forecasts to ensure the potential future use of these credits does not interfere with reasonable further progress and attainment goals.

[4] Pursuant to EPA correspondence letter dated October 30, 2003.

Table A6-1

Summary of Unused Banked Emission Reduction Credits In the Sacramento Nonattainment Area for 2002 Baseline		
Air District [a]	**Avg. Summer Day**	
	VOC (tpd)	**NO_X (tpd)**
Sacramento Metropolitan AQMD	2.075	1.141
Yolo-Solano AQMD	0.082	0.137
Placer County APCD	0.394	0.045
Feather River AQMD (South Sutter)	0	0
Total Unused Banked ERCs	**2.551**	**1.323**

[a] There are no ERCs for El Dorado County AQMD.

Table A6-2

Summary of Future Bankable Rice Burning Emission Reduction Credits In the Sacramento Nonattainment Area		
Air District [a]	**Avg. Summer Day**	
	VOC (tpd)	**NO_X (tpd)**
Sacramento Metropolitan AQMD	0.12	0.13
Yolo-Solano AQMD	0.32	0.35
Placer County APCD	0.18	0.20
Feather River AQMD (South Sutter)	0.29	0.32
Total Future Rice Burning ERCs	**0.91**	**1.00**

[a] There are no future bankable rice burning ERCs for El Dorado County AQMD.

The VOC and NO_X ERC totals from Table A6-1 and A6-2 were rounded up to 4 tons per day VOC and 3 tons per day NO_X and added to the emission inventory forecast years in Chapter 5, Table 5-2 and Table 5-3, respectively.

Appendix A7: 2019 VOC and NO_X Emissions Inventories

Table A7-1 contains the 2019 VOC and NO_X planning inventories. The emissions include ERCs, recently adopted control measures, Jepson Composting, and Heritage Dairy. Except for on-road vehicle category, the emissions were generated using CEPAM: NORCAL 2012 SIP Baseline Emission Projections. The 2019 on-road vehicle emissions were EMFAC2011 output without adjustments (i.e., Advanced Clean Cars, Smog Check, RFG, etc.) using VMT activity forecasts in the SACOG 2013/2016 MTIP[5].

[5] Final 2013/16 Metropolitan Transportation Improvement Program (MTIP), Amendment #1 to the MTP/SCS 2035, and Air Quality Conformity Analysis. (August 16, 2012), FHWA approval December 14, 2012.

Table A7-1. 2019 VOC and NO_X Emissions, Tons/Day

CATEGORY	VOC		CATEGORY	Nox
TOTAL EMISSIONS	99		**TOTAL EMISSIONS**	71
STATIONARY	27		STATIONARY	12
AREA-WIDE	31		AREA-WIDE	3
ON-ROAD MOTOR VEHICLES	17		ON-ROAD MOTOR VEHICLES	32
OTHER MOBILE SOURCES	24		OTHER MOBILE SOURCES	24
STATIONARY			**STATIONARY**	
Solvent/Coatings	9.3		Fuel Combustion	9.9
Petroleum Production/Marketing	6.5		Ag Irrigation Pumps	1.0
Industrial Process	4.6		Industrial Process	0.9
Waste Composting	4.4			
Other	2.5			
AREA-WIDE			**AREA-WIDE**	
Consumer Products	13.3		Residential Fuel Combustion	2.4
Architectural Coatings	9.4		Ag Burn/Other Managed Burn	0.6
Pesticides/Fertilizers	1.2			
Livestock Waste	2.9			
Ag Burn/Other Managed Burn	1.0			
Other	3.2			
ON-ROAD			**ON-ROAD**	
Automobiles	4.0		Heavy Duty Diesel Trucks	17.6
Lt/Med Duty Trucks	7.5		Lt/Med Duty Trucks	6.3
Heavy Duty Gas Trucks	1.6		Automobiles	3.0
Heavy Duty Diesel Trucks	1.3		Heavy Duty Gas Trucks	2.6
Motorcycles	2.2		Buses/Motor Homes	2.1
Buses/Motor Homes	0.2		Motorcycles	0.6
OTHER MOBILE			**OTHER MOBILE**	
Recreational Boats	11.5		Construction & Mining Equip	3.3
Equipment (Const/Ind/Farm)	2.3		Trains	6.9
Lawn & Garden Equipment	5.0		Farm Equipment	4.9
Gas Can	1.3		Boats (Rec/Ships/Harbor Craft)	3.2
Off-Road Recreational Vehicles	2.5		Comm/Ind Equipment	1.2
Trains	0.3		Aircraft	2.9
Aircraft	0.6		Oil Drilling/Workover	0.5
Ocean Vessels & Harbor Craft	0.1		Other	0.9
			Trans Refrig Units	0.5

Source: (CARB 2012), includes ERCs and emission inventory adjustments as shown in Appendix A5. Emissions, except for non-road vehicle category, were generated using CEPAM:NORCAL 2012 SIP Baseline Emission Projections. The 2019 on-road vehicle emissions were EMFAC2011 output without adjustments (i.e., Advance Clean Cars, Smog Check, etc.) using VMT activity forecasts in the SACOG 2013/2016.

Appendix A8: Tables 5-2 through 5-5 of 2009 SIP Revision

Table 5-2
Emissions of VOC[a] (tons per day)
Sacramento Nonattainment Area

	2002	2011	2014	2017	2018
TOTAL EMISSIONS	160	127	121	118	117
STATIONARY	23	23	24	25	25
AREA-WIDE	31	29	30	31	31
ON-ROAD MOTOR VEHICLES	64	38	32	28	27
OTHER MOBILE SOURCES	43	38	36	34	34
STATIONARY					
Solvent/Coatings	8.1	7.5	7.8	8.1	8.3
Petroleum Production/Marketing	4.9	5.3	5.5	5.8	5.9
Industrial Process	3.6	3.9	4.1	4.4	4.5
Waste Composting	4.1	4.1	4.1	4.1	4.1
Other	2.0	2.1	2.2	2.2	2.2
AREA-WIDE					
Consumer Products	14.8	13.8	14.3	14.9	15.1
Architectural Coatings	8.0	7.3	7.6	8.0	8.1
Pesticides	1.8	1.3	1.3	1.3	1.3
Livestock Waste	2.8	2.9	2.9	2.9	2.9
Ag Burn/Other Managed Burn	1.3	1.3	1.2	1.2	1.2
Other	2.1	2.3	2.3	2.4	2.4
ON-ROAD					
Automobiles	26.9	12.2	9.4	7.7	7.3
Lt/Med Duty Trucks	24.4	15.1	13.3	11.9	11.6
Heavy Duty Gas Trucks	6.2	3.5	2.9	2.6	2.4
Heavy Duty Diesel Trucks	3.3	3.2	2.6	2.1	2.0
Motorcycles	2.7	3.4	3.4	3.5	3.5
Buses/Motor Homes	0.5	0.3	0.2	0.2	0.2
OTHER MOBILE					
Recreational Boats	19.1	17.2	16.6	16.3	16.2
Equipment (Const/Ind/Farm)	9.4	6.1	4.9	3.9	3.7
Lawn & Garden Equipment	6.4	5.9	5.4	5.0	4.9
Gas Can	3.1	1.8	1.6	1.4	1.4
Trains	0.6	0.6	0.6	0.6	0.6
Aircraft	0.5	0.6	0.6	0.6	0.6
Other	3.8	5.4	5.9	6.5	6.7

[a] Source: CARB CEFS Version 1.06 Sacramento NAA (Rf#980), February 28, 2007, for average summer day, updated to reflect recently adopted control measures, new emission and February 2008 SACOG transportation data. Emissions from the 2009 Plan revision, Pages 5-6 and 5-7.

Table 5-3
Emissions of NO_X[a] (tons per day)
Sacramento Nonattainment Area

	2002	2011	2014	2017	2018
TOTAL EMISSIONS	196	144	123	106	101
STATIONARY	16	15	15	14	14
AREA-WIDE	3	3	3	3	3
ON-ROAD MOTOR VEHICLES	115	78	61	49	45
OTHER MOBILE SOURCES	61	48	44	40	38
STATIONARY					
Fuel Combustion	7.5	8.1	8.4	8.6	8.6
Ag Irrigation Pumps	7.9	5.9	5.2	4.5	4.3
Industrial Process	0.8	0.9	1.0	1.0	1.0
AREA-WIDE					
Residential Fuel Combustion	2.4	2.5	2.6	2.6	2.7
Ag Burn/Other Managed Burn	0.4	0.4	0.4	0.4	0.4
ON-ROAD					
Heavy Duty Diesel Trucks	54.1	46.4	35.3	26.9	24.7
Lt/Med Duty Trucks	30.4	15.0	12.1	9.7	9.1
Automobiles	19.8	7.9	5.9	4.5	4.2
Heavy Duty Gas Trucks	7.4	5.1	4.6	4.3	4.1
Buses/Motor Homes	3.1	2.7	2.4	2.2	2.1
Motorcycles	0.5	0.9	0.9	0.9	0.9
OTHER MOBILE					
Construction & Mining Equip	18.2	13.0	10.9	8.7	8.0
Trains	12.2	8.8	9.1	9.3	9.4
Farm Equipment	13.0	9.0	7.3	5.8	5.3
Boats	6.2	7.3	7.1	7.1	7.1
Comm/Ind Equipment	4.9	3.2	2.7	2.1	1.9
Trans Refrig Units	1.6	2.0	2.0	2.0	2.0
Oil Drilling/Workover	2.7	1.7	1.4	1.2	1.1
Aircraft	1.6	2.2	2.4	2.7	2.8
Other	0.9	0.8	0.8	0.9	0.9

[a] Source: CARB CEFS Version 1.06 Sacramento NAA (Rf#980), February 28, 2007, for average summer day, updated to reflect recently adopted control measures, new emission and February 2008 SACOG transportation data. Emissions from the 2009 Plan revision, Pages 5-6 and 5-7.

Table 5-4
VOC Emission Reduction Credits Added to the Emission Inventory Forecasts
Sacramento Nonattainment Area

Emissions in tons/day	**2002**	**2011**	**2014**	**2017**	**2018**
Emission Reduction Credits	---	2.6	2.6	2.6	2.6
Future Bankable Rice Burning Emission Reduction Credits	---	0.9	0.9	0.9	0.9
Total ERCs (rounded up)	**---**	**4**	**4**	**4**	**4**
Emission Inventory Forecasts	**160**	**127**	**121**	**118**	**117**
Total	**160**	**131**	**125**	**122**	**121**

Table 5-5
NO_X Emission Reduction Credits Added to the Emission Inventory Forecasts
Sacramento Nonattainment Area

Emissions in tons/day	**2002**	**2011**	**2014**	**2017**	**2018**
Emission Reduction Credits	---	1.4	1.4	1.4	1.4
Future Bankable Rice Burning Emission Reduction Credits	---	1.0	1.0	1.0	1.0
Total ERCs (rounded up)	**---**	**3**	**3**	**3**	**3**
Emission Inventory Forecasts	**196**	**144**	**123**	**106**	**101**
Total	**196**	**147**	**126**	**109**	**104**

Appendix B: Photochemical Modeling

This appendix contains summary information and documentation regarding the photochemical grid modeling performed by the California Air Resources Board in evaluating and supporting the attainment demonstration for the federal 8-hour ozone standard in the Sacramento region. Included in this appendix are the following specific modeling topics:

Selection and Characterization of Modeling Episodes.. B-2

Base Case Model Performance Evaluation B-7

Air Quality Modeling Results B-33

The following California Air Resource Board photochemical modeling documents for the Sacramento Federal Ozone Nonattainment Area provide more complete information. These documents are available at
http://www.airquality.org/notices/CAPUpdate/8hrAPandEIRWorkshopsSept2008.shtml
for reference.

A. Volume 1: Model Performance
B. Volume 2: Future Year Design Value and Carrying Capacity Calculations for the Sacramento Non-Attainment Area
C. Photochemical Modeling Protocol For Development Strategies to Attain The Federal 8-Hour Air Quality Standard in Central California
D. Modeling Emission Inventory
    a. Appendix a: Gridded Inventory Coordination Group Minutes
    b. Appendix b: Development and Vertical Distributions for Modeling Large Wildfires in the CCOS Domain
    c. Appendix c: Proposed Method to Improve Temporal Distribution Of Gridded On-road Motor Vehicle Emissions
    d. Appendix d: Development Of Version Two Of the California Integrated Transportation Network (ITN)
    e. Appendix e: ARB Letter
    f. Appendix f: Draft EMFAC Modeling Change Technical Memo
    g. Appendix g: Development of a biogenic hydrocarbon emission inventory for the Central California Ozone Study domain.
    h. Appendix h: Surrogate Cross-Reference Tables
    i. Appendix i: Sacramento Non-Attainment Area Tabular Summaries

In addition, the California Air Resources Board has established a website for documenting the technical products used to develop the State Implementation Plan (SIP). This website includes SIP modeling tools and documentation, and is located at:
http://eos.arb.ca.gov/eos/SIP_Modeling/

Selection and Characterization of Modeling Episodes

Episode Selection[1]

The evaluation of the episode days selected for air quality modeling included many local, state and federal governmental agencies, consultants, and stakeholder interest groups that participated in the Central California Ozone Study (CCOS) and other air quality technical committees formed in support of ozone SIP developments for Central California. A large body of work was produced by these study groups toward the goal of determining representative candidate episode periods for use in 8-hour ozone SIP modeling for the region. From this collective body of work, the following four episodes were identified as having the greatest potential for SIP modeling in the region:

- July 7-13, 1999 (captured with routine state and local measurements)
- July 29-August 2, 2000 (CCOS-studied episode)
- September 17-21, 2000 (CCOS-studied episode)
- August 8-17, 2002 (captures with routine state and local measurements)

Due to time constraints and based on model performance issues expressed by study efforts for the two later episodes, the first two episodes (July 7-13, 1999 and July 29-August 2, 2000) were determined to be the most adequate for the initial round of 8-hour ozone SIP attainment planning. Brief summaries of the two episodes selected for SIP modeling are included in the next section, Characterization of Selected Modeling Episodes.

With regard to the two potential episodes that were dropped from consideration, CCOS sponsored a project that was focused on developing the third episode (September 17-21, 2000) while the Sacramento Metropolitan Air Quality Management District sponsored a project to develop the fourth episode (August 8-17, 2002). As indicated above, achieving adequate model performance for both of these periods was problematic.

Characterization of Modeling Episodes

The following meteorological characterizations of large-scale synoptic weather patterns include two parameters which historically have correlated well with ozone formation in California. The measurements of 500 mb heights at a fixed location are a general indicator of behavior showing the sequence of pressure ridges and troughs. The 850 mb temperature is a measure of large-scale subsidence which produces stable layers in the atmosphere and limits vertical dispersion of air pollutants. As an example, at the Oakland NWS station during June-September 2000, the 500 mb heights ranged between 5,650 to 6,000 meters and the 850 mb temperatures ranged between 7 to

[1] “Photochemical Modeling Protocol for Developing Strategies to Attain the Federal 8-Hour Ozone Air Quality Standard in Central California” (California Air Resources Board, May 22, 2007).

27°C. In general, a strong positive correlation was evident between daily peak ozone concentrations in Central California and 850 mb temperatures and 500 mb heights.[2]

September 17-21, 2000 Ozone Episode

The September 17-21, 2000 ozone episode was characterized by a high pressure ridge moving into the West Coast and joining with the remnants of a persistent Four Corners high. The 500 mb height peaked at 5,970 m on September 18, and the 850 mb temperature reached 26°C on September 19 at the Oakland NWS station.[3] Peak 8-hour ozone concentrations in the central and southern parts of the San Joaquin Valley exceeded 100 ppb at many monitoring sites and rose as high as 120 ppb during September 18-20. The Bay Area did not experience any ozone exceedances during this episode, and the Sacramento region measured moderate 8-hour ozone exceedances on September 20 at multiple sites with a high of 100 ppb.

This ozone episode was evaluated by a team of modeling consultants headed by Alpine Geophysics and funded as a CCOS project. They prepared refined emissions, meteorological, and photochemical model input files and performed a base case simulation for the episode. There were substantial performance problems with the base case which included a systematic and large under prediction of ozone concentrations. Thus, the consultants were unsuccessful in developing a SIP-quality ozone modeling episode that met EPA performance goals.[4]

August 8-17, 2002 Ozone Episode

This episode is characterized by an Eastern Pacific high. The wind speeds and directions and surface temperatures at both Bethel Island and Sacramento are characteristic of more typical summer day values when an Eastern Pacific high is present.[5] The Bay Area experienced only limited ozone exceedances at Livermore during this episode. However, there were significant widespread 8-hour ozone exceedances throughout the Sacramento region and much of the San Joaquin Valley during most days of this episode. 8-hour ozone concentrations at Cool peaked at 137 ppb on August 14. San Joaquin Valley 8-hour ozone values were highest at Merced with 125 ppb on August 14 and at Arvin with 120 ppb on August 9.

The August 8-17, 2002 ozone episode was pursued by the Sacramento Air District under independent contract with the Desert Research Institute (DRI)[6]. DRI conducted

[2] "Characterization of the CCOS 2000 Measurement Period" (Lehrman, et al., 2003, p. 2-1 to 2-3).
[3] "Characterization of the CCOS 2000 Measurement Period" (Lehrman, et al., 2001) Interim Report.
[4] "Evaluation of the 16-20 September 2000 Ozone Episode for Use in 1-Hr SIP Development in the California Central Valley" (Alpine Geophysics, Tesche et al., February 15, 2004).
[5] "Data Analysis and Episode Selection for SIP Modeling" (Desert Research Institute, September 9, 2003).
[6] "Photochemical Modeling Protocol for Developing Strategies to Attain the Federal 8-Hour Ozone Air Quality Standard in Central California" (California Air Resources Board, May 22, 2007).

meteorological analyses which indicated significant potential transport from the Bay Area into the Sacramento region.[7] However, DRI was not able to achieve adequate model performance with the episode, rendering it unusable for attainment demonstration modeling. This episode was found not to be representative due to the large number of wildfires within the domain and an especially large wildfire in southern Oregon. The smoke and presumably ozone precursors flowed along the coast and some of the smoke plume penetrated into central California near the San Francisco Bay Area.[8] Undoubtedly, emissions from the wildfire influenced ozone levels at many monitors, meaning that these days were not reflective of typical summertime high-ozone days, when precursor emissions are dominated by anthropogenic emissions.[9]

July 29-August 2, 2000 Ozone Modeling Episode

The summer 2000 ozone modeling episode includes 5 days from July 29 to August 2. The start of this episode was characterized by a typical high pressure system centered over the Four Corners area (Utah, Arizona, Colorado, and New Mexico). The relatively large high pressure ridge slowly migrated west and became centered near Reno, Nevada by July 31, creating meteorological conditions conducive to high ozone formation in Central California. The 850 mb temperature reached 27°C, and the 500 mb height peaked at 5,970 m at the Oakland NWS station.[10]

The high pressure system resulted in stable atmospheric layers with limited vertical mixing. Maximum mixing heights of 800-1100 meters were estimated from rawinsonde and ozonesonde data at Granite Bay.[11] Relatively calm to light surface daytime winds varying from the north, west, and southwest were measured in the lower Sacramento Valley region during the beginning and middle of the episode. The surface daytime winds transitioned to mainly delta breezes from the south and southwest near the end of the episode.[12] Maximum surface temperatures in Sacramento were hot throughout the episode and peaked at 40°C (or 104°F) on July 31 (see the following table).

[7] "Data Analysis and Episode Selection for SIP Modeling" (Desert Research Institute, September 9, 2003).
[8] "State Implementation Plan (SIP) Modeling" (Desert Research Institute, November 15, 2004).
[9] California Air Resources Board staff response regarding public comments on episode selection discussion. November 2008 correspondence to SMAQMD.
[10] "Characterization of the CCOS 2000 Measurement Period" (Lehrman, et al., 2003, p. 2-6).
[11] Ibid., p. 3-67.
[12] Surface daytime wind descriptions based on observed wind measurements at Rocklin, Folsom, Auburn, Cool, Sacramento-Del Paso Manor, Roseville, Sloughhouse, and Placerville.

Table B-1
Maximum Surface Temperatures in Sacramento
During the Jul-Aug 2000 Modeling Episode

Max. Temperature	July 29	July 30	July 31	August 1	August 2
Sac. Exec. Airport	37°C (98°F)	37°C (99°F)	40°C (104°F)	39°C (102°F)	38°C (100°F)

Ozone-conducive conditions were prevalent throughout the episode, but the highest ozone readings in the Sacramento region occurred on the last two days of the episode. On August 1, 8-hour ozone concentrations peaked in the southern part of the nonattainment area at Sloughhouse (108 ppb). On August 2, the maximum 8-hour ozone readings were measured in the northeast part of the region at Auburn (107 ppb) and Grass Valley (113 ppb). See the following table of selected high ozone sites:

Table B-2
Maximum 8-Hour Ozone in the Sacrament Region
During the Jul-Aug 2000 Modeling Episode

Max. 8-Hr Ozone (ppb)	July 29	July 30	July 31	August 1	August 2
Auburn (Placer Co.)	**86**	80	81	**95**	**107**
Cool (El Dorado Co.)	**94**	**87**	**89**	**99**	**103**
Grass Valley (Nevada Co.)	**86**	**86**	73	**94**	**113**
Sac-Del Paso Manor (Sac. Co.)	**92**	**93**	74	**100**	79
Sloughhouse (Sac. Co.)	**95**	**91**	82	**108**	**91**

Federal 8-hour ozone exceedances (>84 ppb) in **bold**.

July 9-13, 1999 Ozone Modeling Episode

The July 1999 ozone modeling episode includes 5 days from July 9 to 13. This episode is characterized by a much broader high pressure system than the summer 2000 episode. The high pressure system encompassed the Four Corners area, the Pacific Northwest region, and the Eastern Pacific Ocean, causing meteorological conditions conducive to high ozone formation in Central and Northern California. The 850 mb temperature peaked at 27°C on July 12, and the 500 mb height reached 5,940-5,950 m on July 10 to 12 at the Oakland NWS station.[13]

Relatively calm to light surface daytime winds varying mainly from the west and southwest were measured in the lower Sacramento Valley region during the episode. Sometimes in the morning, the surface winds flowed from the northwest direction as

[13] "Modeling Protocol - Development of a Photochemical Modeling System to Support the Bay Area Air Quality Management District's 2004 State Implementation Plan" (ENVIRON, et al., 2002, p. 2-48).

well.[14] Maximum surface temperatures in Sacramento rose steadily from July 9, peaking at 42°C (or 107°F) on July 12 (see the following table).

Table B-3
Maximum Surface Temperatures in Sacramento
During the July 1999 Modeling Episode

Max. Temperature	July 9	July 10	July 11	July 12	July 13
Sac. Exec. Airport	34°C (93°F)	36°C (97°F)	39°C (102°F)	42°C (107°F)	35°C (96°F)

High surface 8-hour ozone readings were fairly widespread throughout the Sacramento region during the episode. On July 9, maximum 8-hour ozone occurred in the eastern portion of the nonattainment area at Cool (116 ppb), Placerville (110 ppb), and Folsom (109 ppb). On July 10, 8-hour ozone concentrations were high in most of the Sacramento region at Folsom (129 ppb), Placerville (118 ppb), Cool (113 ppb), Sacramento-Del Paso Manor (110 ppb), and Sloughhouse (107 ppb). On July 11, the same areas continued to monitor 8-hour ozone exceedances with maximums at Folsom (123 ppb), Cool (117 ppb), Sloughhouse (113 ppb), and Roseville (113). On July 12, ozone declined in most of the nonattainment area, but still exceeded the 8-hour standard with maximum readings in the southern downwind areas at Jackson (105 ppb) and Sloughhouse (103 ppb) and in the western area at Vacaville (106 ppb). On the last day of the episode, 8-hour ozone concentrations were recorded just above the federal standard with a high of 91 ppb at Auburn. See the following table of selected high ozone sites:

Table B-4
Maximum 8-Hour Ozone in the Sacramento Region
During the July 1999 Modeling Episode

Max. 8-Hr Ozone (ppb)	July 9	July 10	July 11	July 12	July 13
Auburn (Placer Co.)	**104**	**102**	**106**	**90**	**91**
Cool (El Dorado Co.)	**116**	**113**	**117**	**98**	83
Folsom (Sac. Co.)	**109**	**129**	**123**	**101**	**85**
Jackson (Amador Co.)	**89**	**107**	**101**	**105**	**87**
Placerville (El Dorado Co.)	**110**	**118**	**104**	**96**	81
Roseville (Placer Co.)	**86**	**106**	**113**	**88**	**86**
Sac-Del Paso Manor (Sac. Co.)	77	**110**	**107**	**95**	77
Sloughhouse (Sac. Co.)	**86**	**107**	**113**	**103**	81
Vacaville (Solano Co.)	69	81	**102**	**106**	59

Federal 8-hour ozone exceedances (>84 ppb) in **bold**.

[14] Surface daytime wind descriptions based on observed wind measurements at Rocklin, Folsom, Elk Grove, Roseville, Sloughhouse, and Placerville.

Base Case Model Performance Evaluation

EPA modeling guidance[1] recommends the model performance evaluation should compare hourly ozone observations and predictions as well as 8-hour daily maxima observations and predictions over the episode days (excluding ramp-up days). The ozone data should be evaluated for all data pairs in which the observed concentrations are above 60 ppb, and for all data pairs without any minimum threshold. At a minimum, statistical calculations should be performed for: 1) mean normalized bias (MNB), 2) mean normalized gross error (MNGE), and 3) average peak prediction bias and error. The summary statistics should be calculated for individual days averaged over all sites and for individual sites averaged over all days, and then aggregated into meaningful subregions or subperiods.

EPA modeling guidance does not assign an acceptance criteria level that distinguishes between adequate and inadequate model performance. Instead, EPA recommends that a qualitative weight-of-evidence approach consisting of a variety of performance tests be used to determine whether a particular modeling application is valid for assessing the future attainment status of an area.

CARB conducted a model performance analysis of the photochemical modeling used in support of the attainment demonstration for the federal 8-hour ozone air quality standard SIP for Central California. Based on the statistical comparisons between observed and predicted ozone data, the base case modeling scenarios were determined to be performing adequately overall in the Sacramento region.

Various summary base case model performance statistics tables, additional base case model performance evaluations, and modeling documentation are provided in this appendix.

- Summary of Base Case Model Performance Evaluation for Sacramento Region
  - Table B-5: July 9 – July 13, 1999 1-Hour Ozone
  - Table B-6: July 9 – July 13, 1999 8-Hour Ozone
  - Table B-7: July 29 – August 2, 2000 1-Hour Ozone
  - Table B-8: July 29 – August 2, 2000 8-Hour Ozone

- Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
  - Table B-9: July 9, 1999 1-Hour Ozone
  - Table B-10: July 10, 1999 1-Hour Ozone
  - Table B-11: July 11, 1999 1-Hour Ozone
  - Table B-12: July 12, 1999 1-Hour Ozone
  - Table B-13: July 13, 1999 1-Hour Ozone

  - Table B-14: July 9, 1999 8-Hour Ozone
  - Table B-15: July 10, 1999 8-Hour Ozone

[1] "Guidance on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hour Ozone NAAQS" (EPA, October 2005, p. 96).

- Table B-16: July 11, 1999 8-Hour Ozone
- Table B-17: July 12, 1999 8-Hour Ozone
- Table B-18: July 13, 1999 8-Hour Ozone
- Table B-19: July 9-13, 1999 8-Hour Ozone

- Table B-20: July 29, 2000 1-Hour Ozone
- Table B-21: July 30, 2000 1-Hour Ozone
- Table B-22: July 31, 2000 1-Hour Ozone
- Table B-23: August 1, 2000 1-Hour Ozone
- Table B-24: August 2, 2000 1-Hour Ozone

- Table B-25: July 29, 2000 8-Hour Ozone
- Table B-26: July 30, 2000 8-Hour Ozone
- Table B-27: July 31, 2000 8-Hour Ozone
- Table B-28: August 1, 2000 8-Hour Ozone
- Table B-29: August 2, 2000 8-Hour Ozone
- Table B-30: Jul 29-Aug 2, 2000 8-Hour Ozone

Table B-5
Base Case Model Performance Evaluation for Sacramento Region
Site Comparisons Between Observed and Modeled 1-Hour Ozone
July 9 – July 13, 1999 Episode

Statistical Measure – All Sites	Jul 9	Jul 10	Jul 11	Jul 12	Jul 13
60 ppb observed threshold					
Mean Bias (ppb)	-3	-9	-10	-9	-5
Mean Gross Error (ppb)	10	15	12	12	13
Mean Normalized Bias (%)	-3	-9	-11	-10	-6
Mean Normalized Gross Error (%)	12	16	14	14	17
Observed Peak Site Conc. (ppb)	127	147	137	140	103
Peak Site Prediction Ratio	0.99	0.84	1.01	0.85	1.00
Region Peak Prediction Ratio	1.05	0.94	1.07	0.89	1.17
Number of Values Used (site-hrs)	157	199	224	218	160

Table B-6
Base Case Model Performance Evaluation for Sacramento Region
Site Comparisons Between Observed and Modeled 8-Hour Maximum Ozone
July 9 – July 13, 1999 Episode

Statistical Measure – All Sites	Jul 9	Jul 10	Jul 11	Jul 12	Jul 13
60 ppb observed threshold					
Mean Bias (ppb)	3	-6	-7	-10	3
Mean Gross Error (ppb)	8	13	10	11	11
Mean Normalized Bias (%)	5	-5	-7	-11	6
Mean Normalized Gross Error (%)	9	13	10	12	14
Observed Peak Site Conc. (ppb)	116	129	124	107	91
Peak Site Prediction Ratio	0.96	0.87	1.02	1.00	1.04
Region Peak Prediction Ratio	1.02	0.93	1.06	1.03	1.12
Number of Values Used (sites)	16	17	17	16	14

Table B-7
Base Case Model Performance Evaluation for Sacramento Region
Site Comparisons Between Observed and Modeled 1-Hour Ozone
July 29 – August 2, 2000 Episode

Statistical Measure – All Sites	Jul 29	Jul 30	Jul 31	Aug 1	Aug 2
60 ppb observed threshold					
Mean Bias (ppb)	-6	5	4	5	2
Mean Gross Error (ppb)	11	11	10	11	14
Mean Normalized Bias (%)	-6	7	6	6	4
Mean Normalized Gross Error (%)	14	15	13	14	17
Observed Peak Site Conc. (ppb)	118	121	103	133	121
Peak Site Prediction Ratio	1.07	1.04	1.19	1.09	1.04
Region Peak Prediction Ratio	1.11	1.09	1.41	1.15	1.07
Number of Values Used (site-hrs)	135	152	130	141	138

Table B-8
Base Case Model Performance Evaluation for Sacramento Region
Site Comparisons Between Observed and Modeled 8-Hour Maximum Ozone
July 29 – August 2, 2000 Episode

Statistical Measure – All Sites	Jul 29	Jul 30	Jul 31	Aug 1	Aug 2
60 ppb observed threshold					
Mean Bias (ppb)	-3	8	7	8	9
Mean Gross Error (ppb)	10	10	9	9	12
Mean Normalized Bias (%)	-2	12	10	10	13
Mean Normalized Gross Error (%)	11	13	12	11	17
Observed Peak Site Conc. (ppb)	97	93	89	109	107
Peak Site Prediction Ratio	1.03	1.15	1.13	1.05	0.98
Region Peak Prediction Ratio	1.07	1.21	1.32	1.09	1.00
Number of Values Used (sites)	15	15	15	15	16

Table B-9
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 9, 1999 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 190 (07/09) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

			Peak Concentrations						Comparisons with Observations				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	157	12.7	19	12.5	16	-3	0.99	-0.3	1.0	-0.03	0.12	0.75
	Subregional Peak:				13.3	17	-2	1.05	(at 84 x120) NSte: 3187; NSPk: 12.4				
2123	North Highlands-Blackf	1	6.6	16	10.1	16	0	1.53	3.5	3.5	0.53	0.53	-99.00
2143	Davis-UCD Campus	5	9.2	17	9.2	18	1	1.00	0.9	0.9	0.12	0.12	0.04
2731	Sacramento-Del Paso Ma	6	10.0	17	9.7	16	-1	0.97	0.1	1.2	0.03	0.16	0.18
2848	Pleasant Grove-4 miles	6	9.6	16	9.3	17	1	0.97	0.7	0.8	0.10	0.11	0.82
2891	Auburn-Dewitt-C Avenue	20	11.1	19	9.4	18	-1	0.85	-1.6	1.6	-0.19	0.19	0.89
2956	Roseville-N Sunrise Bl	10	9.7	15	10.4	17	2	1.08	0.6	0.8	0.07	0.09	0.94
2977	Elk Grove-Bruceville R	7	9.4	16	8.4	16	0	0.90	0.1	0.7	0.02	0.09	0.80
3002	Colfax-City Hall	16	10.0	19	8.6	18	-1	0.86	-0.4	0.5	-0.05	0.06	0.90
3008	Rocklin-Rocklin Road	10	10.3	16	10.3	18	2	1.00	0.1	0.6	0.01	0.07	0.86
3011	Sacramento-T Street	4	8.5	16	8.0	15	-1	0.94	-0.7	0.7	-0.09	0.09	0.11
3017	Placerville-Gold Nugge	20	12.7	19	12.5	17	-2	0.98	-0.5	1.0	-0.06	0.11	0.87
3155	Vacaville-Elmira Road	8	7.6	18	8.9	17	-1	1.18	0.7	1.0	0.09	0.14	0.79
3187	Folsom-Natoma Street	9	12.7	16	12.5	16	0	0.99	-0.3	0.6	-0.03	0.06	0.93
3196	Cool-Highway 193	16	12.1	15	10.6	18	3	0.88	-1.6	1.6	-0.17	0.17	0.92
3209	Sloughhouse	8	10.0	17	9.2	15	-2	0.92	-0.2	0.9	-0.01	0.10	0.59
3223	Sacramento-3801 Airpor	5	8.1	16	9.3	15	-1	1.15	1.2	1.2	0.17	0.17	0.50
3249	Woodland-Gibson Road	6	9.0	18	9.5	16	-2	1.07	0.3	0.8	0.04	0.11	0.48

Table B-10
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 10, 1999 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 191 (07/10) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
		Peak Concentrations							Comparisons with Observations				
0006	SubRegion	199	14.7	16	12.4	14	-2	0.84	-0.9	1.5	-0.09	0.16	0.56
	Subregional Peak:				13.9	15	-1	0.94	(at 83 x115) NSte: 3209; NSPk: 12.0				
2123	North Highlands-Blackf	6	8.8	15	9.0	16	1	1.02	0.8	0.9	0.12	0.13	-0.33
2143	Davis-UCD Campus	8	10.1	15	10.0	15	0	0.99	0.4	0.5	0.05	0.06	0.86
2731	Sacramento-Del Paso Ma	10	13.1	14	10.7	17	3	0.81	-0.5	1.3	-0.03	0.12	0.74
2848	Pleasant Grove-4 miles	7	9.8	14	10.1	18	4	1.03	0.5	1.3	0.09	0.17	-0.84
2891	Auburn-Dewitt-C Avenue	21	10.7	15	8.6	14	-1	0.81	-1.9	1.9	-0.22	0.22	0.79
2956	Roseville-N Sunrise Bl	11	11.7	17	9.1	19	2	0.78	-1.4	1.6	-0.13	0.15	0.45
2977	Elk Grove-Bruceville R	8	11.8	16	10.0	17	1	0.85	-0.1	1.4	0.03	0.15	0.73
3002	Colfax-City Hall	13	9.7	19	7.8	14	-5	0.80	-0.7	0.8	-0.09	0.09	0.85
3008	Rocklin-Rocklin Road	13	11.9	18	8.7	12	-6	0.73	-1.8	1.8	-0.19	0.19	0.82
3011	Sacramento-T Street	8	10.7	14	9.9	16	2	0.93	0.5	0.8	0.08	0.11	0.81
3017	Placerville-Gold Nugge	22	12.9	19	9.4	16	-3	0.73	-2.1	2.1	-0.20	0.20	0.78
3155	Vacaville-Elmira Road	9	9.3	15	9.4	14	-1	1.01	-0.4	1.1	-0.05	0.15	0.64
3187	Folsom-Natoma Street	13	14.7	16	10.6	13	-3	0.72	-2.0	2.2	-0.15	0.18	0.74
3196	Cool-Highway 193	22	12.4	19	8.8	14	-5	0.71	-2.4	2.4	-0.26	0.26	0.90
3209	Sloughhouse	12	12.8	14	12.4	14	0	0.97	0.5	0.8	0.07	0.09	0.90
3223	Sacramento-3801 Airpor	8	10.0	14	10.6	16	2	1.06	1.3	1.4	0.18	0.19	0.61
3249	Woodland-Gibson Road	8	9.9	15	10.3	15	0	1.04	0.5	0.5	0.06	0.06	0.87

Table B-11
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 11, 1999 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 192 (07/11) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

			Peak Concentrations						Comparisons with Observations				
Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
0006	SubRegion	224	13.7	16	13.9	16	0	1.01	-1.0	1.2	-0.11	0.14	0.78
	Subregional Peak:				14.7	15	-1	1.07	(at 80 x117) NSte: 3187; NSPk: 13.8				
2123	North Highlands-Blackf	5	8.3	13	8.3	11	-2	1.00	0.4	0.5	0.06	0.07	0.79
2143	Davis-UCD Campus	10	9.7	14	9.1	16	2	0.94	-0.3	0.7	-0.02	0.09	0.86
2731	Sacramento-Del Paso Ma	12	12.1	14	11.3	13	-1	0.93	-0.4	0.5	-0.04	0.05	0.96
2848	Pleasant Grove-4 miles	7	8.1	12	7.6	11	-1	0.93	0.0	0.5	0.01	0.08	-0.52
2891	Auburn-Dewitt-C Avenue	20	13.3	18	11.4	19	1	0.86	-1.5	1.5	-0.16	0.17	0.84
2956	Roseville-N Sunrise Bl	17	12.8	15	10.9	18	3	0.85	-1.8	1.9	-0.21	0.22	0.80
2977	Elk Grove-Bruceville R	10	10.1	12	8.7	16	4	0.86	-1.0	1.1	-0.10	0.11	0.55
3002	Colfax-City Hall	12	10.5	20	9.8	20	0	0.94	-0.1	0.8	0.00	0.10	0.58
3008	Rocklin-Rocklin Road	13	12.8	15	11.6	18	3	0.91	-1.3	1.5	-0.12	0.14	0.70
3011	Sacramento-T Street	10	9.6	13	8.9	12	-1	0.93	-0.4	0.7	-0.04	0.09	0.87
3017	Placerville-Gold Nugge	19	11.4	18	11.4	16	-2	1.00	-1.5	1.8	-0.16	0.20	0.59
3155	Vacaville-Elmira Road	12	12.1	16	9.7	17	1	0.79	-1.6	1.6	-0.16	0.17	0.87
3187	Folsom-Natoma Street	20	13.7	16	13.9	16	0	1.01	-0.7	1.1	-0.10	0.14	0.94
3196	Cool-Highway 193	20	13.5	18	11.4	18	0	0.85	-1.5	1.6	-0.15	0.16	0.90
3209	Sloughhouse	18	13.1	14	11.4	16	2	0.87	-1.2	1.4	-0.15	0.16	0.88
3223	Sacramento-3801 Airpor	8	9.2	13	8.5	12	-1	0.92	-0.4	0.7	-0.04	0.08	0.14
3249	Woodland-Gibson Road	11	9.4	17	8.3	17	0	0.88	-0.6	0.6	-0.06	0.07	0.87

Table B-12
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 12, 1999 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 193 (07/12) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
0006	SubRegion	218	14.0	15	11.9	13	-2	0.85	-0.9	1.2	-0.10	0.14	0.68
	Subregional Peak:				12.5	15	0	0.89	(at 67 x107) NSte: 3155; NSPk: 9.7				
2123	North Highlands-Blackf	2	6.9	11	7.1	11	0	1.03	0.4	0.4	0.06	0.06	-99.00
2143	Davis-UCD Campus	9	11.7	17	7.9	18	1	0.68	-1.8	1.9	-0.18	0.19	-0.60
2731	Sacramento-Del Paso Ma	12	11.1	18	8.9	19	1	0.80	-1.2	1.3	-0.12	0.14	0.64
2848	Pleasant Grove-4 miles	7	8.8	15	7.0	16	1	0.79	-1.0	1.1	-0.12	0.14	0.76
2891	Auburn-Dewitt-C Avenue	21	9.9	17	8.4	16	-1	0.84	-1.2	1.2	-0.15	0.15	0.81
2956	Roseville-N Sunrise Bl	14	10.8	19	7.8	20	1	0.72	-1.2	1.3	-0.14	0.15	0.69
2977	Elk Grove-Bruceville R	11	10.8	17	10.9	17	0	1.01	0.2	1.0	0.04	0.12	0.48
3002	Colfax-City Hall	14	8.1	19	8.0	18	-1	0.99	-0.1	0.3	-0.02	0.05	0.89
3008	Rocklin-Rocklin Road	16	10.4	19	8.1	14	-5	0.78	-1.3	1.3	-0.15	0.15	0.80
3011	Sacramento-T Street	10	9.7	18	8.4	18	0	0.86	-0.9	1.3	-0.10	0.16	0.17
3017	Placerville-Gold Nugge	18	10.3	16	9.6	17	1	0.93	-0.6	0.9	-0.07	0.11	0.82
3155	Vacaville-Elmira Road	11	14.0	15	9.8	17	2	0.70	-1.7	2.0	-0.14	0.19	0.66
3187	Folsom-Natoma Street	19	11.1	11	9.3	13	2	0.83	-1.1	1.3	-0.12	0.14	0.87
3196	Cool-Highway 193	21	10.5	11	8.9	13	2	0.85	-1.3	1.3	-0.16	0.16	0.91
3209	Sloughhouse	14	11.0	15	11.9	13	-2	1.08	0.2	0.7	0.02	0.08	0.89
3223	Sacramento-3801 Airpor	10	9.5	18	8.7	19	1	0.91	-0.4	0.9	-0.04	0.12	0.14
3249	Woodland-Gibson Road	9	11.0	18	7.5	17	-1	0.68	-1.3	1.5	-0.12	0.17	0.73

Table B-13
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 13, 1999 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 194 (07/13) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	160	10.3	14	10.3	17	3	1.00	-0.5	1.3	-0.06	0.17	0.33
	Subregional Peak:				12.1	14	0	1.17	(at 86 x115) NSte: 3017; NSPk: 9.1				
2143	Davis-UCD Campus	5	7.8	14	8.1	14	0	1.04	1.0	1.0	0.14	0.14	0.45
2731	Sacramento-Del Paso Ma	6	9.2	16	9.9	18	2	1.08	0.8	1.0	0.12	0.13	0.22
2848	Pleasant Grove-4 miles	2	6.4	15	7.6	15	0	1.19	1.2	1.2	0.19	0.19	-99.00
2891	Auburn-Dewitt-C Avenue	20	9.6	16	7.9	14	-2	0.83	-1.6	1.6	-0.19	0.19	0.46
2956	Roseville-N Sunrise Bl	11	9.8	14	9.1	18	4	0.93	-1.0	1.4	-0.10	0.17	0.21
2977	Elk Grove-Bruceville R	8	8.6	15	10.1	16	1	1.18	1.0	1.0	0.13	0.13	0.54
3002	Colfax-City Hall	12	7.3	15	7.7	16	1	1.05	0.1	0.3	0.02	0.05	0.74
3008	Rocklin-Rocklin Road	13	10.3	14	8.6	18	4	0.84	-1.4	1.5	-0.16	0.17	0.61
3011	Sacramento-T Street	4	7.6	15	9.1	17	2	1.20	1.5	1.5	0.21	0.21	-0.37
3017	Placerville-Gold Nugge	23	8.9	1	9.1	13	12	1.03	-1.5	1.7	-0.20	0.22	0.64
3155	Vacaville-Elmira Road	4	7.1	15	9.2	13	-2	1.30	1.8	1.8	0.26	0.26	0.14
3187	Folsom-Natoma Street	15	9.2	17	9.7	12	-5	1.06	-0.5	1.2	-0.07	0.16	0.70
3196	Cool-Highway 193	18	8.9	15	8.0	15	0	0.90	-1.6	1.6	-0.20	0.20	0.43
3209	Sloughhouse	9	9.2	17	10.3	17	0	1.12	0.8	1.2	0.09	0.16	0.80
3223	Sacramento-3801 Airpor	5	8.0	16	9.8	17	1	1.23	1.4	1.4	0.20	0.20	0.34
3249	Woodland-Gibson Road	5	8.9	15	7.8	17	2	0.88	-0.5	0.9	-0.06	0.11	-1.00

Table B-14
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 9, 1999 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 190 (07/09) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	16	11.6	12	11.2	13	1	0.96	0.3	0.8	0.05	0.09	-42.79
	Subregional Peak:				11.8	13	1	1.02	(at 85 x120) NSte: 3017; NSPk: 11.0				
2143	Davis-UCD Campus	1	7.1	12	8.5	13	1	1.21	1.5	1.5	0.21	0.21	
2731	Sacramento-Del Paso Ma	1	7.8	13	8.2	12	-1	1.05	0.4	0.4	0.05	0.05	
2848	Pleasant Grove-4 miles	1	7.3	12	8.5	12	0	1.16	1.2	1.2	0.16	0.16	
2891	Auburn-Dewitt-C Avenue	1	10.5	14	9.0	12	-2	0.86	-1.4	1.4	-0.14	0.14	
2956	Roseville-N Sunrise Bl	1	8.6	12	9.5	12	0	1.10	0.8	0.8	0.10	0.10	
2977	Elk Grove-Bruceville R	1	7.5	12	7.7	12	0	1.03	0.3	0.3	0.03	0.03	
3002	Colfax-City Hall	1	8.9	13	8.3	13	0	0.93	-0.6	0.6	-0.07	0.07	
3008	Rocklin-Rocklin Road	1	9.4	13	9.5	12	-1	1.02	0.2	0.2	0.02	0.02	
3011	Sacramento-T Street	1	6.7	13	7.1	12	-1	1.05	0.4	0.4	0.05	0.05	
3017	Placerville-Gold Nugge	1	11.0	13	11.2	13	0	1.01	0.1	0.1	0.01	0.01	
3155	Vacaville-Elmira Road	1	7.0	13	7.8	12	-1	1.12	0.8	0.8	0.12	0.12	
3187	Folsom-Natoma Street	1	10.9	13	10.8	12	-1	0.99	-0.1	0.1	-0.01	0.01	
3196	Cool-Highway 193	1	11.6	12	10.0	12	0	0.86	-1.6	1.6	-0.14	0.14	
3209	Sloughhouse	1	8.7	13	8.5	12	-1	0.98	-0.1	0.1	-0.02	0.02	
3223	Sacramento-3801 Airpor	1	6.4	13	8.3	12	-1	1.28	1.8	1.8	0.28	0.28	
3249	Woodland-Gibson Road	1	7.6	12	8.2	12	0	1.09	0.7	0.7	0.09	0.09	

Table B-15
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 10, 1999 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 191 (07/10) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	17	12.9	11	11.2	12	1	0.87	-0.6	1.3	-0.05	0.13	-76.79
	Subregional Peak:				12.1	12	1	0.93	(at 82 x115) NSte: 3209; NSPk: 11.0				
2123	North Highlands-Blackf	1	7.9	11	9.2	12	1	1.16	1.2	1.2	0.16	0.16	
2143	Davis-UCD Campus	1	8.8	12	9.4	11	-1	1.08	0.7	0.7	0.08	0.08	
2731	Sacramento-Del Paso Ma	1	11.1	12	10.2	12	0	0.92	-0.9	0.9	-0.08	0.08	
2848	Pleasant Grove-4 miles	1	8.1	11	9.0	12	1	1.11	0.9	0.9	0.11	0.11	
2891	Auburn-Dewitt-C Avenue	1	10.3	14	8.3	12	-2	0.81	-2.0	2.0	-0.19	0.19	
2956	Roseville-N Sunrise Bl	1	10.7	12	8.6	12	0	0.80	-2.1	2.1	-0.20	0.20	
2977	Elk Grove-Bruceville R	1	9.3	12	9.2	12	0	0.99	-0.1	0.1	-0.01	0.01	
3002	Colfax-City Hall	1	8.6	13	7.7	12	-1	0.89	-0.9	0.9	-0.11	0.11	
3008	Rocklin-Rocklin Road	1	10.7	12	8.5	11	-1	0.79	-2.2	2.2	-0.21	0.21	
3011	Sacramento-T Street	1	8.8	12	9.3	12	0	1.06	0.5	0.5	0.06	0.06	
3017	Placerville-Gold Nugge	1	11.9	13	9.1	12	-1	0.77	-2.7	2.7	-0.23	0.23	
3155	Vacaville-Elmira Road	1	8.2	12	8.4	10	-2	1.01	0.1	0.1	0.01	0.01	
3187	Folsom-Natoma Street	1	12.9	11	9.8	12	1	0.76	-3.1	3.1	-0.24	0.24	
3196	Cool-Highway 193	1	11.4	12	8.5	11	-1	0.75	-2.8	2.8	-0.25	0.25	
3209	Sloughhouse	1	10.7	12	11.2	12	0	1.05	0.5	0.5	0.05	0.05	
3223	Sacramento-3801 Airpor	1	8.5	12	9.8	11	-1	1.16	1.4	1.4	0.16	0.16	
3249	Woodland-Gibson Road	1	9.0	12	9.6	11	-1	1.07	0.7	0.7	0.07	0.07	

Table B-16
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 11, 1999 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 192 (07/11) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			Peak Concentrations						Comparisons with Observations				
Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
0006	SubRegion	17	12.4	11	12.6	11	0	1.02	-0.7	1.0	-0.07	0.10	-47.81
	Subregional Peak:				13.1	11	0	1.06	(at 80 x117) NSte: 3187; NSPk: 12.7				
2123	North Highlands-Blackf	1	6.9	8	8.2	12	4	1.20	1.4	1.4	0.20	0.20	
2143	Davis-UCD Campus	1	9.2	11	8.6	11	0	0.94	-0.6	0.6	-0.06	0.06	
2731	Sacramento-Del Paso Ma	1	10.7	11	10.3	11	0	0.96	-0.5	0.5	-0.04	0.04	
2848	Pleasant Grove-4 miles	1	7.2	10	7.5	11	1	1.04	0.3	0.3	0.04	0.04	
2891	Auburn-Dewitt-C Avenue	1	10.6	14	9.0	13	-1	0.84	-1.7	1.7	-0.16	0.16	
2956	Roseville-N Sunrise Bl	1	11.3	12	9.5	12	0	0.83	-1.9	1.9	-0.17	0.17	
2977	Elk Grove-Bruceville R	1	9.7	11	8.5	12	1	0.88	-1.1	1.1	-0.12	0.12	
3002	Colfax-City Hall	1	8.7	13	8.6	16	3	1.00	0.0	0.0	0.00	0.00	
3008	Rocklin-Rocklin Road	1	11.2	12	9.6	12	0	0.86	-1.5	1.5	-0.14	0.14	
3011	Sacramento-T Street	1	8.8	11	8.1	11	0	0.92	-0.7	0.7	-0.08	0.08	
3017	Placerville-Gold Nugge	1	10.4	14	9.9	11	-3	0.95	-0.5	0.5	-0.05	0.05	
3155	Vacaville-Elmira Road	1	10.2	11	8.2	12	1	0.80	-2.1	2.1	-0.20	0.20	
3187	Folsom-Natoma Street	1	12.4	11	12.6	11	0	1.02	0.3	0.3	0.02	0.02	
3196	Cool-Highway 193	1	11.8	12	9.8	13	1	0.83	-2.0	2.0	-0.17	0.17	
3209	Sloughhouse	1	11.3	11	10.6	12	1	0.94	-0.7	0.7	-0.06	0.06	
3223	Sacramento-3801 Airpor	1	8.5	10	8.1	11	1	0.96	-0.4	0.4	-0.04	0.04	
3249	Woodland-Gibson Road	1	8.7	11	7.9	11	0	0.91	-0.8	0.8	-0.09	0.09	

Table B-17
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 12, 1999 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 193 (07/12) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

Site	Description	No	Peak Concentrations: Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Comparisons with Observations: Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
0006	SubRegion	16	10.7	10	10.7	11	1	1.00	-1.0	1.1	-0.11	0.12	-89.01
	Subregional Peak:				11.0	12	2	1.03	(at 82 x112)	NSte: 3209;	NSPk: 10.7		
2143	Davis-UCD Campus	1	9.2	11	7.3	12	1	0.79	-1.9	1.9	-0.21	0.21	
2731	Sacramento-Del Paso Ma	1	9.5	12	8.0	12	0	0.84	-1.5	1.5	-0.16	0.16	
2848	Pleasant Grove-4 miles	1	7.6	10	7.1	13	3	0.95	-0.4	0.4	-0.05	0.05	
2891	Auburn-Dewitt-C Avenue	1	9.1	11	7.9	11	0	0.87	-1.2	1.2	-0.13	0.13	
2956	Roseville-N Sunrise Bl	1	8.8	12	7.4	13	1	0.84	-1.4	1.4	-0.16	0.16	
2977	Elk Grove-Bruceville R	1	9.5	10	9.4	11	1	0.99	-0.1	0.1	-0.01	0.01	
3002	Colfax-City Hall	1	7.5	13	7.7	16	3	1.03	0.2	0.2	0.03	0.03	
3008	Rocklin-Rocklin Road	1	9.0	12	7.6	10	-2	0.85	-1.4	1.4	-0.15	0.15	
3011	Sacramento-T Street	1	8.7	11	7.4	12	1	0.85	-1.3	1.3	-0.15	0.15	
3017	Placerville-Gold Nugge	1	9.7	14	9.1	14	0	0.94	-0.6	0.6	-0.06	0.06	
3155	Vacaville-Elmira Road	1	10.7	10	8.5	11	1	0.80	-2.2	2.2	-0.20	0.20	
3187	Folsom-Natoma Street	1	10.2	10	8.8	10	0	0.86	-1.4	1.4	-0.14	0.14	
3196	Cool-Highway 193	1	9.9	11	8.6	11	0	0.87	-1.3	1.3	-0.13	0.13	
3209	Sloughhouse	1	10.4	11	10.7	11	0	1.03	0.3	0.3	0.03	0.03	
3223	Sacramento-3801 Airpor	1	8.3	11	7.6	12	1	0.92	-0.6	0.6	-0.08	0.08	
3249	Woodland-Gibson Road	1	8.6	12	7.2	12	0	0.83	-1.5	1.5	-0.17	0.17	

Table B-18
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 13, 1999 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 194 (07/13) 1999
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			Peak Concentrations						Comparisons with Observations				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	14	9.1	12	9.5	11	-1	1.04	0.3	1.1	0.06	0.14	-94.41
	Subregional Peak:				10.2	10	-2	1.12	(at 82	x115)	NSte: 3209;	NSPk: 9.4	
2143	Davis-UCD Campus	1	6.1	12	7.8	11	-1	1.27	1.6	1.6	0.27	0.27	
2731	Sacramento-Del Paso Ma	1	7.7	12	8.6	11	-1	1.12	0.9	0.9	0.12	0.12	
2891	Auburn-Dewitt-C Avenue	1	9.1	12	7.6	11	-1	0.83	-1.5	1.5	-0.17	0.17	
2956	Roseville-N Sunrise Bl	1	8.6	12	7.5	11	-1	0.87	-1.1	1.1	-0.13	0.13	
2977	Elk Grove-Bruceville R	1	7.8	11	8.8	11	0	1.13	1.0	1.0	0.13	0.13	
3002	Colfax-City Hall	1	6.9	11	7.0	10	-1	1.02	0.1	0.1	0.02	0.02	
3008	Rocklin-Rocklin Road	1	8.9	12	7.5	11	-1	0.84	-1.4	1.4	-0.16	0.16	
3011	Sacramento-T Street	1	6.2	12	8.1	12	0	1.30	1.9	1.9	0.30	0.30	
3017	Placerville-Gold Nugge	1	8.1	10	7.6	10	0	0.94	-0.5	0.5	-0.06	0.06	
3187	Folsom-Natoma Street	1	8.6	12	8.8	11	-1	1.02	0.2	0.2	0.02	0.02	
3196	Cool-Highway 193	1	8.3	14	7.9	10	-4	0.94	-0.5	0.5	-0.06	0.06	
3209	Sloughhouse	1	8.1	12	9.5	11	-1	1.17	1.4	1.4	0.17	0.17	
3223	Sacramento-3801 Airpor	1	6.4	11	8.5	12	1	1.33	2.1	2.1	0.33	0.33	
3249	Woodland-Gibson Road	1	7.0	11	7.4	11	0	1.05	0.4	0.4	0.05	0.05	

Table B-19
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 9-13, 1999 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0799_99_camx Simulation ID: 050c

Subregion 0006 Spatially Paired Average 8-Hour Concentrations above 6.0 pphm for DOY 190 through 194
Unpaired Subregional Maximum of 10.6 at Cell 80 x 116 -- Nearest Site: 3209

		Observed							Simulated							
Site ID	Site Description	Site Avg.	DOY 190	DOY 191	DOY 192	DOY 193	DOY 194	DOY 195	Site Avg.	DOY 190	DOY 191	DOY 192	DOY 193	DOY 194	DOY 195	Avg. Ratio
2123	North Highlands-Blackf	7.4	5.3	7.9	6.9	4.9	3.3		8.4	9.1	9.2	8.2	7.5	8.0		1.13
2143	Davis-UCD Campus	8.1	7.1	8.8	9.2	9.2	6.1		8.3	8.5	9.4	8.6	7.3	7.8		1.03
2731	Sacramento-Del Paso Ma	9.4	7.8	11.1	10.7	9.5	7.7		9.0	8.2	10.2	10.3	8.0	8.6		0.97
2848	Pleasant Grove-4 miles	7.6	7.3	8.1	7.2	7.6	5.5		8.0	8.5	9.0	7.5	7.1	7.8		1.06
2891	Auburn-Dewitt-C Avenue	9.9	10.5	10.3	10.6	9.1	9.1		8.4	9.0	8.3	9.0	7.9	7.6		0.84
2956	Roseville-N Sunrise Bl	9.6	8.6	10.7	11.3	8.8	8.6		8.5	9.5	8.6	9.5	7.4	7.5		0.88
2977	Elk Grove-Bruceville R	8.7	7.5	9.3	9.7	9.5	7.8		8.7	7.7	9.2	8.5	9.4	8.8		1.00
3002	Colfax-City Hall	8.1	8.9	8.6	8.7	7.5	6.9		7.9	8.3	7.7	8.6	7.7	7.0		0.97
3008	Rocklin-Rocklin Road	9.8	9.4	10.7	11.2	9.0	8.9		8.6	9.5	8.5	9.6	7.6	7.5		0.87
3011	Sacramento-T Street	7.8	6.7	8.8	8.8	8.7	6.2		8.0	7.1	9.3	8.1	7.4	8.1		1.02
3017	Placerville-Gold Nugge	10.2	11.0	11.9	10.4	9.7	8.1		9.4	11.2	9.1	9.9	9.1	7.6		0.92
3155	Vacaville-Elmira Road	9.0	7.0	8.2	10.2	10.7	6.0		8.2	7.8	8.4	8.2	8.5	8.0		0.90
3187	Folsom-Natoma Street	11.0	10.9	12.9	12.4	10.2	8.6		10.1	10.8	9.8	12.6	8.8	8.8		0.92
3196	Cool-Highway 193	10.6	11.6	11.4	11.8	9.9	8.3		9.0	10.0	8.5	9.8	8.6	7.9		0.85
3209	Sloughhouse	9.8	8.7	10.7	11.3	10.4	8.1		10.1	8.5	11.2	10.6	10.7	9.5		1.03
3223	Sacramento-3801 Airpor	7.6	6.4	8.5	8.5	8.3	6.4		8.5	8.3	9.8	8.1	7.6	8.5		1.11
3249	Woodland-Gibson Road	8.2	7.6	9.0	8.7	8.6	7.0		8.1	8.2	9.6	7.9	7.2	7.4		0.99

Table B-20
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 29, 2000 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 211 (07/29) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
			Peak Concentrations						Comparisons with Observations				
0006	SubRegion	135	11.8	14	12.6	14	0	1.07	-0.6	1.1	-0.06	0.14	0.56
	Subregional Peak:				13.2	15	1	1.11	(at 81	x115)	NSte: SLU ;	NSPk: 12.5	
CUS	Cool Stn (1400 American	13	10.9	12	7.9	13	1	0.73	-1.3	1.3	-0.14	0.14	0.78
DVS	Davis/UCD Campus Stn	6	9.2	14	9.8	14	0	1.07	0.6	0.6	0.08	0.08	0.64
ELK	Elk Grove Stn (Brucevil	5	7.7	14	8.8	14	0	1.14	1.3	1.3	0.20	0.20	-0.26
FLN	Folsom Stn (Natoma St.)	7	8.4	17	10.2	17	0	1.22	1.9	1.9	0.26	0.26	0.97
NAT	Sacramento/Natoma Stn (	7	9.5	15	8.5	17	2	0.90	0.0	0.7	0.01	0.08	0.65
PGN	Placerville Stn (Gold N	17	10.5	18	8.7	18	0	0.83	-1.4	1.4	-0.16	0.16	0.88
PGV	Pleasant Grove Stn (4 S	8	8.7	15	8.6	17	2	0.98	-0.1	1.1	0.01	0.15	-0.32
ROC	Rocklin Stn (5000 Rockl	11	9.7	18	8.0	17	-1	0.82	-1.2	1.2	-0.15	0.16	0.60
ROS	Roseville Stn (151 N Su	9	10.6	17	8.5	17	0	0.81	-1.4	1.4	-0.16	0.16	0.81
S13	Sacramento Stn (1309 T	5	8.8	14	8.1	14	0	0.92	-0.5	0.6	-0.06	0.07	0.50
SDP	Sacramento Stn (Del Pas	9	11.0	15	9.8	14	-1	0.89	-0.9	1.0	-0.10	0.11	0.92
SLU	Sloughouse Rd. Stn	10	11.8	14	12.6	14	0	1.07	0.3	0.5	0.02	0.06	0.98
WLN	Woodland Stn	7	10.0	14	9.1	16	2	0.91	-0.1	0.5	0.00	0.06	0.80
GNBY	Granite Bay Stn	11	11.5	17	9.0	17	0	0.78	-1.9	1.9	-0.22	0.22	0.86
SNH	Sacramento-North Highla	10	9.8	15	8.8	17	2	0.89	-0.9	0.9	-0.10	0.10	0.86

Table B-21
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 30, 2000 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 212 (07/30) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	152	12.1	15	12.5	16	1	1.04	0.5	1.1	0.07	0.15	0.38
	Subregional Peak:				13.2	16	1	1.09	(at 76 x116) NSte: SDP ; NSPk: 13.1				
AUBD	Auburn-Dewitt-C Avenue	16	8.4	15	8.4	15	0	1.00	-0.4	0.5	-0.06	0.07	0.94
CUS	Cool Stn (1400 American	12	8.9	15	9.0	16	1	1.01	-0.2	0.3	-0.03	0.04	0.92
DVS	Davis/UCD Campus Stn	7	9.3	14	9.8	15	1	1.05	0.8	0.9	0.10	0.11	0.38
ELK	Elk Grove Stn (Brucevil	2	6.3	16	9.5	17	1	1.50	3.0	3.0	0.49	0.49	-99.00
FLN	Folsom Stn (Natoma St.)	8	7.4	13	10.7	15	2	1.45	3.4	3.4	0.53	0.53	-0.11
NAT	Sacramento/Natoma Stn (	7	8.3	17	10.3	17	0	1.25	1.7	1.7	0.22	0.22	-0.24
PGN	Placerville Stn (Gold N	19	9.4	17	9.3	16	-1	0.99	-0.4	1.0	-0.04	0.13	0.40
PGV	Pleasant Grove Stn (4 S	8	8.1	14	9.7	18	4	1.20	1.2	1.2	0.17	0.17	-0.03
ROC	Rocklin Stn (5000 Rockl	11	8.6	12	8.6	16	4	1.00	0.2	0.9	0.03	0.12	0.44
ROS	Roseville Stn (151 N Su	9	9.2	12	9.0	18	6	0.97	-0.3	0.9	-0.04	0.11	-0.13
S13	Sacramento Stn (1309 T	7	8.4	14	11.2	15	1	1.34	2.3	2.3	0.32	0.32	0.44
SDP	Sacramento Stn (Del Pas	9	9.9	17	12.5	16	-1	1.27	1.2	1.5	0.13	0.16	0.84
SLU	Sloughouse Rd. Stn	7	12.1	15	10.5	16	1	0.87	-0.5	0.9	-0.04	0.08	0.81
WLN	Woodland Stn	7	8.0	14	9.2	16	2	1.15	0.9	0.9	0.12	0.12	0.87
GNBY	Granite Bay Stn	13	10.2	12	9.3	18	6	0.91	-0.5	1.0	-0.06	0.13	0.70
SNH	Sacramento-North Highla	10	8.4	16	10.1	18	2	1.20	0.3	0.9	0.04	0.11	0.78

Table B-22
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 31, 2000 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 213 (07/31) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	130	10.3	14	12.2	14	0	1.19	0.4	1.0	0.06	0.13	0.27
	Subregional Peak:				14.5	15	1	1.41	(at 79	x110)	NSte: ELK	; NSPk:	11.4
AUBD	Auburn-Dewitt-C Avenue	12	8.9	17	8.1	15	-2	0.91	-0.9	0.9	-0.11	0.12	0.42
CUS	Cool Stn (1400 American	10	9.9	11	8.8	15	4	0.89	-1.2	1.3	-0.13	0.14	0.30
DVS	Davis/UCD Campus Stn	8	10.3	14	9.8	13	-1	0.95	-0.1	0.6	0.00	0.07	0.66
ELK	Elk Grove Stn (Brucevil	6	7.3	15	11.4	15	0	1.56	3.6	3.6	0.53	0.53	0.40
NAT	Sacramento/Natoma Stn (	8	8.7	13	9.2	12	-1	1.05	0.7	0.7	0.10	0.11	0.47
PGN	Placerville Stn (Gold N	14	8.7	13	9.2	17	4	1.05	-0.1	0.8	-0.02	0.10	0.78
PGV	Pleasant Grove Stn (4 S	8	7.8	15	8.2	15	0	1.05	0.6	0.6	0.08	0.08	0.58
ROC	Rocklin Stn (5000 Rockl	8	7.8	13	8.7	15	2	1.12	1.0	1.0	0.13	0.13	0.51
ROS	Roseville Stn (151 N Su	8	8.0	13	8.6	16	3	1.07	1.2	1.2	0.17	0.17	0.21
S13	Sacramento Stn (1309 T	7	8.5	14	9.7	13	-1	1.14	0.4	0.8	0.06	0.11	0.34
SDP	Sacramento Stn (Del Pas	9	8.1	13	9.5	13	0	1.18	0.8	1.4	0.10	0.19	0.54
SLU	Sloughouse Rd. Stn	8	10.0	14	12.2	14	0	1.22	1.2	1.3	0.15	0.16	0.90
WLN	Woodland Stn	8	8.0	12	7.8	13	1	0.97	-0.2	0.6	-0.03	0.07	-0.09
GNBY	Granite Bay Stn	9	8.5	13	8.7	16	3	1.03	0.3	0.4	0.04	0.05	0.78
SNH	Sacramento-North Highla	7	8.1	12	8.6	16	4	1.06	0.6	0.7	0.09	0.09	-0.11

Table B-23
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
August 1, 2000 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 214 (08/01) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
0006	SubRegion	141	13.3	15	14.5	15	0	1.09	0.5	1.1	0.06	0.14	0.68
	Subregional Peak:				15.3	16	1	1.15	(at 82	x114)	NSte: SLU	; NSPk:	14.3
AUBD	Auburn-Dewitt-C Avenue	12	10.3	15	10.0	15	0	0.97	-0.1	0.4	0.00	0.05	0.91
CUS	Cool Stn (1400 American	12	12.0	16	10.0	14	-2	0.83	-0.6	1.1	-0.06	0.11	0.66
DVS	Davis/UCD Campus Stn	6	9.5	15	9.5	13	-2	1.01	0.7	0.8	0.09	0.11	0.41
ELK	Elk Grove Stn (Brucevil	6	7.8	17	10.8	17	0	1.39	3.1	3.1	0.45	0.45	0.50
NAT	Sacramento/Natoma Stn (	7	9.9	16	10.4	13	-3	1.05	0.5	0.9	0.06	0.10	-0.23
PGN	Placerville Stn (Gold N	14	10.2	18	9.5	18	0	0.93	-0.8	1.1	-0.10	0.14	0.58
PGV	Pleasant Grove Stn (4 S	9	10.1	15	10.3	15	0	1.02	0.2	0.8	0.03	0.09	0.69
ROC	Rocklin Stn (5000 Rockl	9	10.3	15	11.8	15	0	1.15	1.7	1.7	0.21	0.21	0.96
ROS	Roseville Stn (151 N Su	9	11.5	15	12.3	14	-1	1.07	1.4	1.4	0.17	0.17	0.92
S13	Sacramento Stn (1309 T	7	9.6	15	10.5	13	-2	1.10	1.8	1.8	0.25	0.25	0.51
SDP	Sacramento Stn (Del Pas	10	11.5	15	13.0	14	-1	1.13	0.4	1.1	0.04	0.13	0.83
SLU	Sloughouse Rd. Stn	11	13.3	15	14.5	15	0	1.09	0.2	0.8	0.02	0.09	0.95
WLN	Woodland Stn	7	10.0	15	9.7	15	0	0.97	0.1	1.0	0.02	0.12	0.36
GNBY	Granite Bay Stn	12	11.5	16	12.3	15	-1	1.07	0.5	0.8	0.05	0.09	0.93
SNH	Sacramento-North Highla	10	12.0	15	12.0	13	-2	1.00	0.5	1.1	0.06	0.13	0.67

Table B-24
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
August 2, 2000 1-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 215 (08/02) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm)

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	138	12.1	15	12.6	16	1	1.04	0.2	1.4	0.04	0.17	0.58
	Subregional Peak:				13.0	14	-1	1.07	(at 78 x123)		NSte: ROC ; NSPk: 11.9		
AUBD	Auburn-Dewitt-C Avenue	13	11.5	18	12.6	16	-2	1.10	-0.6	1.1	-0.06	0.11	0.85
CUS	Cool Stn (1400 American	13	11.6	18	11.0	16	-2	0.95	-0.3	0.9	-0.03	0.10	0.77
DVS	Davis/UCD Campus Stn	5	8.2	13	10.7	15	2	1.31	2.2	2.2	0.31	0.31	0.36
ELK	Elk Grove Stn (Brucevil	4	7.2	14	11.3	15	1	1.56	3.3	3.3	0.48	0.48	-0.10
FLN	Folsom Stn (Natoma St.)	8	11.1	15	10.6	18	3	0.96	-0.8	1.5	-0.09	0.19	0.75
NAT	Sacramento/Natoma Stn (	7	9.6	14	11.2	16	2	1.17	1.3	1.7	0.18	0.25	0.39
PGN	Placerville Stn (Gold N	15	9.5	17	8.6	17	0	0.90	-0.5	0.8	-0.06	0.10	0.72
PGV	Pleasant Grove Stn (4 S	4	8.8	14	10.4	16	2	1.19	2.0	2.0	0.26	0.26	-0.86
ROC	Rocklin Stn (5000 Rockl	10	11.0	16	11.6	14	-2	1.05	0.4	0.9	0.05	0.10	0.76
ROS	Roseville Stn (151 N Su	9	11.2	15	11.4	13	-2	1.02	0.3	1.1	0.04	0.12	0.57
S13	Sacramento Stn (1309 T	4	8.0	14	9.4	15	1	1.17	1.0	1.0	0.15	0.15	0.71
SDP	Sacramento Stn (Del Pas	8	10.2	14	10.6	17	3	1.04	0.3	1.9	0.04	0.27	0.46
SLU	Sloughouse Rd. Stn	11	10.3	16	11.0	17	1	1.07	-0.8	1.4	-0.10	0.18	0.75
WLN	Woodland Stn	6	9.0	14	9.9	16	2	1.10	1.5	1.5	0.21	0.21	0.51
GNBY	Granite Bay Stn	13	12.1	15	10.8	18	3	0.89	-0.8	1.3	-0.09	0.15	0.82
SNH	Sacramento-North Highla	8	10.8	15	11.7	13	-2	1.08	1.3	1.5	0.16	0.18	0.64

Table B-25
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 29, 2000 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 211 (07/29) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	15	9.7	12	10.0	11	-1	1.03	-0.3	1.0	-0.02	0.11	-101.56
	Subregional Peak:				10.4	12	0	1.07	(at 82	x114)	NSte: SLU ;	NSPk:	9.9
CUS	Cool Stn (1400 American	1	9.4	11	7.7	12	1	0.81	-1.8	1.8	-0.19	0.19	
DVS	Davis/UCD Campus Stn	1	7.7	11	8.4	11	0	1.09	0.7	0.7	0.09	0.09	
ELK	Elk Grove Stn (Brucevil	1	6.4	12	8.2	12	0	1.28	1.8	1.8	0.28	0.28	
FLN	Folsom Stn (Natoma St.)	1	7.0	12	8.8	11	-1	1.26	1.8	1.8	0.26	0.26	
NAT	Sacramento/Natoma Stn (	1	8.0	12	8.2	12	0	1.02	0.1	0.1	0.02	0.02	
PGN	Placerville Stn (Gold N	1	9.7	12	8.2	12	0	0.84	-1.6	1.6	-0.16	0.16	
PGV	Pleasant Grove Stn (4 S	1	7.7	11	7.7	12	1	1.00	0.0	0.0	0.00	0.00	
ROC	Rocklin Stn (5000 Rockl	1	8.5	12	7.5	11	-1	0.88	-1.0	1.0	-0.12	0.12	
ROS	Roseville Stn (151 N Su	1	9.0	12	7.6	11	-1	0.84	-1.4	1.4	-0.16	0.16	
S13	Sacramento Stn (1309 T	1	7.2	12	7.1	12	0	0.98	-0.1	0.1	-0.02	0.02	
SDP	Sacramento Stn (Del Pas	1	9.2	12	8.4	11	-1	0.91	-0.8	0.8	-0.09	0.09	
SLU	Sloughouse Rd. Stn	1	9.6	12	10.0	11	-1	1.05	0.5	0.5	0.05	0.05	
WLN	Woodland Stn	1	8.1	11	8.1	11	0	1.00	0.0	0.0	0.00	0.00	
GNBY	Granite Bay Stn	1	9.7	12	8.0	11	-1	0.83	-1.7	1.7	-0.17	0.17	
SNH	Sacramento-North Highla	1	8.9	11	7.9	12	1	0.89	-0.9	0.9	-0.11	0.11	

Table B-26
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 30, 2000 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 212 (07/30) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	15	9.3	11	10.7	12	1	1.15	0.8	1.0	0.12	0.13	-139.05
	Subregional Peak:				11.3	12	1	1.21	(at 77	x117)	NSte: SDP ;	NSPk: 10.9	
AUBD	Auburn-Dewitt-C Avenue	1	8.0	11	8.0	12	1	0.99	-0.1	0.1	-0.01	0.01	
CUS	Cool Stn (1400 American	1	8.7	11	8.5	12	1	0.98	-0.2	0.2	-0.02	0.02	
DVS	Davis/UCD Campus Stn	1	8.0	11	9.0	12	1	1.12	1.0	1.0	0.12	0.12	
FLN	Folsom Stn (Natoma St.)	1	6.6	12	10.0	12	0	1.52	3.4	3.4	0.52	0.52	
NAT	Sacramento/Natoma Stn (	1	7.6	11	9.4	12	1	1.25	1.9	1.9	0.25	0.25	
PGN	Placerville Stn (Gold N	1	8.6	15	8.8	12	-3	1.02	0.2	0.2	0.02	0.02	
PGV	Pleasant Grove Stn (4 S	1	7.4	12	8.7	13	1	1.18	1.3	1.3	0.18	0.18	
ROC	Rocklin Stn (5000 Rockl	1	7.9	11	8.3	12	1	1.05	0.4	0.4	0.05	0.05	
ROS	Roseville Stn (151 N Su	1	8.5	10	8.5	12	2	1.00	0.0	0.0	0.00	0.00	
S13	Sacramento Stn (1309 T	1	7.2	11	9.4	12	1	1.30	2.2	2.2	0.30	0.30	
SDP	Sacramento Stn (Del Pas	1	9.3	11	10.7	12	1	1.15	1.4	1.4	0.15	0.15	
SLU	Sloughouse Rd. Stn	1	9.1	12	8.8	12	0	0.97	-0.3	0.3	-0.03	0.03	
WLN	Woodland Stn	1	7.3	11	8.3	12	1	1.15	1.1	1.1	0.15	0.15	
GNBY	Granite Bay Stn	1	9.2	11	9.0	12	1	0.97	-0.2	0.2	-0.03	0.03	
SNH	Sacramento-North Highla	1	8.1	12	8.8	12	0	1.09	0.7	0.7	0.09	0.09	

Table B-27
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 31, 2000 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 213 (07/31) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	15	8.9	11	10.1	12	1	1.13	0.7	0.9	0.10	0.12	-128.73
	Subregional Peak:				11.8	12	1	1.32	(at 81	x108)	NSte: ELK ;	NSPk: 10.1	
AUBD	Auburn-Dewitt-C Avenue	1	8.2	13	7.5	11	-2	0.91	-0.7	0.7	-0.09	0.09	
CUS	Cool Stn (1400 American	1	8.9	11	7.9	11	0	0.88	-1.1	1.1	-0.12	0.12	
DVS	Davis/UCD Campus Stn	1	8.9	11	9.0	12	1	1.01	0.1	0.1	0.01	0.01	
ELK	Elk Grove Stn (Brucevil	1	6.4	12	10.1	12	0	1.57	3.7	3.7	0.57	0.57	
NAT	Sacramento/Natoma Stn (	1	7.6	11	8.3	11	0	1.09	0.7	0.7	0.09	0.09	
PGN	Placerville Stn (Gold N	1	8.1	13	8.5	12	-1	1.06	0.5	0.5	0.06	0.06	
PGV	Pleasant Grove Stn (4 S	1	7.3	11	7.9	11	0	1.08	0.6	0.6	0.08	0.08	
ROC	Rocklin Stn (5000 Rockl	1	7.3	11	8.2	12	1	1.13	1.0	1.0	0.13	0.13	
ROS	Roseville Stn (151 N Su	1	7.0	11	8.2	11	0	1.17	1.2	1.2	0.17	0.17	
S13	Sacramento Stn (1309 T	1	7.4	12	7.9	11	-1	1.07	0.5	0.5	0.07	0.07	
SDP	Sacramento Stn (Del Pas	1	7.4	12	8.6	11	-1	1.16	1.2	1.2	0.16	0.16	
SLU	Sloughouse Rd. Stn	1	8.3	12	10.1	12	0	1.22	1.8	1.8	0.22	0.22	
WLN	Woodland Stn	1	7.6	12	7.5	11	-1	0.98	-0.1	0.1	-0.02	0.02	
GNBY	Granite Bay Stn	1	8.0	11	8.3	11	0	1.04	0.3	0.3	0.04	0.04	
SNH	Sacramento-North Highla	1	7.7	10	8.2	11	1	1.06	0.5	0.5	0.06	0.06	

Table B-28
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
August 1, 2000 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 214 (08/01) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			------- Peak Concentrations --------						--- Comparisons with Observations ---				
			Observed		Predicted		Time	Peak	Mean	Mean	Normalized		
Site	Description	No	Value	Time	Value	Time	Lag	Ratio	Bias	Error	Bias	Error	(r)
0006	SubRegion	15	10.9	12	11.4	12	0	1.05	0.8	0.9	0.10	0.11	-105.27
	Subregional Peak:				11.8	12	0	1.09	(at 80	x116)	NSte: SLU	; NSPk: 11.3	
AUBD	Auburn-Dewitt-C Avenue	1	9.5	12	9.5	12	0	1.00	0.0	0.0	0.00	0.00	
CUS	Cool Stn (1400 American	1	9.9	13	9.3	12	-1	0.94	-0.6	0.6	-0.06	0.06	
DVS	Davis/UCD Campus Stn	1	8.1	9	9.0	11	2	1.11	0.9	0.9	0.11	0.11	
ELK	Elk Grove Stn (Brucevil	1	6.6	12	9.7	11	-1	1.48	3.2	3.2	0.48	0.48	
NAT	Sacramento/Natoma Stn (	1	9.0	11	9.7	11	0	1.08	0.7	0.7	0.08	0.08	
PGN	Placerville Stn (Gold N	1	8.9	14	8.6	13	-1	0.96	-0.3	0.3	-0.04	0.04	
PGV	Pleasant Grove Stn (4 S	1	9.3	12	9.4	11	-1	1.01	0.1	0.1	0.01	0.01	
ROC	Rocklin Stn (5000 Rockl	1	8.9	11	10.5	11	0	1.19	1.7	1.7	0.19	0.19	
ROS	Roseville Stn (151 N Su	1	9.3	11	10.7	11	0	1.16	1.5	1.5	0.16	0.16	
S13	Sacramento Stn (1309 T	1	7.6	12	9.5	11	-1	1.25	1.9	1.9	0.25	0.25	
SDP	Sacramento Stn (Del Pas	1	10.1	12	10.7	11	-1	1.07	0.7	0.7	0.07	0.07	
SLU	Sloughouse Rd. Stn	1	10.9	12	11.4	12	0	1.05	0.5	0.5	0.05	0.05	
WLN	Woodland Stn	1	8.4	12	8.7	11	-1	1.03	0.3	0.3	0.03	0.03	
GNBY	Granite Bay Stn	1	9.9	12	10.6	11	-1	1.07	0.7	0.7	0.07	0.07	
SNH	Sacramento-North Highla	1	10.0	12	10.5	11	-1	1.05	0.5	0.5	0.05	0.05	

Table B-29
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
August 2, 2000 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Statistics were calculated for the 24-hour period of DOY 215 (08/02) 2000
Included were data-pairs with observed concentrations above a threshold of 6.0 (pphm); Averaged over 8 hours

			Peak Concentrations						Comparisons with Observations				
Site	Description	No	Observed Value	Observed Time	Predicted Value	Predicted Time	Time Lag	Peak Ratio	Mean Bias	Mean Error	Normalized Bias	Normalized Error	(r)
0006	SubRegion	16	10.7	12	10.5	12	0	0.98	0.9	1.2	0.13	0.17	-72.44
	Subregional Peak:				10.8	12	0	1.00	(at 79	x124)	NSte: ROC ;	NSPk: 10.3	
AUBD	Auburn-Dewitt-C Avenue	1	10.7	12	10.5	12	0	0.98	-0.2	0.2	-0.02	0.02	
CUS	Cool Stn (1400 American	1	10.4	13	10.0	12	-1	0.97	-0.3	0.3	-0.03	0.03	
DVS	Davis/UCD Campus Stn	1	6.7	12	8.7	11	-1	1.30	2.0	2.0	0.30	0.30	
ELK	Elk Grove Stn (Brucevil	1	6.3	12	8.7	11	-1	1.39	2.4	2.4	0.39	0.39	
FLN	Folsom Stn (Natoma St.)	1	9.5	12	9.1	11	-1	0.96	-0.4	0.4	-0.04	0.04	
NAT	Sacramento/Natoma Stn (	1	7.5	12	9.2	11	-1	1.24	1.8	1.8	0.24	0.24	
PGN	Placerville Stn (Gold N	1	8.7	14	8.1	12	-2	0.92	-0.7	0.7	-0.08	0.08	
PGV	Pleasant Grove Stn (4 S	1	6.6	11	9.8	11	0	1.48	3.2	3.2	0.48	0.48	
ROC	Rocklin Stn (5000 Rockl	1	9.8	11	10.2	11	0	1.04	0.4	0.4	0.04	0.04	
ROS	Roseville Stn (151 N Su	1	9.7	11	10.1	11	0	1.04	0.4	0.4	0.04	0.04	
S13	Sacramento Stn (1309 T	1	6.3	13	8.4	11	-2	1.32	2.0	2.0	0.32	0.32	
SDP	Sacramento Stn (Del Pas	1	8.0	12	9.2	11	-1	1.16	1.3	1.3	0.16	0.16	
SLU	Sloughouse Rd. Stn	1	9.1	12	8.8	11	-1	0.96	-0.4	0.4	-0.04	0.04	
WLN	Woodland Stn	1	7.0	12	8.8	11	-1	1.26	1.8	1.8	0.26	0.26	
GNBY	Granite Bay Stn	1	10.3	11	9.6	11	0	0.94	-0.6	0.6	-0.06	0.06	
SNH	Sacramento-North Highla	1	8.7	10	10.4	11	1	1.19	1.7	1.7	0.19	0.19	

Table B-30
Base Case Model Performance Evaluation for Individual Sites in Sacramento Region
July 29 - August 2, 2000 8-Hour Ozone

* * * Model Performance Evaluation * * *

Pollutant: O3 (pphm) Project: arb_050c_0700_00_camx Simulation ID: 050c

Subregion 0006 Spatially Paired Average 8-Hour Concentrations above 6.0 pphm for DOY 211 through 215
Unpaired Subregional Maximum of 10.0 at Cell 78 x 117 -- Nearest Site: SDP

		- - - - - - Observed - - - - - -							- - - - - - Simulated - - - - - -							
Site ID	Site Description	Site Avg.	DOY 211	DOY 212	DOY 213	DOY 214	DOY 215	DOY 216	Site Avg.	DOY 211	DOY 212	DOY 213	DOY 214	DOY 215	DOY 216	Avg. Ratio
AUBD	Auburn-Dewitt-C Avenue	9.1	-99.0	8.0	8.2	9.5	10.7		8.5	7.2	8.0	7.5	9.5	10.5		0.94
CUS	Cool Stn (1400 American	9.5	9.4	8.7	8.9	9.9	10.4		8.7	7.7	8.5	7.9	9.3	10.0		0.92
DVS	Davis/UCD Campus Stn	7.9	7.7	8.0	8.9	8.1	6.7		8.8	8.4	9.0	9.0	9.0	8.7		1.12
ELK	Elk Grove Stn (Brucevil	6.4	6.4	5.0	6.4	6.6	6.3		9.1	8.2	8.7	10.1	9.7	8.7		1.42
FLN	Folsom Stn (Natoma St.)	7.7	7.0	6.6	1.9	-99.0	9.5		9.5	8.8	10.0	8.6	10.8	9.1		1.23
NAT	Sacramento/Natoma Stn (	7.9	8.0	7.6	7.6	9.0	7.5		9.0	8.2	9.4	8.3	9.7	9.2		1.13
PGN	Placerville Stn (Gold N	8.8	9.7	8.6	8.1	8.9	8.7		8.4	8.2	8.8	8.5	8.6	8.1		0.96
PGV	Pleasant Grove Stn (4 S	7.7	7.7	7.4	7.3	9.3	6.6		8.7	7.7	8.7	7.9	9.4	9.8		1.13
ROC	Rocklin Stn (5000 Rockl	8.5	8.5	7.9	7.3	8.9	9.8		9.0	7.5	8.3	8.2	10.5	10.2		1.06
ROS	Roseville Stn (151 N Su	8.7	9.0	8.5	7.0	9.3	9.7		9.0	7.6	8.5	8.2	10.7	10.1		1.04
S13	Sacramento Stn (1309 T	7.2	7.2	7.2	7.4	7.6	6.3		8.4	7.1	9.4	7.9	9.5	8.4		1.18
SDP	Sacramento Stn (Del Pas	8.8	9.2	9.3	7.4	10.1	8.0		9.5	8.4	10.7	8.6	10.7	9.2		1.08
SLU	Sloughouse Rd. Stn	9.4	9.6	9.1	8.3	10.9	9.1		9.8	10.0	8.8	10.1	11.4	8.8		1.05
WLN	Woodland Stn	7.7	8.1	7.3	7.6	8.4	7.0		8.3	8.1	8.3	7.5	8.7	8.8		1.08
GNBY	Granite Bay Stn	9.4	9.7	9.2	8.0	9.9	10.3		9.1	8.0	9.0	8.3	10.6	9.6		0.97
SNH	Sacramento-North Highla	8.7	8.9	8.1	7.7	10.0	8.7		9.1	7.9	8.8	8.2	10.5	10.4		1.05

Air Quality Modeling Results

This section of Appendix B provides a summary of the air quality modeling analysis process and includes additional information and graphs on the air quality modeling results described in Chapters 6 and 8 of the main report. The model runs summarized in this appendix were prepared in 2009 Plan, using the emissions inventory developed for use in that Plan. Table B-31 provides a comparison of the inventories used in the 2009 Plan and this 2013 update.

Air Quality Modeling Runs Performed

After the photochemical modeling base case episodes were shown to perform adequately, the modeling was used for assessing attainment of the federal ozone standard. First, the air quality model was run with 2002 baseline year emissions to provide baseline year ozone concentrations. Next, model runs with emissions forecasts (including ERCs and existing control strategies) for 2018 were conducted to estimate the future ozone concentrations. The relative decline between modeled baseline and future year ozone concentrations at each ozone nonattainment monitoring site was calculated. This relative reduction factor was applied to baseline ozone design values to predict a future ozone design value for each monitoring site and then compared to the federal ozone standard. Based on the photochemical modeling results, attainment was predicted at all ozone monitors in 2018, except for two sites (Cool and Folsom) located in the eastern part of the Sacramento region. Therefore, supplemental modeling runs were done to estimate the additional emission reductions needed to demonstrate attainment of the 8-hour ozone NAAQS.

Development of Ozone/Emission Reduction Graphs

Systematic reductions in all anthropogenic VOC and/or NO_X emissions were simulated to characterize the change in the resulting ozone concentrations. For each individual modeling run, domain-wide (including areas outside of the Sacramento nonattainment area) emissions for NO_X-only, VOC-only, or both VOC and NO_X are scaled by factors ranging from 100% to 80% in increments of 5%. As a result, forecasted ozone concentrations were determined for 25 different combinations of varying VOC and/or NO_X emission reductions. For example, one modeling run scaled VOC emissions by 95% and NO_X emissions by 85%, and then another run scaled VOC emissions by 85% and NO_X emissions by 95%.

The forecasted ozone concentration data (in ppb) associated with each of the 25 emission reduction modeling scenarios were used to calculate the future ozone design values, which were plotted on a graph for an individual monitoring site. These diagrams show the pattern of ozone responses to varying combinations in VOC and NO_X emission reductions. This exercise was performed for the 2018 attainment demonstration year, and evaluated at each of the nonattainment air monitoring sites.

2018 Ozone/Emission Reduction Graphs for Peak Ozone Site and Other Nonattainment Sites

The 2018 ozone/emission reduction graph for the peak ozone site at Cool is provided in Figure B-1. The 2018 ozone/emission reduction graphs for other nonattainment ozone monitoring sites (Auburn, Colfax, Folsom, Grass Valley, North Highlands, Placerville, Roseville, Sacramento-Del Paso Manor, and Sloughhouse) in the Sacramento region are presented in Figures B-2 through B-10. See Figure B-11 for a map of the location of the ozone monitoring stations.

The graph for the peak ozone design value site in the Sacramento region will generally determine the extent of additional emission reductions needed for attainment.

Some general conclusions can be drawn based on the 2018 modeling results of forecasted emissions and the additional across-the-board percent emission reduction scenarios. The air quality modeling analysis shows that attainment can be reached by 2018 with different combinations of VOC and NO_X control. The modeling results indicate that both VOC and NO_X reductions provide ozone benefits in the Sacramento region, but on a ton for ton basis NO_X reductions provide greater ozone benefits than VOC reductions.

EPA modeling guidance states that the modeled attainment test is conducted using the predicted future ozone design value concentrations (truncated to whole ppb). All modeled ozone concentrations are truncated to integers for purposes of determining attainment. Following EPA guidance, for example, and truncating all numbers to the whole number, 84.99 would be truncated to 84 ppb.

Figure B-1 contains the ozone and pollutant emission reduction graph for the 2018 peak ozone design value site at Cool in the Sacramento region. The x and y axes represent fractional emissions reductions from the forecasted 2018 planning emissions inventory (without new control measures): 121 tpd of ROG and 104 tpd of NO_X. The whole numbers on the graph represent predicted ozone design value concentrations (truncated to whole ppb), based on modeling results for fractional VOC and NO_X reductions at 5% increments. For example, the upper right corner truncated integer (88 ppb) represents the predicted 2018 ozone design value at Cool with existing control strategies and no additional fractional emission reductions.

Because planning commitments to specific emissions reduction projections may not be one of the exact modeled reduction scenarios reflected on the ozone/emission reduction graph, contours are drawn to estimate a continuum of reductions between the modeled points with the same ozone concentration (called isopleths). Because of the truncation policy, these contours would be more accurately characterized as bands, than lines. However, for simplicity the contours are drawn as lines.

The CARB modeling results for predicted ozone design value concentrations were provided to the districts as truncated integers at a resolution of 5% emission reduction increments. Therefore, in an effort to better characterize the ozone modeling results and the relative benefits of VOC and NO_X emissions reduction strategies, District staff obtained ozone modeling output files which provided 5% increment modeled ozone values rounded to the tenth of a ppb. Staff interpolated whole ppb results to establish the ozone concentration contour lines in Figure B-1. The 85 ppb ozone contour line lies just below the CARB truncated 85 ppb concentrations and has a slope that illustrates the relative benefit of VOC strategies to NO_X strategies. Looking at the relative ozone benefit from a 20 percent reduction in anthropogenic emissions of VOC and NO_X suggests that overall a 1 ton per day reduction in NO_X is equivalent to a 7 ton per day reduction in VOC.

Attainment Demonstration Evaluation

Attainment of the 8-hour ozone NAAQS is evaluated for a 2018 "severe" classification scenario, based on modeling results for the peak ozone site (Cool) in the Sacramento region. The 2018 ozone/emission reduction graph for the peak ozone site at Cool (Figure B-1) shows the various combinations of percent emission reduction attainment levels below the 85 ppb contour line. There are number of potential VOC and NO_X reduction combinations that could provide for attainment. The combined reductions from new state and federal control measures and from new regional and local proposed control measures contained in this plan are used to assess future 2018 attainment. Attainment is evaluated for the 2018 emission reductions from all new local, regional, state and federal control measure committals. The total benefits from measures identified in this Plan that have not yet been adopted are estimated to be 8 tpd of VOC and 1 tpd of NO_X in 2018, although, it is anticipated that attainment would be achieved by the 2018 deadline even if there is a reduction in these emission benefits.

Attainment Demonstration Results

The combination of emission reductions from new control measures were converted to percent emission reductions of the forecasted 2018 planning emissions inventory (without new control measures): 121 tpd of ROG and 104 tpd of NO_X. The combination of percent emission reductions was plotted on the graph in Figure B-1 to demonstrate attainment of the 1997 federal 8-hour ozone standard (84 ppb). Attainment demonstration results are given for:

1) the 2018 emission reductions from all new local, regional, state and federal control measure committals (11.6% of VOC and 16.3% of NO_X, designated at Point A). These reductions are more than the percent reduction attainment targets for attaining the 1997 federal 8-hour ozone standard by 2018, and so will provide reductions for accelerated progress.

2) the 2018 emission reductions from only the new local, regional, state and federal control measures adopted by the end of 2008 (3.3% of VOC and 12.5% of NO_X, designated at Point B). These levels also provide for attainment (just below the 85 ppb ozone contour line).

Emission Inventory Improvements for the Sacramento Region

Nature of Emissions Update

The Air Districts within the Sacramento Federal Nonattainment Area (SFNA) initially adopted the 2009 Sacramento Regional 8-hour ozone Attainment and Reasonable Further Progress Plan (Plan) in February 2009. At that time, the Plan reflected the best available emissions inventory estimates, technical calculations, and air quality modeling to meet federal air quality planning requirements.

Since the Plan was adopted, both ARB and the SFNA Districts have continued to evaluate and update emission inventory categories under their respective authority. ARB has identified emissions inventory improvements through the recent rulemaking process for trucks, in-use off-road equipment, ocean-going vessels, and cargo handling equipment. The SFNA Districts have also identified emissions inventory and forecasting method improvements subsequent to the adoption of the 2009 Plan.

The SFNA District's improvements include the use of the most recent transportation activity data provided by Sacramento Area Council of Governments (SACOG) and updates to several categories subject to recent District rulemaking. ARB staff undertook a thorough review of the off-road mobile source inventory methodology, and updated many key factors used in estimating emissions from off-road vehicles. This included new population and activity data reported to ARB, as well as new published studies and other data that evaluated emissions from off-road vehicles. Staff also evaluated new data that showed that the previous inventory overestimated how much and how hard off-road vehicles work. This review has resulted in the 33 percent reduction in off-road baseline NO_X emissions and a 17 percent reduction in off-road baseline VOC emissions.

In aggregate, the emission estimates based on CARB and SFNA Districts' improvements show a 16 percent reduction in baseline NO_X emissions and 9 percent reduction in regional baseline VOC emissions for 2002. The revised combined emission estimates for NO_X and VOC are shown in Table B-31.

Relationship to SIP Emissions Targets

The SIP attainment demonstration shows how the 2018 emissions targets will be met through a combination of adopted measures and new SIP measures. The SIP emission targets represent the emission carrying capacities, or the maximum allowable emission levels that the nonattainment area can accommodate while attaining the standard. The attainment demonstration in the 2009 Plan was based on air quality modeling which used procedures set by EPA. Developing new SIP modeling and revisiting the adopted attainment demonstration would be a multi-year process. However, the planning effort to address the 2008 8-hour ozone standard will include new air quality modeling using more current inventory and air quality data. This modeling can also be used to assess progress towards attainment of the 1997 8-hour ozone standard that is the subject of this plan.

Review of SIP Modeling Results

In accordance with U.S. EPA procedures, air quality models are used to predict the relative response to reductions in ozone-forming emissions for each site in the region. Two model runs are conducted. The first model run is for the reference year (in this case 2002) using estimates of ozone-forming emissions in that year. The second model run is for a future year (in this case 2018) using forecasted emissions that include activity growth factors and the benefits of adopted controls, but no new SIP measures. This provides modeled ozone concentrations on a gridded basis for 2002 and 2018. The ratio of these two concentrations at each grid point is termed a relative reduction factor (RRF). Each RRF reflects the modeled decrease in ozone levels between 2002 and 2018. The RRF is then applied to an observed baseline ozone level calculated according to U.S. EPA guidance to project the expected ozone level in the attainment year. In the SFNA this projected ozone level was above the federal 8-hour ozone standard, indicating additional emission reductions were needed.

Since the modeling analyses forecasted the Cool monitoring site to have the highest ozone levels in the SFNA, the Cool site was designated as the design site for attainment of the federal 8-hour ozone standard. An ozone response diagram was developed for the Cool site to determine the additional reductions needed beyond the 2018 baseline emission forecast, shown in Figure B-0. To develop this diagram, further modeling simulations were conducted, using incremental reductions of 20, 40, and 60 percent from the projected uncontrolled 2018 emissions levels. The resulting diagram, shown in Figure B-0, provides the percent reduction needed to achieve an ozone concentration that meets the standard. This procedure established the SIP emission targets for the 2009 Plan.

Because photochemical modeling is a time and resource intensive process, the revised emission targets used in this update were developed utilizing an alternative analysis method. The RRFs developed in the 2009 plan show that ozone concentrations decrease more rapidly as we approach the lower levels of the NO_X inventory: as overall NO_X emission decrease, each new ton of NO_X reductions will have an incrementally greater ozone benefit. The 2009 Plan attainment demonstration was made by showing the reduction in the 2018 inventory from new controls was reduced by the percent reductions needed using Figure B-0, Cool 2018 Ozone Response diagram. Because the updated inventories changed both the baseline and attainment year inventories, and some of the new controls are reflected in the 2018 inventory projections, the same demonstration method is not possible. Instead this analysis determines whether the region attains by determining whether the percent emissions reductions from the baseline year are achieved using the existing modeling results. An analysis of the percent NO_X emissions reductions from the 2002 baseline year to the 2018 attainment year inventory shows the region will achieve roughly the same percentage of emissions reductions by 2018 that the existing modeling indicates will result in attainment. As a result, the existing modeling supports the conclusion that adopted controls will result in attainment by 2018.

Table B-31

Comparison of Original and Revised NO_X and VOC Emission Estimates in the Sacramento Federal Nonattainment Area

	NO_X (tpd)		**VOC(tpd)**	
	2009 SIP Emissions	**CEPAM 2012 Emissions**	**2009 SIP Emissions**	**CEPAM 2012 Emissions**
2002 Baseline Emission Inventory	196[a]	165[c]	160[a]	147
2018 Projected Emission Inventory	104[a]	74[c]	121[a]	98[c]
Reductions needed for attainment	13[b]	-	4[b]	-
MVEB Safety Margin	0	3	0	1
2018 Attainment inventory[d]	91	77	117	99
Percent Change Between 2002 and 2018	54%	53%	27%	33%

a See Tables 5-4 and 5-5 in Appendix A8
b 12.5% of NO_X and 3.3% of VOC from the 2018 projected emissions using Figure B-0
c See Table 5-3
d 2009 SIP Emissions columns represent emission targets for attainment; CEPAM2012 Emissions columns represent projected emissions with adopted controls.

Figure B-0

Cool 2018 Ozone Response Diagram

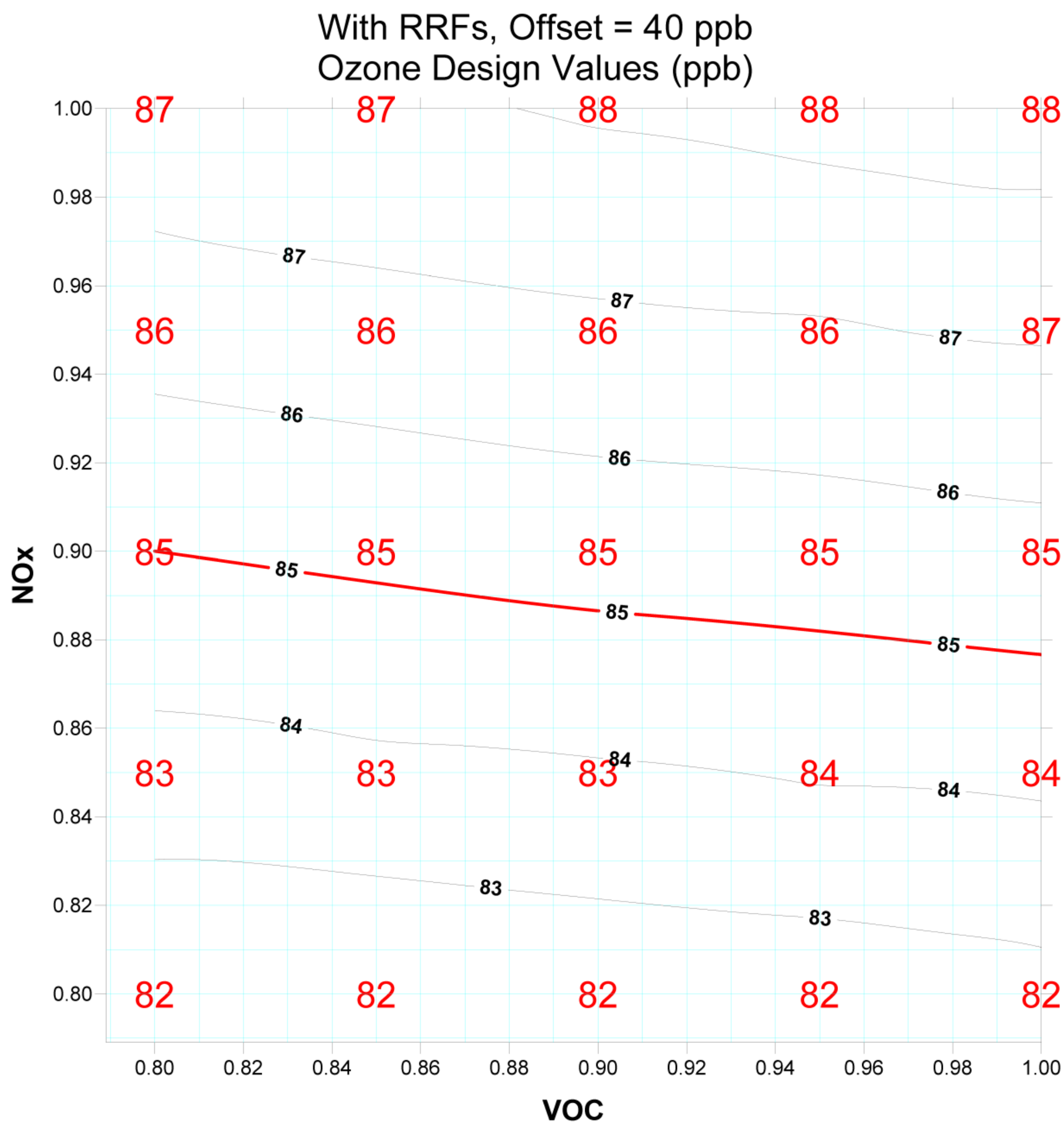
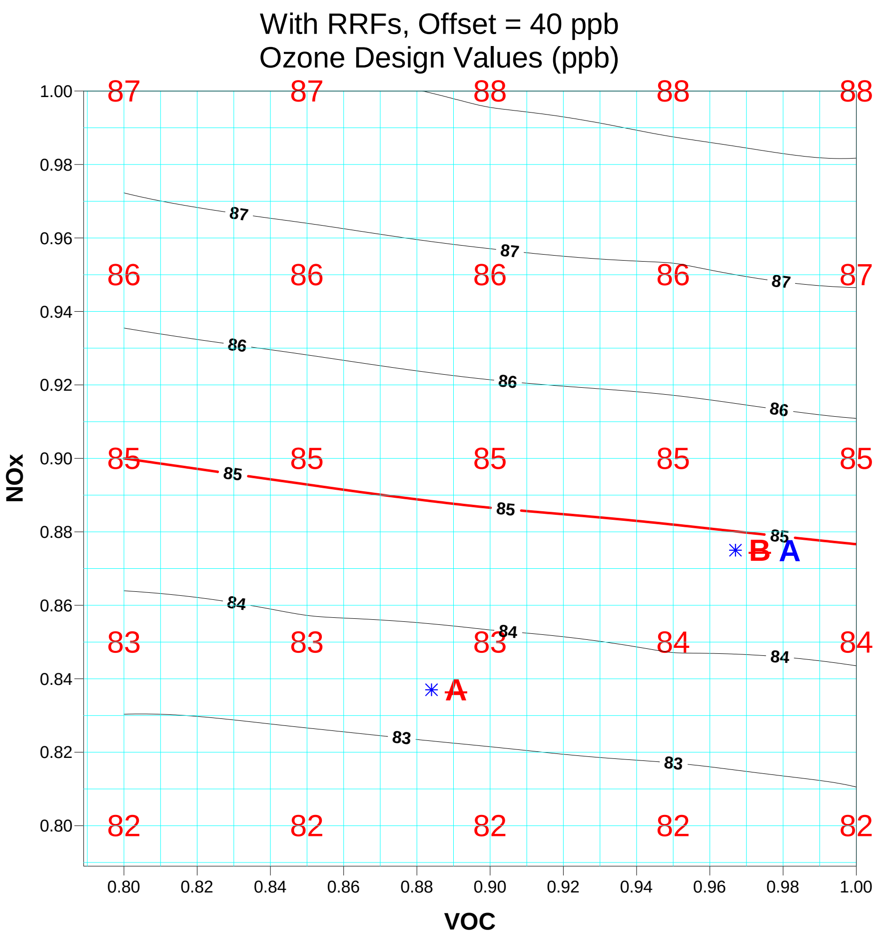


Figure B-1
2018 Ozone/Emission Reduction Graph for the Cool Monitoring Site Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: CUS - Cool Stn (1400 American **Subregion:** 6 **Reference Year Design Value:** 105 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	116	114	118	100	94	94	87	90	99	104
Peak Simulated 8-hour Ozone	95	82	93	83	76	75	83	78	92	100
Peak Simulated 8-hour Ozone within 15 km	111	86	106	85	79	81	88	85	98	105
Reference Year 15-km, 8-hour Average Ozone	98									
Future Year 15-km, 8-hour Average Ozone	93	75	87	72	69	72	76	72	85	89
Use in RRF Analysis?	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes



1. The upper right corner point designates the predicted 2018 peak ozone design value (88 ppb) based on the forecasted 2018 planning emissions inventory used in the Plan as adopted in 2009 (without new control measures): 121 tpd of VOC and 104 tpd of NO_X.
2. The x and y axes represent fractional emissions reductions from the forecasted 2018 planning emissions inventory used in the Plan as adopted in 2009.
3. The whole numbers on the graph represent predicted ozone design value concentrations (truncated to whole ppb), based on modeling results for fractional VOC and NO_X reductions at 5% increments. Values below 85 ppb represent attainment of the federal 8-hour ozone standard.

4. The horizontal contour lines represent the District's interpolated ppb 8-hour ozone concentrations based on 5% increment modeled ozone values rounded to the tenth of a ppb.
5. Point A identifies the percentage emission reductions (3.3% VOC and 12.5% NO_X) from 2018 emissions projected without new controls) that would have been achieved with the control strategy identified in the plan as adopted by local districts in 2009. Point A is below 85 ppb, demonstrating that this percentage of reductions would result in attainment of the standard at the Cool monitoring site.

Figure B-2
2018 Ozone/Emission Reduction Graphs – Auburn Monitoring Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: AUBD - Auburn-Dewitt-C Avenue **Subregion:** 6 **Reference Year Design Value:** 98 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	105	103	107	102	91	-99	80	82	95	107
Peak Simulated 8-hour Ozone	87	80	86	77	73	71	78	74	93	104
Peak Simulated 8-hour Ozone within 15 km	106	84	101	84	77	79	86	83	106	106
Reference Year 15-km, 8-hour Average Ozone	105									
Future Year 15-km, 8-hour Average Ozone	89	73	83	71	67	70	75	74	91	90
Use in RRF Analysis?	Yes	No	Yes	No	No	No	No	No	Yes	Yes

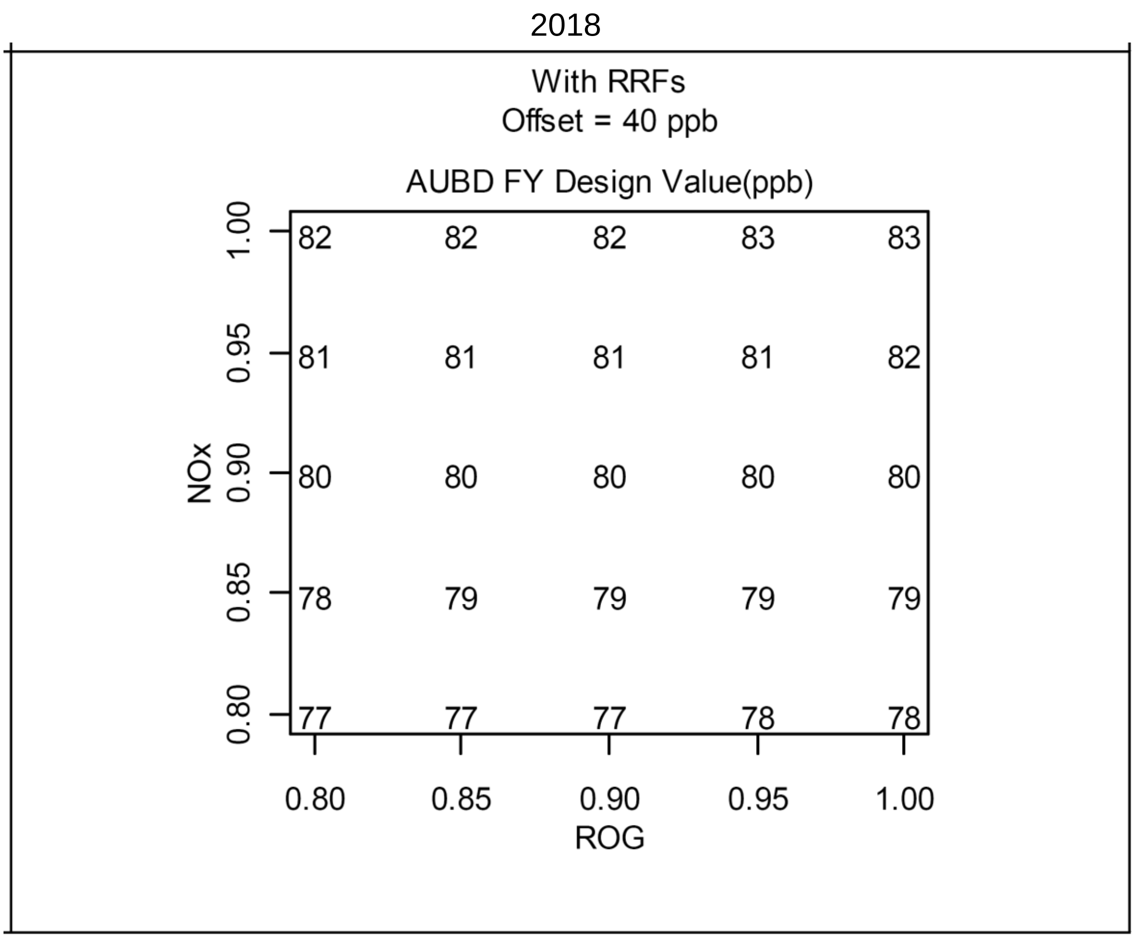


Figure B-3
2018 Ozone/Emission Reduction Graphs – Colfax Monitoring Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: 3002 - Colfax-City Hall **Subregion:** 6 **Reference Year Design Value:** 85 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	89	86	87	82	69	-99	-99	-99	-99	-99
Peak Simulated 8-hour Ozone	81	75	83	75	69	75	78	74	85	100
Peak Simulated 8-hour Ozone within 15 km	92	80	91	82	74	78	83	79	92	105
Reference Year 15-km, 8-hour Average Ozone	91									
Future Year 15-km, 8-hour Average Ozone	76	70	75	69	65	70	73	69	79	89
Use in RRF Analysis?	Yes	No	Yes	No	No	No	No	No	No	No

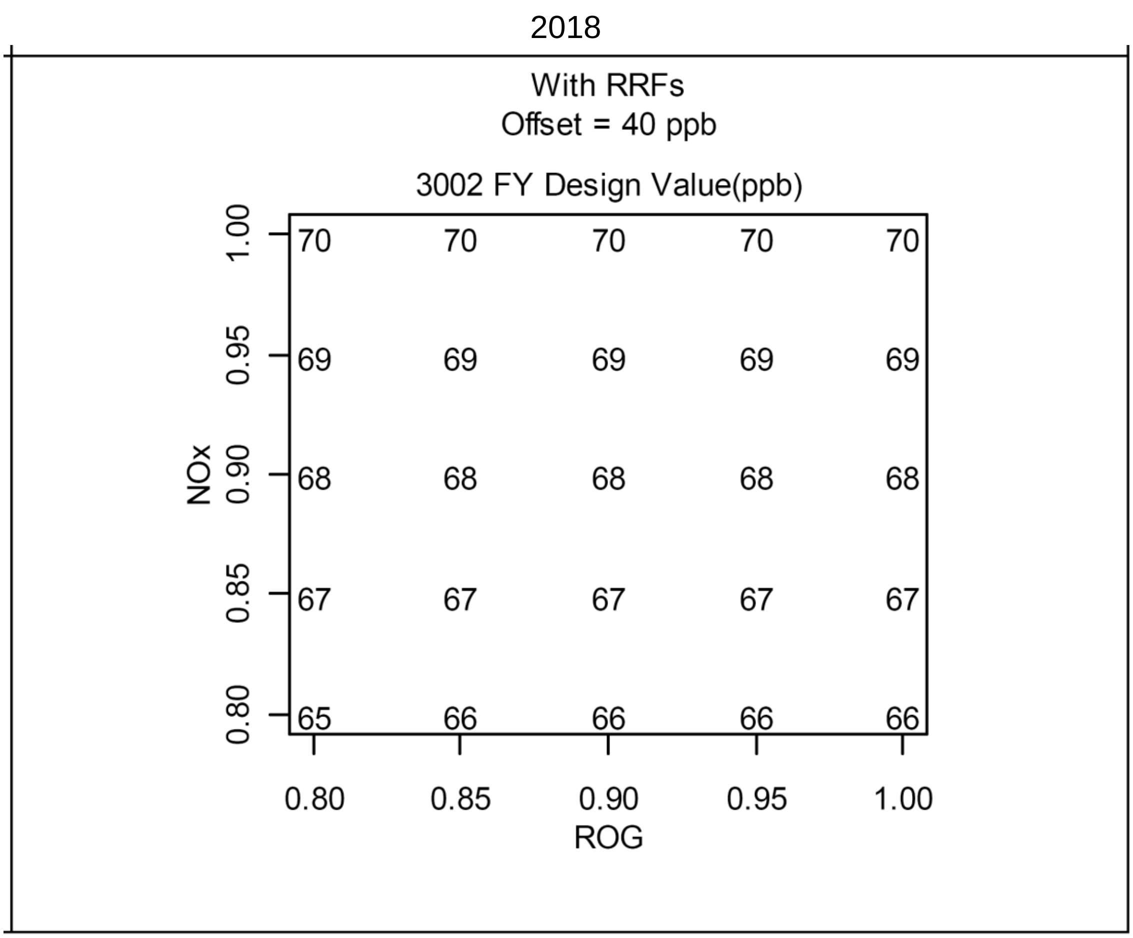


Figure B-4
2018 Ozone/Emission Reduction Graphs – Folsom Monitoring Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: FLN - Folsom Stn (Natoma St.) **Subregion:** 6 **Reference Year Design Value:** 99 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	109	129	124	102	86	70	66	43	-99	95
Peak Simulated 8-hour Ozone	109	96	121	87	87	88	97	84	105	88
Peak Simulated 8-hour Ozone within 15 km	115	114	125	98	98	101	107	92	116	104
Reference Year 15-km, 8-hour Average Ozone	108									
Future Year 15-km, 8-hour Average Ozone	102	96	101	80	87	88	96	82	98	90
Use in RRF Analysis?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes

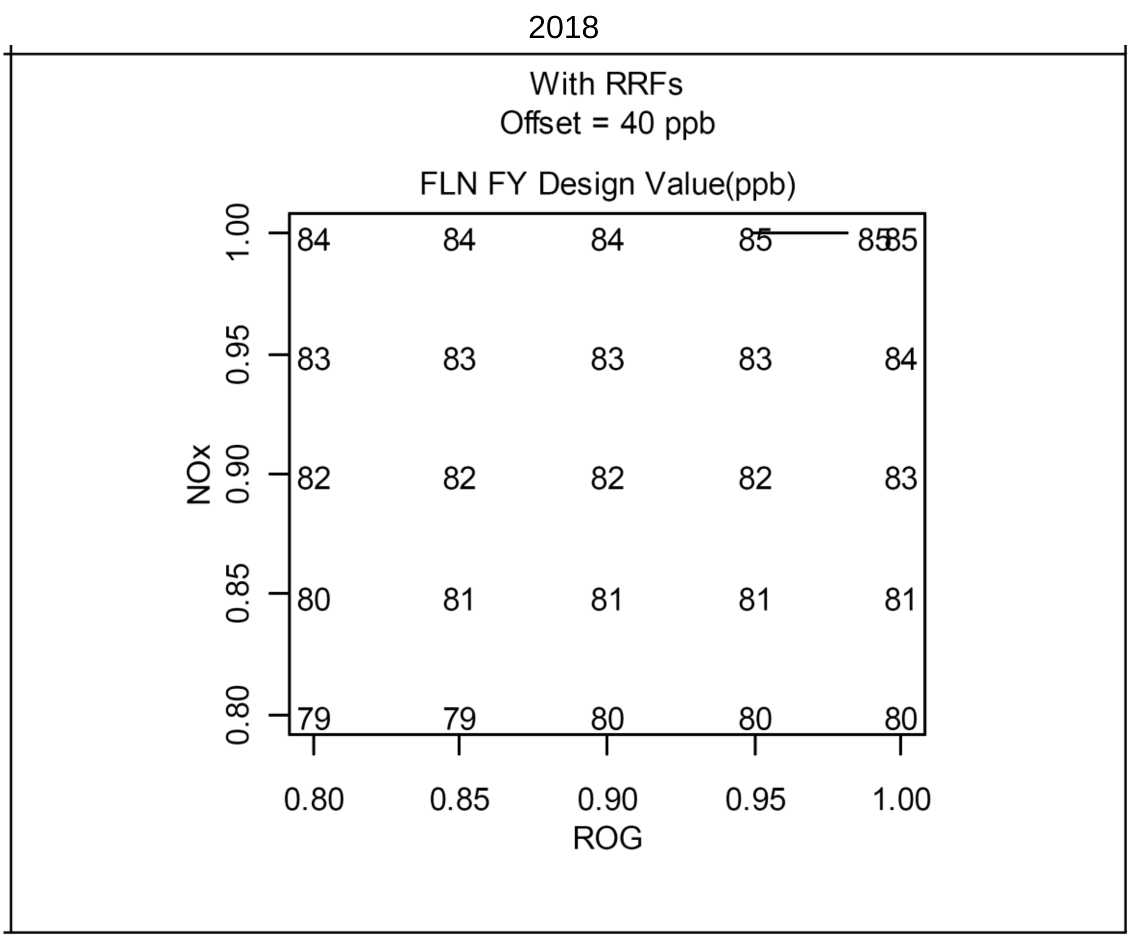
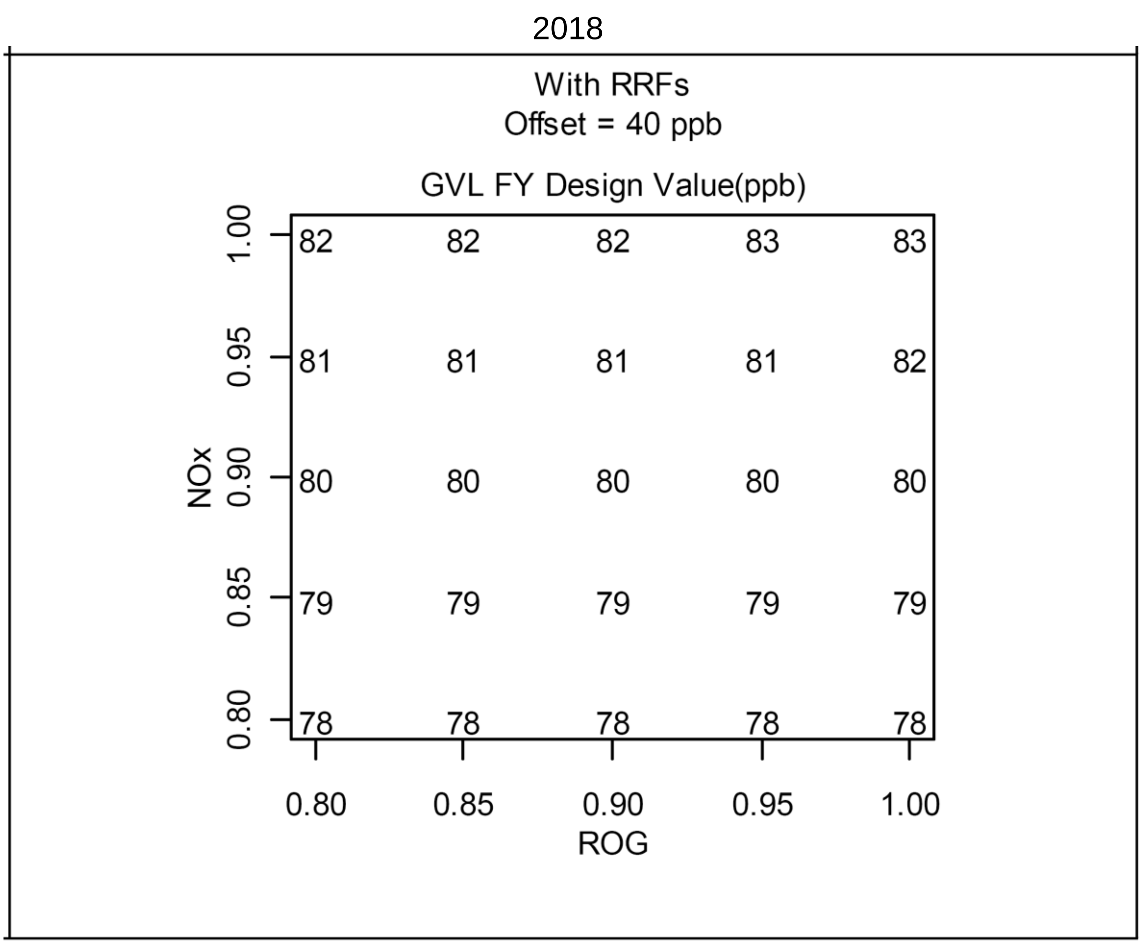


Figure B-5
2018 Ozone/Emission Reduction Graphs – Grass Valley Monitoring Site*
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: GVL - Grass Valley Stn- Litto **Subregion:** 13 **Reference Year Design Value:** 97 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Fail	Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Peak Observed 8-hour Ozone	93	93	97	100	82	79	87	78	94	113
Peak Simulated 8-hour Ozone	78	71	79	75	68	74	76	72	83	91
Peak Simulated 8-hour Ozone within 15 km	85	78	84	76	72	76	81	75	91	99
Reference Year 15-km, 8-hour Average Ozone	95									
Future Year 15-km, 8-hour Average Ozone	73	69	71	66	64	69	74	67	78	84
Use in RRF Analysis?	No	No	No	No	No	No	No	No	Yes	Yes



*Grass Valley monitoring site is outside the Sacramento nonattainment area, but is a nearby downwind site.

Figure B-6
2018 Ozone/Emission Reduction Graphs – North Highlands Monitoring Site Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: SNH - Sacramento-North Highla **Subregion:** 6 **Reference Year Design Value:** 89 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	53	79	69	64	80	89	81	77	100	87
Peak Simulated 8-hour Ozone	90	88	79	72	78	78	85	79	103	102
Peak Simulated 8-hour Ozone within 15 km	103	105	124	85	90	94	110	87	113	105
Reference Year 15-km, 8-hour Average Ozone	101									
Future Year 15-km, 8-hour Average Ozone	100	91	101	72	84	84	99	78	98	92
Use in RRF Analysis?	No	Yes	No	No	Yes	Yes	No	No	Yes	Yes

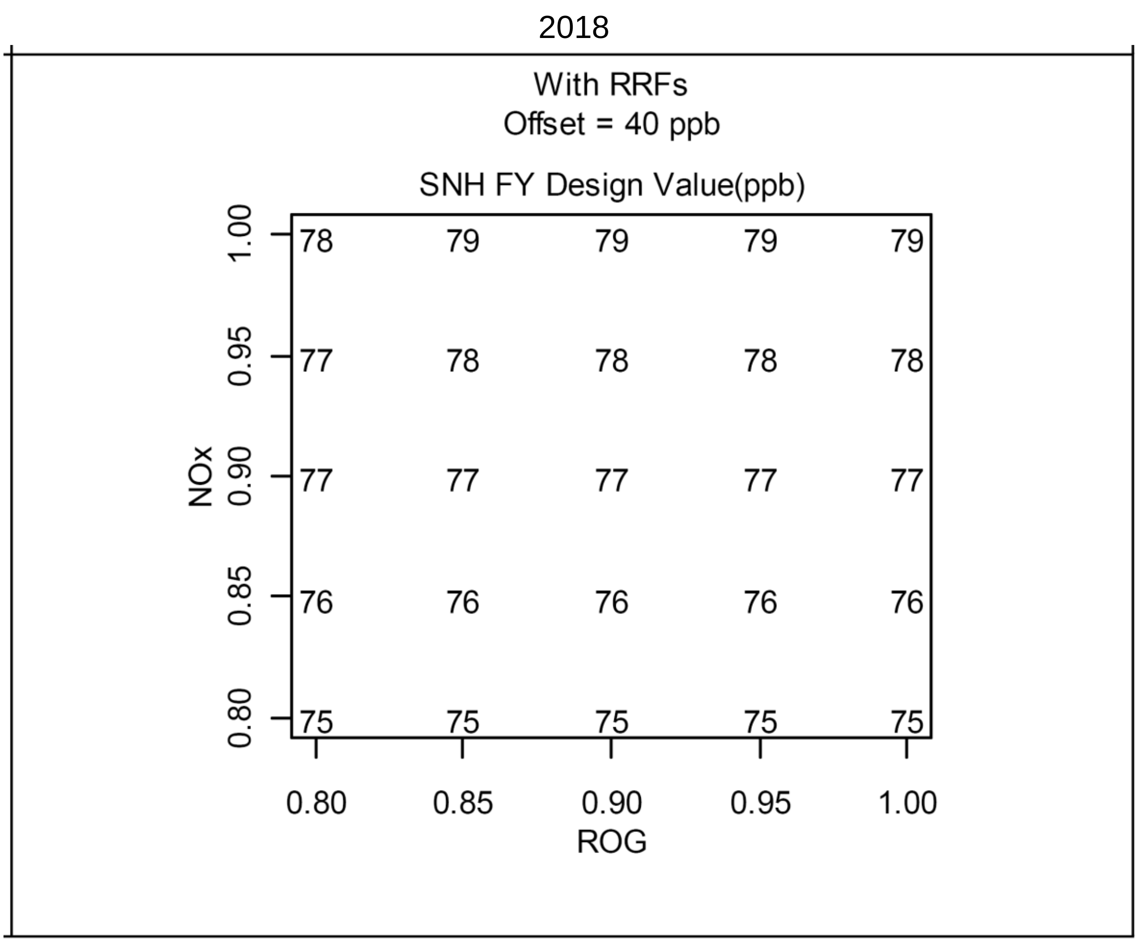


Figure B-7
2018 Ozone/Emission Reduction Graphs – Placerville Monitoring Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: PGN - Placerville Stn (Gold N **Subregion:** 6 **Reference Year Design Value:** 94 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	110	119	111	98	92	97	93	82	89	88
Peak Simulated 8-hour Ozone	107	88	94	89	74	80	85	83	85	79
Peak Simulated 8-hour Ozone within 15 km	115	106	106	95	92	97	94	86	93	91
Reference Year 15-km, 8-hour Average Ozone	99									
Future Year 15-km, 8-hour Average Ozone	98	89	87	78	78	83	82	75	81	78
Use in RRF Analysis?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes

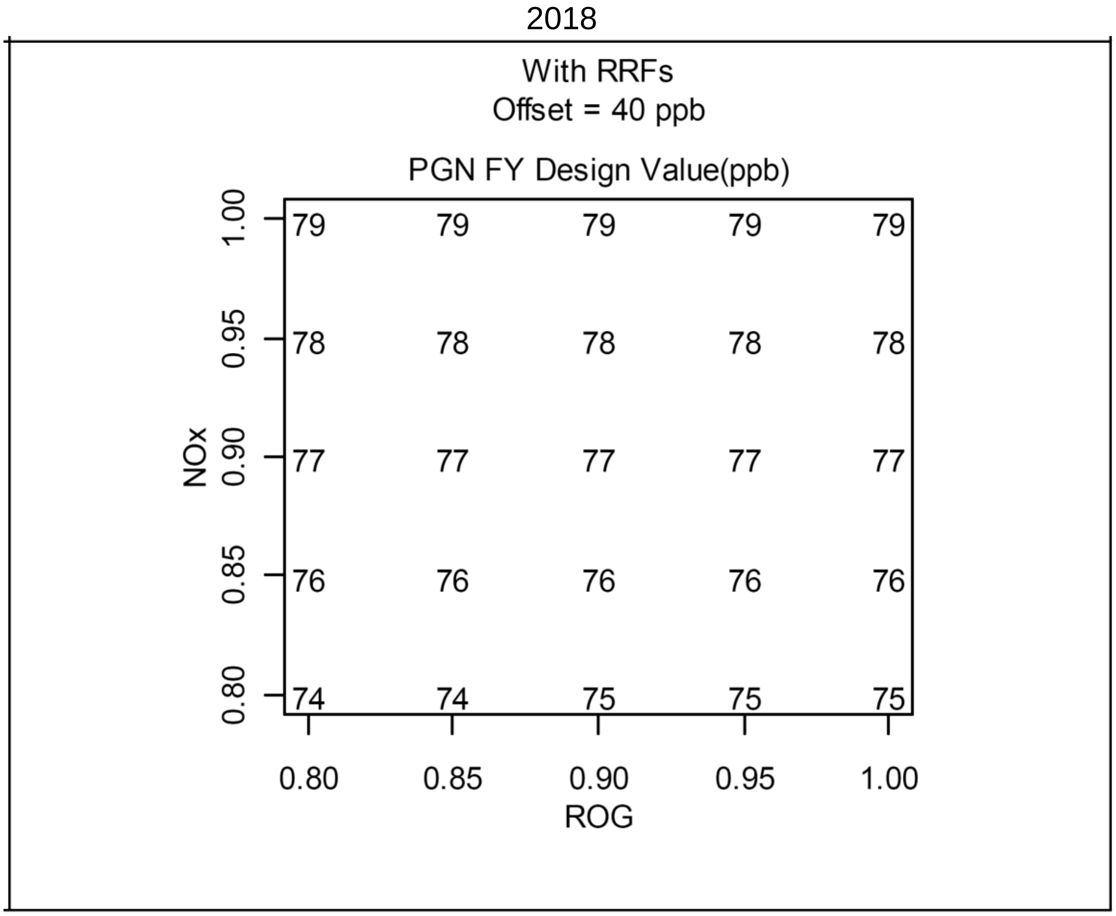


Figure B-8
2018 Ozone/Emission Reduction Graphs – Roseville Monitoring Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: ROS - Roseville Stn (151 N Su **Subregion:** 6 **Reference Year Design Value:** 89 ppb

Episode Days	**99190**	**99191**	**99192**	**99193**	**99194**	**00211**	**00212**	**00213**	**00214**	**00215**
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	86	107	113	88	86	90	85	70	93	97
Peak Simulated 8-hour Ozone	92	83	86	71	73	75	83	80	107	102
Peak Simulated 8-hour Ozone within 15 km	111	101	125	89	90	92	107	85	113	106
Reference Year 15-km, 8-hour Average Ozone	103									
Future Year 15-km, 8-hour Average Ozone	102	86	101	74	80	81	94	76	97	92
Use in RRF Analysis?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes

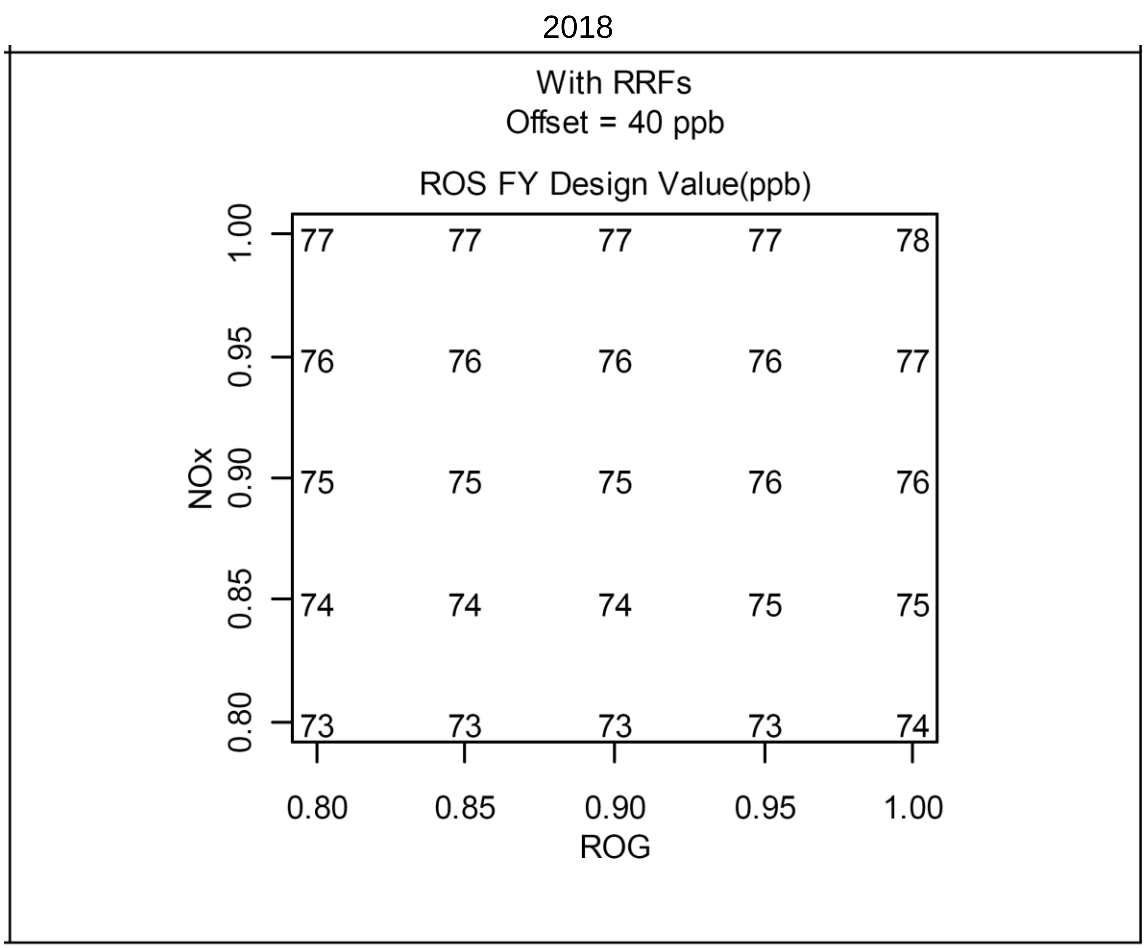


Figure B-9
2018 Ozone/Emission Reduction Graphs – Sacramento DPM Monitor Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: SDP - Sacramento Stn (Del Pas **Subregion:** 6 **Reference Year Design Value:** 95 ppb

Episode Days	99190	99191	99192	99193	99194	00211	00212	00213	00214	00215
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	78	111	107	95	77	92	93	74	101	80
Peak Simulated 8-hour Ozone	81	100	100	78	85	84	107	84	105	90
Peak Simulated 8-hour Ozone within 15 km	103	113	124	102	95	99	110	99	115	102
Reference Year 15-km, 8-hour Average Ozone	107									
Future Year 15-km, 8-hour Average Ozone	100	97	101	84	88	89	100	92	98	92
Use in RRF Analysis?	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes

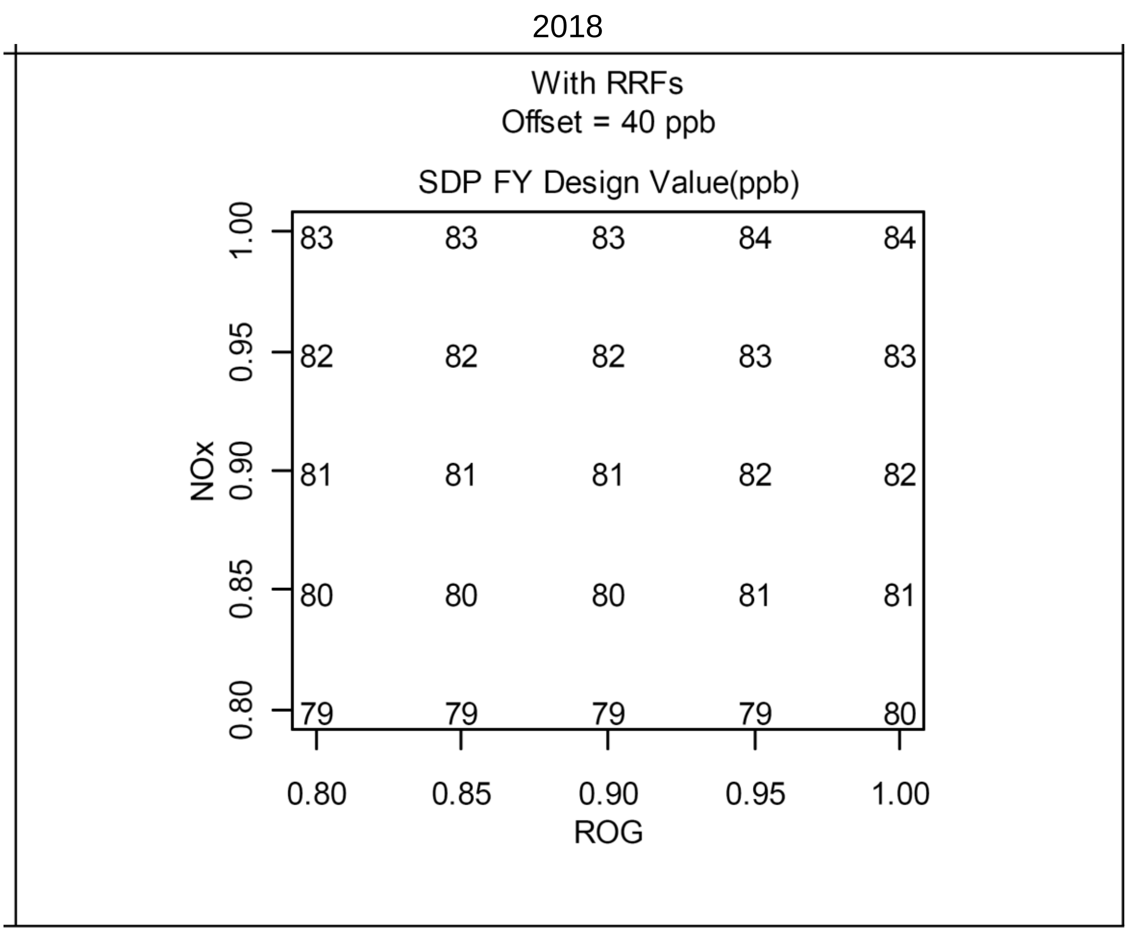


Figure B-10
2018 Ozone/Emission Reduction Graphs – Sloughhouse Monitoring Site
Based on Photochemical Modeling Results

Year: 2018 **Model:** CAMX/MM5/SAPRC99
Site: SLU - Sloughouse Rd. Stn **Subregion:** 6 **Reference Year Design Value:** 94 ppb

Episode Days	**99190**	**99191**	**99192**	**99193**	**99194**	**00211**	**00212**	**00213**	**00214**	**00215**
Performance Status	Pass	Pass	Pass	Pass	Pass	Pass	Fail	Fail	Pass	Pass
Peak Observed 8-hour Ozone	-99	-99	-99	-99	-99	96	91	83	109	91
Peak Simulated 8-hour Ozone	85	111	106	102	94	98	87	99	110	87
Peak Simulated 8-hour Ozone within 15 km	99	116	125	107	99	102	110	110	116	91
Reference Year 15-km, 8-hour Average Ozone	103									
Future Year 15-km, 8-hour Average Ozone	94	98	101	87	88	90	100	97	98	85
Use in RRF Analysis?	No	No	No	No	No	Yes	No	No	Yes	Yes

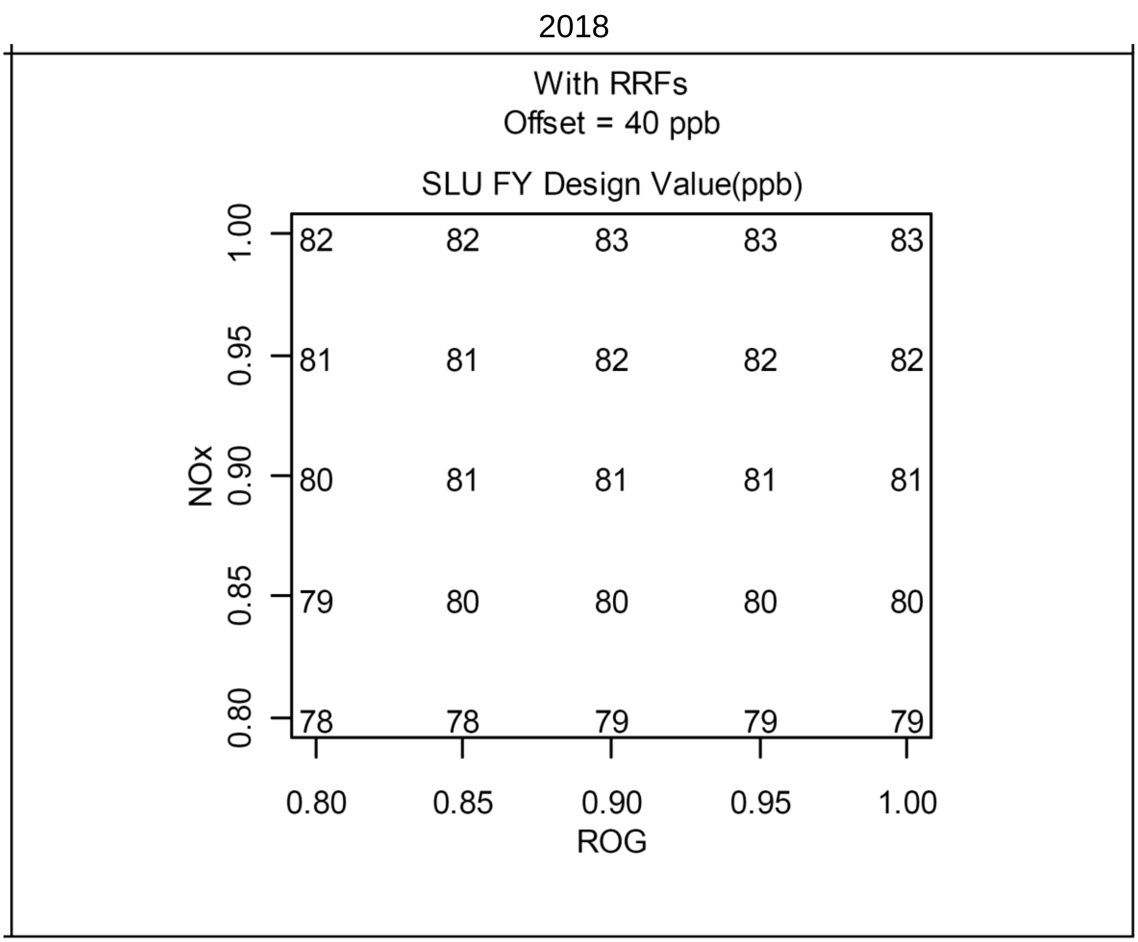
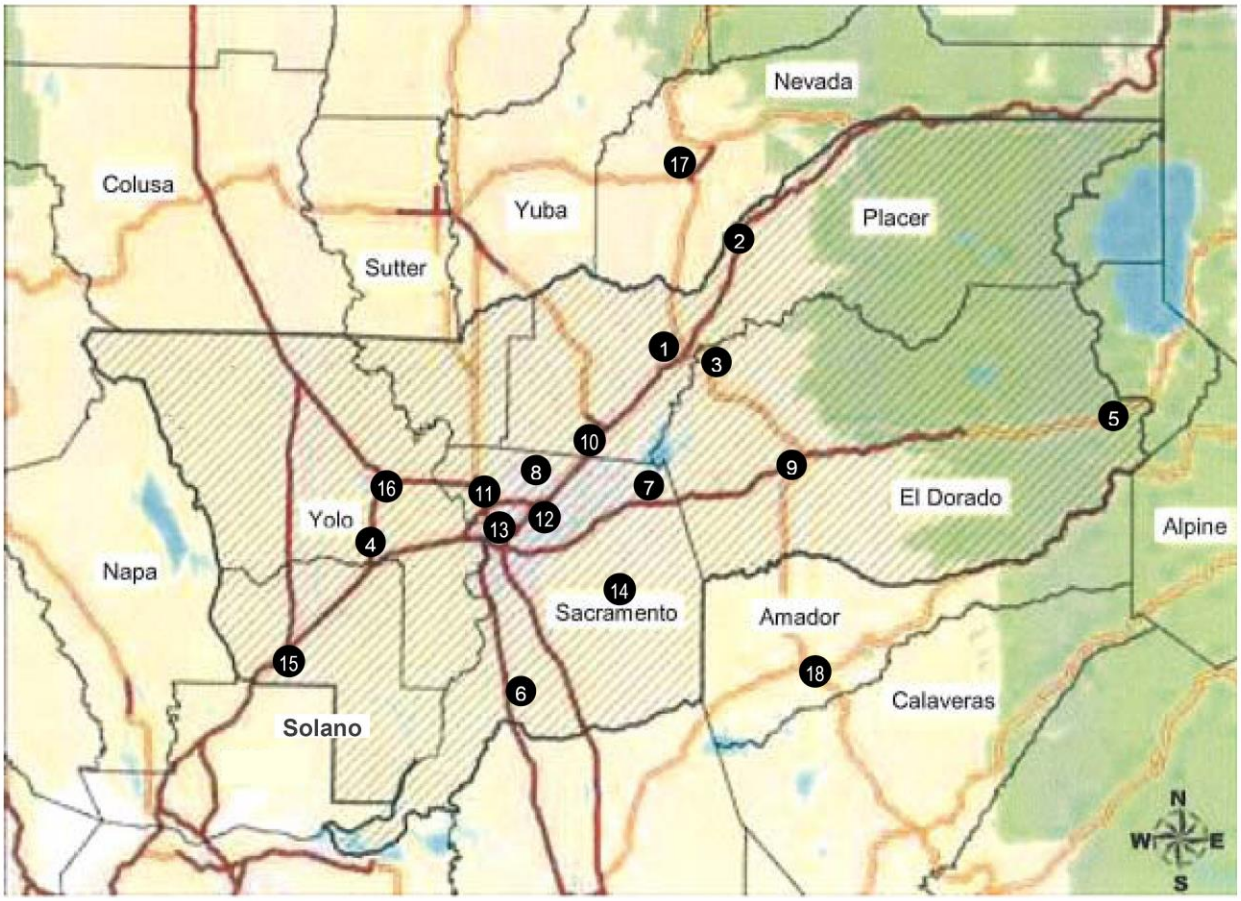


Figure B-11
Sacramento Nonattainment Area
Ozone Monitoring Stations



2008 Ozone Monitoring Sites (County)

Sacramento Nonattainment Area Sites

1. Auburn (Placer Co.)
2. Colfax (Placer Co.)
3. Cool (El Dorado Co.)
4. Davis (Yolo Co.)
5. Echo Summit (El Dorado Co.)
6. Elk Grove (Sac. Co.)
7. Folsom (Sac. Co.)
8. North Highlands (Sac. Co.)
9. Placerville (El Dorado Co.)
10. Roseville (Placer Co.)
11. Sacramento – Airport Rd. (Sac. Co.)
12. Sacramento – Del Paso Manor (Sac. Co.)
13. Sacramento – T Street (Sac. Co.)
14. Sloughhouse (Sac. Co.)
15. Vacaville (Solano Co.)
16. Woodland (Yolo Co.)

Other Sites

17. Grass Valley* (Nevada Co.)
18. Jackson** (Amador Co.)

*Grass Valley site: 2007 ozone design value = 95 ppb, and modeling analysis is applied for 2018.
**Jackson site informational only: 2007 ozone design value = 81 ppb, and modeling analysis is not applied.

Appendix C: Proposed Control Measures

Appendix C contains a summary table of emission reductions by control measure and a summary table of emission reductions by air district. This appendix also includes more detailed information on the individual proposed control measures. The non-regulatory control measures are listed first and include various regional measures (on-road and off-road mobile incentive programs, and an emerging/voluntary urban forest development program). These are followed by the regulatory control measures, which include a variety of stationary and area-wide source control measures. The stationary and area-wide source measures include write-ups for individual air districts in the Sacramento nonattainment area. The final section includes a description of further study measures. Information on transportation control measures is included in Appendix D.

Summary Table of Emission Reductions by Control Measure C-4

Summary Table of Emission Reductions by Air District C-6

Summary Table of Emission Reductions for Adopted New Local Control Measures C-7

NON-REGULATORY CONTROL MEASURES

Regional Mobile Measures

All Mobile Source Incentive Programs C-9

Regional Urban Forest Control Measures

SMAQMD-1 Urban Forest Air Quality Development Program C-15

REGULATORY CONTROL MEASURES

Stationary and Area-wide Source Control Measures

VOC Control Measures

Architectural Coatings C-56

SMAQMD-442
EDCAQMD-215
FRAQMD-3.15
PCAPCD-218
YSAQMD-2.14

Automotive Refinishing C-81

SMAQMD-459
FRAQMD-3.19
PCAPCD-234
YSAQMD-2.26

Degreasing/Solvent Cleaning C-90

FRAQMD-3.14
YSAQMD-2.24/2.31

Graphic Arts........ C-97

YSAQMD-2.29

Miscellaneous Metal Parts and Products........ C-100

PCAPCD-CM3

Natural Gas Production and Processing........ C-103

SMAQMD-461

NO_X Control Measures

Boilers, Steam Generators, and Process Heaters........ C-107

YSAQMD-2.27

IC Engines........ C-110

FRAQMD-3.22

Water Heaters C-113

EDCAQMD-239
FRAQMD-3.23
PCAPCD-CM2
YSAQMD-2.37

Further Study Measures

Urban Heat Island........ C-123

Alternative Energy C-125

Energy Efficency........ C-127

Gasoline Transfer Phase I/II........ C-128

Lubricants........ C-131

Episodic Controls........ C-133

Summary Table of Emission Reductions by Control Measure

Measure Name	Emission Reductions (TPD) 2018	
	VOC	NO_X
Non-regulatory Measures		
Regional Mobile Incentive Program – On-road	**0.032**	**0.50**
Regional Mobile Incentive Program – Off-road	**0.005**	**0.013**
Spare The Air Program	**0.059**	**0.046**
SACOG Transportation Control Measures	**tbd**	**tbd**
Urban Forest Development Program	**0 - 0.18**	**-**
Total Non-regulatory Measures	**0.10**	**0.56**
Regulatory Measures		
Stationary and Area-wide Source Measures		
Architectural Coating		
SMAQMD-442	0.913	-
EDCAQMD-215	0.186	-
FRAQMD-3.15	0.004	-
PCAPCD-218	0.201	-
YSAQMD-2.14	0.214	-
Total Architectural Coating	**1.52**	
Automotive Refinishing		
SMAQMD-459	0.113	-
FRAQMD-3.19	0.001	-
PCAPCD-234	0.045	-
YSAQMD-2.26	0.058	-
Total Automotive Refinishing	**0.22**	
Degreasing/Solvent Cleaning		
FRAQMD-3.14	0.001	-
YSAQMD-2.24/2.31	0.762	-
Total Degreasing/Solvent Cleaning	**0.76**	
Graphic Arts		
YSAQMD-2.29	---	-
Total Graphic Arts	**---**	
Miscellaneous Metal Parts and Products		
PCAPCD-CM3	0.014	-
Total Miscellaneous Metal Parts and Products	**0.01**	
Natural Gas Production and Processing		
SMAQMD-461	0.116	-
Total Natural Gas Production and Processing	**0.12**	-

Measure Name	Emission Reductions (TPD)	
	2018	
	VOC	NO_X
Boilers, Steam Gen. and Process Heaters		
YSAQMD-2.27	-	0.288
Total Boilers, Steam Gen. and Process Heaters		**0.29**
IC Engines		
FRAQMD-3.22	-	0.004
Total IC Engines		**0.00**
Large Water Heaters and Small Boilers		
EDCAQMD-239	-	0.003
FRAQMD-3.23	-	0.000
PCAPCD-CM2	-	0.030
YSAQMD-2.37	-	0.240
Total Large Water Heaters and Small Boilers		**0.27**
Total Stationary and Area Source Measures	**2.63**	**0.56**
Total Regulatory Measures	**2.63**	**0.56**
Total Reductions	**2.73**	**1.12**

tbd = to be determined

Summary Table of Emission Reductions by Air District

Air District Control Measure Name (Rule No.)	Emission Reductions (TPD) 2018	
	VOC	**NO_X**
Stationary and Area Source Measures		
Sacramento Metropolitan AQMD		
Architectural Coating (SMAQMD-442)	0.913	-
Automotive Refinishing (SMAQMD-459)	0.113	-
Natural Gas Production and Processing (SMAQMD-461)	0.116	-
Total Sacramento Metropolitan AQMD	**1.14**	**0.00**
El Dorado County AQMD		
Architectural Coating (EDCAQMD-215)	0.186	-
Large Water Heaters and Small Boilers (EDCAQMD-239)	-	0.003
Total El Dorado County AQMD	**0.17**	**0.00**
Feather River AQMD		
Architectural Coating (FRAQMD-3.15)	0.004	-
Automotive Refinishing (FRAQMD-3.19)	0.001	-
Degreasing/Solvent Cleaning (FRAQMD-3.14)	0.001	-
IC Engines (FRAQMD-3.22)	-	0.004
Large Water Heaters and Small Boilers (FRAQMD-3.23)	-	0.000
Total Feather River AQMD	**0.01**	**0.00**
Placer County APCD		
Architectural Coating (PCAPCD-218)	0.201	-
Automotive Refinishing (PCAPCD-234)	0.045	-
Misc. Metal Parts and Products (PCAPCD-CM3)	0.014	-
Large Water Heaters and Small Boilers (PCAPCD-CM2)	-	0.030
Total Placer County APCD	**0.26**	**0.03**
Yolo-Solano AQMD		
Architectural Coating (YSAQMD-2.14)	0.214	-
Automotive Refinishing (YSAQMD-2.26)	0.058	-
Degreasing/Solvent Cleaning (YSAQMD-2.24/2.31)	0.762	-
Graphic Arts (YSAQMD-2.29)	---	-
Boilers, Steam Gen. & Process Heaters (YSAQMD-2.27)	-	0.288
Large Water Heaters and Small Boilers (YSAQMD-2.37)	-	0.240
Total Yolo-Solano AQMD	**1.03**	**0.53**
Total Stationary and Area-wide Source Measures	**2.63**	**0.56**

Non-regulatory Control Measures

CONTROL MEASURE NUMBER: Regional Mobile Measures

Control Measure Title: All Mobile Source Incentive Programs
Evaluation Date: July 29, 2008

Control Measure Description

Mobile sources such as trucks, automobiles, trains, boats, construction and farm equipment are by far the largest sources of ozone precursors in the Sacramento nonattainment area. Included under this major source category are all non-stationary sources from lawn mowers to jumbo jets. The air districts do not have authority to directly regulate mobile source emissions through emission standards; however, the air district incentive programs may complement state and federal regulatory efforts in reducing mobile source emissions. These regional mobile source incentive measures are implemented in all or parts of the Sacramento nonattainment area by the air districts.

The estimated emission reductions from these proposed regional mobile incentive measures are summarized for all mobile source incentive programs and disaggregated by reductions for the on-road mobile and off-road mobile control measures.

Because many of the incentive measures in the categories below target the same vehicles or engines, it is difficult to predict in advance what portion of the benefits should be assigned to each of the individual strategies. Therefore, the benefits from the collection of measures have been estimated, and all or any portion of the measures may be implemented to achieve those benefits. Some measures noted may likewise not be implemented if cost effective reductions are not available. However, for purposes of establishing motor vehicle emission budgets in each of the milestone years for transportation conformity, an explicit commitment is made to the reductions associated with the on-road mobile source incentive program.

The incentive program measures noted below rely on funding provided according to existing laws and policies. The funding sources for 2008-2018 include SECAT program ($33.0M) and local district Department of Motor Vehicle fees ($13.0M).

Individual Measure Descriptions

Implement a variety of incentive programs for on-road vehicles and off-road equipment. The programs include:

ONMS-LD-1 (ONMS-LD-2). Light Duty Early Retirement - Implement an incentive based light-duty vehicle early retirement program. The program is focused on accelerating retirement of non-OBD-II vehicles.

ONMS-HD-1 (ONMS-HD-5). SECAT-Like Program - The measure implements an incentive program for NO_X reduction in heavy-duty vehicles similar to that created by the Sacramento Emergency Clean Air Transportation (SECAT) program.

SMAQMD OFMS-SI-1. Zero Emission Lawn and Garden Incentive (Residential) - This measure implements a year-round continuous incentive program for the replacement of residential spark ignited gasoline-powered mowers with electric or zero emission alternatives in 2008-2018.

SMAQMD OFMS-HD-1. Off-road CI Incentive Program - This measure implements an incentive program for NO_X reductions through aftertreatment retrofits, engine replacement and fleet modernization in off-road heavy-duty compression ignition (CI) equipment.

Control Measure Funding and Sources

There are a number of funding sources available to the Sacramento region for reducing emissions. These funding sources include the Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer), the Sacramento Emergency Clean Air and Transportation Program (SECAT) and the Goods Movement Emission Reduction Program (GMERP). The California Air Resources Board (CARB) develops guidelines and provides the funding for the Moyer and GMERP Programs[1]. The guidelines for the SECAT Program are developed by the Sacramento Air District (District) and approved by the boards of both the District and the Sacramento Area Council of Governments (SACOG). The funding for the SECAT Program is provided by SACOG from federal transportation funds. The district also collects fees on vehicles registered in Sacramento County. Two dollars of that fee is used to fund local match for the Moyer Program and for funding school bus projects. The table below summarizes these funding sources from 2008 to 2018.

<table>
<tr><th>Description</th><th>Funding Sources</th></tr>
<tr><td>ONMS-LD-1</td><td rowspan="2">AB923 - $1,000,000 annually ('09-'14)
SECAT - $3,000,000 annually ('08-'18);</td></tr>
<tr><td>ONMS-HD-1</td></tr>
<tr><td>OFMS-SI-1</td><td rowspan="2">DMV, AB923 –
$1,000,000 annually ('08-'14)</td></tr>
<tr><td>OFMS-HD-1</td></tr>
</table>

Targeted EIC Categories and Planning Inventory

The emissions reductions and percentages were also broken out for the on-road and off-road segments. On-road segments in EIC codes 710, 722, and 723. Off-road segments include EIC codes 860 and 870. The impact on various part of the EIC categories differ based on difference between old and new vehicle emissions rates. Evaporative EIC categories will have different percent effectiveness than exhaust categories.

[1] We have assumed that the ARB will take credit for all Moyer and GMERP emission reductions so no District Moyer or GMERP funding or emissions were included.

EIC codes	Description	Non-Attainment Planning Inventory					
		2014		2017		2018	
		NO_X (tpd)	ROG (tpd)	NO_X (tpd)	ROG (tpd)	NO_X (tpd)	ROG (tpd)
710	LIGHT DUTY PASSENGER (LDA)	4.69	6.41	3.51	4.38	3.16	3.85
722	LIGHT DUTY TRUCKS - 1 (LDT1)	1.42	2.36	1.14	1.81	1.04	1.66
723	LIGHT DUTY TRUCKS - 2 (LDT2)	3.11	2.99	2.28	2.31	2.03	2.13
744	MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	5.58	0.30	4.05	0.21	3.63	0.20
746	HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	12.68	0.63	9.74	0.57	8.99	0.58
860	OFF-ROAD EQUIPMENT	7.26	7.31	7.58	6.76	6.88	6.58
870	AGRICULTURAL EQUIPMENT	7.33	1.41	5.80	1.09	5.32	0.99
	Total	**42.08**	**21.41**	**34.10**	**17.13**	**31.06**	**15.98**

Emission Reductions

The emission reductions are based on a variety of actions taken for all on- and off-road applications. The table below provides aggregate emission reductions and percentages for all milestone years and the compliance year 2018.

Total

Year	NO_X		ROG	
	Tpd	%	Tpd	%
2014	0.634	1.51%	0.138	1.59%
2017	0.438	1.28%	0.045	0.58%
2018	0.505	1.63%	0.037	0.49%

On-road Measures

Year	NO_X		ROG	
	Tpd	%	Tpd	%
2014	0.529	1.93%	0.097	0.77%
2017	0.407	1.96%	0.033	0.36%
2018	0.492	2.61%	0.032	0.39%

Off-road Measures

Year	NO_X		ROG	
	Tpd	%	Tpd	%
2014	0.105	0.72%	0.041	0.47%
2017	0.031	0.23%	0.012	0.15%
2018	0.013	0.11%	0.005	0.07%

Needed Resources and Authority:

Potential Implementing Agency	Agency Type	Authority Origin
Air Districts	Regional	All Air Districts: California Health and Safety Code 44299.50-44299.55 SMAQMD Only: California Health and Safety Code 41014, 41062, 41081, 41082, Other Air Districts: California Health and Safety Code: 44220 et. seq.

References:

ONMS-LD-1:
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Bureau of Automotive Repair Website: www.smogcheck.ca.gov.

Bay Area Air Quality Management District Website: www.baaqmd.gov

Bay Area Air Quality Management District Vehicle Buy Back Program Annual Report, July 1, 2004

Consumer Assistance Program (CAP) Background Information Fact Sheet (http://www.breatheeasier.ca.gov/be_capbackground.pdf)

Consumer Assistance Program (CAP) retirement application (http://smogcheck.ca.gov/ftp/pdfforms/cap_app.pdf)

Vanessa Mongeon, Vehicle Buy Back program manager, BAAQMD.

ONMS-HD-1:
"Currently Verified Technologies", California Air Resources Board, http://www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm, accessed on 6 July 2006.

Johnson-Matthey EGRT Data Sheet, accessed at http://ect.jmcatalysts.com/pdf/EGRT.pdf on 7 July 2006.

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Appendix C: Cost Effectiveness Methodology, Public Fleet Rule, ARB.

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"Off-road Construction Equipment Diesel Emission Reduction Technologies, Tier 1-4 Implementation Schedule"
TIAX. Presentation to CAPCOA Workshop, July 2004.

"Public Workshop to Discuss Diesel Off-Road Equipment Measure", California Air Resources Board presentation, 24 January 2006.

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"Proposed New SIP Measures – Descriptions" Chapter 5, 2007 State Implementation Plan, CARB, April 26, 2007 -- http://www.arb.ca.gov/planning/sip/2007sip/2007sip.htm

OFMS-SI-1:

"Report to the Board on the Potential Electrification Programs for Small Off-Road Engines", ARB Staff Report, 2 April 2004.

Lifetime considerations. Charlene McGhee, SMAQMD. (Mow Down Air Pollution Control Studies through 2007)

Control Measure Number: SMAQMD-1

Control Measure Title: Urban Forest Air Quality Development Program

Control Measure Summary

The regional urban forest is populated by 7 million trees from over 100 different species. Each of these tree species can be categorized as low, medium, and high biogenic volatile organic compound (BVOC) emitting trees. Currently, 61% of the trees are considered as low emitting trees, 28% as medium emitting trees, and 11% as high emitting trees. This control measure proposes a targeted urban forest management program to reduce total urban forest BVOC emissions[1] by favoring the planting of low emitting trees rather than medium and high emitting trees in the next 10 years[2]

Through a combination of community education and governmental policy change over the next 10 years, this control measure calls for a minimum 390,000 low emitting trees to be planted that otherwise would have been medium or high emitting trees. This tree planting strategy change will reduce BVOC emissions by up to 0.84 tpd. The total estimated project cost is $1.71 million. Although the duration of the project is 10 years, the actual benefit will last many years. To be conservative we assume a 25 years planning period and the cost effectiveness of the BVOC reduction is $1,291 per ton or $0.65 per pound.

Control Measure Description

Our region, which includes the Sacramento Federal Ozone Nonattainment Area, has succeeded in creating a renowned urban forest. Our forest evolved over many years, with each generation of our community adding trees that met the needs of their day. In earlier years, urban trees were planted for comfort cooling and public health benefits. More recently, the Sacramento Municipal Utility District (SMUD) has invested millions of dollars in the strategic planting of an energy-saving urban forest. Today we have a pressing need to improve the purity of the region’s air. While our urban trees make a major contribution to air quality, they were not planted with this in mind and so do not do as much as they could.

We enjoy the benefits of 7 million trees in the urban areas of our region. These trees shade between 12% and 14% of our urban area (McPherson 1998 and STF UFORE 2007). The variety of threats that urban trees confront (mortality, diseases, and natural disasters) reduces their average life to 40 years. Consequently, just to maintain our current canopy level, the region will collectively need to plant 1.75 million replacement trees over the next 10 years. To optimize the benefits of these trees for air quality, care must be taken to select trees that will not only grow well in Sacramento’s climate but that will also emit low levels of BVOCs.

Historically, the trees planted in our region have been 61% low-emitting and 39% high/medium-emitting trees (Simpson 2007). This traditional tree selection, defined as the ‘current mix,’ determines the emission profile for the current urban forest. By emphasizing low-emitter planting

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[1] BVOC emissions from trees largely consist of isoprene, monoterpenes, and methlybutenol (MBO). However a host of other compounds are emitted in smaller quantities, referred to here as other VOCs (OVOCs). No MBO emissions were assumed since they only occur only with a few species of pine not used. The approach are similar to that used by the California Air Resources Board to account for OVOCs (Klaus Scott, Emission Inventory Analysis Section, personal communication, 7/28/2006), which is to estimate OVOCs as 30% of the total emissions of isoprene + monoterpenes + MBO. More information in the Phase 1a report (Simpson 2007)

[2] STF is currently working on providing tree lists for each emitter category for different jurisdictions and will be provided by SIP submittal date to EPA.

without considering the additional urban growth in the next 10 years, this control measure will at minimum change the future mix to be 66% low-emitting and 34% high/medium-emitting trees. To achieve this change, the control measure proposes an education program for community and landscape industry leaders in conjunction with local government policy changes. The planting assumptions are spelled out in the References of this measure (McPherson 1998, Simpson 2006, Simpson 2007).

Four groups within our region--local governments, community groups, property owners, and developers, either by themselves or through their landscapers—plant almost all trees. Local governments plant trees directly on land they control, such as parks or streets. Through the ordinances and policies that they create, local government also influence the planting of a great many more trees. The development community plants a large number of trees for this reason. Six tree non-profits in our region are major tree planters and a large number of community service groups occasionally host tree-planting projects. Private property owners, apart from any activities of the not-for-profits or local governments, are significant tree planters.

One of the requirements of a SIP control measure is that the emission reductions be verified. This requirement presents a special challenge for a tree measure. Tree planting is broadly dispersed and undertaken by a large number of individuals and organizations. There are few reporting mechanisms and almost no tracking requirements. It is not possible today to predict who specifically will plant the millions of trees we will need or where they will be planted. It is infeasible to strictly account for each tree planted and then to verify the planting and survival of a statistically valid number of individual trees. These difficulties in quantification have historically kept trees out of air quality attainment plans.

In September 2004, USEPA issued guidance giving states the opportunity to include a small number of projects that do not have the same high level of certainty as traditional control measures (USEPA 2004). Tree planting measure is specifically included as an option under this policy. The policy guidance is clear that these non-traditional, voluntary measure, or emerging measures, as they have become known, still require verification and tracking with best information systems available. This is consistent with EPA policy[1] for incorporating emerging and voluntary measures in a SIP but limiting the amount of emission reductions allowed due to the uncertainty and untested nature of the control mechanisms. For total emerging and voluntary measures, EPA has adopted a presumptive limit[2,3] of 6 percent of the total amount of emission reductions necessary to demonstrate attainment. For this region, the 6% level limits this measure to 0.18 tpd of VOC reductions. A detailed calculation of claimable emission reductions is described in Appendix 9.

To meet the verification requirement, the Urban Forest Air Quality Development Program will use a system of field surveys to measure actual planting activity, tree survival and growth. This survey system is named the Urban Forest Effects model (UFORE) and was developed by the US Forest Service. When this survey system is employed, sample plots are established throughout the urban forest and detailed information is collected that can be used to characterize the entire forest. Periodic re-sampling at milestone years will track urban forest changes during the life of the project and demonstrate that low emitting trees are planted at a higher rate. In addition to the UFORE system, the Urban Forest Air Quality Program will ask participating jurisdictions and retailers to keep a comprehensive database of any tree planting or

[1] "Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)" (OAQPS, EPA, September 2004).
[2] Ibid., p. 9.
[3] The limit is presumptive in that the USEPA believes it may approve measure into a SIP in excess of the presumptive 6 percent where a clear and convincing justification is made by the State for a higher limit.

tree sales through 2018. This will aid in quantifying and verifying planting efforts in the region and supplement the UFORE survey results. A more detailed description of the UFORE system and how the tree database will aid if jurisdictions meet planting goals is presented in Appendices 4, 5 and 6 of this measure.

At least one and perhaps several agencies and organizations will be responsible for the timely completion of the activities of the control measure. In this measure, local governments will formally guarantee by resolution the tree species composition changes needed to complete this measure.

Emissions estimating and validation

To calculate emissions reductions, forest canopy emissions were estimated in two ways. The first estimate is derived from the business-as-usual (BAU) scenario. In the BAU scenario, we assumed that the current urban forest—its species and size distribution of trees--would be maintained and planted between now and 2018. The second estimate is the control measure scenario (CMS). To create the CMS, we changed the mix of tree species planted to favor lower emitting trees over higher emitting trees and recalculated emissions. The emission reduction claim of the control measure is the difference between these two scenarios.

The reduction calculation requires much more detail, beginning with the business-as-usual scenario. We had to contend with a variety of issues. The existing forest continues to grow and expand. Trees are planted and die. Smaller trees have different effects than larger trees. Each species of tree has a different effect on air quality. The urbanized area of the region continues to expand into undeveloped areas. During this transformation, pre-development trees are often replaced with very different urban trees. At first, the canopy cover of urbanizing areas often drops as land is cleared for development but soon young trees grow to create a much greater cover.

To address these issues, the Sacramento Urban Forest Ecosystem Study (McPherson, 1998) and the Benefit Cost Analysis of Modesto's Municipal Urban Forest (McPherson et al, 1999) were used to characterize current regional urban forest. These studies conclude that the regional canopy is 14% in developed areas and 5% in undeveloped areas slated for development. Tree species, size, age and health distributions documented in these studies were applied to the Sacramento region's canopy coverage figures to characterize the current urban forest. To estimate the business-as-usual canopy of 2018, the same ratios were applied to the future forest. As the community expands, as trees are planted and as they grow, the BAU scenario assumes that emitter category distribution of the urban forest remains constant.

Calculating the actual BVOC emissions of the current and projected urban forests is not straightforward. Of the hundreds of species of trees that exist in the Sacramento region, only handfuls have had their emissions measured. Biogenic VOC emissions are species-specific, and strongly dependent on the amount of leaf mass and environmental conditions such as available sunlight. Field sampling has found large variation in BVOC emissions for a particular species of tree from region-to-region, day-to-day and even hour-to-hour. To simplify the calculation and create a manageable data set for analysis, the 100+ tree species present in the Sacramento regional urban forest were consolidated into eleven categories or families that have reasonably well-known emission profiles. Total emissions were then calculated considering the number and size of these trees today and in 2018 (Simpson, McPherson, 2007).

The CMS was created using the same base studies and assumptions used in the BAU scenario with one key difference. Since there are 7 million trees in the urban forest (61% low emitters, 28% medium, and 11% high emitters), approximately 1.75 million trees will be planted to replace trees that die. The BAU scenario assumes that replacements trees will follow the current mix profile. The initial study (Simpson 2007) of the control measure estimated that 1.75 million trees will be needed to be replaced over the next 10 years to maintain the current tree canopy cover due to the natural death of trees, tree diseases, or natural disasters. Preliminary photochemical modeling indicated that a total of 12tpd of VOC emissions was needed to demonstrate attainment in 2018. This established the limit of claimable reductions of 0.84tpd [1] Therefore it was determined that the minimum number of trees needed to be diverted from the number of 1.75 million replacement trees would be 390,000. Any future trees planted in the region using the CMS tree species profile will secure the emission reductions claimed in this control measure.

In addition to tree replacement, new trees will be planted in the new developed areas to maintain the region's traditional urban tree canopy cover in the urban area; these may include both suburbs and in-fills. However, there is a degree of uncertainty on the number of additional trees that will be planted in the Sacramento Region for the next 10 years, so the total number of trees in 2018 will be variable (n_{2018}). These figures are summarized in Table 2.

[1] EPA has a presumptive limit of 6% of the total amount of emission reduction necessary to achieve the planning requirement for attainment demonstration purposes. The 0.84 was based on preliminary modeling results. Final modeling and claimable reduction calculation details are provided in Appendix 9.

Table 1: 2018 Business-as-usual forest populations

2018 Business-as-usual forest canopy

Tree to maintain target urban tree canopy

Units: millions	Low emitting trees	Medium Emitting trees	High emitting trees	Total Trees
(1) 2008 trees remaining in 2018	3.20	1.47	0.58	5.25
(2) Replacement Trees	1.07	0.48	0.20	1.75
(3) New Trees	$0.61(n_{2018}-7)$	$0.28(n_{2018}-7)$	$0.11(n_{2018}-7)$	$N_{2018}-7$
(4) Resulting Total	$0.61n_{2018}$	$0.28n_{2018}$	$0.11n_{2018}$	n_{2018}

Table 2: Control measure results anticipated in 2018[1]

2018 Control Measure Scenario

Trees to maintain target urban tree canopy

Units: millions	Low emitting trees	Medium Emitting trees	High emitting trees	Total Trees
(1) 2008 trees remaining in 2018	3.20 (61%)	1.47 (28%)	0.58 (11%)	5.25 (100%)
(2) Replacement Trees	1.45 (83%)	0.21 (12%)	0.09 (5%)	1.75 (100%)
(3) New Trees	$(n_{2018}-7)\times 83\%$ (83%)	$(n_{2018}-7)\times 12\%$ (12%)	$(n_{2018}-7)\times 5\%$ (5%)	$N_{2018}-7$
(4) Resulting Total	$0.83n_{2018}-1.16$	$0.12n_{2018}+0.84$	$0.05n_{2018}+0.32$	n_{2018}
(5) Emission category, all 2018 trees	$\frac{0.83n_{2018}-1.16}{n_{2018}}\times 100\%$	$\frac{0.12n_{2018}+0.84}{n_{2018}}\times 100\%$	$\frac{0.05n_{2018}+0.32}{n_{2018}}\times 100\%$	100%

For discussion purposes, these trees are moved from high and medium emitter category to a low emitter category and are defined as 'diverted trees[2].' Table 3 summarizes this change.

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[1] n_{2018} is the total number of trees in the Sacramento Region in 2018.

[2] Diverted Trees are a subset of Replacement Trees. Trees that are moved from high and medium emitter category to a low emitter category.

Table 3: Comparison of tree planting results in different scenarios

Units: millions	Low emitting trees	Medium Emitting trees	High emitting trees	Total Trees
BAU tree plantings (Minimum # of trees)	1.07	0.48	0.20	1.75
CMS tree plantings (Minimum # of trees)	1.45	0.21	0.09	1.75
Diverted trees	0.39	-0.28	-0.11	0.00

The emission reduction claim of this control measure is entirely the result of the lowered emission rates of 390,000 diverted trees. By 2018, the urban forest control measure is expected to reduce BVOC emissions by at least 0.84 tpd.

Table 4: Summary of emission reduction estimation

Emission Reduction Estimate

Units: millions	Low emitting trees	Medium Emitting trees	High emitting trees	Total Trees
Business As Usual (BAU)	$0.61n_{2018}$	$0.28n_{2018}$	$0.11n_{2018}$	n_{2018}
Control Measure Scenario (CMS)	$n_{2018,low\_emitter}$	$n_{2018,medium\_emitter}$	$n_{2018,high\_emitter}$	n_{2018}
Difference in number of trees between BAU and CMS	$\Delta_{low\_emitter}=0.61n_{2018}-n_{2018,low\ emitter}$	$\Delta_{medium\_emitter}=0.28n_{2018}-n_{2018,medium\_emitter}$	$\Delta_{high\_emitter}=0.11n_{2018}-n_{2018,high\_emitter}$	
Emission factor[1] (grams/tree/day)	0.24	1.32	4.44	
Emission changes (grams/day)	$\Delta E_1=0.24\times\Delta_{low\_emitter}$	$\Delta E_2=1.32\times\Delta_{medium\_emitter}$	$\Delta E_3=4.44\times\Delta_{high\_emitter}$	$\Delta E_1+\Delta E_2+\Delta E_3$

Again, the actual number of trees in 2018 is assumed to be n_{2018}. Emission per tree per day is the product of emission rate, leaf weight, and hours of emission per day. Conservative values assumed for the emission rates are 1, 6, and 19 for low, medium, high emitters respectively. These emission rates are the averages of the trees from the analysis performed by Simpson and McPherson 2006 and 2007. Low emitters are defined at 1 or less, medium 1-10, and high is

[1] Emission rates of 1,6, and 19µg per gram dry leaf weight per hour for low, medium, and high emitters respectively were conservative estimates which used a weighted average based on the species present from the 2007 UFORE study, emissions for the species in the region, and a study by Benjamin 1995, Benjamin 1997.These emission rates are then multiplied by the estimated 40kg of dry leaf weight and 6 hours per day of emissions.

anything over 10. The unit of the emission rate is micrograms per gram leaf per hour. The leaf weight[1] is assumed to be on average 40 kg per tree and the hour of emission per day is 6 hours.

The net benefit of a tree moved to a lower emission category can be represented with the following equation:

$$\begin{aligned}
&\text{EmissionChange}\left[\frac{\text{tons}}{\text{day}\cdot\text{tree}}\right] \\
&= \text{EmissionChange}\left[\frac{\text{grams}}{\text{day}\cdot\text{tree}}\right] \times \frac{1}{907{,}185}\left[\frac{\text{tons}}{\text{grams}}\right] \\
&= \sum_{\substack{i=\text{low emitter,}\\ \text{medium emitter,}\\ \text{high emitter}}} \text{EmissionChange}_i\left[\frac{\text{grams}}{\text{day}\cdot\text{tree}}\right] \times \frac{1}{907{,}185}\left[\frac{\text{tons}}{\text{grams}}\right] \\
&= \sum_{\substack{i=\text{low emitter,}\\ \text{medium emitter,}\\ \text{high emitter}}} \left[\left(\#\text{ of trees in BAU}_i - \#\text{ of trees in CMS}_i\right) \times \text{EmissionFactor}_i\left[\frac{\text{grams}}{\text{tree}\cdot\text{day}}\right]\right] \times \frac{1}{907{,}185}\left[\frac{\text{tons}}{\text{grams}}\right]
\end{aligned}$$

Table 4 is a representation of the modeling effort used to calculate the benefits of this control measure. It is presented as an aid to understanding the key changes that will be created by this control measure. The actual analysis supports the conclusions which also take into account the air temperature relationships to BVOC performed by Jim Simpson and Greg McPherson of the US Forest Service Center for Urban Forest Research (CUFR). For a detailed explanation of the development of these claims, please refer to Simpson and McPherson 2006 and 2007.

[1] Leaf weight is used rather than the typical Leaf area index (LAI) used for emission from vegetation. The flux of a BVOC (μg hr^{-1} m^{-2} [land surface area]) from a vegetative canopy is often expressed as a function of its emission factor (μg g^{-1} [dry leaf weight] hr^{-1}) and foliar density (g [dry leaf weight] m^{-2} [land surface area]. Alternatively, foliar density can be replaced with the product of species specific leaf weight (SLW, g [dry leaf weight] m^{-2} leaf area) and LAI (m^{-2} leaf area/ m^{-2} land area) in the flux equation, as done in the Biogenic Emission Inventory GIS (BEIGIS) model developed by the California Air Resources Board.

Table 5: Planning Emission Inventory and Emission Reductions

	2002	2007	2018
Planning emission inventory (tpd) for BAU Case	69	75	83
Planning emission inventory (tpd) for CMS Case	69	75	82
Emission Reduction (tpd)	0.00	0.00	0.84[1]

Table 5 is the planning emission inventory and the emission reductions benefits from the tree program. The Business-As-Usual case would yield a VOC inventory of 83tpd, while the Control Measure Scenario with the emission reductions of 0.84tpd from the tree program will result in 82tpd of VOC. Although it may seem as though BVOC emissions has increased from 2002 to 2018, the increase in emissions is due to the natural growth of the urban forest and the appropriate comparison is between the planning inventory between the BAU case and the CMS case.

Other Air Quality Benefits

It is noteworthy that the benefits of trees planted under this control measure will not cease after the completion of the project. Trees will continue to grow and with each year create larger emission reductions. Also of note, this analysis only examines one aspect of trees, BVOC emissions, because the emissions are quantifiable by the most current science. Trees affect air chemistry in many direct and indirect ways: pollutant absorption, temperature reduction, carbon sequestration, and particle scrubbing. These are significant benefits of the urban forest. Unfortunately, scientific understanding of these tree effects is not sufficient to include them in the air quality attainment plan at this time. As the science evolves, we can look forward to trees playing an increasingly vital part of our region's air quality attainment plans. The current estimation of the NO_X (Nitrogen Oxides) air quality benefits is 0.048 tpd, Ozone absorption is 0.2tpd, and Particulate Matter[2] (PM) emission reduction is 0.24 tpd, which does not currently include avoided evaporative emissions from cooling vehicles. Until the scientific understanding of the NO_X, direct Ozone absorption and PM effects of trees becomes more complete, this control measure is only taking the BVOC reduction claim.

[1] This control measure is considered as an emerging and voluntary measure. The USEPA set a percent limitation of 6% for the emerging and voluntary measure emission reduction claims. Therefore, the maximum emissions reduction claim of the urban forest measure is 0.18 tpd. Appendix 9 shows the detailed calculation for the percentage limitation of this control measure. The range for emission reductions for this control measure is 0-0.18 tpd. Because the measure requires commitments that have not been secured the minimum benefit is 0 if no jurisdictions commit.

[2] Particulate Matter, also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

Adoption year

2014. This control measure relies on commitments from local jurisdictions. SMAQMD is working with the STF to identify the jurisdictions in the region that are interested in making this commitment and to secure their approval. The final plan will identify the jurisdictions and the adoption schedule. Currently STF anticipates several counties and cities in the region will adopt an air quality friendly tree list which should help the region achieve emission reductions from the tree measure. The minimum emission benefits are set at 0 if no jurisdictions approve a formal commitment as required by EPA guidance.

Implementation year

Planting began in 2008 and will continue through 2018. The urban forest tree compositions and profile are presented in the Appendix 1 of this control measure as reference.

Cost Effectiveness

Based only on BVOC reductions, the cost effectiveness of the measure is $1,291 per ton or $0.65 per pound. The derivation of this value is explained in Appendix 2.

Authority

This project will rely on the general police power of cities and counties to adopt policies and ordinances that are not in conflict with general laws and that are for the protection of the general welfare (Cal. Const. art X1, section 7.) Under this measure, each jurisdiction will create a list of preferred low emitting trees and commit to a total number of trees by resolution and encourage tree planting by developers or municipalities to trees on that list to be diverted to the low emitting category. The sum of all diverted trees by all jurisdictions will total more than 390,000. A sample report and resolution are included in Appendix 3.

Funding

The Sacramento Tree Foundation (STF) will be the lead organization responsible for accomplishing the goals of this control measure. STF has been in the tree business for 26 years and has an annual budget of $2.7 million. The Sacramento Tree Foundation receives its funding from membership, partner agencies, grants and stipends, and private donations. STF efforts have grown steadily over the years and there is every expectation that it will continue to grow in the foreseeable future. STF intends to seek grant funding to complete this project but will use existing resources from its operations if no additional funding can be secured. The estimated budget for the project is $1.71 million during the next 10 years, about $171,000 per year. In STF current operations, they dedicate $475,000 per year to various education projects, $85,000 per year to advocacy and $700,000 per year to tree planting. A letter from STF to commit the necessary funds and resources from its operations can be found in Appendix 6.

Implementation

To achieve the objectives of this control measure, STF will develop an education program for community organizations, local governments, tree not-for-profits, landscape industry professionals and retail tree distributors. The education program will continue for the life of the control measure and will result in a reduction in the planting rate of medium and high emitting trees.

District's Role – Oversight Agency

The Sacramento Metropolitan Air Quality Management District will oversee and review milestone reports, emission reduction calculations, conclusions and recommendations set forth by the Sacramento Tree Foundation to ensure that the tree program is making progress and will meet its emission reductions targets. STF will report to SMAQMD as information are collected and analyzed. SMAQMD is currently working to make available a program evaluation document that describes the administrative details associated with the process and informational requirements the district will use to assess the success of the control measure. The program evaluation document will be included in the final Sacramento Regional 8-hour Ozone Attainment and Reasonable Further Progress Plan.

Verification and Tracking

There will be two methods used to demonstrate that this control measure has been successfully completed. The primary effort will utilize the urban forest assessment tool developed by the US Forest Service known as UFORE. This tool will follow changes in the forest population and will allow changes in emissions to be calculated. Additional steps will be taken to verify the results of the UFORE analysis. The most significant of these steps will be to use high-resolution aerial images to verify regional forest canopy coverage.

In conjunction with the education program, the STF will collect both historical and current planting and sales information from a variety of sources in the region. These will demonstrate that relative planting species distributions have changed from the pre-project species distributions, that the 390,000 diverted trees have been planted and that the BVOC reductions needed have been reached. The number of diverted trees will be calculated by applying the ratios of pre- and post-project planting rates of the three emission categories to the actual number of trees planted.

Although the measure only commits to achieve reductions by the attainment year, 2018, to monitor progress the STF established reasonable planting rates. To monitor progress and validate the emission reductions, the STF will conduct a UFORE analysis supplemented with the Tree Counting analysis for every milestone year and the attainment year, 2018. The results from the UFORE analysis in conjunction with methods used in CUFR's Phase 1a report will be used to compare with emission reduction estimates. The details of the verification and tracking are described in Appendices 4, 5 and 6.

Enforcement

Local governments electing to participate in this measure will adopt binding commitments to reach planting goals within their jurisdictions and to specify a tree list that contains preponderance of low emitting trees. Field surveys will substantiate the accomplishments within the jurisdiction of participating agencies and the region as a whole. STF will notify jurisdictions if they are not meeting milestone targets. Jurisdictions are then responsible to committing to potentially take corrective actions, and use additional resources to reach their goals.

Remedying Emission Credit Shortfall

Because of the uncertainties associated with implementation and validation of this urban forest measure, if this strategy falls short of its emission reduction target, the reductions will be backstopped and replaced by the other strategies that provide reductions surplus to those required to demonstrate attainment.

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Appendix 1: Forest Composition and Tree Profile

This table presents the minimum number of trees and tree compositions expected in the urban forest for the business as usual and control measure scenarios. The determination of growth, death, and expansion of the urban forest is a very complicated science. This table does not represent a SIP commitment. It should only be used as a guide for planning purposes. We assume that a quarter of the trees in the current forest will be removed due to mortality and/or other reasons. The numbers for the interim years are linearly interpolated between 2007 and 2018.

Program Year	**Year**	**Business-As-Usual Minimum Tree Planting**			**Control Measure Program Minimum Tree Planting**		
Units: million		Low-E	Medium-E	High-E	Low-E	Medium-E	High-E
0	2007	4.27	1.96	0.77	4.27	1.96	0.77
1	**2008**	**4.27**	**1.96**	**0.77**	**4.31**	**1.93**	**0.76**
2	2009	4.27	1.96	0.77	4.34	1.91	0.75
3	2010	4.27	1.96	0.77	4.38	1.88	0.74
4	**2011**	**4.27**	**1.96**	**0.77**	**4.41**	**1.86**	**0.73**
5	2012	4.27	1.96	0.77	4.45	1.83	0.72
6	2013	4.27	1.96	0.77	4.48	1.81	0.71
7	**2014**	**4.27**	**1.96**	**0.77**	**4.52**	**1.78**	**0.70**
8	2015	4.27	1.96	0.77	4.55	1.76	0.69
9	2016	4.27	1.96	0.77	4.59	1.73	0.68
10	**2017**	**4.27**	**1.96**	**0.77**	**4.62**	**1.71**	**0.67**
11	2018	4.27	1.96	0.77	4.66	1.68	0.67
Program Year	**Year**	**Business-As-Usual Minimum Tree Planting**			**Control Measure Program Minimum Tree Planting**		
Units:%		Low-E	Medium-E	High-E	Low-E	Medium-E	High-E
0	2007	61.0	28.0	11.0	61.0	28.0	11.0
1	**2008**	**61.0**	**28.0**	**11.0**	**61.5**	**27.6**	**10.9**
2	2009	61.0	28.0	11.0	62.0	27.3	10.7
3	2010	61.0	28.0	11.0	62.5	26.9	10.6
4	**2011**	**61.0**	**28.0**	**11.0**	**63.0**	**26.5**	**10.5**
5	2012	61.0	28.0	11.0	63.5	26.2	10.3
6	2013	61.0	28.0	11.0	64.0	25.8	10.2
7	**2014**	**61.0**	**28.0**	**11.0**	**64.5**	**25.5**	**10.0**
8	2015	61.0	28.0	11.0	65.0	25.1	9.9
9	2016	61.0	28.0	11.0	65.5	24.7	9.8
10	**2017**	**61.0**	**28.0**	**11.0**	**66.0**	**24.4**	**9.6**
11	2018	61.0	28.0	11.0	66.5	24.0	9.5

Appendix 2: Cost Effectiveness Estimates

As living organisms, the air quality effects of trees are always changing. Trees grow, air temperature varies, sunlight changes, and soil moisture fluctuates, leaves come and go with the seasons. Three quantities are necessary to calculate the cost effectiveness of a tree SIP measure. This Appendix examines the derivation of values for annual emissions reduction, project cost and life of the improvements. These values are then used in the standard CARB mobile source equation to determine the cost effectiveness of the measure.

The following table presents four cases for consideration. In each case, controlling parameters for cost effectiveness are varied within a range of values deemed reasonable for this control measure. Case 2 has been selected as the most reasonable.

Table 2.1 Cost Effectiveness Scenarios

Cost Effectiveness Scenarios						
Case		1	2	3	4	
Year of Evaluation		2018	2018	2028	2028	
Conditions		Control Measure, BVOC Only	Control Measure, Criteria pollutants	Control Measure, BVOC Only, Additional growth	Control Measure, Criteria pollutants, Additional growth	
Pollutants						
	BVOC	0.84	0.84	1.29	1.29	
	NOx		0.048		0.144	
	Particulates		0.244		0.728	
	Total	0.84	1.13	1.29	2.16	tons/day
Annualizing factor		37%	37%	37%	37%	
Pollutant reduction		113	153	174	292	tons/year
Annual pollutant reduction		226755	305580	348231	583625	lbs/year
Project recovery period		25	25	25	25	years
Discount rate		7%	7%	7%	7%	
Cost Recovery Factor		0.086	0.086	0.086	0.086	
Project Cost, unadjusted		$ 1,706,000	$ 1,706,000	$ 1,706,000	$ 1,706,000	
Cost Effectiveness		$ 1,291	$ 958	$ 841	$ 502	$/ton-yr
Cost Effectiveness		$ 0.65	$ 0.48	$ 0.42	$ 0.25	$/lb-yr

<u>Emissions Inventory for Cost Effectiveness</u>

Emissions reductions, shown as Pollutants in the table, were developed by the Center for Urban Forest Research (Simpson and McPherson 2006, 2007) and are described in detail in the body of the control measure. These represent the peak values obtained during a year. To determine the cost effectiveness of the measure, we had to decide what pollutants to include in the total reductions.

This control measure makes claims for BVOC reductions but the measure will also reduce NO_X and particulate matter. Table 2.1 presents the full BVOC reduction estimated both with and without the addition of the other criteria pollutants.

Annualizing Emissions Reductions

The cost effectiveness is based on the annual emission reduction. For a typical control measure, this is the daily emission reduction multiplied by the number of days of operation during a year. This straightforward approach does not properly characterize this control measure. Biogenic emission reductions are not the same all year. The reductions are related to photosynthesis, leaf area and ambient temperature. The reductions from this control measure peak during the summer ozone season and fall to near zero during the winter because many trees lose their leaves during the winter and due to higher temperatures during the summer ozone season the emission benefits are the greatest during this time. If we calculate the cost effectiveness using the strict annual sum, the effect of trees during summer ozone season is lost. On the other hand, if we apply the peak summer reduction across the entire year, the cost effectiveness is dramatically over-stated when compared to other measures.

The following chart is adapted from the California Almanac of Emissions and Air Quality. It represents the changes in statewide biogenic emissions during a typical year.

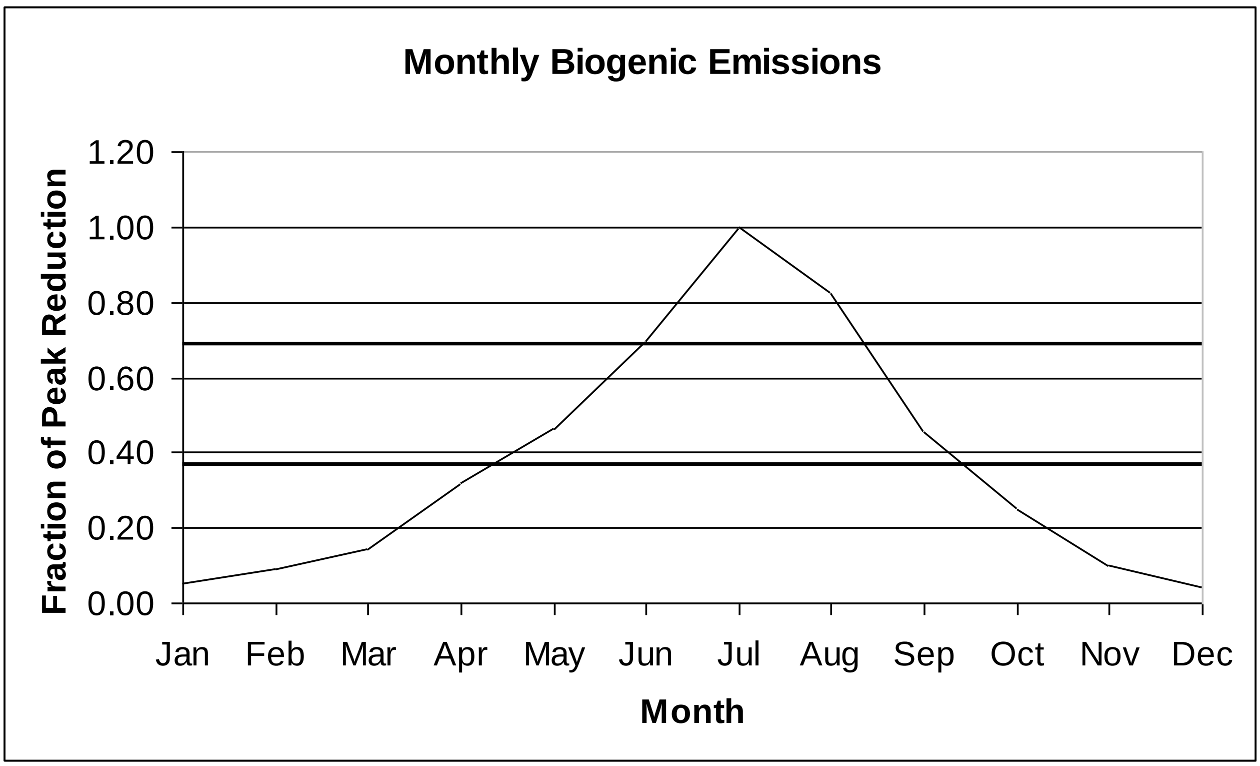


Figure 2.1 Monthly Biogenic Emissions

To determine the cost effectiveness of a variable reduction, we assumed that emission reduction was proportional to emission generation as presented in this chart. From this, the average annual reduction would be 37% of the peak value. To incorporate the significance of ozone season reductions, we also examined the average May through September reduction, which is 69% of the peak value. We decided that the most accurate comparison was to use the lower 37% figure to annualize the peak reductions. This percentage appears in the Cost Effectiveness Scenarios table as the Annualizing Factor. The annual tonnage used for comparison purposes is the peak daily tonnage reduction multiplied by the annualizing factor and multiplied by 365.

Project Cost

Several aspects of the project cost are summarized in the following table.

Project Cost						
						Total Cost
Community Group Outreach						
	Program implementation		$ 10,000	per year	$	110,000
Government Directed Planting						
	Program implementation		$ 21,000	per year	$	231,000
Tree Seller Outreach						
	Program implementation		$ 35,000	per year	$	385,000
Landscape Industy Outreach						
	Program implementation		$ 50,000	per year	$	550,000
Program management			$ 25,000	per year	$	275,000
Education materials			$ 10,000	per year	$	110,000
Field Survey			$ 15,000	per survey	$	45,000
Total					**$**	**1,706,000**

Table 2.2 Project cost

Table 2.2 estimates both the direct cost of the control measure. We assume that tree planting is not a project cost because this control measure is not committing to plant additional trees to expand the urban forest. Also, planting low emitters does not cost more than medium or high emitters. The total expenditures necessary to complete this control measure are estimated to be $1.71 million. These costs include local government costs required to update current ordinances to specify low-emitting trees, the cost to secure commitments from tree retail sales outlets to emphasize the sale of low emitting trees, field survey inspections, an extensive community and landscape industry education program as well as general program management.

Cost Effectiveness Calculation

The formula provided by the California Air Resources Board for emission reduction cost effectiveness (CARB 2005) is:

$$\text{Cost Effectiveness} = \frac{(\text{CRF} \times \text{Funding}_{\text{Present Value}})(\$)}{\Delta(\text{ROG} + \text{NO}_X + \text{PM}_{10})(\text{lb/year})} = \$/\text{lb}$$

CRF, the capital recovery factor, is used to annualize the cost of a long-term project. Longer lived projects have lower recovery factors. The capital recovery factor is calculated with this equation:

$$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

$$CRF = \frac{7\%(1+7\%)^{25}}{(1+7\%)^{25} - 1}$$

$$CRF = 0.089$$

where i is the discount rate and n is project life.

For this control measure, the discount rate, i, is 7% and improvement life, n, is the 25-year average tree life. The resulting value is $1,291 per ton or $0.65 per pound, assuming that NO_X and PM_{10} reductions are 0.

Appendix 3: Sample Report and Resolution for Local Governments

November 2008

ADOPT REGIONAL AIR QUALITY CONTROL MEASURE THAT INCLUDES URBAN FORESTS TO ATTAIN AIR QUALITY GOALS

ISSUE:
The regional air quality board has included trees in the State Implementation Plan control measure to improve air quality. The City/County of _______ is requested to adopt measures recommended by the Sacramento Tree Foundation to contribute to the overall improvement of the region's air quality. By managing the number and types of trees planted in our jurisdiction, we can reduce the formation of ozone and improve air quality. Minimum participation includes adopting a best tree list for our jurisdiction and agreeing to numerical tree planting goals.

RECOMMENDATION:
Approve a resolution adopting the preferred air quality control measures that include planting an agreed upon number and type of trees and utilizing a tree list to guide species composition and diversity.

DISCUSSION:
Our region is remarkably well suited to capture the benefits trees provide. Our hot summers and cool winters enable us to maximize the benefits of shade trees through energy savings, air quality improvement, storm water runoff retention, and community enhancement.

In 2006, City/County of _______________ passed the resolution to adopt the regional Greenprint, a four decade program of incremental investments in our community trees, that will double the regional tree canopy and result in more livable communities through the best urban forest.

One key objective of the Greenprint is to reduce the costs and increase the benefits of tree ownership by strategically placing trees that are well-suited to our climate, soil and site conditions in locations where they can best reduce energy consumption, shade infrastructure, and improve water quality.

Our region has the challenge of unhealthful levels of ozone pollution. The U.S. Forest Service Center of Urban Forest Research (CUFR) and Sacramento Tree Foundation (Tree Foundation) conducted a study about the effects of trees on ozone air pollution and found that urban forestry can be an important part of our air quality attainment strategy. This study was sponsored by the regional Air Quality Districts and funded with the grant from Sacramento Area Council of Governments (SACOG) and California Department of Transportation (CalTrans).

The scientific community generally agrees that trees improve air quality. It has been measured that some trees - because of leaf canopy size, pollen, amount of time leaves are present on the trees and levels of biogenic volatile organic compounds (BVOC's) - provide more benefits than others. The net effect depends on the species, location and ultimate size of the trees chosen. For this reason, our jurisdiction can encourage the planting of the best suited trees for our climate combined with the best air quality characteristics to improve local and regional air quality.

In several important ways, air quality attainment plans are predictive. In adopting the plans, the air districts, and by extension the member jurisdictions, must estimate the air quality improvement steps that will be taken in the future. These estimates are then used to predict air quality progress. In areas where continued air quality improvement has been difficult, the estimates tend to evolve into goals and in situations with severe air quality, may evolve into mandates.

To know the net effect of the new trees on regional air quality, accurate estimates of number and type of trees planted in our jurisdiction must be known. Our jurisdiction is being asked to commit to the best tree profiles and a minimum number of trees that will be planted in the jurisdiction on both public and private property during the next decade. It is important to note that the best trees commitment includes both public and private tree planting. As this commitment will become part of a federally mandated regional air quality attainment plan, regional partners agreeing to the ratio are expected to be successful.

To prepare for this planting program, council / board authorization is requested to participate with our regional partners and adopt the list of tree species that will grow well in our jurisdiction and be the most capable of air quality improvement. This list will serve as our recommended tree list to be used by staff for making decisions on species selection where trees within the City/County are specified.

Staff and the Tree Foundation have estimated that the managed planting of trees within the jurisdiction over the next ten years will allow us to meet the air quality control measure target. The best trees list may be amended as appropriate over time to include new species and research that enhances our choices for planting the best trees.
Limited exposure is present as is the case with other Council/Board decisions. After adoption, potential enforcement may be initiated by citizens and or/EPA if project goals are not met pursuant to the Clean Air Act (42USCA Section 7413 and 7604).

As we have the numbers of trees to plant (February 09?):
The Council/Board has adopted the regional Greenprint Initiative to double the regional tree canopy over the next four decades. The regional goal to meet this effort is to plant 5 million trees by 2025, increasing in our regional canopy from about 12% to 25%. The 2009 Tree Foundation study reveals that our jurisdiction has the capacity to plant ___ trees. Staff has concluded that the Council/Board can confidently commit to the planting of ___ trees (__ % of capacity) in our jurisdiction. Of the trees planted by the fall of 2018 the species composition will meet the list of best trees for air quality control measure compliance.

ENVIRONMENTAL CONSIDERATIONS:
Action in adopting this resolution is exempt from CEQA as it does not specifically result in a project. This decision will be re-visited at such time as a project as defined by CEQA is considered.

RECOMMENDATION APPROVED BY:

Executive ___________________________
Title ________________________________
Key Staff:____________________________

DRAFT SAMPLE RESOLUTION FOR AIR QUALITY CONTROL MEASURE

RESOLUTION NO. _____
ADOPTED BY _________________

On Date of ________________

RESOLUTION SUPPORTING LOCAL COMPONENT OF THE REGIONAL URBAN FOREST TO ATTAIN REGIONAL STATE IMPLEMENTATION PLAN AIR QUALITY CONTROL MEASURES GOALS

WHEREAS, the City/County of __________ recognizes the importance of tree canopies and their contributions to clean air and water, stormwater runoff reduction, energy conservation, improved public health, and increased property values; and

WHEREAS, the City/County of ______ have adopted the regional Greenprint initiative to optimize the tree canopy and benefits of trees in our region; and

WHEREAS, current science concludes that our enhanced urban forest will improve both local and regional air quality; and

WHEREAS, the species composition and number of trees planted during the coming years will determine the net air quality improvement our region can expect; and

WHEREAS, a select group of tree species are best suited to the climate and soils of our jurisdiction; and

WHEREAS, a list has been created of the best trees for our climate and air quality for both public and private trees that will be planted in our jurisdiction; and

WHEREAS, we recognize that by participating in the regional urban forest control measure through the fall of 2018 to attain air quality goals that we are expected to succeed and potential enforcement can be initiated by citizens and or/EPA if project goals are not met pursuant to the Clean Air Act (42USCA Section 7413 and 7604).

NOW, THEREFORE, BE IT RESOLVED BY THE <u>COUNCIL/BOARD</u> OF THE <u>CITY/COUNTY OF</u>:

The <u>Council/Board</u> hereby authorizes the City Manager/County Executive to create a policy to regulate the planting of an agreed upon number of trees of certain species composition and use the preferred list of best trees suitable for climate and air quality to require specific tree planting associated with permitted projects on both public and private properties within our jurisdiction; and,

Hereby authorizes the City Manager/County Executive to implement the best tree list where appropriate within the operations of the jurisdiction; and, Hereby expects all persons planting trees within the jurisdiction to choose an appropriate tree from this best tree list; and,

Hereby commits that the trees be planted within the jurisdiction prior to the fall of 2018 will be in accordance with the Urban Forest Air Quality Control Measure as part of our region's federal air quality attainment plans. (; and,)

As the numbers of trees to plant by jurisdiction after February 09 –
Hereby commits that ___ trees will be planted in within the jurisdiction by 2025 to meet the Greenprint goal of doubling the regional tree canopy.

Passed and Adopted by the Council/Board of the City/County of _________ at a regular meeting thereof held on the ___________by the following roll call votes:

____
Presiding Officer

ATTEST:

____
Clerk_________________________________

Agenda Notice:

Item # ________ - Local Component of the Regional Urban Forest Project to Attain Air Quality Conformity
Authorize creation and implementation of a recommended list of tree species

Appendix 4: Verification and Tracking

This control measure proposes to gradually change the percentages of the different tree species that make up the urban forest of the Sacramento region. Consequently, to gauge the success of the control measure, an inventory of the urban forest needs to be created and maintained. Changes in the tree inventory over time will demonstrate the success of this control measure.

It is also important to track current conditions of the urban forest. To create this SIP measure, we based emissions calculations on the best information that we have today. This information is several years old and, in some cases, was derived for an urban forest of our neighboring region. To assure decision-makers that the estimates are reliable, an updated canopy inventory must be created.

Counting tree plantings is a tempting short cut to estimating change in a forest canopy, but necessary to quantify jurisdictional efforts and private owner planting behaviors. Therefore counting trees will be used as a supplement to the UFORE Survey System to verify the order of magnitude of tree planting efforts. Unfortunately, planting rates are only one aspect of canopy change. Survival, maintenance and growth are also key factors that can often out-weigh the impact of young tree planting.

The urban forest has many parameters that need to be tracked. On a per tree basis, it is important to know tree species, size, location, and health. This information is used to predict the future growth rate, survival, and leaf area of the tree. By accumulating this information for all trees in the forest, the species distribution and average age, size, health, and total leaf area can be determined. This composite information can then be used to determine the air quality, energy reduction, water purification, and real estate value effects of the forest. This information needs to be regularly updated to understand how the forest is changing as a result of this measure.

UFORE Survey System

By current estimate, there are 7 million trees in the region's urban forest. Measuring each of these trees would be a monumental undertaking. Recognizing this impracticality, the US Forest Service has developed an information system that accurately assesses an urban forest by sampling a limited number of locations throughout the forest. The system is named the Urban Forest Effects model (UFORE).

UFORE is a forest-modeling and inventory suite that allows users to calculate urban forest data, including estimates of the ecosystem services and emissions. The results are based on the tree and site information collected from 300 field survey plots selected randomly throughout the region. Each field survey plot is 1/10 acre in size. A detailed, structured data collection protocol is used to ensure the field information can be statistically employed to determine the make-up of the entire forest from this relatively small sample. UFORE calculates species and age distribution of the urban forest and also estimates the monetized benefits of the forest. The species and forest structure information are used to calculate emissions changes. The additional information that UFORE produces will be used to calculate costs and benefits of maintaining the urban forest. UFORE is currently in use and has produced satisfactory peer-reviewed results in several communities in North America including Atlanta, Baltimore, Boston, Calgary, Houston, Jersey City, New York City, Philadelphia, Syracuse, and Toronto. Links to online reports for Atlanta, New York City and Houston are listed in the References of this control measure.

The survey area of the assessment is the urbanized area of each of the cities and counties in the non-attainment area with the addition of the respective spheres of influence. The spheres are included to allow changes to be tracked as urbanization grows. Sample plots are assigned within this large area using a random generator supplied by the US Forest Service. It is critical to the accuracy of the results that the plot assignment be completely random. Any thoughtful relocation of the plots will invalidate the results of the assessment.

This randomness can be unsettling. The first UFORE assessment has been started and the plots have been located. Many plots are located in places that intuitively make sense, like front yards, parks and golf courses. Other plots have landed in areas that are very unlikely to have any trees ever, like freeways, runways or in Folsom Lake. Taken as a whole though, these plots average out the variety of land uses that comprise our region and will give an accurate assessment of the urban forest. A Keyhole Markup Language (KML) layer file is provided in the References so that reviewers can examine the plot locations using a geo-referenced imaging system, in this case, Google Earth.

It should be noted that UFORE algorithms used to estimate BVOC emissions are standard but estimates of biomass are based on leaf area and fresh weight to dry weight relationships may not be characteristic of trees in this region. Local tree biomass data will be used in conjunction with the UFORE survey system to provide the most accurate information and emission reduction calculations.

UFORE results compared to previous SUFES results

An initial UFORE study was conducted in 2007 to define the initial conditions of the region's urban forest. In comparison with the 1998 SUFES study, results are comparable. The SUFES (Sacramento Urban Forest Ecosystem Study) was the first attempt to understand and estimate the tree species distribution and canopy cover of the region. There are several minor differences between two studies but their results and conclusion are similar. The SUFES (1998) found that the urban area tree canopy cover was 13-15% and six million trees in the urban area of the Sacramento region. It also found that the leading two species are live oak and valley oak. These two species accounted for 8.2% and 7.2% of trees in the urban forest. The UFORE study (2007) found that tree canopy was 12.1% and seven million trees in the region, while valley oak (10%) and live oak (6.7%) were the leading species in the Sacramento urban forest.

Field Surveys

The Sacramento Tree Foundation (STF), working with the tree organizations throughout the region, will lead the regional UFORE assessment. Seventy-five volunteers have been recruited from the six-county region. Each volunteer has undergone five hours of training before starting field survey work. The training covers each of more than 40 parameters that are recorded at every plot during tree species identification and the plot assessment process.

The volunteers are organized into three member teams and then each team is assigned approximately 10 plots located close to each other. Teams find the plot locations using a combination of aerial photographs and GPS coordinates. Teams complete their plot assessments over four weeks. All information is recorded on field data sheets that are collected by the STF.

Each plot measures 1/10 acre. A map of the UFORE study area is included in Appendix 10. Teams collect six separate types of information from each plot, including square footage of each ground cover type, buildings, impervious surfaces, shade, shrubs and the location information of reference objects so that re-sampling can be completed accurately. A drawing is created of each plot. Following this, each tree on the plot is located, measured and 10 data points of information are collected about the size, species, health, and leaf area.

Teams spend an average of 2 hours per plot measuring, drawing and recording the data. To complete a plot assessment, the team will first locate the center of the plot. The center is marked and then a scale drawing is made. The actual land use category of the site is recorded. Next the ground cover areas are drawn to scale. The angle and distance to reference objects are recorded on the drawing. Each tree on the site is then carefully located on the drawing. The next step is to record the various tree parameters on a tree data sheet. A separate tree data sheet is filled out for each tree. Once all the tree information is obtained, the areas of shade canopy are also recorded on the plot drawing. Finally, the actual areas of each classification are calculated and recorded on the data sheets. Field data sheets are presented in Appendices 5, 6 and 7.

The plot drawings are necessary so that the results can be verified. To ensure the accuracy of the field collection data, a limited number of re-surveys are conducted by trained staff from STF. Each team will have at least one plot inspected. If the re-inspection finds that errors have been made, all of the team's work will be re-inspected. Sample plot data collection forms are included with this proposal.

As the plot survey information is returned to the STF, it is first reviewed for completeness and cross-checked to catch errors that may have been made. The data is then imported to an electronic database. Once all plot information has been entered, the data is presented to the US Forest Service who analyzes the information and creates the statistical report on forest composition and monetized benefits. The results will then be returned to the STF and used to calculate BVOC changes.

The STF completed the initial 300 plot survey during summer 2007. The entire survey will be repeated on the same 300 plots in 2011, 2014 and 2017. The data from subsequent surveys will be compared with earlier surveys to monitor progress of this control measure. The Sacramento Tree Foundation will report on progress and post the report on its Sacramento Tree Foundation website and air district websites. Information will be available to the public during milestone years and attainment year.

This control measure proposes additional information collection and analysis as a cross check of the UFORE results. Historical and future sales data from tree retailers and tree wholesalers will be collected. Local governments and tree planting groups will also be asked to report as much information as possible about historical and future tree species and planting locations.

STF will use this information to calculate changes in tree planting activities. Historical species and planting activities will establish the Business-as-usual case for each entity. As new data arrives, the calculations will be repeated based on the new information. A difference should slowly accumulate that demonstrates the successful implementation of the control measure education program.

County and State level agricultural agencies will also be polled for information. Individual property owners will be encouraged to record their tree planting activities on a website developed to encourage participation in the regional planting goal. While this expanded net of information collection is extensive, it will never, as a voluntary, convenience sample, have the statistical accuracy needed to demonstrate performance of the control measure. It will, however, be a meaningful way to double-check the accuracy of the field survey effort and should alert reviewers to problems with the effort in time to correct them prior to 2018.

As a final step of data collection, high-resolution satellite imagery will also be employed to ensure the accuracy of the field sample information. The science of aerial tree sampling is rapidly evolving. It may be possible during the life of this control measure to replace some components of data collection with aerial survey image processing.

Tree Counting

In addition to using UFORE as a tool to measure the change in the tree canopy, tree counting will be used to support and verify the results we obtain from the UFORE Survey Studies. Realizing that planting rates are only one aspect of tree canopy change, tree counting can support quantifying regional efforts. It will also aid participating jurisdictions in measuring and verifying their implementation strategies and planting activities through 2018.

Jurisdictions will keep an extensive database of their tree plantings which will include information such as the number of trees, species, location, age, and whether or not it is a new or a replacement tree.

Data collected from the tree retailers and nurseries in the region will provide information about private owner tree planting behaviors, such as the number of trees planted by private owners and if a shift from historical planting rates occurred.

The information collected from jurisdictions, and retailers will be used to supplement the UFORE study, verifying tree planting rates and order of magnitudes of the tree species changes. Figure A-4a shows a sample flow chart to track planting efforts by participating jurisdictions and private owners. The control measure recognizes that there is uncertainty whether or not trees sold by the retailers were actually planted within the region or whether or not the trees were even sold by the retailers in the region, but since it is used only to verifying orders of magnitude to supplement the UFORE study, the assumption is that all of these trees will be planted within the region. Attempts will be made to verify and collect information from private owner tree plantings by providing avenues to register the tree purchase with the Sacramento Tree Foundation.

Data Collection Budget

The budget for monitoring activity and for all remaining project management is $320,000 over the project life.

Application of Collected Information

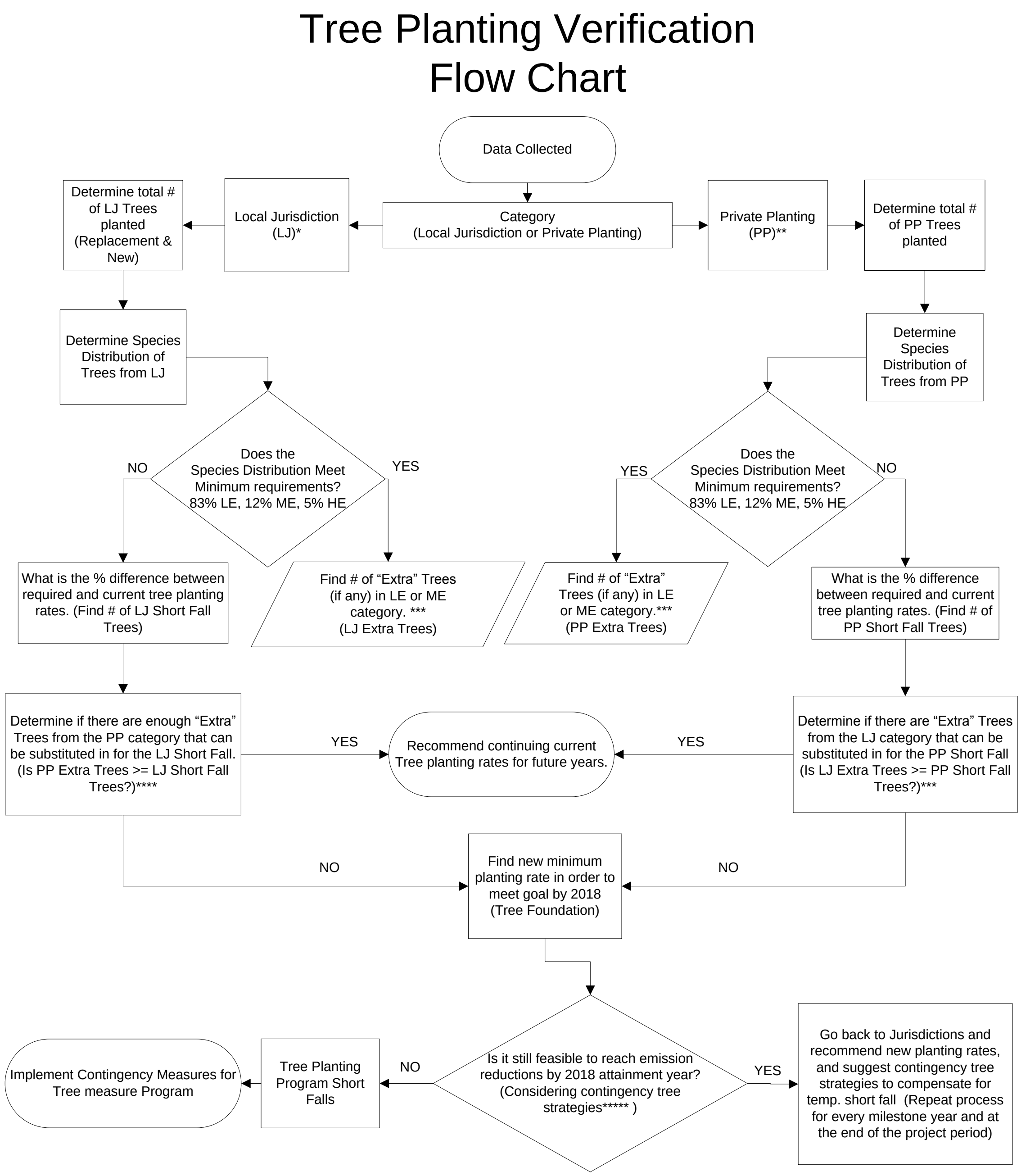
The information collected during the UFORE effort will be used to create a profile of the urban forest. This snapshot will reveal the region’s canopy cover percentage, the number, size, and types of trees that make up the urban forest. This forest composition information will be analyzed using the models that were the basis of this control measure (Simpson & McPherson, 2006 and 2007). The models will yield an emission profile for this snapshot of the forest.

Over the years, trees will be planted and removed. Mostly low emitting trees will be planted but some medium and high emitting trees will also be planted. If the control measure is being successfully implemented, each iteration of the UFORE analysis will show that low emitting trees are becoming a higher percentage of the forest population. Gridded emission inventory modeling of the air basin using the updated tree species information will at first show a slight change in BVOC emissions. With each new canopy assessment, a larger difference between the current forest and the unaltered forest will appear. This difference will be the measure of the success of the control measure.

Potential Issues

It usually takes time for the UFORE tracking system to make intuitive sense to reviewers, given the small sampling frequency of the survey. The area of the plots totals 30 acres and the urbanized area of the region totals more than 300,000 acres. This means that only 1/10,000 of the region is being sampled. Fortunately, in random sample statistical analysis, the error bounds of the result are a function of the deviation of the samples and the number of samples taken and not dependent on the size of population (Mendes 2002). For the UFORE analysis, the sampling fraction of 300 plots will provide an uncertainty in the results of 7.5% with a 99% confidence. This accuracy changes very little for a broad range of sampling fractions as shown on the following chart.

Figure A-4a Tree Planting Verification Flow Chart



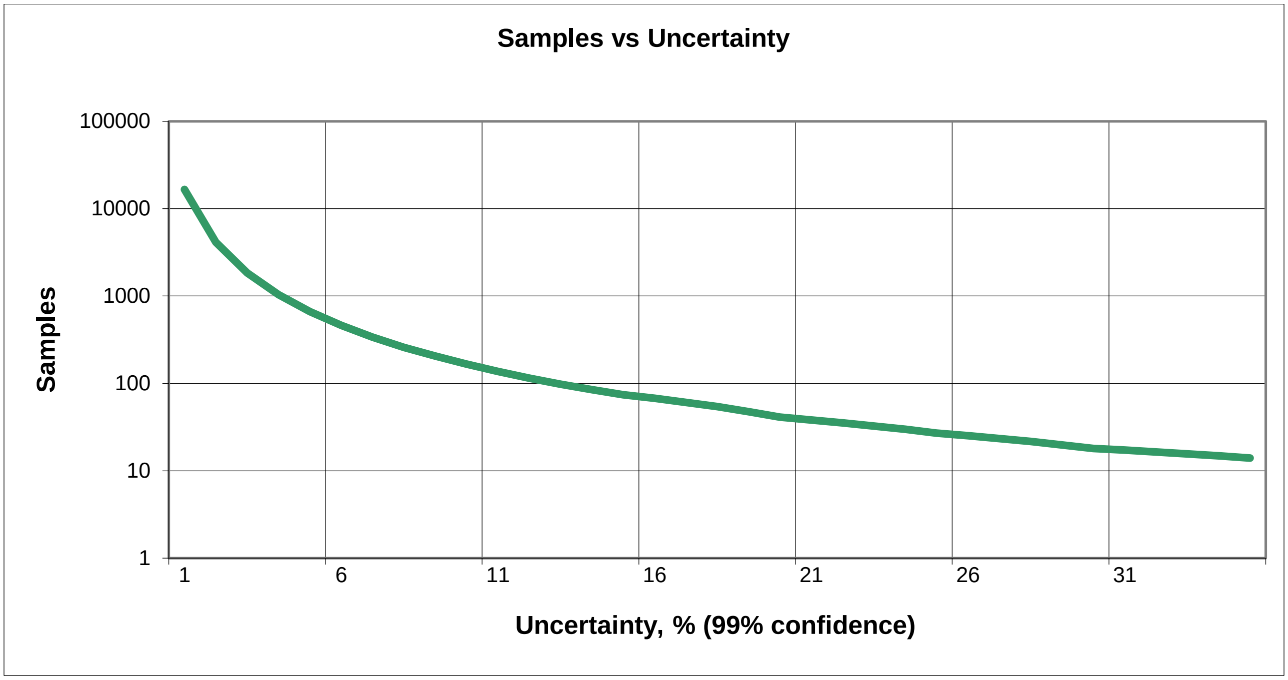
* Local Jurisdictions Trees may include trees from Green print , trees planted in new developments, and other planting efforts.

**Private Planting may include trees from retailers and nursery information in the area

***Any # of Trees over min requirement in that category is considered to be "Extra" Tree for that category. Calculated by subtracting Min Requirement Rate for each category from Current Rate for each Category.

****Only a lower or equal BVOC tree can be used to substitute in and counted as an extra tree. For example, HE can not act as a substitute for a ME or a LE, but LE can be a substituted in for a ME or HE, and ME can only act as a substitute for a HE.

***** Suggested Contingency Tree Strategies can be found in Appendix 7.



This system will only produce this accuracy for the entire urban forest, taken as a whole. The results for smaller stratifications, or sub-areas within the larger sample area, can be extracted from the data, but the accuracy will be lower as there will be fewer plots in the subdivision. A sample size of 30 will produce results of 24% uncertainty, 100 samples yield 13% accuracy. From the data collected, stratified results will be used to inform each participating local governmental jurisdiction of its progress in reaching the canopy goals it has adopted.

A second concern is typically raised about the accuracy of the field measurements. We intend to minimize these errors through volunteer training and re-surveying a sample of each team's work. The large number of people involved in the study also tends to reduce magnitude of systematic measurement errors. When a judgment is required, in the case of leaf area for example, a range of estimates always results. Each estimator will have a bias, sometimes higher and sometimes lower, than the actual value. Since many estimators are involved, the bias is averaged out of the final result. This is a practical application of the Law of Large Numbers.

Tree species identification is difficult. As correct tree species identification is critical to the results of the study, teams are encouraged to collect leaf samples from any unknown trees for review by urban foresters. Tree datasheets will be amended based on the decision of the forester.

The final major concern that needs to be addressed arises from use of defined, long-term reference plots. There are reasonable concerns that non-random changes will occur in reference plots because of the presence of the sampling teams and the public information that is distributed. In other words, property owners may decide to plant or maintain trees just because they realize that their land is part of a reference plot. This activity would not be random and so the plot would no longer represent the entire region. We plan to examine this possibility during re-sampling. Testing will be completed to determine if new random plots need to be created or if the original plots continue to accurately reflect the regional value.

Appendix 5: Tree Survey Sheet

Tree Information Sheet

Plot ID #__________

1. Tree Number [ ]
(Each tree has own number, start at North and move clockwise; please number each one on drawing)

2. Tree Species [ ]

3. Direction from Plot Center [degrees]

4. Distance from Plot Center [feet]

5. Circumference @ 4.5 ft. (use tape)

Trunk#1	inches @	ft.
Trunk#2	inches @	ft.
Trunk#3	inches @	ft.
Trunk#4	inches @	ft.
Trunk#5	inches @	ft.

6. Tree Height (protractor angle) [degrees]

7. Height to your eyes	feet	inches
7.a. Distance from tree to you	feet	inches

8. Protractor angle to live top [ ]
(**only** if dead branches form top of canopy)
(maintain same distance and direction as tree height)

9. Ground to first branch (estimate) [feet]

10. Crown width (use rope)

North-South	feet	inches
East-West	feet	inches

11. % Missing (circle a percentage)

Trunk-north end: 0 10 20 30 40 50 60 70 80 90 100%
Trunk-south end: 0 10 20 30 40 50 60 70 80 90 100%
Trunk-east end: 0 10 20 30 40 50 60 70 80 90 100 %
Trunk-west end: 0 10 20 30 40 50 60 70 80 90 100 %

12. % Dieback (circle a percentage)

Trunk-north end: 0 10 20 30 40 50 60 70 80 90 100%
Trunk-south end: 0 10 20 30 40 50 60 70 80 90 100%
Trunk-east end: 0 10 20 30 40 50 60 70 80 90 100 %
Trunk-west end: 0 10 20 30 40 50 60 70 80 90 100 %

13. # squares impervious material under tree (use drawing) [ ]

14. # squares shrub under tree (use drawing) [ ]

15. Crown Light Exposure (1-5 sides) [ ]

16. Closest building distance and location (use drawing)

_____ feet ________degrees
_____ feet ________degrees
_____ feet ________degrees

Appendix 6: Funding Agreement Letter

SACRAMENTO TREE FOUNDATION

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EXECUTIVE DIRECTOR
Raymond L.
Tretheway III

12 November 2008

Mr. Larry Greene
Air Pollution Control Officer/Executive Director
Sacramento Metropolitan Air Quality Management District
777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Dear Mr. Greene,

Please accept this letter as a statement of commitment by the Sacramento Tree Foundation to achieve the 'urban forest for clean air' control measure submitted as part of the Air District's air quality attainment State Implementation Plan (SIP).

In summary, the control measure increases the percentage of lower Biogenic Volatile Organic Compound (BVOC) emitting trees in the region by influencing the tree selection choices of the majority of tree planters. This outcome will be achieved through a number of coordinated efforts that can be grouped into three categories: community education, local government action, and strategic tree planting.

The Sacramento Tree Foundation will commit the necessary funds and resources to influence our partner cities and counties and local tree suppliers to reach the control measure species composition goals. The estimated budget range for this project is up to $1.71 million during the next 10 years, or about $171,000 per year. In our current operations, we dedicate $420,000 per year to various education projects and $880,000 per year to planting trees. The Tree Foundation's urban forest efforts and influence have expanded steadily over the years, and we have every expectation that they will continue to grow with the implementation of our Greenprint Initiative. Encompassing the Air District's airshed, Greenprint is a regional initiative dedicated to building the best regional urban forest in the nation. We will seek funding support for this SIP control measure, and if necessary, re-focus our current funding efforts to ensure its completion.

The Sacramento Tree Foundation has an annual budget of almost $3 million which has allowed us to develop a staff of 33 professionals dedicated to advancing the Sacramento region's urban forest. We also lead the hard work of thousands of volunteers each year.

During 26 years of urban forest enhancement we have fostered good relationships with local governments and communities in our region. Our work has included partnerships with many grantors, including the Sacramento Metropolitan Air Quality Management District. In the 1990s we led the planting of over one million trees in Sacramento County.

With this letter I commit the resources and goodwill of the Sacramento Tree Foundation to implement this urban forest SIP control measure. We look forward to partnering with you and your staff to clean the air in the Sacramento Region.

Sincerely,

Ray Tretheway

Ray Tretheway
Executive Director

191 Lathrop Way, Suite D Sacramento, CA 95815
(916) 924-TREE | Fax (916) 924-3803 | www.sactree.com
Our Mission:
To build the best urban forest for the Sacramento region

Appendix 7: Contingency Tree Measure Strategies

This control measure proposes, in a general sense, that participating groups can plant hundreds of thousands of trees during a few short years as a result improved community education and strategic changes to the policies of local governments. If a participating group is falling behind on its tree planting commitments, there are many additional tools and practices from the urban forest community that can be implemented to assist in reaching the goals. A sampling of tools includes:

Tree planting contests with quality prizes for the most successful groups:

- Individuals
- Neighborhoods
- Business districts
- Organization

Sponsor tree plantings in communities and on public land:

- Parks, roadways and near building
- Homes of seniors
- Tree removal mitigation planting

Free or reduced cost trees:

- Partner with electric utilities for planting free energy saving trees: SMUD and now PG&E
- Offer rebate coupons for purchasing low emitting trees

Reduce cost of tree establishment:

- Offer utility rebates for tree planting based on reducing long-term water consumption
- Host tree planting, pruning and maintenance clinics to improve canopy health

Reduce demand for medium and high emitting trees:

- Work with the landscape design industry to change specifications
- Communicate with residents about the better trees

Restrict the availability of medium and high emitting trees:

- Work with local tree suppliers to reduce or eliminate stocking of medium and high emitting trees
- Work with the county agricultural commissioner to quarantine very high emitting species
- Seek State action to prohibit the sale of selected very high emitting tree species within the geographic area

Appendix 8: Field Data Sheet

Section 1: Site and Team Info[1]

Location[2]
Group[6]:
Plot ID[3]
Year[7] Date:[8]
Field Land Use 1[4]
FLU1 (Squares)[9]
Field Land Use 2[5]
FLU2 (Squares)[10]

Section 2: Plot/Contact Information[11]

Address:[12] __________________________
Phone:[14] __________________________
Resident:[13] __________________________
Notes:[15] __________________________

Section 3: GPS Coordinates / Photograph[16]

GPS X:[17]
GPS Z:[19]
GPS Y:[18]
Photo ID #:[20]

Section 4: Reference Object Designation (skip if there are 3 trees/plot)

ID[21]	Description[22]	Direction from center (angle)[23]	Distance from center (feet)[24]	Notes and Comments[25]
1				
2				

Section 5: Ground Covers (show abbreviations on drawing; count squares)[26]

Building (B)[27]	Concrete (C)[28]	Asphalt (A)[29]	(OI) Other Impervious[30]	Maintained Grass (MG)[31]	Unmaintained Grass (UG)[32]	Water (W)[33]
Duff & Mulch (M)[34]	Bare Soil (BS)[35]	Seedlings (S)[36]	Herbs & Ivy (HI)[37]	Agricultural Crops (AC)[38]	Pervious Rock (PR)[39]	Shrub (SH)[40]

Section 6: Summary of Plot Areas (in Squares from drawing)[41]

Tree Cover[42] [ ]

Shrub Area[43] [ ]

Plantable Space[44] [ ]

Below is a description of each of the terms used on the Field Data Collection sheet.

[1] Site and Team Info: This section of the data describes where the plot site is located, how to find it again later and who did the site review.

[2] Location: The general area of the plot

[3] Plot ID: The identification number assigned to the plot

[4] Field Land Use 1: This is the land use that exists on the plot. It doesn't always agree with the government database and so needs to be corrected in the field.

Land Use Types
Residential
Multi-Family Residential
Commercial/Industrial
Park
Cemetery
Golf Course

Land Use Types
Agriculture
Vacant
Institutional
Transportation
Utility
Water/Wetland

[5] Field Land Use 2: If the plot falls on two substantially different land uses, indicate the second class of land use. An example is when plot falls on a house next to a supermarket. This is rarely a substantial issue. You should not count a backyard garden as agricultural or the road in front of a home as transportation.

[6] Group: Your group number.

[7] Year: the year of the field survey

[8] Date: the date the field survey is completed

[9] FLU1 (Squares): In this box, record the Field Land Use 1 area in squares on the plot drawing

[10] FLU2 (Squares): In this box, record the Field Land Use 2 area in squares on the plot drawing

[11] Plot/Contact Information: This is the contact information for the plot owner

[12] Address: the address of the plot, if available

[13] Resident: the name of the person/s living on the plot

[14] Phone: the phone number of the resident

[15] Notes: general information about the plot location, owner or resident

[16] GPS Coordinates / Photograph: this section has the precise location of the center point of the plot.

[17] GPS X: this is the GPS longitude of the plot location. The units are decimal degrees

[18] GPS Y: this is the GPS latitude of the plot location. The units are decimal degrees

[19] GPS Z: this is the altitude of the plot. The units are feet.

[20] Photo ID #: If you take a picture of the site, enter the file name of the picture here.

[21] ID: the number of the reference item. Also show on plot drawing.

[22] Description: the name of the object, like “fire hydrant.”

[23] Direction from center: this is the direction in degrees from the plot center. Use the markings on the center marker to figure out the angle. 0 degrees is North, 90 degrees is East.

[24] Distance from center: this is the distance from the center of the plot to the nearest edge of the reference object

[25] Note and Comments: anything noteworthy about the reference item.

[26] Ground Covers (in squares): this section is used to describe all of the different ground covers that are on the plot. From the plot drawing that you make, roughly count the number of squares of each type. Enter the number in the adjacent box to the cover type. Put an “R” for “Remainder” in the box of the most extensive cover. For example, if a plot falls in an asphalt parking lot, enter R under Asphalt and then the number of squares in each of the other types present. The abbreviations for the cover types are shown in parentheses with each type.

[27] Building (B): this is for any structure. Only count the floor area of the building. Don’t include any awnings or gables or the like.

[28] Concrete (C): The standard material for sidewalks, curbs and gutters, the concrete designation also includes the colored, stamped driveways and walkways that are becoming more common.

[29] Asphalt (A): this is for any tar covered surface except roofs. Roads, parking lots, most basketball courts fit here.

[30] Other Impervious (OI): Any surface that doesn’t allow water penetration. An example of this is brick.

[31] Maintained Grass (MG): grass that is mowed, lawns. Include here lawns that need mowing.

[32] Unmaintained Grass (UG): natural grass areas. These could be natural areas of native grasses or pastures that don’t normally get mowed and irrigated

[33] Water (W): Any area of water including fountains, ponds, lakes and streams

[34] Duff & Mulch (M): any ground cover composed of decaying plant materials

[35] Bare Soil (BS): soil that has few or no plants growing in it.

[36] Seedlings (S): areas with small trees too numerous to count.

[3]7 Herbs & Ivy (HI): any low growing ground cover that can’t easily be distinguished as individual plants

[38] Agricultural Crops (AC): Crops grown on commercial farms. This doesn’t include backyard gardens

[39] Pervious Rock (PR): gravel, cobbles, boulders that generally allow water to reach the ground beneath rather than forcing it to run off the site

[40] Shrub (SH): leafy plant that does not count as a tree. Do not double count for ground cover under the shrub.

[41] Summary of Plot Areas (in Squares): this section is used to give an overall summary of the key coverage areas on the site. The units are squares taken from the plot drawing.

[42] Tree Cover: the total area in squares that is beneath all the trees on the plot. Take this number from the drawing and record in squares. Also include the shade canopy from branches that come from trees outside of the plot

[43] Shrub Area: the total area in squares that is generally occupied by shrubs. Take this number from the drawing and record in squares.

[44] Plantable Space: a rough approximation of the number of squares that could have a tree planted in them. Don’t assume that construction work will be done to create a planting area.

Appendix 9: 6% Cap Calculations for Tree Measure Emission Reductions

The methodology for calculating the estimated maximum limit on emission reductions from the Urban Forest Air Quality Development Program for the Sacramento region is summarized below. This is consistent with EPA policy[1] for incorporating emerging and voluntary measures in a SIP that limits the amount of emission reductions allowed due to the uncertainty and untested nature of the control mechanisms. For total emerging and voluntary measures, EPA has a presumptive limit[2] of 6 percent of the total amount of emission reduction necessary to achieve the planning requirement for attainment demonstration purposes.

Methodology to Calculate VOC Reduction Limit for Tree Measure

Figure A9-1 contains the 2018 ozone/emission reduction graph for the peak ozone design value site at Cool in the Sacramento region. This diagram shows the pattern of ozone responses to varying combinations in domain-wide VOC and NO_X emission reductions. The air quality modeling analysis for 2018 shows that attainment can be reached with different percent combinations of VOC and NO_X control. Assuming the combination of percent reductions from only new VOC and NO_X control measures adopted by the end of 2008, the 1997 federal 8-hour ozone standard could be attained by reducing 2018 modeled emissions by about 3.3% VOC and 12.5% NO_X (shown as Point B on Figure A9-1) This emission reduction target represents the attainment shortfall).

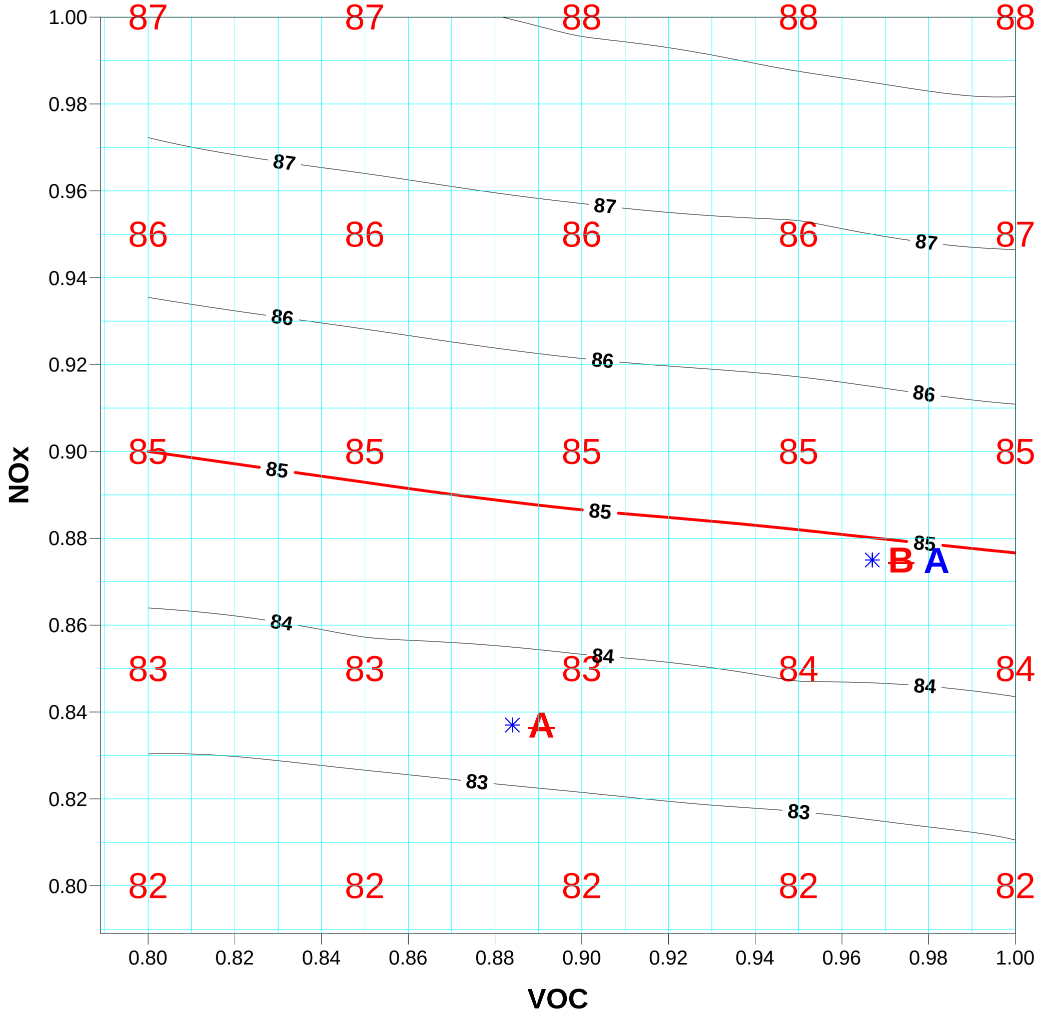
The cap on eligible emission reductions from emerging and voluntary measures is 6 percent of the VOC attainment shortfall. Since the 6 percent cap applies to all emerging and voluntary measures, the maximum reduction limit available for the Tree Measure needs to subtract out any reductions from other emerging or voluntary measures, such as "Spare The Air" Program[3].

Six Percent Reduction Calculations

The 2002 base year emission level (planning inventory) of the Sacramento Federal Ozone Nonattainment Area is 160 tpd of VOC and 196 tpd of NO_X. Without any new emission control measures, the 2018 emission inventory is forecasted to be 121 tpd of VOC and 104 tpd of NO_X. Based on the 2018 attainment shortfall analysis, 3.3% of the VOC and 12.5% of NO_X emissions must be reduced to achieve the attainment standards. This means that VOC emissions must be reduced to 117 tpd and NO_X emissions must be reduced to 91 tpd. The attainment shortfall for VOC is 4 tpd and NO_X is 13 tpd. The Urban Forest for Clean Air Demonstration Program claims BVOC reductions only. By applying the 6 percent cap on the VOC shortfall, this measure and the Spare The Air Program have a limit of 0.24 tpd of VOC emission reductions. Since the Spare The Air Program will claim 0.06 tpd of VOC emission reduction credit, the tree program is capped at 0.18 tpd of BVOC reduction as an emerging and voluntary measure.

[1] "Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)" (OAQPS, EPA, September 2004).
[2] Ibid., p. 9.
[3] Spare The Air Program (TCM-ONMS-ED-1) is a voluntary measure to inform and encourage the public to reduce vehicle trips, especially during forecasted high ozone days.

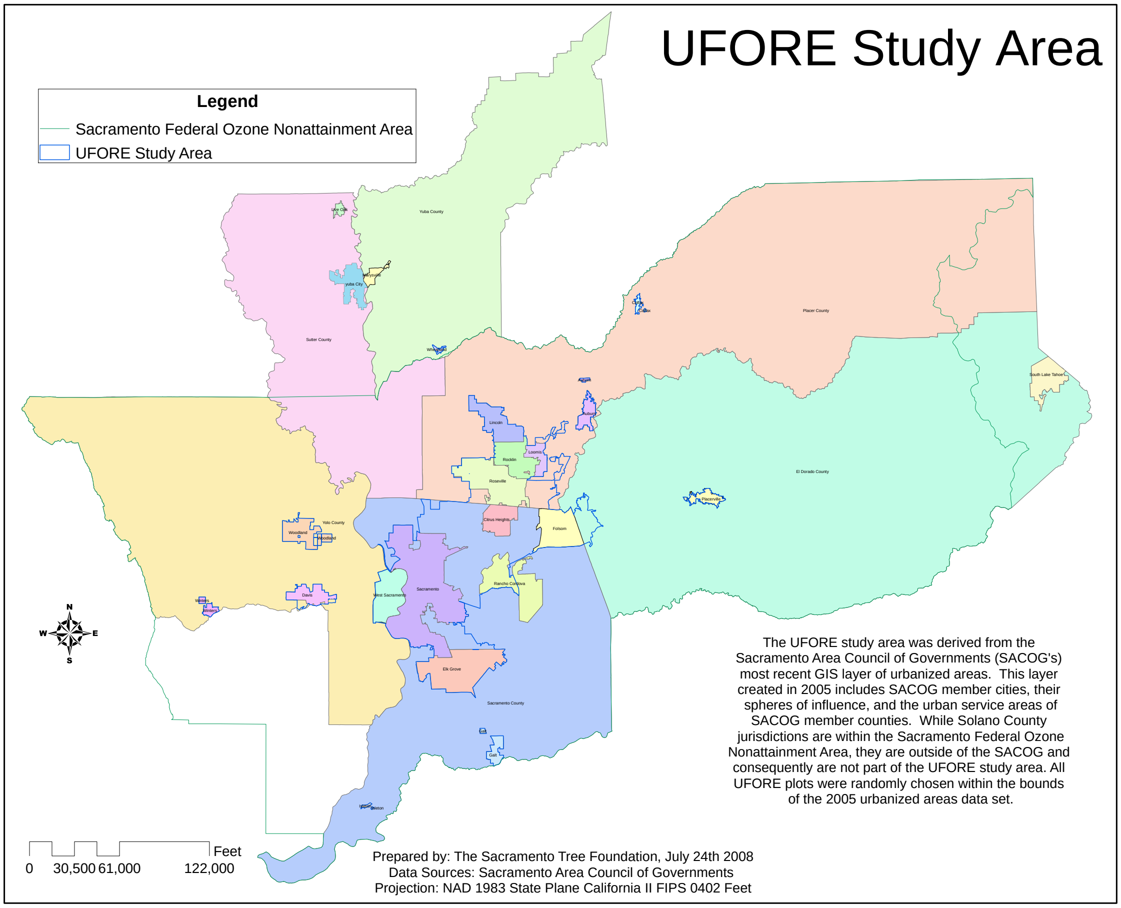
Figure A9-1
Ozone/Emission Reduction Graph
2018 Cool Peak Ozone Design Value Site



1. X and Y Axes: fractional emission reductions of VOC and NO_X from the forecasted 2018 planning emission inventory used in the Plan as adopted in 2009.
2. Whole (Red) Numbers: predicted ozone design value concentrations (truncated) based on modeling results for fractional VOC and NO_X reductions at 5% increments.
3. Horizontal Contour Lines: District interpolated whole ppb ozone contour lines based on 5% increment modeled ozone values rounded to the tenth of a ppb.
4. Point A designates the 2018 emission reductions (3.3% VOC and 12.5% NO_X) from only the new local, regional, state and federal control measures adopted by the end of 2008. These levels represent percent emission reduction targets for attainment (just below 85 ppb).

Using the combination of emission reduction levels from only new control measures adopted by the end of 2008, attainment of the 1997 federal 8-hour ozone standard (84 ppb) could be achieved by reducing 2018 modeled VOC and NO_X emissions by about 3.3% for VOC and 12.5% for NO_X (Point B). Since ozone design values are truncated to the whole ppb, ozone design values between 84 to <85 ppb are truncated to 84 ppb.

Appendix 10: UFORE Study Area



Regulatory Control Measures

Stationary and Area-wide Source Control Measures

Emission inventories by EIC based on CARB CEFS Version 1.06 Sacramento NAA (Rf#980), February 28. 2007

VOC
Control Measures

Architectural Coatings

Control Measure Number: SMAQMD - 442

Control Measure Title: Architectural Coatings

Date: May 8, 2008

Control Measure Description

This control measure regulates the volatile organic compound (VOC) content in coatings applied to stationary structures and their appurtenances (e.g., general use flats, general use non-flats, and specialty coatings such as industrial maintenance coatings, lacquers, floor coatings, roof coatings, stains, etc.). The strategy also regulates the sale of coatings within the district by prohibiting manufacturers and suppliers of coatings from selling coatings that do not comply with the strategy.

The SMAQMD's architectural coating rule (Rule 442) was originally adopted in 1978 and has been amended seven times with the most recent amendment occurring in May 2001. The amendment in May 2001 adopted CARB's 2000 SCM for this category. On October 25, 2007, CARB adopted a new SCM for Architectural Coatings that established lower VOC limits for some coating categories.

The table below shows a comparison between the VOC limits in the current Rule 442 and the new SCM; coating categories that do not have lower VOC limits are not included.

Category	SMAQMD Rule 442 (g/l)	CARB SCM (g/l)
Flat Coating	100	50
Nonflat Coating	150	100
Nonflat-High Gloss	250	150
Antenna Coating	530	250
Antifouling Coatings	400	250
Bituminous Roof Coatings	300	50
Clear Wood Coatings:		275
Clear Brushing Lacquer	550	
Lacquers (including lacquer sanding sealers)	550	
Sanding Sealers (other than lacquer sanding sealers)	350	
Varnishes	350	
Concrete/Masonry Sealer (was Waterproofing Concrete/Masonry Sealer	400	100
Reactive Penetrating Sealer	400	350
Dry Fog Coatings	400	150
Fire Retardant Coatings:		350
Clear	650	
Opaque	350	
Floor Coatings	250	100
Flow Coatings	420	250
Mastic Texture Coatings	300	100
Primers, Sealers, and Undercoaters	200	100
Quick Dry Enamels	250	150
Quick Dry Primers, Sealers, Undercoaters	200	100
Roof Coatings	250	50
Rust Preventative Coatings	400	250
Specialty Primers, Sealers, Undercoaters	350	100
Temperature-Indicator Safety Coating	550	420
Traffic Marking Coatings	150	100

Emission Inventory –2018

EIC Code	EIC Description	ROG Planning Inventory Tons/day
		2018
520-520-9100-0000	Oil-Based (Organic Solvent Based) Coatings (Unspecified)	0.0850
520-520-9105-0000	Oil-Based Primers, Sealers, And Undercoaters	0.1614
520-520-9106-0000	Oil-Based Quick Dry Primers, Sealers, And Undercoaters	0.0958
520-520-9108-0000	Oil-Based Specialty Primer, Sealer, And Undercoaters	0.0050
520-520-9109-0000	Oil-Based Bituminous Roof Primer	0.0160
520-520-9113-0000	Oil-Based Waterproofing Sealers	0.0744
520-520-9118-0000	Oil-Based Waterproofing Concrete/Masonry Sealers	0.0525
520-520-9122-0000	Oil-Based Faux Finishing	0.0016
520-520-9124-0000	Oil-Based Mastic Texture	0.0232
520-520-9126-0000	Oil-Based Rust Preventative	0.0370
520-520-9131-0000	Oil-Based Stains - Clear/Semitransparent	0.2948
520-520-9136-0000	Oil-Based Stains – Opaque	0.0278
520-520-9141-0000	Oil-Based Varnish - Clear/Semitransparent	0.1957
520-520-9153-0000	Oil-Based Quick Dry Enamel Coatings	0.0672
520-520-9157-0000	Oil-Based Lacquers (Unspecified)	0.0727
520-520-9159-0000	Oil-Based Flat Coatings	0.0026
520-520-9160-0000	Oil-Based Nonflat - Low Gloss/Medium Gloss	0.1081
520-520-9161-0000	Oil-Based High Gloss Nonflat Coatings	0.1171
520-520-9164-0000	Oil-Based Bituminous Coatings	0.2206

EIC Code	EIC Description	ROG Planning Inventory Tons/day
		2018
520-520-9165-0000	Oil-Based Concrete Curing Compounds	0.0042
520-520-9166-0000	Oil-Based Dry Fog Coatings	0.0437
520-520-9169-0000	Oil-Based Floor Coatings	0.0121
520-520-9170-0000	Oil-Based Form Release Coatings	0.0310
520-520-9172-0000	Oil-Based Industrial Maintenance Coatings	0.4144
520-520-9173-0000	Oil-Based Metallic Pigmented Coatings	0.1410
520-520-9174-0000	Oil-Based Roof Coatings	0.0107
520-520-9176-0000	Oil-Based Traffic Coatings	0.0383
520-520-9177-0000	Oil-Based Wood Preservatives	0.0348
520-520-9200-0000	Water-Based Coatings (Unspecified)	0.0112
520-520-9205-0000	Water-Based Primers, Sealers, And Undercoaters	0.1707
520-520-9206-0000	Water-Based Quick Dry Primers, Sealers, And Undercoaters	0.0135
520-520-9208-0000	Water-Based Specialty Primer, Sealer, And Undercoaters	0.0107
520-520-9209-0000	Water-Based Bituminous Roof Primer	0.0027
520-520-9213-0000	Water-Based Waterproofing Sealers	0.0098
520-520-9218-0000	Water-Based Waterproofing Concrete/Masonry Sealers	0.0141
520-520-9222-0000	Water-Based Faux Finishing	0.0094
520-520-9223-0000	Water-Based Form Release Compounds	0.0003
520-520-9224-0000	Water-Based Mastic Texture	0.0116
520-520-9226-0000	Water-Based Rust Preventative	0.0014
520-520-9231-0000	Water-Based Stains - Clear/Semitransparent	0.0167
520-520-9236-0000	Water-Based Stains - Opaque	0.0259
520-520-9241-0000	Water-Based Varnishes - Clear/Semitransparent	0.0261
520-520-9257-0000	Water-Based Lacquers (Unspecified)	0.0051
520-520-9259-0000	Water-Based Flat Coatings	0.6747
520-520-9260-0000	Water-Based Nonflat - Low Gloss/Medium Gloss	0.7753
520-520-9261-0000	Water-Based High Gloss Nonflat Coatings	0.0701
520-520-9264-0000	Water-Based Bituminous Coatings	0.0013
520-520-9265-0000	Water-Based Concrete Curing Compounds	0.0148
520-520-9266-0000	Water-Based Dry Fog Coatings	0.0126
520-520-9269-0000	Water-Based Floor Coatings	0.0325
520-520-9272-0000	Water-Based Industrial Maintenance Coatings	0.0326
520-520-9273-0000	Water-Based Metallic Pigmented Coatings	0.0033
520-520-9274-0000	Water-Based Roof Coatings	0.0185
520-520-9276-0000	Water-Based Traffic Coatings	0.117
520-520-9277-0000	Water-Based Wood Preservatives	0.0003
Total		**4.4709**

Emission Reductions

EIC Description	Adoption date	Implementation Date	ROG Emission Reduction Tons/day
			2018
Architectural Coating Categories	2014	2016	0.9138

Cost Effectiveness

The cost effectiveness calculations were based upon economic analyses conducted by the South Coast Air Quality Management District for amendments to Rule 1113. The specific economic analyses used are listed below:

- December 6, 2002 Amendments (based on vacated May 14, 1999 Amendments) (1998 economic data) – industrial maintenance coatings; rust preventative coatings; floor coatings; non-flats; primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; and quick-dry enamels.
- December 5, 2003 Amendments (2003 economic data) – clear wood finishes (including sanding sealers and varnish); roof coatings; stains; and waterproofing sealers (including concrete and masonry sealers). Range of cost effectiveness was $4,229 - $11,405/ton.
- June 9, 2006 Amendments (2006 economic data) – concrete-curing compounds; dry-fog coatings; and traffic coatings. Range of cost effectiveness was $4,882/ton.

It was assumed that the economic relationships between Sacramento and South Coast suppliers and users of architectural coatings do not differ significantly. Therefore, the estimated South Coast cost effectiveness values were assumed to be transferable to Sacramento.

The cost effectiveness values calculated from the December 6, 2002 and December 5, 2003 amendments were adjusted to 2006 dollars (from 1998 and 2003 dollars, respectively) using the Bureau of Labor Statistics' Consumer Price Index for West Urban consumers. The estimated overall cost effectiveness for this proposed measure is estimated to be $10,485/ton

Authority

Authority to implement this control measure by the SMAQMD is in accordance with California Health and Safety Code, Sections 40000, 40001, and 41010.

Implementation

The Sacramento Metropolitan Air Quality Management District is the implementing agency.

References

1. Sacramento Metropolitan Air Quality Management District, Rule 442 (Architectural Coatings). Amended May 24, 2001.
2. South Coast Air Quality Management District, Rule 1113 (Architectural Coatings). Amended June 9, 2006.
3. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). May 14, 1999.

4. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). December 6, 2002.
5. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). December 5, 2003.
6. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). June 9, 2006.
7. U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index 1996-2006.
8. CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (RF#980), November 16, 2006
9. California Air Resources Board Suggested Control Measure for Architectural Coatings, October 25, 2007
10. Control Measure, SMAQMD - 442, November 28, 2006
11. Control Measure 442 Calculation Spreadsheet, SMAQMD, May 14, 2008

Control Measure Number: EDCAQMD - 215

Control Measure Title: Architectural Coatings

Date: May 12, 2008

Control Measure Description

This control measure regulates the volatile organic compound (VOC) content in coatings applied to stationary structures and their appurtenances (e.g., general use flats, general use non-flats, and specialty coatings such as industrial maintenance coatings, lacquers, floor coatings, roof coatings, stains, etc.). The strategy also regulates the sale of coatings within the district by prohibiting manufacturers and suppliers of coatings from selling coatings that do not comply with the strategy.

The existing Rule 215-Architectural Coatings was adopted on September 8, 1994 and subsequently amended on September 27, 1994. In 2000, the California Air Resources Board (CARB) adopted the Suggested Control Measures (SCM) for Architectural Coatings. This SCM established VOC limits that obtained about a 20% overall reduction for this category. On October 25, 2007, CARB adopted a new SCM for Architectural Coatings that established lower VOC limits for some coating categories.

The table below shows a comparison between the VOC limits in the current rule and the limits in the new SCM; coating categories that do not have lower VOC limits are not included.

Category	EDCAQMD Rule 215 (g/l)	CARB SCM (g/l)
Flat Coating Specialty Flat	100 400	50
Nonflat Coating	250	100
Nonflat-High Gloss	250	150
Antenna Coating	530	250
Antifouling Coatings	400	250
Bituminous Roof Coatings	300	50
Clear Wood Coatings: Clear Brushing Lacquer Lacquers (including lacquer sanding sealers) Sanding Sealers (other than lacquer sanding sealers) Varnishes	 680 680 350 350	275
Concrete/Masonry Sealer (was Waterproofing Concrete/Masonry Sealer Reactive Penetrating Sealer	400 400	100 350
Dry Fog Coatings	400	150
Fire Retardant Coatings: Clear Opaque	 650 350	350
Floor Coatings	250	100
Flow Coatings	420	250
Industrial Maintenance High temp Antigraffiti	 420 340	250
Mastic Texture Coatings	300	100
Multi-color	420	250
Pretreatment Wash Primers	675	420
Primers, Sealers, and Undercoaters	350	100
Quick Dry Enamels	400	150
Quick Dry Primers, Sealers, Undercoaters	350	100
Roof Coatings	300	50
Rust Preventative Coatings	420	250
Specialty Primers, Sealers, Undercoaters	350	100
Stains	350	250
Swimming Pool Repair and Maintenance	650	340
Temperature-Indicator Safety Coating	550	420
Traffic Marking Coatings	250	100
Water proofing Sealers	400	250

Emission Inventory –2018

EIC Code	EIC Description	ROG Planning Inventory Tons/day 2018
520-520-9100-0000	Oil-Based (Organic Solvent Based) Coatings (Unspecified)	0.0092
520-520-9105-0000	Oil-Based Primers, Sealers, And Undercoaters	0.0278
520-520-9106-0000	Oil-Based Quick Dry Primers, Sealers, And Undercoaters	0.0335
520-520-9108-0000	Oil-Based Specialty Primer, Sealer, And Undercoaters	0.0005
520-520-9109-0000	Oil-Based Bituminous Roof Primer	0.0016
520-520-9113-0000	Oil-Based Waterproofing Sealers	0.0089
520-520-9118-0000	Oil-Based Waterproofing Concrete/Masonry Sealers	0.0055
520-520-9122-0000	Oil-Based Faux Finishing	0.0002
520-520-9124-0000	Oil-Based Mastic Texture	0.0024
520-520-9126-0000	Oil-Based Rust Preventative	0.0039

EIC Code	EIC Description	ROG Planning Inventory Tons/day
		2018
520-520-9131-0000	Oil-Based Stains - Clear/Semitransparent	0.0402
520-520-9136-0000	Oil-Based Stains – Opaque	0.0045
520-520-9141-0000	Oil-Based Varnish - Clear/Semitransparent	0.0205
520-520-9153-0000	Oil-Based Quick Dry Enamel Coatings	0.0133
520-520-9157-0000	Oil-Based Lacquers (Unspecified)	0.0129
520-520-9159-0000	Oil-Based Flat Coatings	0.0003
520-520-9160-0000	Oil-Based Nonflat - Low Gloss/Medium Gloss	0.0119
520-520-9161-0000	Oil-Based High Gloss Nonflat Coatings	0.0123
520-520-9164-0000	Oil-Based Bituminous Coatings	0.0231
520-520-9165-0000	Oil-Based Concrete Curing Compounds	0.0005
520-520-9166-0000	Oil-Based Dry Fog Coatings	0.0046
520-520-9169-0000	Oil-Based Floor Coatings	0.0013
520-520-9170-0000	Oil-Based Form Release Coatings	0.0033
520-520-9172-0000	Oil-Based Industrial Maintenance Coatings	0.0719
520-520-9173-0000	Oil-Based Metallic Pigmented Coatings	0.0148
520-520-9174-0000	Oil-Based Roof Coatings	0.0012
520-520-9176-0000	Oil-Based Traffic Coatings	0.004
520-520-9177-0000	Oil-Based Wood Preservatives	0.0037
520-520-9200-0000	Water-Based Coatings (Unspecified)	0.0012
520-520-9205-0000	Water-Based Primers, Sealers, And Undercoaters	0.0182
520-520-9206-0000	Water-Based Quick Dry Primers, Sealers, And Undercoaters	0.0014
520-520-9208-0000	Water-Based Specialty Primer, Sealer, And Undercoaters	0.0011
520-520-9209-0000	Water-Based Bituminous Roof Primer	0.0003
520-520-9213-0000	Water-Based Waterproofing Sealers	0.0014
520-520-9218-0000	Water-Based Waterproofing Concrete/Masonry Sealers	0.0015
520-520-9222-0000	Water-Based Faux Finishing	0.001
520-520-9223-0000	Water-Based Form Release Compounds	0
520-520-9224-0000	Water-Based Mastic Texture	0.0012
520-520-9226-0000	Water-Based Rust Preventative	0.0002
520-520-9231-0000	Water-Based Stains - Clear/Semitransparent	0.0021
520-520-9236-0000	Water-Based Stains - Opaque	0.0028
520-520-9241-0000	Water-Based Varnishes - Clear/Semitransparent	0.0027
520-520-9257-0000	Water-Based Lacquers (Unspecified)	0.0005
520-520-9259-0000	Water-Based Flat Coatings	0.0895
520-520-9260-0000	Water-Based Nonflat - Low Gloss/Medium Gloss	0.0937
520-520-9261-0000	Water-Based High Gloss Nonflat Coatings	0.0074
520-520-9264-0000	Water-Based Bituminous Coatings	0.0001
520-520-9265-0000	Water-Based Concrete Curing Compounds	0.0016
520-520-9266-0000	Water-Based Dry Fog Coatings	0.0013
520-520-9269-0000	Water-Based Floor Coatings	0.0034
520-520-9272-0000	Water-Based Industrial Maintenance Coatings	0.0037
520-520-9273-0000	Water-Based Metallic Pigmented Coatings	0.0003
520-520-9274-0000	Water-Based Roof Coatings	0.0019
520-520-9276-0000	Water-Based Traffic Coatings	0.0123
520-520-9277-0000	Water-Based Wood Preservatives	0
Total		**0.5886**

Emission Reductions

EIC Description	Adoption date	Implementation Date	ROG Emission Reduction Tons/day
			2018
Architectural Coating Categories	2013	2015	0.1862

Cost Effectiveness

The proposed VOC limits from the SCM are already in place in a number of air districts. When the SCM was adopted, the cost effectiveness was determined to be an average of $3.20 per pound ($6400 per ton) of ROG reduced. The proposed SCM VOC limits were identified by SCAQMD and are already in place in there. Based on the 1999 Socioeconomic impact assessment used in the socioeconomic analysis for the Rule 1113 amendments, the cost effectiveness was estimated to be $8.50 per pound ($16,996 per ton) of ROG reduced. These cost-effectiveness estimates will be used as representative of the economic relationships of suppliers and users within El Dorado County.

Authority

The above control measure will be implemented by amendment to the existing Rule 215 Architectural Coatings. The El Dorado Air Quality Management District has the authority to propose rules and regulations to the District Board for adoption under HSC 40001.

Implementation

The implementation of this proposed control measure does not involve any other agency other than the El Dorado County Air Quality Management District.

References

1. CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (RF#980 November 16, 2006)
2. California ARB Staff Report for the Proposed Suggested Control Measure for Architectural Coating, Released June 6, 2000
3. South Coast AQMD Staff Report for Proposed Amended Rule 1113-Architectural Coating, dated December 6, 2002
4. South Coast AQMD Preliminary Draft Staff Report for Proposed Amended Rule 1113-Architectural Coating, dated April 1, 2001
5. Control Measure 215 Calculation Spreadsheet, SMAQMD, May 15, 2008
6. Control Measure EDCAQMD - 215, January 30, 2007
7. California Air Resources Board Suggested Control Measure for Architectural Coatings, October 25, 2007

Control Measure Number: FRAQMD - 3.15

Control Measure Title: Architectural Coatings

Date: May 20, 2008

Control Measure Description

This control measure regulates the volatile organic compound (VOC) content in coatings applied to stationary structures and their appurtenances (e.g., general use flats, general use non-flats, and specialty coatings such as industrial maintenance coatings, lacquers, floor coatings, roof coatings, stains, etc.). The strategy also regulates the sale of coatings within the district by prohibiting manufacturers and suppliers of coatings from selling coatings that do not comply with the strategy.

The existing Rule 3.15-Architectural Coatings was adopted in June, 1991 and subsequently amended on May 6, 1996 and November 13, 2002. The amendment in November 2002 adopted CARB's 2000 SCM for this category. On October 25, 2007, CARB adopted a new SCM for Architectural Coatings that established lower VOC limits for some coating categories.

The table below shows a comparison between the VOC limits in the current Rule 3.15 and the new SCM; coating categories that do not have lower VOC limits are not included.

Category	FRAQMD Rule 3.15 (g/l)	CARB SCM (g/l)
Flat Coating	100	50
Nonflat Coating	150	100
Nonflat-High Gloss	250	150
Antenna Coating	530	250
Antifouling Coatings	400	250
Bituminous Roof Coatings	300	50
Clear Wood Coatings:		275
Clear Brushing Lacquer	680	
Lacquers (including lacquer sanding sealers)	550	
Sanding Sealers (other than lacquer sanding sealers)	350	
Varnishes	350	
Concrete/Masonry Sealer (was Waterproofing Concrete/Masonry Sealer	400	100
Reactive Penetrating Sealer	400	350
Dry Fog Coatings	400	150
Fire Retardant Coatings:		350
Clear	650	
Opaque	350	
Floor Coatings	250	100
Flow Coatings	420	250
Mastic Texture Coatings	300	100
Primers, Sealers, and Undercoaters	200	100
Quick Dry Enamels	250	150
Quick Dry Primers, Sealers, Undercoaters	200	100
Roof Coatings	250	50
Rust Preventative Coatings	400	250
Specialty Primers, Sealers, Undercoaters	350	100
Temperature-Indicator Safety Coating	550	420
Traffic Marking Coatings	150	100

Emission Inventory – 2018

EIC Code	EIC Description	ROG Planning Inventory Tons/day
		2018
520-520-9100-0000	Oil-Based (Organic Solvent Based) Coatings (Unspecified)	0.0004
520-520-9105-0000	Oil-Based Primers, Sealers, And Undercoaters	0.0008
520-520-9106-0000	Oil-Based Quick Dry Primers, Sealers, And Undercoaters	0.0005
520-520-9108-0000	Oil-Based Specialty Primer, Sealer, And Undercoaters	0
520-520-9109-0000	Oil-Based Bituminous Roof Primer	0.0001
520-520-9113-0000	Oil-Based Waterproofing Sealers	0.0004
520-520-9118-0000	Oil-Based Waterproofing Concrete/Masonry Sealers	0.0003
520-520-9122-0000	Oil-Based Faux Finishing	0
520-520-9124-0000	Oil-Based Mastic Texture	0.0001
520-520-9126-0000	Oil-Based Rust Preventative	0.0002
520-520-9131-0000	Oil-Based Stains - Clear/Semitransparent	0.0013
520-520-9136-0000	Oil-Based Stains – Opaque	0.0001
520-520-9141-0000	Oil-Based Varnish - Clear/Semitransparent	0.0009
520-520-9153-0000	Oil-Based Quick Dry Enamel Coatings	0.0003
520-520-9157-0000	Oil-Based Lacquers (Unspecified)	0.0004
520-520-9159-0000	Oil-Based Flat Coatings	0
520-520-9160-0000	Oil-Based Nonflat - Low Gloss/Medium Gloss	0.0005
520-520-9161-0000	Oil-Based High Gloss Nonflat Coatings	0.0006
520-520-9164-0000	Oil-Based Bituminous Coatings	0.001
520-520-9165-0000	Oil-Based Concrete Curing Compounds	0
520-520-9166-0000	Oil-Based Dry Fog Coatings	0.0002

EIC Code	EIC Description	ROG Planning Inventory Tons/day
		2018
520-520-9169-0000	Oil-Based Floor Coatings	0.0001
520-520-9170-0000	Oil-Based Form Release Coatings	0.0002
520-520-9172-0000	Oil-Based Industrial Maintenance Coatings	0.0016
520-520-9173-0000	Oil-Based Metallic Pigmented Coatings	0.0007
520-520-9174-0000	Oil-Based Roof Coatings	0.0001
520-520-9176-0000	Oil-Based Traffic Coatings	0.0002
520-520-9177-0000	Oil-Based Wood Preservatives	0.0002
520-520-9200-0000	Water-Based Coatings (Unspecified)	0.0001
520-520-9205-0000	Water-Based Primers, Sealers, And Undercoaters	0.0008
520-520-9206-0000	Water-Based Quick Dry Primers, Sealers, And Undercoaters	0.0001
520-520-9208-0000	Water-Based Specialty Primer, Sealer, And Undercoaters	0
520-520-9209-0000	Water-Based Bituminous Roof Primer	0
520-520-9213-0000	Water-Based Waterproofing Sealers	0
520-520-9218-0000	Water-Based Waterproofing Concrete/Masonry Sealers	0.0001
520-520-9222-0000	Water-Based Faux Finishing	0
520-520-9223-0000	Water-Based Form Release Compounds	0
520-520-9224-0000	Water-Based Mastic Texture	0.0001
520-520-9226-0000	Water-Based Rust Preventative	0
520-520-9231-0000	Water-Based Stains - Clear/Semitransparent	0.0001
520-520-9236-0000	Water-Based Stains - Opaque	0.0001
520-520-9241-0000	Water-Based Varnishes - Clear/Semitransparent	0.0001
520-520-9257-0000	Water-Based Lacquers (Unspecified)	0
520-520-9259-0000	Water-Based Flat Coatings	0.0028
520-520-9260-0000	Water-Based Nonflat - Low Gloss/Medium Gloss	0.0036
520-520-9261-0000	Water-Based High Gloss Nonflat Coatings	0.0003
520-520-9264-0000	Water-Based Bituminous Coatings	0
520-520-9265-0000	Water-Based Concrete Curing Compounds	0.0001
520-520-9266-0000	Water-Based Dry Fog Coatings	0.0001
520-520-9269-0000	Water-Based Floor Coatings	0.0002
520-520-9272-0000	Water-Based Industrial Maintenance Coatings	0.0001
520-520-9273-0000	Water-Based Metallic Pigmented Coatings	0
520-520-9274-0000	Water-Based Roof Coatings	0.0001
520-520-9276-0000	Water-Based Traffic Coatings	0.0005
520-520-9277-0000	Water-Based Wood Preservatives	0
Total		**0.0205**

Emission Reductions

EIC Description	Adoption date	Implementation Date	ROG Emission Reduction Tons/day
			2018
Architectural Coating Categories	2014	2014	0.0044

Cost Effectiveness

The cost effectiveness calculations were based upon economic analyses conducted by the South Coast Air Quality Management District for amendments to Rule 1113. The specific economic analyses used are listed below:

- December 6, 2002 Amendments (based on vacated May 14, 1999 Amendments) (1998 economic data) – industrial maintenance coatings; rust preventative coatings;

floor coatings; non-flats; primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; and quick-dry enamels.

- December 5, 2003 Amendments (2003 economic data) – clear wood finishes (including sanding sealers and varnish); roof coatings; stains; and waterproofing sealers (including concrete and masonry sealers). Range of cost effectiveness was $4,229 - $11,405/ton.
- June 9, 2006 Amendments (2006 economic data) – concrete-curing compounds; dry-fog coatings; and traffic coatings. Range of cost effectiveness was $4,882/ton.

It was assumed that the economic relationships between Sacramento and South Coast suppliers and users of architectural coatings do not differ significantly. Therefore, the estimated South Coast cost effectiveness values were assumed to be transferable to Sacramento.

The cost effectiveness values calculated from the December 6, 2002 and December 5, 2003 amendments were adjusted to 2006 dollars (from 1998 and 2003 dollars, respectively) using the Bureau of Labor Statistics' Consumer Price Index for West Urban consumers. The estimated overall cost effectiveness for this proposed measure is $10,133/ton

Authority

Authority to implement this control measure by the FRAQMD is in accordance with California Health and Safety Code, Sections 40000, 40001, and 41010.

Implementation

The FRAQMD is the implementing agency.

References

1. South Coast Air Quality Management District, Rule 1113 (Architectural Coatings). Amended June 9, 2006.
2. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). May 14, 1999.
3. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). December 6, 2002.
4. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). December 5, 2003.
5. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). June 9, 2006.
6. U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index 1996-2006.
7. CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (RF#980), November 16, 2006
8. Control Measure 3.15 calculation spreadsheet, SMAQMD, May 19, 2008

9. Control Measure, FRAQMD 3.15, dated February 1, 2007
10. California Air Resources Board Suggested Control Measure for Architectural Coatings, October 25, 2007

Control Measure Number: PCAPCD - 218

Control Measure Title: Architectural Coating

Date: May 20, 2008

Control Measure Description

This control measure regulates the volatile organic compound (VOC) content in coatings applied to stationary structures and their appurtenances (e.g., general use flats, general use non-flats, and specialty coatings such as industrial maintenance coatings, lacquers, floor coatings, roof coatings, stains, etc.). The strategy also regulates the sale of coatings within the district by prohibiting manufacturers and suppliers of coatings from selling coatings that do not comply with the strategy.

The PCAPCD's architectural coating rule (Rule 218) was originally adopted in 1983 and has been amended several times with the most recent amendment occurring in December 2001. The amendment in December 2001 adopted CARB's 2000 SCM for this category. On October 25, 2007, CARB adopted a new SCM for Architectural Coatings that established lower VOC limits for some coating categories.

The table below shows a comparison between the VOC limits in the current Rule 218 and the new SCM; coating categories that do not have lower VOC limits are not included.

Category	PCAPCD Rule 218 (g/l)	CARB SCM (g/l)
Flat Coating	100	50
Nonflat Coating	150	100
Nonflat-High Gloss	250	150
Antenna Coating	530	250
Antifouling Coatings	400	250
Bituminous Roof Coatings	300	50
Clear Wood Coatings:		275
Clear Brushing Lacquer	550	
Lacquers (including lacquer sanding sealers)	550	
Sanding Sealers (other than lacquer sanding sealers)	350	
Varnishes	350	
Concrete/Masonry Sealer (was Waterproofing Concrete/Masonry Sealer	400	100
Reactive Penetrating Sealer	400	350
Dry Fog Coatings	400	150
Fire Retardant Coatings:		350
Clear	650	
Opaque	350	
Floor Coatings	250	100
Flow Coatings	420	250
Mastic Texture Coatings	300	100
Primers, Sealers, and Undercoaters	200	100
Quick Dry Enamels	250	150
Quick Dry Primers, Sealers, Undercoaters	200	100
Roof Coatings	250	50
Rust Preventative Coatings	400	250
Specialty Primers, Sealers, Undercoaters	350	100
Temperature-Indicator Safety Coating	550	420
Traffic Marking Coatings	150	100

Emission Inventory – 2018

EIC Code	EIC Description	ROG Planning Inventory Tons/day 2018
520-520-9100-0000	Oil-Based (Organic Solvent Based) Coatings (Unspecified)	0.0192
520-520-9105-0000	Oil-Based Primers, Sealers, And Undercoaters	0.0364
520-520-9106-0000	Oil-Based Quick Dry Primers, Sealers, And Undercoaters	0.0216
520-520-9108-0000	Oil-Based Specialty Primer, Sealer, And Undercoaters	0.0012
520-520-9109-0000	Oil-Based Bituminous Roof Primer	0.0037
520-520-9113-0000	Oil-Based Waterproofing Sealers	0.0167
520-520-9118-0000	Oil-Based Waterproofing Concrete/Masonry Sealers	0.0120
520-520-9122-0000	Oil-Based Faux Finishing	0.0004
520-520-9124-0000	Oil-Based Mastic Texture	0.0052
520-520-9126-0000	Oil-Based Rust Preventative	0.0084
520-520-9131-0000	Oil-Based Stains - Clear/Semitransparent	0.0667
520-520-9136-0000	Oil-Based Stains – Opaque	0.0063
520-520-9141-0000	Oil-Based Varnish - Clear/Semitransparent	0.0442
520-520-9153-0000	Oil-Based Quick Dry Enamel Coatings	0.0152
520-520-9157-0000	Oil-Based Lacquers (Unspecified)	0.0164
520-520-9159-0000	Oil-Based Flat Coatings	0.0007
520-520-9160-0000	Oil-Based Nonflat - Low Gloss/Medium Gloss	0.0245
520-520-9161-0000	Oil-Based High Gloss Nonflat Coatings	0.0265
520-520-9164-0000	Oil-Based Bituminous Coatings	0.0498
520-520-9165-0000	Oil-Based Concrete Curing Compounds	0.001

EIC Code	EIC Description	ROG Planning Inventory Tons/day
		2018
520-520-9166-0000	Oil-Based Dry Fog Coatings	0.01
520-520-9169-0000	Oil-Based Floor Coatings	0.0028
520-520-9170-0000	Oil-Based Form Release Coatings	0.0071
520-520-9172-0000	Oil-Based Industrial Maintenance Coatings	0.0847
520-520-9173-0000	Oil-Based Metallic Pigmented Coatings	0.0319
520-520-9174-0000	Oil-Based Roof Coatings	0.0024
520-520-9176-0000	Oil-Based Traffic Coatings	0.0086
520-520-9177-0000	Oil-Based Wood Preservatives	0.0079
520-520-9200-0000	Water-Based Coatings (Unspecified)	0.0025
520-520-9205-0000	Water-Based Primers, Sealers, And Undercoaters	0.0385
520-520-9206-0000	Water-Based Quick Dry Primers, Sealers, And Undercoaters	0.0031
520-520-9208-0000	Water-Based Specialty Primer, Sealer, And Undercoaters	0.0024
520-520-9209-0000	Water-Based Bituminous Roof Primer	0.0007
520-520-9213-0000	Water-Based Waterproofing Sealers	0.0022
520-520-9218-0000	Water-Based Waterproofing Concrete/Masonry Sealers	0.0032
520-520-9222-0000	Water-Based Faux Finishing	0.0021
520-520-9223-0000	Water-Based Form Release Compounds	0.0001
520-520-9224-0000	Water-Based Mastic Texture	0.0026
520-520-9226-0000	Water-Based Rust Preventative	0.0003
520-520-9231-0000	Water-Based Stains - Clear/Semitransparent	0.0038
520-520-9236-0000	Water-Based Stains - Opaque	0.0058
520-520-9241-0000	Water-Based Varnishes - Clear/Semitransparent	0.0059
520-520-9257-0000	Water-Based Lacquers (Unspecified)	0.0011
520-520-9259-0000	Water-Based Flat Coatings	0.1312
520-520-9260-0000	Water-Based Nonflat - Low Gloss/Medium Gloss	0.1752
520-520-9261-0000	Water-Based High Gloss Nonflat Coatings	0.0159
520-520-9264-0000	Water-Based Bituminous Coatings	0.0003
520-520-9265-0000	Water-Based Concrete Curing Compounds	0.0033
520-520-9266-0000	Water-Based Dry Fog Coatings	0.0029
520-520-9269-0000	Water-Based Floor Coatings	0.0074
520-520-9272-0000	Water-Based Industrial Maintenance Coatings	0.0068
520-520-9273-0000	Water-Based Metallic Pigmented Coatings	0.0008
520-520-9274-0000	Water-Based Roof Coatings	0.0042
520-520-9276-0000	Water-Based Traffic Coatings	0.0265
520-520-9277-0000	Water-Based Wood Preservatives	0.0001
Total		**0.9804**

Emission Reductions

EIC Description	Adoption date	Implementation Date	ROG Emission Reduction Tons/day
			2018
Architectural Coating Categories	2012	2013	0.2014

Cost Effectiveness

The cost effectiveness calculations were based upon economic analyses conducted by the South Coast Air Quality Management District for amendments to Rule 1113. The specific economic analyses used are listed below:

- December 6, 2002 Amendments (based on vacated May 14, 1999 Amendments) (1998 economic data) – industrial maintenance coatings; rust preventative coatings;

floor coatings; non-flats; primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; and quick-dry enamels.
- December 5, 2003 Amendments (2003 economic data) – clear wood finishes (including sanding sealers and varnish); roof coatings; stains; and waterproofing sealers (including concrete and masonry sealers). Range of cost effectiveness was $4,229 - $11,405/ton.
- June 9, 2006 Amendments (2006 economic data) – concrete-curing compounds; dry-fog coatings; and traffic coatings. Range of cost effectiveness was $4,882/ton.

It was assumed that the economic relationships between Placer and South Coast suppliers and users of architectural coatings do not differ significantly. Therefore, the estimated South Coast cost effectiveness values were assumed to be transferable to Sacramento.

The cost effectiveness values calculated from the December 6, 2002 and December 5, 2003 amendments were adjusted to 2006 dollars (from 1998 and 2003 dollars, respectively) using the Bureau of Labor Statistics' Consumer Price Index for West Urban consumers. The estimated overall cost effectiveness for this proposed measure is $10,119/ton.

Authority

Authority to implement this control measure by the PCAPCD is in accordance with California Health and Safety Code, Sections 40000, 40001, and 41010.

Implementation

The PCAPCD is the implementing agency.

References

1. South Coast AQMD Staff Report for Proposed Amended Rule 1113 - Architectural Coating, dated December6, 2002.
2. South Coast AQMD Preliminary Draft Staff Report for Proposed Amended Rule 1113 – Architectural Coating, dated August 15, 2003
3. Sacramento Metropolitan AQMD Staff Report for Rule 442 – Architectural Coating, Dated April 21st, 2001
4. ARB Forecasted Emissions by Summary Category Ozone SIP Planning Projections v1.06 RF #980. November 16, 2006.
5. Control Measure 218 calculation spreadsheet, SMAQMD, May 20, 2008
6. Control Measure, PCAPCD 218, February 5, 2007
7. California Air Resources Board Suggested Control Measure for Architectural Coatings, October 25, 2007

Control Measure Number: YSAQMD – 2.14

Control Measure Title: Architectural Coatings

Date: February 2, 2007

Control Measure Description

This control measure regulates the volatile organic compound (VOC) content in coatings applied to stationary structures and their appurtenances (e.g., general use flats, general use non-flats, and specialty coatings such as industrial maintenance coatings, lacquers, floor coatings, roof coatings, stains, etc.). The strategy also regulates the sale of coatings within the district by prohibiting manufacturers and suppliers of coatings from selling coatings that do not comply with the strategy.

The YSAQMD's architectural coating rule (Rule 2.14) was originally adopted in 1979 and with the most recent amendment occurring in November 2001. The amendment in November 2001 adopted CARB's 2000 SCM for this category. On October 25, 2007, CARB adopted a new SCM for Architectural Coatings that established lower VOC limits for some coating categories.

The table below shows a comparison between the VOC limits in the current Rule 2.14 and the new SCM; coating categories that do not have lower VOC limits are not included.

Category	YSAQMD Rule 2.14 (g/l)	CARB SCM (g/l)
Flat Coating	100	50
Nonflat Coating	150	100
Nonflat-High Gloss	250	150
Antenna Coating	530	250
Antifouling Coatings	400	250
Bituminous Roof Coatings	300	50
Clear Wood Coatings:		275
Clear Brushing Lacquer	550	
Lacquers (including lacquer sanding sealers)	550	
Sanding Sealers (other than lacquer sanding sealers)	350	
Varnishes	350	
Concrete/Masonry Sealer (was Waterproofing Concrete/Masonry Sealer	400	100
Reactive Penetrating Sealer	400	350
Dry Fog Coatings	400	150
Fire Retardant Coatings:		350
Clear	650	
Opaque	350	
Floor Coatings	250	100
Flow Coatings	420	250
Mastic Texture Coatings	300	100
Primers, Sealers, and Undercoaters	200	100
Quick Dry Enamels	250	150
Quick Dry Primers, Sealers, Undercoaters	200	100
Roof Coatings	250	50
Rust Preventative Coatings	400	250
Specialty Primers, Sealers, Undercoaters	350	100
Temperature-Indicator Safety Coating	550	420
Traffic Marking Coatings	150	100

Emission Inventory – 2018

EIC Code	EIC Description	ROG Planning Inventory Tons/day 2018
520-520-9100-0000	Oil-Based (Organic Solvent Based) Coatings (Unspecified)	0.0201
520-520-9105-0000	Oil-Based Primers, Sealers, And Undercoaters	0.0382
520-520-9106-0000	Oil-Based Quick Dry Primers, Sealers, And Undercoaters	0.0226
520-520-9108-0000	Oil-Based Specialty Primer, Sealer, And Undercoaters	0.0012
520-520-9109-0000	Oil-Based Bituminous Roof Primer	0.0037
520-520-9113-0000	Oil-Based Waterproofing Sealers	0.0176
520-520-9118-0000	Oil-Based Waterproofing Concrete/Masonry Sealers	0.0123
520-520-9122-0000	Oil-Based Faux Finishing	0.0004
520-520-9124-0000	Oil-Based Mastic Texture	0.0054
520-520-9126-0000	Oil-Based Rust Preventative	0.0088
520-520-9131-0000	Oil-Based Stains - Clear/Semitransparent	0.0696
520-520-9136-0000	Oil-Based Stains – Opaque	0.0066
520-520-9141-0000	Oil-Based Varnish - Clear/Semitransparent	0.0463
520-520-9153-0000	Oil-Based Quick Dry Enamel Coatings	0.0159
520-520-9157-0000	Oil-Based Lacquers (Unspecified)	0.0172
520-520-9159-0000	Oil-Based Flat Coatings	0.0006
520-520-9160-0000	Oil-Based Nonflat - Low Gloss/Medium Gloss	0.0256
520-520-9161-0000	Oil-Based High Gloss Nonflat Coatings	0.0276
520-520-9164-0000	Oil-Based Bituminous Coatings	0.0521
520-520-9165-0000	Oil-Based Concrete Curing Compounds	0.0011
520-520-9166-0000	Oil-Based Dry Fog Coatings	0.0103

520-520-9169-0000	Oil-Based Floor Coatings	0.0029
520-520-9170-0000	Oil-Based Form Release Coatings	0.0073
520-520-9172-0000	Oil-Based Industrial Maintenance Coatings	0.1067
520-520-9173-0000	Oil-Based Metallic Pigmented Coatings	0.0333
520-520-9174-0000	Oil-Based Roof Coatings	0.0025
520-520-9176-0000	Oil-Based Traffic Coatings	0.0091
520-520-9177-0000	Oil-Based Wood Preservatives	0.0083
520-520-9200-0000	Water-Based Coatings (Unspecified)	0.0026
520-520-9205-0000	Water-Based Primers, Sealers, And Undercoaters	0.0403
520-520-9206-0000	Water-Based Quick Dry Primers, Sealers, And Undercoaters	0.0031
520-520-9208-0000	Water-Based Specialty Primer, Sealer, And Undercoaters	0.0025
520-520-9209-0000	Water-Based Bituminous Roof Primer	0.0006
520-520-9213-0000	Water-Based Waterproofing Sealers	0.0023
520-520-9218-0000	Water-Based Waterproofing Concrete/Masonry Sealers	0.0033
520-520-9222-0000	Water-Based Faux Finishing	0.0022
520-520-9223-0000	Water-Based Form Release Compounds	0
520-520-9224-0000	Water-Based Mastic Texture	0.0028
520-520-9226-0000	Water-Based Rust Preventative	0.0003
520-520-9231-0000	Water-Based Stains - Clear/Semitransparent	0.0039
520-520-9236-0000	Water-Based Stains - Opaque	0.0061
520-520-9241-0000	Water-Based Varnishes - Clear/Semitransparent	0.0062
520-520-9257-0000	Water-Based Lacquers (Unspecified)	0.0012
520-520-9259-0000	Water-Based Flat Coatings	0.1538
520-520-9260-0000	Water-Based Nonflat - Low Gloss/Medium Gloss	0.1832
520-520-9261-0000	Water-Based High Gloss Nonflat Coatings	0.0166
520-520-9264-0000	Water-Based Bituminous Coatings	0.0003
520-520-9265-0000	Water-Based Concrete Curing Compounds	0.0035
520-520-9266-0000	Water-Based Dry Fog Coatings	0.003
520-520-9269-0000	Water-Based Floor Coatings	0.0077
520-520-9272-0000	Water-Based Industrial Maintenance Coatings	0.0087
520-520-9273-0000	Water-Based Metallic Pigmented Coatings	0.0008
520-520-9274-0000	Water-Based Roof Coatings	0.0044
520-520-9276-0000	Water-Based Traffic Coatings	0.0276
520-520-9277-0000	Water-Based Wood Preservatives	0
Total		**1.0603**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	ROG Emission Reduction Tons/day
			2018
Architectural Coating Categories	2014	2016	0.2144

Cost Effectiveness

The cost effectiveness calculations were based upon economic analyses conducted by the South Coast Air Quality Management District for amendments to Rule 1113. The specific economic analyses used are listed below:

- December 6, 2002 Amendments (based on vacated May 14, 1999 Amendments) (1998 economic data) – industrial maintenance coatings; rust preventative coatings; floor coatings; non-flats; primers, sealers, and undercoaters; quick-dry primers, sealers, and undercoaters; and quick-dry enamels.
- December 5, 2003 Amendments (2003 economic data) – clear wood finishes (including sanding sealers and varnish); roof coatings; stains; and waterproofing

sealers (including concrete and masonry sealers). Range of cost effectiveness was $4,229 - $11,405/ton.

- June 9, 2006 Amendments (2006 economic data) – concrete-curing compounds; dry-fog coatings; and traffic coatings. Range of cost effectiveness was $4,882/ton.

It was assumed that the economic relationships between Yolo/Solano and South Coast suppliers and users of architectural coatings do not differ significantly. Therefore, the estimated South Coast cost effectiveness values were assumed to be transferable to Sacramento.

The cost effectiveness values calculated from the December 6, 2002 and December 5, 2003 amendments were adjusted to 2006 dollars (from 1998 and 2003 dollars, respectively) using the Bureau of Labor Statistics' Consumer Price Index for West Urban consumers. The estimated overall cost effectiveness for this proposed measure is $10,387/ton.

Authority

Authority to implement this control measure by the YSAQMD is in accordance with California Health and Safety Code, Sections 40000, 40001, and 41010.

Implementation

The YSAQMD is the implementing agency.

References

1. Yolo-Solano Air Quality Management District, Rule 2.14, Architectural Coatings; November 14, 2001.
2. California Environmental Protection Agency – Air Resources Board, Suggested Control Measure for Architectural Coatings, June 22, 2000.
3. South Coast Air Quality Management District, Rule 1113, Architectural Coatings; June 9, 2006.
4. California Environmental Protection Agency – Air Resources Board, Forecasted Emissions by Summary Category Ozone SIP Planning Projections - V1.06 RF#980; Date Of Last Update: November 16, 2006.
5. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). May 14, 1999.
6. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). December 6, 2002.
7. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). December 5, 2003.
8. South Coast Air Quality Management District, Staff Report for Proposed Amended Rule 1113 (Architectural Coatings). June 9, 2006.
9. U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index 1996-2006.

10. Control Measure, YSAQMD – 2.14, February 2, 2007
11. California Air Resources Board Suggested Control Measure for Architectural Coatings, October 25, 2007
12. Control Measure 2.14 Calculation Spreadsheet, SMAQMD, May 20, 2008

Automotive Refinishing

Control Measure Number: SMAQMD - 459

Control Measure Title: Automotive Coatings

Date: December 8, 2006

Control Measure Description

Automotive refinishing coatings are used on motor vehicles and other mobile equipment, primarily by auto body repair and paint shops and automotive dealerships. VOC emissions from the surface coating operations result from the evaporation of the organic solvents used in the coatings. These emissions occur in a number of places during the operation, including surface preparation and cleanup, application of the coating, drying of the parts, and cleanup of the application equipment.

On October 20, 2005, CARB adopted a Suggested Control Measure (SCM) for automotive coatings. The SCM would introduce several significant changes into SMAQMD Rule 459, Automotive, Truck, and Heavy Equipment Refinishing Operations, such as:

- Consolidation of limits for Group I and Group II vehicles
- Consolidation of the precoats, primers, primer sealers, and primer surfacers categories
- Deletion of the multi-stage topcoats category, and replacement with separate limits for color coats and clear coats
- Elimination of the specialty coatings category, with specific limits for each type of coating, and a general limit applicable to all other coatings.
- Lower VOC limits for most coating categories.

The proposed control measure will evaluate the information from CARB's SCM and propose amendments to Rule 459.

Emission Inventory – 2018

EIC Code	EIC Description	VOC Planning Inventory (tpd)
		2018
230-218-9000-0000	Automobile Refinish Coatings, Unspecified	0.8610
510-500-9021-0000	Aerosol Coatings, Auto Body Primers	0.0077
510-500-9082-0000	Aerosol Coatings, Auto Bumper and Trim Coatings	0.0068
510-500-9083-0000	Aerosol Coatings, Exact Match Engine Enamel	0.0065
510-500-9084-0000	Aerosol Coatings, Exact Match Automotive Coatings	0.0117
510-506-6558-0000	Consumer Products, Automotive Undercoating, Aerosol	0.0243
510-506-6559-0000	Consumer Products, Automotive Undercoating, Non-Aerosol	0.0018
Total		**0.9198**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	VOC Emission Reduction (tpd)
			2018
Automotive Refinishing	2011	2012	0.1130

Cost Effectiveness

CARB estimated the overall, statewide cost effectiveness of the SCM to be $1.43 per pound of VOC reduced. However, this takes into account reductions in districts with a wide range of stringency in their existing rules. Statewide, CARB estimated a 65% reduction in emissions from automotive refinish coatings. Based on our existing rule limits, District staff has estimated that within the SMAQMD, only a 16.4% reduction in VOC emissions will occur if the SCM is adopted in place of current limits. A large portion of the costs for compliance is based on retrofitting existing facilities to be compatible with water-borne coatings. Compliance costs for the SMAQMD will be similar to the statewide estimates, but the emission reductions in SMAQMD are expected to be lower than the statewide average by a factor of 3.96. Therefore, the cost effectiveness for the measure in the SMAQMD is estimated to be 3.96 times higher than the statewide average, or $5.66 per pound ($11,326 per ton) of VOC reduced.

Authority

The District is authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001, 40702, and 41010.

Implementation

This control measure will be implemented by the SMAQMD through Rule 459.

References

1. CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (Rf#980), November 16, 2006
2. Control Measure, SMAQMD - 459, December 8, 2006
3. CARB, Staff Report for the Proposed Suggested Control Measure for Automotive Coatings, October 2005.

Control Measure Number: FRAQMD - 3.19

Control Measure Title: Vehicle and Mobile Equipment Coating Operations

Date: February 2, 2007

Control Measure Description

Automotive refinishing coatings are used on motor vehicles and other mobile equipment, primarily by auto body repair and paint shops and automotive dealerships. VOC emissions from the surface coating operations result from the evaporation of the organic solvents used in the coatings. These emissions occur in a number of places during the operation, including surface preparation and cleanup, application of the coating, drying of the parts, and cleanup of the application equipment.

On October 20, 2005, CARB adopted a Suggested Control Measure (SCM) for automotive coatings. The SCM would introduce several significant changes into FRAQMD Rule 3.19, Vehicle and Motor Equipment Coating Operations, such as:

- Consolidation of limits for Group I and Group II vehicles
- Consolidation of the primers, primer sealers, and primer surfacer categories
- Deletion of the multi-stage topcoats category, and replacement with separate limits for color coats and clear coats
- Elimination of the specialty coatings category, with specific limits for each type of coating, and a general limit applicable to all other coatings.
- Lower VOC limits for most coating categories.

The proposed control measure will evaluate the information from CARB's SCM and propose amendments to Rule 3.19.

Emission Inventory – 2018

The population growth rate in South Sutter is purely based on the current Sutter County population growth rate projected by SACOG. The potential growth of proposed South Sutter Specific Plan (now called Sutter Pointe Specific Plan) is not factored in.

EIC Code	EIC Description	VOC Planning Inventory (tpd)
		2018
230-218-9000-0000	Automobile Refinish Coatings, Unspecified	0.0035
Total		**0.0035**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	VOC Emission Reduction (tpd)
			2018
Automotive Refinishing	2016	2017	0.0008

Cost Effectiveness

The cost effectiveness is expected to range between $5,560 and $77,300 per ton of ROG reduced.

Authority

The Feather River Air Quality Management District has the authority to propose rules and regulations to the District Board for adoption under HSC 40001.

Implementation

The implementation of this control measure does not involve any other agency other than the Feather River Air Quality Management District.

References

1. El Dorado County AQMD Rule 230, Adopted September 27, 1994.
2. Feather River AQMD Rule 3.19, Adopted August 6, 1998.
3. Placer County APCD Rule 234, Revised April 9, 1998.
4. Sacramento Metro AQMD Rule 459, Revised October 2, 1997.
5. Yolo-Solano AQMD Rule 2.26, Revised August 13, 1997.
6. Draft Staff Report, Rule 459, SMAQMD, August 2001.
7. Rule adoption files, Rule 459, SMAQMD.
8. California Air Resources Board, Staff Report for The Proposed Suggested Control Measures Automotive Coatings, October 2005
9. California ARB Forecasted Emissions by Summary Category, Ozone SIP Sacramento NAA Projections (v1.06_RF980) www.arb.ca.gov/app/emsinv/03sip/fcemssumcat_03v1.06.php. November 16, 2006
10. Control Measure, FRAQMD – 3.19, February 2, 2007

Control Measure Number: PCAPCD - 234

Control Measure Title: Automotive Refinishing Operations

Date: February 5, 2007

Control Measure Description

Automotive refinishing coatings are used on motor vehicles and other mobile equipment, primarily by auto body repair and paint shops and automotive dealerships. VOC emissions from the surface coating operations result from the evaporation of the organic solvents used in the coatings. These emissions occur in a number of places during the operation, including surface preparation and cleanup, application of the coating, drying of the parts, and cleanup of the application equipment.

On October 20, 2005, CARB adopted a Suggested Control Measure (SCM) for automotive coatings. The SCM would introduce several significant changes into PCAPCD Rule 234, such as:

- Consolidation of limits for Group I and Group II vehicles
- Consolidation of the precoats, primers, primer sealers, and primer surfacers categories
- Deletion of the multi-stage topcoats category, and replacement with separate limits for color coats and clear coats
- Elimination of the specialty coatings category, with specific limits for each type of coating, and a general limit applicable to all other coatings.
- Lower VOC limits for most coating categories.

The proposed control measure will evaluate the information from CARB's SCM and propose amendments to Rule 234.

Emission Inventory – 2018

EIC Code	EIC Description	VOC Planning Inventory (tpd) 2018
230-218-9000-0000	Automobile Refinish Coatings, Unspecified	0.1836

Emission Reductions

EIC Description	Adoption Date	Implementation date	VOC Emission Reduction (tpd) 2018
Automobile Refinish Coatings	2015	2017	0.045

Cost Effectiveness

CARB estimated the overall, statewide cost effectiveness of the SCM to be $1.43 per pound of VOC reduced. The annual cost for this measure is approximately $57,229/yr.

Authority

California Health and Safety Code, Sections 40000, 40001, and 40702

Implementation

This control measure will be implemented by the PCAPCD through Rule 234.

References

1. El Dorado County AQMD Rule 230, Adopted September 27, 1994.
2. Feather River AQMD Rule 3.19, Adopted August 6, 1998.
3. Placer County APCD Rule 234, Revised April 9, 1998.
4. Sacramento Metro AQMD Rule 459, Revised October 2, 1997.
5. Yolo-Solano AQMD Rule 2.26, Revised August 13, 1997.
6. Draft Staff Report, Rule 459, SMAQMD, August 2001.
7. Rule adoption files, Rule 459, SMAQMD.
8. Staff Report for the Proposed Suggested Control Measure for Automotive Coating, CARB, October 2005.
9. “ARB Forecasted Emissions by Summary Category Ozone SIP Planning Projections v1.06 RF #980”. November 16, 2006.
10. Control Measure, PCAPCD 234, February 5, 2007

Control Measure Number: YSAQMD – 2.26

Control Measure Title: Automotive Refinishing

Date: February 5, 2007

Control Measure Description

Automotive refinishing coatings are used on motor vehicles and other mobile equipment, primarily by auto body repair and paint shops and automotive dealerships. VOC emissions from the surface coating operations result from the evaporation of the organic solvents used in the coatings. These emissions occur in a number of places during the operation, including surface preparation and cleanup, application of the coating, drying of the parts, and cleanup of the application equipment.

On October 20, 2005, CARB adopted a Suggested Control Measure (SCM) for automotive coatings. The SCM would introduce several significant changes into YSAQMD Rule 2.26, Motor Vehicle and Mobile Equipment Coating Operation:

- Consolidation of limits for Group I and Group II vehicles
- Consolidation of the precoats, primers, primer sealers, and primer surfacers categories
- Deletion of the multi-stage topcoats category, and replacement with separate limits for color coats and clear coats
- Elimination of the specialty coatings category, with specific limits for each type of coating, and a general limit applicable to all other coatings.
- Lower VOC limits for most coating categories.

The proposed control measure will evaluate the information from CARB's SCM and propose amendments to Rule 2.26.

Emission Inventory –2018

EIC Code	EIC Description	VOC Planning Inventory (tpd)
		2018
230-218-9000-0000	Coatings	0.0907
230-218-9050-0000	Topcoats	0.0809
230-240-8300-0000	Thinning and Cleanup Solvents	0.0169
Total		**0.1885**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	VOC Emission Reduction (tpd)
			2018
Automotive Refinishing	2008	2009-2010	0.0581

Cost Effectiveness

The SCM staff report calculates that the annualized cost to for facilities with a single booth with no heater and an annual revenue less than $1 million, to be $1,648 (Page C-5). The cost includes upgrades to existing air moving/heating equipment, the purchasing of new application equipment, and worker training. This cost has been annualized over 15 years for major non-recurring costs, over 5 years for all other costs, and then adjusted for capital cost recovery. The SCM estimates the recurring costs of equipment operation and maintenance, and the increased coating costs, to be $533 per year. Therefore, the total annual cost to facilities is estimated to be $2,181. Adjusting for inflation in 2008, the annual cost becomes $2,344.58. Currently there are 80 permitted sources that will be affected by this proposed control measure. The annual ROG emission reductions have been calculated using the emission inventory estimates over a 5 day per week and 52 weeks per year operational schedule.

Year	2018
Lifetime Cost Effectiveness ($/ton)	
ROG	$11,643

Total Cost: $2,637,647 over 15 years (2008)

Authority

The District is authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001, 40702, and 41010.

Implementation

This control measure will be implemented by the YSAQMD.

References

1. California Environmental Protection Agency – Air Resources Board, Staff Report for the Proposed Suggested Control Measure for Automotive Coatings; October 2005.
2. Forecasted Emissions by Summary Category Ozone SIP Planning Projections - v1.06 RF#980; Date of Last Update: November 16, 2006.
3. Yolo-Solano Air Quality Management District, Rule 2.26, Motor Vehicle and Mobile Equipment Coating Operation; August 13, 1997.

Degreasing/ Solvent Cleaning

Control Measure Number: FRAQMD - 3.14

Control Measure Title: Solvent Degreasing

Date: February 2, 2007

Control Measure Description

Degreasing and solvent cleaning operations are performed by many commercial and industrial facilities. Solvents are used for surface preparation for further processing and cleaning after manufacturing. Degreasing is widely used by automotive repair and maintenance facilities and by electric apparatus and electronic component manufacturing or repair, construction trades, printing shops, metal parts and products, can coating, and other types of commercial and manufacturing facilities. Solvents are also used by coating operations for cleaning of coating application equipment such as spray guns and brushes.

The existing Rule 3.14- Solvent Degreasing was adopted in June 1991. Both Placer County Air Pollution Control District (PCAPCD) and Sacramento Metropolitan Air Quality Management District (SMAQMD) have revised their degreasing and surface preparation and cleanup rules in recent years to replace general solvent cleaning with aqueous cleaners or exempt solvent cleaners. This control measure will evaluate implementing similar limits in Sutter and Yuba Counties if they are feasible and cost effective.

Emission Inventory –2018

The population growth rate in South Sutter is purely based on the current Sutter County population growth rate projected by SACOG. The potential growth of proposed South Sutter Specific Plan (now called Sutter Pointe Specific Plan) is not factored in.

EIC Code	EIC Description	ROG Planning Inventory (Tons/day)
		2018
220-204-0500-0000	Cold Cleaning – Petroleum Naphtha	0.0069
220-208-0500-0000	Handwiping – Petroleum Naphtha	0.0007
Total		**0.0076**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	ROG Emission reductions (Tons/day)
			2018
Degreasing/Solvent Cleaning	2011	2011	0.0006

Cost Effectiveness

Based on the Placer County Air Pollution Control District staff report for Rule 216-Organic Solvent Cleaning and Degreasing Operations, the cost impact of changing from solvent based cleaners to aqueous based cleaners is minimal.

Authority

The above control measure will be implemented by amendment to the existing Rule 3.14 Solvent Degreasing. The Feather River Air Quality Management District has the authority to propose rules and regulations to the District Board for adoption under HSC 40001.

Implementation

The implementation of this proposed control measure does not involve any other agency other than the Feather River Air Quality Management District.

References

1. California ARB Forecasted Emissions by Summary Category, Ozone SIP Sacramento NAA Projections (v1.06_RF980) www.arb.ca.gov/app/emsinv/03sip/fcemssumcat_03v1.06.php. November 16, 2006
2. Placer County Air Pollution Control District Staff Report for Rule 216, December 11, 2003
3. Control Measure, FRAQMD 3.14, February 2, 2007

Control Measure Number: YSAQMD – 2.24/2.31

Control Measure Title: General Surface Preparation/Cleanup and Degreasing

Date: February 5, 2007

Control Measure Description

Degreasing and solvent cleaning operations are performed by many commercial and industrial facilities. Solvents are used for surface preparation for further processing and cleaning after manufacturing. Degreasing is widely used by automotive repair and maintenance facilities and by electric apparatus and electronic component manufacturing or repair, construction trades, printing shops, metal parts and products, can coating, and other types of commercial and manufacturing facilities. Solvents are also used by coating operations for cleaning of coating application equipment such as spray guns and brushes.

The proposed control measure consists of the District revising the ROG limits of Rule 2.13[1] (Organic Solvents), Rule 2.24[2] (Solvent Cleaning Operations - Degreasing), and Rule 2.31[3] (Surface Preparation and Cleanup) to match the ROG limits currently feasible and required by South Coast AQMD's Rule 1122[4] (Solvent Degreasers) and Rule 1171[5] (Solvent Cleaning Operations). It is expected that most of the ROG-content limits will be reduced to 25 grams per liter (g/L).

Emission Inventory – 2018

EIC Code	EIC Description	ROG Planning Inventory (Tons/day)
		2018
22020405000000	0500-Petroleum Naphtha	0.4243
22020430220000	3022-Alcohols (Unspecified)	0.0089
22020430830000	3083-Chlorofluorocarbons (Unspecified)	0.0006
22020431760000	3176-Glycol Ethers (Unspecified)	0.0008
22020432040000	3204-Ketones (Unspecified)	0.0003
22020433330000	3333-Terpenes (Unspecified)	0.0035
22020481060000	8106-Degreasing Solvents - Blends (Unspecified)	0.0265
22020630830000	3083-Chlorofluorocarbons (Unspecified)	0.0005
22020633460000	3346-Trichloroethylene (Tce)	0.0004
22020805000000	0500-Petroleum Naphtha	0.0359
22020830220000	3022-Alcohols (Unspecified)	0.0193
22020830830000	3083-Chlorofluorocarbons (Unspecified)	0.0000
22020831760000	3176-Glycol Ethers (Unspecified)	0.0039
22020832040000	3204-Ketones (Unspecified)	0.0145
22020833390000	3339-Toluene/xylene	0.0035
22020833460000	3346-Trichloroethylene (Tce)	0.0004
22020881040000	8104-Degreasing Solvents - Pure (Unspecified	0.0029
22020881060000	8106-Degreasing Solvents - Blends (Unspecified)	0.0087
Total		**0.5549**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	ROG Emission Reduction (tpd)
			2018
Degreasing/Solvent Cleaning	2008	2009	0.762

Cost Effectiveness

The cost effectiveness for this control method varies depending on the type of cleaning being performed. Cost analysis was performed for each solvent cleaning application (e.g., electrical parts, architectural coatings application equipment). Switching to cleaners with lower VOC content would result in either cost decreases or increases, depending on the particular application. The costs are expected to range from a cost savings to $6.60/lb across the different applications. The overall cost effectiveness for this proposal is estimated at $2,398 per ton of VOC reduced.

Authority

The District is authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001, 40702, and 41010.

Implementation

This control measure will be implemented by the YSAQMD.

References

1. Yolo-Solano Air Quality Management District, Rule 2.13, Organic Solvents; May 25, 1994.
2. …, Rule 2.24, Solvent Cleaning Operations (Degreasing); August 13, 1997.
3. …, Rule 2.31, Surface Preparation and Cleanup; August 13, 1997.
4. South Coast Air Quality Management District, Rule 1122, Solvent Degreasers; October 1, 2004.
5. …, Rule 1171, Solvent Cleaning Operations; May 6, 2005.
6. California Environmental Protection Agency – Air Resources Board, Forecasted Emissions by Summary Category Ozone SIP Planning Projections - v1.06 RF#980; Date of Last Update: November 16, 2006.

Graphic Arts

Control Measure Number: YSAQMD – 2.29

Control Measure Title: Graphic Arts

Date: February 7, 2007

Control Measure Description

VOC emissions from graphic art operations result from the evaporation of organic solvents in the inks, fountain solutions, and solvents used in the various types of printing processes. These operations produce a wide variety of printed products that include books, magazines, newspapers, fliers, posters, and packaging materials. These various types of products require that facilities use very specific materials and printing methods. The different types of printing methods include lithography, flexography, gravure, and letterpress. Although the District's graphic arts rule (Rule 2.29) contains specific screen printing requirements, for the purposes of the SIP, the screen printing category will be grouped into the paper, fabric, and film coating category.

For certain lithographic and flexographic printing operations heatset inks are used. These viscous inks are cured using indirect hot air dryers that evaporate the ink solvents immediately after printing. In the Yolo-Solano AQMD, smaller heatset presses are equipped with electric hot air or UV light dryers. However, the larger heatset presses are equipped with natural gas fired dryers. Currently, only a single flexographic printing facility is permitted to use a Regenerative Thermal Oxidizer (RTO) to control the ROG emissions from its operation. Because no additional NO_X controls are currently available for combustion devices being used as air pollution control equipment, NO_X reductions associated with graphic arts operations will not be addressed in this control strategy.

The first proposed control measure in reducing the ROG emissions would be to lower the District's current rule exemption limit from 400 pounds per month to 60 pounds per month. The second proposed control measure is to revise the Districts' various cleaning solvent ROG limits to match the current Sacramento Metropolitan AQMD standards. The District's ROG emission exemption is contained in Rule 2.29, Graphic Arts Printing Operations, while the allowable solvent limits are contained in District Rule 2.31, Solvent Preparation and Cleanup.

Emission Inventory –2018

EIC Code	EIC Description	ROG Inventory for Control Measures (tpd)
		2018
24099580000000	Solvent	0.125

Emission Reductions

EIC Description	Adoption Date	Implementation Date	ROG Emission Reduction (tpd)
			2018
Solvent	2016	2018	Not available

Yolo Solano Air Quality Management District does not have enough data to quantify the emission reduction.

Cost Effectiveness

Because of the various types of solvents currently used in this wide source category and the unavailability of specific usage data, the District cannot perform a cost effectiveness calculation for this control measure. However, it is expected that because of the availability of the compliant products in the Sacramento Metropolitan Air Quality Management District, the added costs associated with purchasing and disposing of the ROG compliant materials will not greatly differ from the cost of the currently compliant ROG products.

Authority

The District is authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001, 40702, and 41010.

Implementation

This control measure will be implemented by the YSAQMD.

References

1. California Environmental Protection Agency – Air Resources Board, Forecasted Emissions by Summary Category Ozone SIP Planning Projections - V1.06 RF#980; Date of Last Update: November 16, 2006.
2. Sacramento Metropolitan Air Quality Management District, Rule 450, Graphic Arts Operations; March 24, 2000.
3. Yolo-Solano Air Quality Management District, Rule 2.29, Graphic Arts Printing Operations; August 13, 1997.
4. Rule 2.31, Solvent Preparation and Cleanup; August 13, 1997.

Miscellaneous Metal Parts and Products

Control Measure Number: PCAPCD - CM3

Control Measure Title: Miscellaneous Metal Parts and Products

Date: February 5, 2007

Control Measure Description

This category is comprised of VOC emissions from the coating of miscellaneous metal parts and products including signs, storage and trash containers, door frames, window frames, panels, metal cabinets, caskets and various other metal coating operations. VOC emissions from the surface coating operations result from the evaporation of the organic solvents used in the coatings. These emissions occur in a number of places during the operation, including surface preparation and cleanup, application of the coating, drying of the parts, and cleanup of the application equipment. This control measure will only address the VOC emissions from the coating process. The surface preparation and cleanup VOC emissions are addressed under other measures.

Staff evaluated the miscellaneous metal parts and products VOC limits that are included in EPA's Control Technique Guideline for Metal Parts and Products.

Emission Inventory – 2018

EIC Code	EIC Description	VOC Planning Inventory (tpd)
		2018
230-230-9000-0000	Metal Parts And Products Coating	0.0405

Emission Reductions

EIC Description	Adoption Date	Implementation Date	VOC Emission Reductions (tpd)
			2018
Metal Parts And Products Coating	2009	2009	0.014

Cost Effectiveness

The cost effectiveness for this measure has not been determined. Other VOC rules within the nonattainment area have ranged in cost effectiveness from $110 - $8,330 per ton of VOC reduced.

Authority

The Placer County Air pollution Control District has the authority to propose rules and regulations to the District Board for adoption under HSC 40001.

Implementation

The implementation of this proposed control measure does not involve any other agency other than the Placer County Air pollution Control District.

References

1. California ARB Forecasted Emissions by Summary Category, Ozone SIP Sacramento NAA Projections (v1.06_RF980) www.arb.ca.gov/app/emsinv/03sip/fcemssumcat_03v1.06.php. November 16, 2006
2. CARB's Areawide Source Methodologies, Industrial Coatings, Updated February 1990; Reissued October 1997
3. Control Measure, PCAPCD CM3, February 5, 2007

Natural Gas Production and Processing

Control Measure Number: SMAQMD - 461

Control Measure Title: Natural Gas Production and Processing

Date: December 8, 2006

Control Measure Description

There are several natural gas production fields within Sacramento County. Fugitive emissions of VOC from natural gas production occur from equipment leaks in valves, pumps, compressors, pressure relief devices, flanges, and threaded connections at gas wells and associated transmission systems. The proposed control measure would establish inspection and repair requirements for leaking components or other requirements to achieve similar results.

Emission Inventory – 2018

EIC Code	EIC Description	VOC Planning Inventory (tpd) 2018
310-302-1600-0000	Oil and Gas Production Fugitive Losses - Valves	0.3279
310-304-1600-0000	Oil and Gas Production Fugitive Losses - Fittings	0.1348
310-306-1600-0000	Oil and Gas Production Fugitive Losses - Pumps	0.0005
310-308-1600-0000	Oil and Gas Production Fugitive Losses - Compressors	0.0014
Total		**0.4646**

Note: The inventory in the above table is based on the current CARB planning inventory. However, the District conducted a survey of natural gas producers in 2004 that produced an emission estimate of only 0.161 tons/day from fugitive components.

Emission Reductions

EIC Description	Adoption Date	Implementation Date	VOC Emission Reduction (tpd) 2018
Fugitive Emissions – Oil and Gas Production	2014	2015	0.116-0.334

Cost Effectiveness

The cost effectiveness of the leak detections and repair program was estimated by CARB in the 1993 RACT determination document at $3.70 per pound in 1989 dollars. Adjusted for inflation, this is equivalent to $11,900 per ton in 2006 dollars.

Authority

The District is authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001, 40702, and 41010.

Implementation

This control measure will be implemented by the SMAQMD.

References

1. CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (Rf#980), November 16, 2006
2. Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, U.S. EPA, November 1995.
3. Determination of Reasonably Available Control Technology for the Control of Fugitive Emissions of Volatile Organic Compounds from Oil and Gas Production and Processing Facilities, Refineries, Chemical Plants, and Pipeline Transfer Stations, California Air Resources Board, December 1993.
4. Control Measure, SMAQMD – 461, December 8, 2006

NO_X Control Measures

Boilers, Steam Generators, and Process Heaters

Control Measure Number: YSAQMD – 2.27

Control Measure Title: Boilers, Steam Generators, and Process Heaters/Space Heaters

Date: February 6, 2007

Control Measure Description

Boilers and steam generators are used to provide hot water and steam for a variety of industrial and commercial applications. These applications include space heating, food processing, garment laundering, and equipment sterilization. Manufacturing operations use process heaters to heat materials or equipment during the manufacturing process. The equipment burners can be fired on solid, liquid or gaseous fuels. A unit's maximum input rating can be calculated from the fuel heat input value over an hour's time and is reported in British Thermal Units per hour (MMBTU/hr). Per regulatory convention, the emissions from these types of units are reported in parts per million (ppm) corrected to 3% oxygen (O_2).

The proposed control measure consists of the District amending Rule 2.27 (Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters) to incorporate a multi-tiered NO_X emission limit.

Emission Inventory - 2018

EIC Code	EIC Description	NO_X Planning Inventory (tpd)
		2018
5000501100000	Manufacturing and Industrial Boilers, Natural Gas Fuel	0.0302
5001001100000	Manufacturing and Industrial Boilers, Propane Fuel	0.0068
5099501100000	Manufacturing and Industrial Process Heaters, Natural Gas Fuel	0.8936
5200501100000	Manufacturing and Industrial Process Heaters, Distillate Oil Fuel	0.141
5201001100000	Manufacturing and Industrial Oven Heaters (Forced Drying Surface Coatings), Natural Gas Fuel	0.0217
6000501100000	Manufacturing and Industrial, Other, Natural Gas Fuel	0.1428
6001001100000	Manufacturing and Industrial, Other, LPG Fuel	0.0078
6099501100000	Food and Agricultural Process Boilers, Natural Gas Fuel	0.6945
31035601100000	Food and Agricultural Process Heaters, Natural Gas Fuel	0.0099
Total		**1.9483**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	NO_X Emission Reduction Tons/day
			2018
Boilers	2016	2018	0.2883

Cost Effectiveness

From an analysis performed by the Sacramento Metropolitan AQMD in 2003[2], the cost for boiler retrofits will vary on the size, the type, and the age of an individual unit. It is expected that some of the older units that have reached the end of their service lives may be replaced instead of being retrofitted with low-NO_X equipment or post-combustion controls. Based on this analysis, the cost of equipment modifications ranged from $12,664 - $23,359 per ton of NO_X reduced. Adjusted for inflation, the expected cost in 2007 will be $13,934 - $25,718.

Total Cost: $17,924,227 - $33,061,593 over a 15 year equipment useful life (2007).

Authority

The District is authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001, 40702, and 41010.

Implementation

This control measure will be implemented by the YSAQMD through Rule 2.27.

References

1. California Environmental Protection Agency – Air Resources Board, Forecasted Emissions by Summary Category Ozone SIP Planning Projections - v1.06 RF#980; Date of Last Update: November 16, 2006.
2. Sacramento Metropolitan Air Quality Management District, Final Draft – Sacramento Off-Road Measures: Boilers, Steam Generators, and Process Heaters/Space Heaters, October 14, 2003.

IC Engines

Control Measure Number: FRAQMD - 3.22

Control Measure Title: Stationary Internal Combustion Engines (Non-Agricultural)

Date: February 5, 2007

Control Measure Description

Internal combustion (IC) engines are in place at a wide variety of stationary sources. Use times range from a few hours a month for emergency standby engines to full-time for engines that are used as prime power. Standby engines tend to have small horsepower ratings (under 300) and may be in place to operate fire pumps or to provide backup power in case of an electrical outage, while engines that provide prime power are larger (often over 600 hp) and usage may be constant.

The most common fuel type for emergency standby engines is diesel, and for prime power engines, natural gas. Other fuels such as propane, gasoline, and landfill gas are also used occasionally, depending on the engine application. Many of the natural gas engines are in remote locations and used to compress natural gas from natural gas wells. These engines can be either lean burn or rich burn. The pollutants of primary concern that result from the combustion process are NO_X and CO; however, recent rulemaking efforts at the statewide level have focused on diesel PM, which has been identified as a carcinogen and a toxic air contaminant. SO_X and ROG also result from the combustion process.

The proposed control measure would establish emission standards for non-agricultural stationary IC engines.

EIC Emission Inventory:

The population growth rate in South Sutter is purely based on the current Sutter County population growth rate projected by SACOG. The potential growth of proposed South Sutter Specific Plan (now called Sutter Pointe Specific Plan) is not factored in.

Emission Inventory - 2018

EIC Code	EIC Description	NO_X Inventory for Control Measures (tpd)
		2018
060-995-1220-0000	Service and Commercial, Other, Distillate	0.002
099-995-0000-0000	Fuel Combustion (other)	0.018
Total		**0.020**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	NO_X Emission Reductions (tpd)
			2018
IC Engines	2010	2011	0.0045

Cost Effectiveness

The cost effectiveness is estimated to be $11,500 per ton of NO_X reduced.

Implementation

The Feather River Air Quality Management District proposes to implement this rule in 2011.

Authority

Feather River Air Quality Management District has the authority to regulating stationary internal combustion engines is within provisions of the California Health and Safety Code.

References

1. Placer County Air Pollution Control District Rule 242 Internal Combustion Engines
2. South Coast AQMD Rule 1110.2, Emissions from Gaseous and Liquid-Fueled Engines
3. San Joaquin 2002 and 2005 Rate of Progress Plan
4. Draft Final Sacramento Off-road Measures, Control Measure D-20, Cogeneration/IC Engines, Sacramento Metropolitan AQMD, October 14, 2003.
5. "ARB Forecasted Emissions by Summary Category Ozone SIP Planning Projections v1.06 RF #980". www.arb.ca.gov/app/emsinv/0#sip/fcemssumcat_0#v106.php. November 16, 2006.
6. Control Measure, FRAQMD 3.22, February 2, 2007

Water Heaters

Control Measure Number: EDCAQMD - 239

Control Measure Title: Natural Gas-Fired Water Heaters

Date: January 31, 2007

Control Measure Description

This control measure will evaluate low NO_X limits for all new boilers and water heaters within a heat input range of less than 1,000,000 Btu/hr. At the current time, El Dorado County Air Quality Management District (EDCAQMD) Rule 239 (Natural Gas-Fired Water Heaters) sets NO_X emission standards for water heaters with rated capacities of less than 75,000 Btu/hr.

The heat input range addressed by this control measure generally applies to small commercial/industrial boilers and hot water heaters that predominantly burn natural gas and are used to heat water and generate steam. These units are used in a variety of applications, including in restaurants, retail stores, schools, hotels and office buildings. The smaller units in this heat input range (i.e., <300,000 Btu/hr) use the natural draft created by combustion of natural gas and air to transfer heat to the confined water and do not rely on fans or blowers to transport either air or combustion gases. These combustion units are known as “atmospheric” and are rather simple in their operation. The larger units in this heat input range (i.e., >300,000 Btu/hr) usually resemble small boilers because water circulates through a series of water tubes or water jackets close to the flow of hot gases and are heated as the gases flow around them. Burners on these units can be either atmospheric or forced draft.

Emission Inventory –2018

EIC Code	EIC Description	NO_X Inventory for Control Measures (tpd)
		2018
060-995-0110-0000	Service and Commercial (Other)	0.011
610-608-0110-0000	Residential Natural Gas Water Heating	0.017
Total		**0.028**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	NO_X Emission Reductions (tpd)
			2018
Water Heaters	2015	2016	0.0035

Cost Effectiveness

Based on the May 5, 2006 South Coast Air Quality Management District Staff Report for Rule 1146.2 Measures, the cost effectiveness ranges from \$2400-\$16,000/ton of NO_X reduced.

Authority

The above control measure will be implemented by amendment to the existing Rule 239 Natural Gas-Fired Residential Water Heaters. The El Dorado Air Quality Management District has the authority to propose rules and regulations to the District Board for adoption under HSC 40001.

Implementation

The implementation of this proposed control measure does not involve any other agency other than the El Dorado County Air Quality Management District.

References

1. California ARB Forecasted Emissions by Summary Category, Ozone SIP Sacramento NAA Projections (v1.06_RF980) www.arb.ca.gov/app/emsinv/03sip/fcemssumcat_03v1.06.php. November 16, 2006
2. South Coast Air Quality Management District Staff Report for Rule 1146.2, May 5, 2006
3. Control Measure, EDCAQMD 239, January 31, 2007

Control Measure Number: FRAQMD - 3.23

Control Measure Title: Large Water Heaters and Small Boilers

Date: February 5, 2007

Control Measure Description

This control measure will evaluate low NO_X limits for all new boilers and water heaters within the heat input range of 75,000 to 1,000,000 Btu/hr. This category includes small commercial/industrial boilers and hot water heaters that predominately burn natural gas and are used to heat water and generate steam. These units are used to heat water or create steam for a variety of purposes. Users of these units include restaurants, retail stores, schools, hotels and office buildings. The smaller units in this size range (<300,000 Btu/hr) use the natural draft created by combustion of natural gas and air to transfer heat to the confined water and do not rely on fans or blowers to transport either air or combustion gases. These combustion units are known as “atmospheric” and are rather simple in their operation. Units with heat inputs larger than 300,000 Btu/hr usually resemble small boilers because water circulates through a series of water tubes or water jackets close to the flow of hot gases and are heated as the gases flow around them. Burners on these units can be either atmospheric or forced draft. Currently Sacramento, Yolo/Solano, and El Dorado all have rules for natural gas fired water heaters that apply to units with a heat input of less than 75,000 Btu/hr but do not have a rule for larger units in the size range for this measure.

Emission Inventory –2018

The population growth rate in south Sutter is purely based on the current Sutter County population growth rate projected by SACOG. The potential growth of proposed South Sutter Specific Plan (now called Sutter Pointe Specific Plan) is not factored in.

EIC Code	EIC Description	NO_X Inventory for Control Measures (tpd)
		2018
610-608-0110-0000	Residential Natural Gas Water Heating	0.0041

Emission Reductions

EIC Description	Adoption Date	Implementation Date	NO_X Emission Reductions (tpd)
			2018
Water Heaters	2016	2017	0.0001

Cost Effectiveness

Cost effectiveness is expected to range between $9,000 and $21,308 per ton of NO_X reduced.

Authority

Feather River Air Quality Management District has the authority to regulating stationary internal combustion engines is within provisions of the California Health and Safety Code.

References

1. Sonoma Technology Method Summary for Commercial Gas Fuel Usage and Emissions, September 16, 2002
2. California Energy Commission 2000 natural gas database by natural gas usage and number of accounts by county and SIC code.
3. Staff Report, Rule 1146.2, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers, South Coast Air Quality Management District, January 9, 1998
4. Staff Report, Rule 74.11.1, Large Water Heaters and Small Boilers, Ventura County Air Pollution Control District, August 31, 1999
5. Staff Report, Rule 360, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers, Santa Barbara County Air Pollution Control District, October 17, 2002.
6. California ARB Forecasted Emissions by Summary Category, Ozone SIP Sacramento NAA Projections (v1.06_RF980) www.arb.ca.gov/app/emsinv/03sip/fcemssumcat_03v1.06.php. November 16, 2006
7. Control Measure, FRAQMD 3.23, February 5, 2007

Control Measure Number: PCAPCD - CM2

Control Measure Title: Large Water Heaters and Small Boilers

Date: February 5, 2007

Control Measure Description

This control measure will evaluate low NO_X limits for all new boilers and water heaters within the heat input range of 75,000 to 1,000,000 Btu/hr. This category includes small commercial/industrial boilers and hot water heaters that predominately burn natural gas and are used to heat water and generate steam. These units are used to heat water or create steam for a variety of purposes. Users of these units include restaurants, retail stores, schools, hotels and office buildings. The smaller units in this size range (<300,000 Btu/hr) use the natural draft created by combustion of natural gas and air to transfer heat to the confined water and do not rely on fans or blowers to transport either air or combustion gases. These combustion units are known as "atmospheric" and are rather simple in their operation. Units with heat inputs larger than 300,000 Btu/hr usually resemble small boilers because water circulates through a series of water tubes or water jackets close to the flow of hot gases and are heated as the gases flow around them. Burners on these units can be either atmospheric or forced draft. Currently Sacramento, Yolo/Solano, and El Dorado all have rules for natural gas fired water heaters that apply to units with a heat input of less than 75,000 Btu/hr but do not have a rule for larger units in the size range for this measure.

Emission Inventory –2018

EIC Code	EIC Description	NO_X Inventory for Control Measures (tpd)
		2018
060-995-0110-0000	Service and Commercial (Other)	0.7827
610-608-0110-0000	Residential Natural Gas Water Heating	0.2055
Total		**0.9882**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	NO_X Emission Reductions (tpd)
			2018
Residential Natural Gas Water Heating	2015	2017	0.030

Cost Effectiveness

The estimated cost effectiveness of this measure is \$2,300 - \$21,309/ton of NO_X reduced.

Authority

California Health and Safety Code, Sections 40000, 40001, and 40702

Implementation

The Placer County Air Pollution Control District is the implementing agency.

References

1. SMAQMD Method Summary for natural gas consumption by commercial gas combustion categories by Hao Quinn, November 12, 2002.
2. Sonoma Technology Method Summary for Commercial Gas Fuel Usage and Emissions, September 16, 2002
3. California Energy Commission 2000 natural gas database by natural gas usage and number of accounts by county and SIC code.
4. Database query of stationary fuel combustion and residential combustion from 7-15-03 CEFS forecast output (provided by Larry Hunsaker, CARB).
5. Communication with Ali Mohamad of the SMAQMD on July 24, 2003 to discuss SMAQMD staff report on Rule 411, Boiler NO_X.
6. Communication with Hao Quinn of the SMAQMD on July 29, 2003 to determine estimated fuel use and number of sources for large water heaters and small boilers.
7. Staff Report, Rule 1146.2, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers, South Coast Air Quality Management District, January 9, 1998
8. Staff Report, Rule 74.11.1, Large Water Heaters and Small Boilers, Ventura County Air Pollution Control District, August 31, 1999
9. Staff Report, Rule 360, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers, Santa Barbara County Air Pollution Control District, October 17, 2002.
10. Staff Report, Rule 411, NO_X from Boilers, Process Heaters and Steam Generators, Sacramento Metropolitan Air Pollution Control District, October 27, 2005.
11. CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (Rf#980), November 16, 2006.
12. Control Measure, PCAPCD CM2, February 5, 2007

Control Measure Number: YSAQMD – 2.37

Control Measure Title: Large Water Heaters and Small Boilers

Date: February 1, 2007

Control Measure Description

This control measure will evaluate low NO_X limits for all new boilers and water heaters within the heat input range of 75,000 to 1,000,000 Btu/hr. At the current time, Yolo-Solano Air Quality Management District (YSAQMD) Rule 2.37 (Natural Gas Fired Residential Water Heaters) sets NO_X emission standards for water heaters with rated capacities of less than 75,000 Btu/hr. This control measure addresses boilers and water heaters that fall between the heat capacity ranges of 75,000 to 1,000,000 Btu/hr.

The heat input range addressed by this control measure generally applies to small commercial/industrial boilers and hot water heaters that predominantly burn natural gas and are used to heat water and generate steam. These units are used in a variety of applications, including in restaurants, retail stores, schools, hotels and office buildings. The smaller units in this heat input range (i.e., <300,000 Btu/hr) use the natural draft created by combustion of natural gas and air to transfer heat to the confined water and do not rely on fans or blowers to transport either air or combustion gases. These combustion units are known as “atmospheric” and are rather simple in their operation. The larger units in this heat input range (i.e., >300,000 Btu/hr) usually resemble small boilers because water circulates through a series of water tubes or water jackets close to the flow of hot gases and are heated as the gases flow around them. Burners on these units can be either atmospheric or forced draft.

Emission Inventory –2018

The Yolo-Solano planning emission inventory for water heaters is presented below for NO_X and VOC, although this control measure pertains to NO_X emissions, only.

EIC Code	EIC Description	NO_X Inventory for Control Measures (tpd)
		2018
052-005-0110-0000	Food and Agricultural Processing - Boilers	0.141
052-010-0110-0000	Food and Agricultural Processing - Process Heaters	0.0217
060-005-0110-0000	Service and Commercial - Boilers	0.1428
060-010-0110-0000	Service and Commercial - Process Heaters	0.0078
060-995-0110-0000	Service and Commercial - Other	0.6945
310-356-0110-0000	Oil and Gas Production - Natural Gas Production	0.0099
610-608-0110-0000	Residential Fuel Combustion - Fuel Combustion - Water Heating	0.2322
610-995-0110-0000	Residential Fuel Combustion - Other	0.0419
Total		**1.2918**

Emission Reductions

EIC Description	Adoption Date	Implementation Date	NO_X Emission Reductions (tpd)
			2018
Water Heaters	2009	2010	0.2403

Cost Effectiveness

Cost effectiveness was estimated based upon economic analyses conducted by the SCAQMD for a similar measure.

It was assumed that the economic conditions for equipment dealers in the Yolo-Solano area do not differ significantly than the economic conditions for equipment dealers in the South Coast area; therefore, the estimated South Coast cost effectiveness values were assumed to be appropriate for Yolo-Solano. SCAQMD Rule 1121 and 1146.2 amendments are not considered to be technology forcing and compliant heaters are already being manufactured and sold in the current consumer market.

Based on cost effectiveness information from the SCAQMD rules, the overall cost effectiveness for the proposed measure is estimated to be $9,903/ton.

Authority

Authority to implement this control measure by the SMAQMD is in accordance with California Health and Safety Code, Sections 40000, 40001, and 41010.

Implementation

The Yolo-Solano Air Quality Management District is the implementing agency.

References

1. California Environmental Protection Agency – Air Resources Board, Forecasted Emissions by Summary Category Ozone SIP Planning Projections - v1.06 RF#980; Date of Last Update: November 16, 2006.
2. Yolo-Solano Air Quality Management District, Rule 2.37, Natural Gas-Fired Residential Water Heaters, November 9, 1994.
3. South Coast Air Quality Management District; Rule 1146.2, Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters, Mat 5, 2006.
4. Sacramento Metropolitan Air Quality Management District, Final Draft – Sacramento Off-Road Measures: Large Water Heaters and Small Boilers, October 14, 2003.

Further Study Measures

Further Study Measures

Further study measures are measures for which insufficient information was available during the development of the control strategy to allow the region to commit to them as control measures. The adoption of further study measures requires full evaluations of emission data, cost effectiveness, technological feasibility, and authority for implementation. If the evaluations show that the measures are viable control measures, they will be considered for adoption and implementation.

This section includes the description of six further study measures. These measures are evaluated qualitatively for environmental impacts in this State Implementation Plan and will be evaluated quantitatively for the actual emission benefits and feasibility in the future. These further study measures are: 1) Heat Island Mitigation, 2) Alternative Energy, 3) Energy efficiency, 4) Gasoline Transfer Phase I/II, 5) Lubricants, and 6) Episodic Controls.

Control Measure Number: Further Study – 1

Control Measure Title: Urban Heat Island

Control Measure Description:

The purpose of this control measure is to encourage activities that would lower ambient temperatures in urban areas. This control measure focuses on encouraging activities such as using lighter, more reflective surface materials and increased tree planting.

This further study measure will evaluate the potential to develop programs that promote the use of light colored roofing and pavement materials, solar roofing membranes, and increased tree planting. Also programs to promote use of more reflective pavement and tree planting could be a required element for new sources, or could be included as recommendations through the California Environmental Quality Act (CEQA) Air Quality Handbook. Sources such as builders, utilities, cities and local government agencies, and private citizens, etc. that promote the use of lighter colored materials and increased tree planting could be eligible for an emission credit. Emission credits could be issued based on types of surface materials used or numbers of trees per unit or area that meet or exceed a specified benchmark.

There are a variety of potential techniques that can be implemented to reduce urban temperatures and increase the albedo of roofs, pavements, and building surfaces. Most of these techniques can be implemented during the maintenance or modification of existing structures or during the building stages of new structures.

Emission Inventory - 2018

The air districts do not have sufficient information to calculate the inventory for this potential control measure at this time.

Emissions Reductions

The air districts are not able to calculate the potential emission reductions from this control measure because the emission inventory is unknown. The amount of emission reductions will be determined during implementation of this control measure.

Cost Effectiveness

The air districts do not have sufficient information to calculate the cost effectiveness of this control measure. The air districts will continue to monitor the progress made on a similar control measure for urban heat islands proposed in both the SJVUAPCD 2007 Ozone Plan and SCAQMD Final 2007 AQMP and determine at a later date if the control measure is feasible and cost effective.

Authority

The implementing agencies could include the air districts and local governments.

Recommendation

This control measure requires additional information and further study and is not recommended at this time. The air districts will continue to monitor the progress made on the control measure for urban heat islands proposed in SJVUAPCD and SCAQMD.

References

2007 Ozone Plan, Chapter 8: Innovative Strategies and Programs: 8.2.4, San Joaquin Valley Air Pollution Control District, April 30, 2007.

Final 2007 AQMP, Appendix IV-A: CM#2007MCS-03, South Coast Air Quality Management District, June 2007.

Control Measure Number: Further Study – 2

Control Measure Title: Alternative Energy

Control Measure Description:

The use of alternative energy sources either in transportation or stationary applications can reduce ozone precursors. This further study measure looks at reductions possible in the stationary sector of the Sacramento region. This source category includes facilities or operations that have VOC-containing byproducts that can be converted to electric energy by utilizing currently available technology or other byproducts such as biomass waste, from which energy could also be derived. The electricity produced may be used for internal facility needs or metered back and sold to utility companies.

This further study measure will evaluate potential opportunities to convert green waste, dairy manure, and other forms of biomass into usable energy for electricity generation. The converted fuel depending on the type could be used in fuel cells, internal combustion (IC) engines or mini-turbines.

The San Joaquin APCD proposed in their 2007 Ozone Plan a measure very similar to this one and has also committed to study this measure further.

Emission Inventory - 2018

There is no specific inventory attributable to this source category, since it can include any application for which there is technology that can produce energy without using fossil-based materials.

Emissions Reductions

The air districts do not have sufficient information to calculate the potential emission reductions from this control measure.

Cost Effectiveness

The air districts do not have sufficient information to calculate the cost effectiveness of this control measure. The air districts will continue to monitor the progress made on a similar control measure for alternative energy proposed in SJVUAPCD and determine at a later date if the control measure is feasible and cost effective.

Authority

The implementing agencies still need to be determined.

Recommendation

This control measure requires additional information and further studies and is not recommended at this time. The air districts will continue to monitor the progress made on the control measure for alternative energy proposed in the SJVUAPCD.

References

2007 Ozone Plan, Chapter 8: Innovative Strategies and Programs: 8.2.5, San Joaquin Valley Air Pollution Control District, April 30, 2007.

Control Measure Number: Further Study – 3

Control Measure Title: Energy Efficiency

Control Measure Description:

The purpose of this further study measure is to look at possible sources of emissions in the region that could reduce ozone precursors by reducing energy consumption.

This future study measure will evaluate energy efficiency projects and practices that have a demonstrable benefit to air quality, such as energy efficient water pumps, solar water heaters, reduced agricultural field passes, use of GPS in agricultural operations, and other conservation management practices that simultaneously reduce PM and ozone precursors. In addition, this further study measure will examine green certification of energy efficient homes, offices, and commercial and industrial facilities that utilized green building practices.

Emission Inventory - 2018

There is inadequate information to calculate the emission inventory from these projects at this time.

Emissions Reductions

There is inadequate information to calculate the potential emission reductions. The air districts will monitor the development of a similar control measure in the SCAQMD and SJVUAPCD and determine the potential emission reductions once more information becomes available.

Cost Effectiveness

The air districts do not have sufficient information to calculate the cost effectiveness of this control measure. The air districts will continue to monitor the progress made on a similar control measure for alternative energy proposed in SCAQMD and determine at a later date if the control measure is feasible and cost effective.

Authority

The implementing agencies could include the air districts and local governments.

Recommendation

This control measure requires additional information and further studies and is not recommended at this time. The air districts will continue to monitor the progress made on the control measure for energy efficiency proposed in the SCAQMD.

References

Final 2007 AQMP, Appendix IV-A: CM#2007MCS-03, South Coast Air Quality Management District, June 2007.

2007 Ozone Plan, Chapter 8: Innovative Strategies and Programs: 8.2.4, San Joaquin Valley Air Pollution Control District, April 30, 2007.

Control Measure Number: Further Study – 4

Control Measure Title: Gasoline Transfer Phase I/II

Control Measure Description

The purpose of this control measure is to reduce VOC and toxic emissions from gasoline dispensing facilities (GDFs) by improving implementation of the Enhanced Vapor Recovery (EVR) Regulation.

The EVR includes testing and certification procedures to improve the performance and specification of both Phase I and Phase II vapor recovery systems. The EVR for Phase I includes the improvements of the spill containment and cover, rotatable product and vapor adaptors, overfill prevention device, and pressure vacuum vent gauges. The EVR for Phase II includes, but is not limited to, the onboard refueling vapor recovery (ORVR) and the in-station diagnostic (ISD). The ORVR routes gasoline vapor displaced during vehicle fueling to the onboard canister on the vehicle. The ISD is designed to provide continuous real-time monitoring of vapor collection and containment efficiencies, alert the GDF operator when a failure mode is detected so that corrective action can be taken, shut down the dispensers if repairs are ignored and provide compliance records.

Currently, emissions from GDFs are regulated by the EVR regulation of the California Air Resources Board (CARB) and local air district rules.

This control measure will evaluate methods to improve the functions of the ISD. Some improvements may include providing earlier warning signal, changing both the warning and gross failure alerting ranges, disallowing the use of the reset button, or installing a “shut down” sensor or mechanism on the dispenser to stop fueling if the fuel filters are blocked and the fueling flow rate drops below the system certification standards.

In addition, this control measure will explore the option to require controls for mobile refuelers if a district rule has not established such requirements.

Emission Inventory

SMAQMD – 2002 Baseline Emission Inventory (Summer)

EIC Code	EIC Description	VOC/ROG (tpd)
330-374-1100-0000	FUEL DISPENSING TANKS - WORKING LOSSES	0.1404
330-376-1100-0000	FUEL DISPENSING TANKS - BREATHING LOSSES	0.1072
330-378-1100-0000	VEHICLE REFUELING - VAPOR DISPLACEMENT LOSSES	0.8888
330-380-1100-0000	VEHICLE REFUELING - SPILLAGE	0.1473
	Total	1.2837

PCAPCD – 2002 Baseline Emission Inventory (Summer)

EIC Code	EIC Description	VOC/ROG (tpd)
330-374-1100-0000	FUEL DISPENSING TANKS - WORKING LOSSES	0.0518
330-376-1100-0000	FUEL DISPENSING TANKS - BREATHING LOSSES	0.0251
330-378-1100-0000	VEHICLE REFUELING – VAPOR DISPLACEMENT LOSSES	0.21
330-380-1100-0000	VEHICLE REFUELING - SPILLAGE	0.035
Total		0.3219

YSAQMD – 2002 Baseline Emission Inventory (Summer)

EIC Code	EIC Description	VOC/ROG (tpd)
330-374-1100-0000	FUEL DISPENSING TANKS - WORKING LOSSES	0.2431
330-376-1100-0000	FUEL DISPENSING TANKS - BREATHING LOSSES	0.1657
330-378-1100-0000	VEHICLE REFUELING – VAPOR DISPLACEMENT LOSSES	1.3848
330-380-1100-0000	VEHICLE REFUELING - SPILLAGE	0.2293
Total		2.0229

Emission Reductions

There is inadequate information to calculate the potential emission reductions. The air districts will monitor the development of a similar control measure in SCAQMD and determine the potential emission reductions once more information becomes available.

Cost Effectiveness

The air districts will continue to monitor the progress made on the similar control measure proposed in SCAQMD and determine at a later date if the control measure is feasible and cost effective.

Authority

The air districts are authorized to adopt and amend rules and regulations by Health and Safety Code Sections 40001and 40702.

Recommendation

This control measure requires additional information and further studies, and is not recommended at this time. The air districts will continue to monitor the developments of the enhanced detection warnings by SCAQMD and determine the feasibility of this control measure once more information becomes available.

References

Final 2007 AQMP, Appendix IV-A: CM#2007FUG-02, South Coast Air Quality Management District, June 2007.

2007 Ozone Plan, Appendix I: Candidate Control Measures, S-PET-2. San Joaquin Valley Unified Air Pollution Control District, April 30, 2007.

CARB Ozone SIP Planning Inventory, Version 1.06, Sacramento NAA (Rf#980), August 26, 2008

Control Measure Number: Further Study – 5

Control Measure Title: Lubricants

Control Measure Description

The proposed control measure seeks to reduce VOC emissions from the use of lubricants that are utilized by a variety of different industries and new facility processes. Lubricants include product such as coolants in manufacturing processes, stamping fluids, vanishing oils, and cutting, forming, and honing oils, and are used by various companies in the region including, but not limited to machine shops, auto rebuilders, and auto part manufacturers. Many lubricants and their additives, such as rust and corrosive inhibitors, are at least 50 percent VOC solvents and are believed to emit a significant amount of VOCs. In addition, mineral spirits and kerosene used to dilute lubricants contain traces of benzene, toluene, and xylene, which are all classified as Hazardous Air Pollutants (HAPs) by the EPA and Toxic Air Contaminants (TACs) by the state of California.

Currently, there are no regulations or emission restrictions specifically concerned with industrial lubricants in place at the local, state or federal levels. However, South Coast proposed in their Final 2007 AQMP to refine the emission inventory for this category and seek alternatives to high-VOC lubricants. SCAQMD also proposes to develop rules to further seek emission reductions. This control measure proposes to look at further reducing source emissions by either placing an overall emission limit by source, or by limiting VOC content in lubricant formulations at the point of sale and/or use.

Emission Inventory -2018

The emission inventory for this source category is unknown because this source category does not have a specific Emission Inventory Code. Lubricants may be categorized under coating and/or solvent operations.

Emission Reductions

The air districts are not able to calculate the potential emission reductions from this control measure because the emission inventory is unknown.

Cost Effectiveness

The air districts do not have sufficient information to calculate the cost effectiveness of this control measure. The District will continue to monitor the progress made on a similar control measure for lubricants proposed in SCAQMD and determine at a later date if the control measure is feasible and cost effective.

Authority

The air districts have the authority to regulate VOC emissions from industrial coatings and solvent operations, under which industrial lubricants are categorized.

Recommendation

This control measure requires additional information and further studies and is not recommended at this time. The air districts will continue to monitor the progress made on the control measure for lubricants proposed in SCAQMD.

References

Final 2007 AQMP, Appendix IV-A: CM#2007CTS-01, South Coast Air Quality Management District, June 2007.

Control Measure Number: Further Study – 6

Control Measure Title: Episodic Controls
(Combination of OFMS-8, OFMS13, OFMS16, OFMS19, OFMS20, OFMS21, OFMS24, OFMS42)

Control Measure Description:

There are various emission reduction strategies that could potentially be implemented on an episodic basis when meteorological conditions would normally result in ozone exceedances. This further study measure will evaluate the feasibility of banning or reducing the use of a variety of types of equipment on high ozone days such as construction equipment, pleasure craft or other recreational vehicles; and lawn and landscaping equipment. As part of this evaluation the potential emission reductions, cost effectiveness, technical feasibility and the authority to implement these measures would be analyzed.

SJVUAPCD has a similar control measure included in their Innovative Technologies section of their plan, but has not ascribed any specific emission reduction commitments to this innovative measure.

Emission Inventory - 2018

Each of these different approaches would affect a different inventory category or different categories.

Emissions Reductions

The air districts are not able to calculate the potential emission reductions from these potential control measures because the mechanisms for achieving the banning or reductions in use have not been identified.

Cost Effectiveness

The air districts do not have sufficient information to calculate the cost effectiveness of any of these potential control measures.

Authority

The implementing agencies would need to be determined for each of the potential control measures.

Recommendation

This control measure requires additional information and further studies and is not recommended at this time. The air districts will continue to monitor the progress made by SJVUAPCD on similar episodic controls that are included in their plan and determine at a later date if this control measure is feasible and cost effective.

Appendix D: Transportation Control Measures

The following section outlines the development process, selection criteria, and analysis procedures used by the Sacramento Area Council of Governments (SACOG) in identifying potential transportation control measures (TCMs). Based on this analysis, measures were either: i) included in the 8-hour ozone attainment plan, ii) rejected as infeasible, or iii) rejected and referred to the air district for its determination on whether the measures, as well as all other feasible rejected measures, would advance the attainment date by one or more years. The purpose of this analysis is to ensure that the Sacramento Region is implementing all reasonably available control measures (RACM), as required to demonstrate attainment of the 8-hour ozone standard as expeditiously as practicable.

Regional Transportation Control Measures

Background

Transportation Control Measures (TCMs) are defined as strategies that adjust trip patterns or otherwise modify vehicle use in ways that reduce air pollutant emissions, and which are specifically identified and committed to in the most recently approved Air Quality Management Plan or State Implementation Plan (AQMP/SIP). TCMs are included in the SIP as part of the overall control strategy to demonstrate the region's ability to come into attainment with the National Ambient Air Quality Standards (NAAQS). Historically, the majority of emission reductions from mobile sources have come from technological improvements in vehicle engines and fuel, which are stipulated by U.S. EPA and CARB. However, by law, and according to the Transportation Conformity Rule, vehicle technology-based, fuel chemistry-based and fleet maintenance-based measures cannot be considered as TCMs for timely implementation purposes.

A definition of TCMs is provided in EPA's Transportation Conformity Rule - 40 CFR Parts 51 and 93:

Transportation control measure (TCM) is any measure that is specifically identified and committed to in the applicable implementation plan that is either one of the types listed in §108 of the CAA, or any other measure for the purpose of reducing emissions or concentrations of air pollutants from transportation sources by reducing vehicle use or changing traffic flow or congestion conditions. Notwithstanding the above, vehicle technology-based, fuel-based, and maintenance-based measures which control the emissions from vehicles under fixed traffic conditions are not TCMs for the purposes of this subpart.

The Rule also defines the criteria and procedures for timely implementation of TCMs as follows:

§93.113 Criteria and procedures: Timely Implementation of TCMs
(c) For TIPs, this criterion is satisfied if the following conditions are met:

(1) An examination of the specific steps and funding source(s) needed to fully implement each TCM indicates that TCMs which are eligible for funding under title 23 U.S.C. or the Federal Transit Laws are on or ahead of the schedule established in the applicable implementation plan, or, if such TCMs are behind the schedule established in the applicable implementation plan, the MPO and DOT have determined that past obstacles to implementation of the TCMs have been identified and have been or are being overcome, and that all State and local agencies with influence over approvals or funding for TCMs are giving maximum priority to approval or funding of TCMs over other projects within their control, including projects in locations outside the nonattainment or maintenance area.

(2) If TCMs in the applicable implementation plan have previously been programmed for Federal funding but the funds have not been obligated and the TCMs are behind the schedule in the implementation plan, then the TIP cannot be found to conform if the funds intended for those TCMs are reallocated to projects in the TIP other than TCMs, or if there are no other TCMs in the TIP, if the funds are reallocated to projects in the TIP other than projects which are eligible for Federal funding intended for air quality improvement projects, e.g. the Congestion Mitigation and Air Quality Improvement Program.

(3) Nothing in the TIP may interfere with the implementation of any TCM in the applicable implementation plan.

CAA Section 108(f)(1)(A)6 lists the following sixteen categories as illustrative of TCMs.

i. Programs for improved use of public transit;
ii. Restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high occupancy vehicles;
iii. Employer-based transportation management plans, including incentives;
iv. Trip-reduction ordinances;
v. Traffic flow improvement programs that achieve emission reductions;
vi. Fringe and transportation corridor parking facilities, serving multiple occupancy vehicle programs or transit service;
vii. Programs to limit or restrict vehicle use in downtown areas or other areas of emission concentration, particularly during periods of peak use;
viii. Programs for the provision of all forms of high-occupancy, shared-ride services, such as the pooled use of vans;
ix. Programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place;
x. Programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas;
xi. Programs to control extended idling of vehicles;
xii. Programs to reduce motor vehicle emissions, consistent with Title II of the Clean Air Act, which are caused by extreme cold start conditions;
xiii. Employer-sponsored programs to permit flexible work schedules;
xiv. Programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity;
xv. Programs for new construction and major reconstruction of paths, tracks or areas solely for the use by pedestrian or other non-motorized means of transportation, when economically feasible and in the public interest; and

xvi. Programs to encourage the voluntary removal from use and the marketplace of pre- 1980 model year light duty vehicles and pre-1980 model light duty trucks.

In addition to the measures listed above, other measures may be considered as TCMs if they reduce emissions or concentrations of air pollutants from transportation sources by modifying vehicle use, changing traffic flow, or mitigating traffic congestion conditions. TCMs may be voluntary programs, incentive-based programs, regulatory programs, as well as market- or pricing-based programs.

Based on suggestions received from interagency consultation and discussions with transportation and air quality stakeholders via the Regional Planning Partnership (RPP), SACOG formally refines the types of projects to be included as TCMs as appropriate during the SIP and/or Metropolitan Transportation Improvement Program (MTIP) and MTIP Guidelines development process. During the regular update cycle for each of the listed documents, SACOG, in coordination with the RPP, will refine and revise TCM descriptions and definitions in order to clarify the general TCM process as well as resolve specific implementation issues. It is SACOG's aim to work with the project implementing agencies, air quality stakeholders, and any other interested parties, primarily through the RPP, to facilitate the TCM process and implement TCMs appropriately.

It is SACOG's responsibility to ensure that TCM strategies are funded in a manner consistent with the implementation schedule established in the MTIP at the time a project is identified as a committed TCM. The transportation conformity process is designed to ensure timely implementation of TCM strategies. If the implementation of a TCM strategy is delayed, or if a TCM strategy is only partially implemented, the emission reduction shortfall must be made up by either substituting a new TCM strategy or by enhancing other control measures through the substitution process described in this Appendix.

TCM Enforceability and Monitoring

The TCM strategies contained in the SIP are expected to be real, quantifiable, and enforceable. The region's long-range transportation plan (the previously triennial and now quadrennial Metropolitan Transportation Plan, or MTP) and the shorter-term programming used to fund the improvements (the MTIP) together form the foundation and the keystone for improving transportation system performance while at the same time assuring the timely attainment of air quality goals within the region.

Assessing the consistency of emissions deriving from these mobility strategies against the corresponding mobile source emission budgets contained in the applicable SIP serves as the basis for determining conformity to the SIP. The MTIP provides the information needed in assuring the timely implementation of TCM strategies described in this document. The projects and programs that make up the MTP and MTIP form the basis for assuring an enforceable commitment for each TCM. Federal law requires that funding priority be given to TCMs in developing the MTIP. Therefore, the report on the timely implementation of TCMs will continue to serve as one of the methods of monitoring the air quality impacts of transportation system improvements.

Developing a List of Potential Transportation Control Measures
Assumptions and Approach

SACOG is now working with the region's air districts on the development of a new SIP designed to meet the 1997 8-hour ozone standard. The inclusion of TCMs in the SIP sends a clear signal that SACOG is serious about doing its part in helping to attain the federal air quality standards.

The Clean Air Act defines a list of sixteen potential TCM categories (see previous section). Essentially a TCM can be any measure that is focused on reducing vehicle use or traffic/congestion.

Risks
There are some risks with designating projects as transportation control measures, and they are significant. Every time SACOG makes a conformity determination to accompany a new Metropolitan Transportation Plan (MTP), a new Metropolitan Transportation Improvement Program (MTIP) or an amendment to either document, we must demonstrate that all TCMs are still on track to be implemented in a timely fashion.

Implications
If a TCM does not stay on schedule or experiences a funding shortfall, SACOG must show that "all State and local agencies with influence over approvals or funding for TCMs are giving maximum priority to approval or funding of TCMs over other projects within their control…" (40CFR 93.113 (c) 1). If the TCMs are shown to be falling behind the schedule shown in the SIP or are not fully funded, "then the TIP cannot be found to conform." In other words, SACOG may not be able to demonstrate conformity on a new or amended MTP or MTIP if a TCM is failing. SACOG and any other responsible agencies would have to either ensure that the TCM is able to get back on schedule and demonstrate that it is fully-funded, or begin the TCM substitution process if that is not feasible.

Specific Situations:

Example: Regional Rideshare Program
Several years ago, the State cut funding for ridesharing programs. The SACOG Board wanted to eliminate the program. However, since the Regional Rideshare Program is a TCM, it could not be eliminated.

Example: The Bay Area's Transit Ridership Increase TCM
The San Francisco Bay Area adopted a TCM that called for an increase in transit ridership of 15% over five years. When the region failed to meet that benchmark, the

MPO was sued and the region went into a conformity lapse. Eventually a substitute TCM was adopted, a settlement was reached and the region came out of the lapse.

Substitution Process

A standardized TCM substitution process was established as part of the Federal transportation bill, SAFETEA-LU (Section 6011(d))[37]. The TCM substitution process will allow SACOG and the Air District to substitute TCMs that either are unable to be delivered, are no longer feasible or otherwise are no longer desired as TCMs. Prior to the changes implemented as part of SAFETEA-LU, a SIP revision and a conformity determination were required. These actions are no longer required. The following is an outline of the general requirements:

For a TCM in an approved SIP to be removed and replaced with an alternate TCM, SAFETEA-LU requires that:

- the substitute TCM(s) must achieve equal or greater emission reductions;
- the substitute TCM(s) must be implemented on a schedule that is consistent with the schedule for the TCM(s) being removed from the SIP; or, if the implementation date has passed for the TCM(s) being replaced, the replacement TCM must be implemented as soon as practicable but not later than the date on which emission reductions from the TCM(s)are necessary to achieve the purpose of the implementation plan;
- the substitute TCM(s) must be accompanied by evidence of adequate personnel, and funding and authority under state or local law to implement, monitor and enforce the TCM(s);
- the substitute TCM(s) must be developed through a collaborative process that includes participation by all affected jurisdictions (state and local air pollution control agencies and state and local transportation agencies such as the MPO, state and city DOTs, and transit providers); consultation with EPA; and reasonable notice and opportunity for public comment; and
- the equivalency of the substitute TCM(s) must be concurred on by the MPO, the state air pollution control agency and EPA.

A full description of this process is outlined in Attachment A-1 for information.

Preliminary Analysis of the Projects

The projects selected for inclusion in this list of potential TCMs was based on several criteria. TCMs chosen were to provide air quality benefits, while at the same time leaving as much flexibility as possible for implementation. Projects likely to experience delays or cost overruns were avoided. Nearly all the TCMs have the following

[37] Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (Section 6011(d)) amended Section 176(c) of the Clean Air Act (42 U.S.C. 7506(c)) by adding Substitution of Transportation Control Measures as paragraph (8).

characteristics: early completion dates (most are almost done or will be soon), reasonable costs, fully committed funding, and projects of small or moderate-sized scope. Big projects were seen to represent too big a cost commitment and also likely to experience overruns and delays. SACOG also avoided projects such as HOV lanes where the science for estimating the air quality benefits is uncertain at best. For some categories, we grouped individual projects altogether. This has the benefit of a smaller number of projects to track and more flexibility of selecting the ‘right project at the right time.’ In all cases, funding levels have been kept at a reasonable and conservative level in the event that future funding sources are reduced or unavailable. Emissions reduction calculations are included for projects where that data exists. Most of the emission reduction figures were produced using the California Air Resources Board “*Automated Methods to Find the Cost-Effectiveness of Funding Air Quality Projects".* These are provided only as information and would be used if a TCM substitution were required. All of the TCMs were included in the travel modeling that was used to prepare the motor vehicle emissions inventory. Therefore, the emissions benefits from the TCMs are included in this SIP emissions inventory projections and motor vehicle emissions budgets.

New and Continuing Projects

All of the projects chosen were selected because they had early completion dates, costs were reasonable, funding was already committed and delivery appeared to be likely. Given the serious consequences with TCM failures, these projects were specifically chosen to maximize the potential for timely TCM implementation.

Individual Projects

Intelligent Transportation Systems (ITS) Projects

ITS projects use advanced technology to help improve the operating efficiency of the existing infrastructure by increasing traffic flow, providing real-time information on traffic conditions, and coordinating operations at local traffic centers. Examples of ITS technology and tools are freeway ramp meters, dynamic message signs, and traffic signal timing.

CONTROL MEASURE NUMBER: ITS-1

TCM ID: ITS-1
Control Measure Title: Arden Way "Smart Corridor"

Control Measure Description

Construct improvements on Arden Way from Del Paso Boulevard to Watt Avenue. Project includes the following intelligent transportation system (ITS) elements:

- A fiber optic trunk line
- Closed circuit television cameras
- Transit signal priority
- Changeable message signs, and
- Count stations

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2008.

Cost

The total budget for this measure is $2,627,794

Needed Resources and Authority

City of Sacramento Department of Transportation

Eligible per the Clean Air Act as Amended, Section 108 (f) (v)

CONTROL MEASURE NUMBER: ITS-2

TCM ID: ITS-2
Control Measure Title: Sacramento Traffic Operations Center

Control Measure Description

This project will evaluate and implement on downtown and other major corridors, Intelligent Transportation System (ITS) elements and infrastructure necessary to provide traffic responsive/coordinated signal timing and communications to the Traffic Operation Center.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2009.

Cost

The total budget for this measure is $1,130,000

Needed Resources and Authority

City of Sacramento Department of Transportation

Eligible per the Clean Air Act as Amended, Section 108 (f) (v)

CONTROL MEASURE NUMBER: ITS-4

TCM ID: ITS-4
Control Measure Title: STARNET Implementation

Control Measure Description

The Sacramento Transportation Area Network, or STARNET, is an information exchange network and operations coordination framework that will be used by the operators of transportation facilities and emergency responders in the Sacramento region of California. STARNET will enable the real-time sharing of data and live video, and refinement of joint procedures pertaining to the operation of roadways and public transit, and public safety activities. It will also provide more information for travelers via the region’s 511 web site and interactive telephone service (dial 511).
The goals of STARNET are:

- Make travel easier and safer
- Gather and disseminate more and better real-time travel information
- Better travel decisions – time, mode, route
- Provide transportation system managers and emergency responders with more and better real-time information
- Including information from other agencies
- Better operational decisions and actions
- Allow shared use of field devices when appropriate
- Better use of resources and better operation

STARNET will build upon the previous Intelligent Transportation System (ITS) investments by using, with little to no modifications, the existing field infrastructure (cameras, changeable message signs, traffic signals, vehicle location systems, etc.) and central systems (freeway management systems, traffic signal systems, transit management systems, computer aided dispatch systems, etc.) already operated by each agency. As part of the STARNET implementation, interfaces will be developed to these existing systems to enable them to share data and video with each other, provide data and video to the public via the 511 regional travel information system, and provide operations and emergency response personnel with a map-based regional transportation management display.

STARNET was identified as a high priority project for the Sacramento area in the region’s Intelligent Transportation Systems Strategic Deployment Plan.

During 2006, the involved agencies are preparing a concept of operations, system requirements, and a request for proposals for system integration. The system is expected to be operational in 2008.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2009.

Cost

The total budget for this measure is $3,260,000

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (v)

Park and Ride Lots / Transit Centers

CONTROL MEASURE NUMBER: TF-1

TCM ID: TF-1
Control Measure Title: El Dorado Central Park and Ride Facility

Control Measure Description

In Diamond Springs, on Commerce Way at State Route 49: Construct Central Transfer Facility and Park & Ride with capacity for 95 spaces. This property is adjacent to El Dorado Transit's office and maintenance facility.
The location of this facility is approximately 42 miles from downtown Sacramento, and thus has the potential of reducing passenger vehicle travel by 2,000,000 miles per year.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2009.

Cost

The total budget for this measure is $550,574.

Needed Resources and Authority

El Dorado County Transit Authority

Eligible per the Clean Air Act as Amended, Section 108 (f) (vi)

CONTROL MEASURE NUMBER: TF-2

TCM ID: TF-2
Control Measure Title: Improvements to Loomis Multimodal Center

Control Measure Description

Design and construct pedestrian and landscaping improvements at the multimodal center including a Class I bike facility adjacent to Taylor Rd. from downtown Loomis to Sierra College Blvd. Specific improvements include:

- Construct pedestrian walkways up to Taylor Road and around the depot
- Install bike parking equipment
- Install landscaping and other transit and pedestrian amenities

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2010.

Cost

The total budget for this measure is $659,225

Needed Resources and Authority

Town of Loomis Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (xv)

CONTROL MEASURE NUMBER: TF-3

TCM ID: TF-3
Control Measure Title: 13th and 16th Street Light Rail Station Improvements

Control Measure Description

RT, in partnership with the Capitol Area Development Authority (CADA) and the City of Sacramento, is improving the 13th & 16th Street light rail stations. This project is to renovate and improve connectivity to the 13th Street and 16th Street light rail stations, which are within the R Street Corridor redevelopment area. The total project cost is estimated at $1,883,000. The project will be implemented by RT (for the portion comprising the light rail stations and bus stops) and the City of Sacramento (for the portions within City rights-of-way). RT's portion of the project cost is estimated at $988,000.

RT, in partnership with the Capitol Area Development Authority (CADA) and the City of Sacramento, has applied for and received a grant of $1,693,000 from the SACOG Community Development Grants program. The grant is administered by the California Transportation Commission (CTC) and the California Department of Transportation (Caltrans). Of the $190,000 local match, $90,000 is coming from CADA tax increment revenues, and $100,000 is being contributed by RT from Measure A funds.

Scope of Work (revised 7/30/07)

13th Street Station:

- Mini-high shelters on ramps
- Cosmetic improvements to existing shelter
- Cosmetic improvements to existing walls
- Additional light poles
- New seating
- Miscellaneous plant replacements
- Miscellaneous tree and shrub pruning
- Repainting

16th Street Station:

- New mini-high ramp and removal of existing vertical lift
- Mini-high Shelters on ramps
- Replace existing shelter canopy
- Additional light poles
- New seating
- Cosmetic improvements to walls on north side
- Increase sitting/standing pavement area on south side

- Planting screen on garage face
- Miscellaneous plant replacements
- Miscellaneous tree and shrub pruning
- Repainting

Both stations will also receive sidewalk improvements and directional signage within a 1-block radius, as well as other improvements to be constructed by the City.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2009.

Cost

The total budget for this measure is $988,000.

Needed Resources and Authority

Sacramento Regional Transit District

Eligible per the Clean Air Act as Amended, Section 108 (f) (xv)

Funding Programs

Transit Service

Investment in transit is one of the cornerstones of the MTP for 2035. The overall philosophy followed in the MTP for 2035 seeks to increase transit service significantly, aimed at:

- improving service for the transit dependent,
- attracting riders who could otherwise choose to drive,
- extending rail where it can be cost effective considering surrounding housing and employment densities, and
- setting up new bus or rail services on corridors connecting suburban activity centers.

In that context, SACOG through the MTP gives primary priority to transit expansion, with the objective of an effective transit system that both serves those who rely on transit and attracts riders who also have the choice to drive. The MTP proposes to invest the maximum feasible share of the region’s flexible capital funding into transit expansion, commensurate with funding to operate and need for road capacity for transit to run on. This investment approximately triples the amount of transit available in 2035 compared to today. There are no funds available to operate more service beyond that level, and a modest amount of flexible funds must be invested in road improvements so that transit can move effectively through areas of congested traffic.

Travel by transit is of great interest in the Sacramento region for several reasons. First, transit provides an opportunity for substantially reducing VMT, through shifts from low-occupancy modes like driving alone to a very high occupancy mode of travel. Second, for commute trips, which tend to occur at peak periods of travel demand when congestion is highest, transit can provide substantial congestion relief. Finally, high quality transit service can provide necessary mobility to residents and employees in higher density, mixed-use areas, where auto travel can be impractical. For these reasons, SACOG proposes making a commitment to maintain existing levels of transit service through the following TCMs:

Transit Vehicle Acquisitions (TR-1)

List of bus replacement projects include:

TCM ID	SACOG ID	Measure Title	Cost
TR-1	PLA25223	Auburn Transit Bus Replacement	$225,000
	PLA25371	Roseville Transit Bus Purchase	$2,300,000
	PLA25322	Roseville Transit Bus Replacement	$375,000
	SAC24365	Replacement Neighborhood Ride Buses	$255,000
	SAC24418	E-Tran Replacement Buses	$1,400,000
	REG17924	SRTD Neighborhood Ride Vehicle Replacement	$3,600,000
	YST10418	Yuba Sutter Transit Bus Expansion	$1,500,000
	YCT18176	YCTD Bus Replacement	$1,700,000

CONTROL MEASURE NUMBER: TR-1A

TCM ID: TR-1A
Control Measure Title: Auburn Transit Bus Replacement

Control Measure Description

Replacement of 1 CNG bus for Auburn Transit.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2008.

Cost

The total budget for this measure is $225,000.

Needed Resources and Authority

City of Auburn Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1B

TCM ID: TR-1B
Control Measure Title: Roseville Transit Bus Purchase

Control Measure Description

Purchase 3 30' replacement fixed route buses, 3 30' expansion fixed route buses, and 1 40' replacement commuter bus

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2009.

Cost

The total budget for this measure is $2,300,000.

Needed Resources and Authority

City of Roseville Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1C

TCM ID: TR-1C
Control Measure Title: Roseville Transit Bus Replacement

Control Measure Description

Replace five (5) cutaway buses.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2008.

Cost

The total budget for this measure is $375,000.

Needed Resources and Authority

City of Roseville Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1D

TCM ID: TR-1D
Control Measure Title: Replacement Neighborhood Ride Buses

Control Measure Description

Replace three diesel cutaways that are used for neighborhood ride routes and paratransit service.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2012.

Cost

The total budget for this measure is $255,000.

Needed Resources and Authority

City of Elk Grove

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1E

TCM ID: TR-1E
Control Measure Title: E-Tran Replacement Buses

Control Measure Description

Purchase six CNG replacement buses for the City of Elk Grove's E-Tran bus transit buses. The CNG buses replace six CNG and diesel buses that are beyond their useful life. Later, programming team moved $1,070,000 from 2010 back to 2009.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2010.

Cost

The total budget for this measure is $1,400,000.

Needed Resources and Authority

City of Elk Grove

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1F

TCM ID: TR-1F
Control Measure Title: SRTD Neighborhood Ride Vehicle Replacement

Control Measure Description

Purchase 14 Neighborhood Ride Vehicles to replace vehicles which have surpassed their useful lives. 17 are needed, but 3 will be funded from an alternate source. RT assumes $110,000 per vehicle and a 5-year life.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2010.

Cost

The total budget for this measure is $3,600,000.

Needed Resources and Authority

Sacramento Regional Transit District

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1G

TCM ID: TR-1G
Control Measure Title: Yuba Sutter Transit Bus Expansion

Control Measure Description

Purchase three specially equipped, heavy-duty clean diesel commuter buses with a seating capacity of 45 or more to expand the current fleet of commuter buses from 11 to 14. These three commuter buses will be 40' to 45' in length.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2010.

Cost

The total budget for this measure is $1,500,000.

Needed Resources and Authority

Yuba Sutter Transit

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-1H

TCM ID: TR-1H
Control Measure Title: YCTD Bus Replacement

Control Measure Description

This project will replace 4 40-ft 1993 CNG transit buses.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2010.

Cost

The total budget for this measure is $1,700,000.

Needed Resources and Authority

Yolo County Transportation District

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

Transit Operations (TR-2)

For these control measures, transit operations consist of 'transit operating assistance' for public transit operators. The operating assistance funds the difference between the costs of operating an eligible public transportation service and the revenues derived from system operations. Operating assistance funds can be used by public transit operators for any transit service that is open to the general public (i.e. it cannot be used for school bus or charter services). These funds can be used for fixed route transit service as well as for dial-a-ride or paratransit service. Some transit operators also use these funds for preventive maintenance of their transit vehicles.

List of funded transit operations include:

TCM ID	SACOG ID	Measure Title	Cost
TR-2	ELD19267	El Dorado Transit Operating Assistance	$580,000
	PLA25215	Roseville Operating Assistance	$145,000
	SAC24060	Elk Grove Operating Assistance	$1,800,000
	SAC24061	Folsom Operating Assistance	$745,000
	PAR10002	Paratransit Operating Assistance	$350,000
	SAC24173	Sacramento County Operating Assistance	$59,000
	REG16670	Regional Transit Operating Assistance	$364,000,000
	YCT18094	YCTD Operating Assistance	$1,100,000

CONTROL MEASURE NUMBER: TR-2A

TCM ID: TR-2A
Control Measure Title: El Dorado Transit Operating Assistance

Control Measure Description

Operating Assistance (FTA 5311 Cycle 26)

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2009.

Cost

The total budget for this measure is $580,000.

Needed Resources and Authority

El Dorado County Transit

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2B

TCM ID: TR-2B
Control Measure Title: Roseville Operating Assistance

Control Measure Description

The City of Roseville Transit is applying for $71,514 in JARC funds in order to extend their weekday revenue hours on core fixed routes, as well as an extension of the hours on their Dial-A-Ride (DAR) services (and operate DAR on 3 current non-service holidays) to provide transportation to employees getting off work in the evening. The additional hours will also allow employees to connect with Placer County Transit and Sacramento Regional Transit in the evening.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure will be in effect through 2012.

Cost

The total budget for this measure is $145,000.

Needed Resources and Authority

City of Roseville Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2C

TCM ID: TR-2C
Control Measure Title: Elk Grove Operating Assistance

Control Measure Description

In Elk Grove, preventive maintenance for Elk Grove transit operations.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure will be in effect through 2011.

Cost

The total budget for this measure is $1,800,000.

Needed Resources and Authority

City of Elk Grove

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2D

TCM ID: TR-2D
Control Measure Title: Folsom Operating Assistance

Control Measure Description

In Folsom, provide operating assistance for Folsom Stage Lines.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure will be in effect through 2011.

Cost

The total budget for this measure is $745,000.

Needed Resources and Authority

City of Folsom Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2E

TCM ID: TR-2E
Control Measure Title: Paratransit Operating Assistance

Control Measure Description

Paratransit, Inc. is asking for FFY 2006 JARC funds to continue to provide much needed and currently limited transportation options between low-income residential areas, and employment & job training centers, especially in the Point West area, in the retail areas around Arden Fair Mall, as well as other parts of Sacramento County. [Contains FFY 06 and 07 operating funds]

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure will be in effect through 2008.

Cost

The total budget for this measure is $350,000.

Needed Resources and Authority

Paratransit, Inc.

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2F

TCM ID: TR-2F
Control Measure Title: Sacramento County Operating Assistance

Control Measure Description

Expand the South County Transit/Link Highway 99 bus services between the City of Lodi in San Joaquin County, Galt, Elk Grove, and the Regional Transit Transfer Center at Florin Mall. This route provides connections to the South County Transit Galt and Delta routes, Elk Grove Transit (e-TRAN), Sacramento Regional Transit, Lodi Grapeline transit service, and the San Joaquin Regional Transit District.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure will be in effect through 2008.

Cost

The total budget for this measure is $59,000.

Needed Resources and Authority

Sacramento County Department of Transportation

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2G

TCM ID: TR-2G
Control Measure Title: Regional Transit Operating Assistance

Control Measure Description

Continued operation and maintenance of bus, light rail, and paratransit services.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure will be in effect through 2010.

Cost

The total budget for this measure is $364,000,000.

Needed Resources and Authority

Sacramento Regional Transit District

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

CONTROL MEASURE NUMBER: TR-2H

TCM ID: TR-2H
Control Measure Title: YCTD Operating Assistance

<u>Control Measure Description</u>

YCTD FY 08 Operating Assistance for ADA Paratransit Service

<u>Emission Reductions</u>

No emission reductions are being claimed for this measure in the SIP.

<u>Timeframe</u>

This measure will be in effect through 2008.

<u>Cost</u>

The total budget for this measure is $1,100,000.

<u>Needed Resources and Authority</u>

Yolo County Transportation District

Eligible per the Clean Air Act as Amended, Section 108 (f) (i)

Air Quality Programs

CONTROL MEASURE NUMBER: AQ-1

TCM ID: AQ-1
Control Measure Title: Freeway Service Patrol

<u>Control Measure Description</u>

The Freeway Service Patrol (FSP) is a program which reduces freeway congestion by quickly finding and removing minor incidents from the freeway. Minor incidents include stalled cars and "fender-bender" accidents which, in total, account for more than half of all non-recurrent freeway congestion.

FSP's special team of tow truck drivers patrols the Sacramento freeways during the times when they are the busiest (the two peak commute periods, one in the morning and the other in the late afternoon). FSP drivers assist stranded motorists by helping them change a flat tire, providing a gallon of fuel, jump-starting their car, or making other minor repairs as needed. If FSP cannot quickly get the vehicle running, it is towed to a CHP-approved location off the freeway away from the fast-moving traffic and where the motorist can arrange for towing and/or repair.

The efforts of FSP to quickly remove minor freeway incidents during peak commute periods saves Sacramento motorists over 2 million wasted hours every year.
The Freeway Service Patrol program operates on the following Sacramento Freeways:

- Highway 99 - Grant Line Road to the Hwy 99/50 Interchange
- Capital City Freeway (Business 80) - Hwy 99/50 Interchange to the I-80 Interchange
- Interstate 5 - Elk Grove Blvd to the Highway 99 Interchange
- Highway 50 - Interstate 5 to Scott Road
- Interstate 80 - Interstate 5 to the Placer County Line; in Yolo County from Mace Blvd. to Jefferson Blvd.

The Freeway Service Patrol operates from 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:30 p.m. Monday through Friday (except holidays).

FSP is coordinated by the STA, California Highway Patrol, and Caltrans. Major funding is provided by the State of California and the Sacramento Area Council of Governments (SACOG). There is absolutely no charge to motorists for FSP services.

Most of the funding for our FSP Program comes from the State of California through the State Highway Account and from the Sacramento Area Council of Governments (SACOG) which staffs and manages the Capitol Valley Regional Service Authority for Freeways and Expressways (SAFE). The SAFE monies from SACOG serves as the required by the local match obligation attached to the State monies. STA administration funds are also used to supplement funding.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This measure is implemented continuously through 2018.

Cost

The annual budget for this measure is $1,400,000.

Needed Resources and Authority

Sacramento Transportation Authority

Eligible per the Clean Air Act as Amended, Section 108 (f) (v)

CONTROL MEASURE NUMBER: AQ-2

TCM ID: AQ-2
Control Measure Title: SECAT

Control Measure Description

The Sacramento Emergency Clean Air & Transportation (SECAT) Program is a partnership between the Sacramento Metropolitan Air Quality Management District (SMAQMD) and the Sacramento Area Council of Governments (SACOG). The Program's goal is to reduce harmful emissions from on-road heavy-duty vehicles operating in the Sacramento region. This program was originally created by California Assembly Bill (AB) 2511 to help assure that the Sacramento region meet its commitments under the State Implementation Plan (SIP) for air quality attainment. The goal of the program is to reduce the nitrogen oxide emissions in our air from heavy-duty vehicles to meet the 2018 federal 8-hour ozone standard.

Emission Reductions

Total emission reductions taken for this measure will be:
NO_X: 0.91 tons per day
ROG: 0.06 tons per day

Note: The reductions noted here include benefits from other funding streams.

Timeframe

This measure is implemented continuously through 2018.

Cost

The annual budget for this measure is $3,000,000.

Needed Resources and Authority

Sacramento Metropolitan Air Quality Management District

Eligible per the Clean Air Act as Amended, Section 108 (f) (xvi)

CONTROL MEASURE NUMBER: TCM-ONMS-ED-1 (AQ-3)

Control Measure Title: Notification for Spare the Air Days

Control Measure Description

The "Spare the Air" program is a year-round public education program with an episodic ozone reduction element during the summer ozone season, plus general awareness throughout the rest of the year. It is designed to inform people when air quality is unhealthy and achieve voluntary emission reductions by encouraging them to reduce vehicle trips. The Spare the Air program has operated in the Sacramento region since 1995 and has been funded largely by Congestion Mitigation and Air Quality funds.

The program includes but is not limited to a Web site (www.SpareTheAir.com), daily regional air quality forecasting, mapping of real time air quality data, production and airing of television and radio commercials, free Air Alert notifications, brochures and other printed materials distributed to the public & business community, elementary school assemblies, participation in community events throughout the region. This measure also commits to perform an annual awareness survey to judge the program's effectiveness.

This control measure seeks to reduce vehicle activity. The current Spare the Air program is included in the most recent approved MTP. This program currently costs approximately $600,000 per year and will require adjustments to account for inflationary cost increases. This measure is to continue the program funding and achieve at least the same effectiveness as today's program.

This is a transportation control measure (TCM) measure with its primary goal being to reduce passenger car VMT, trips, or both.

Targeted EIC Categories and Planning Inventory

This measure discourages vehicle use for light-duty vehicles. These 10-digit codes have been summarized into 3-digit EIC summary codes where most sub-codes are equally affected by the measure. The resting and diurnal evaporative emissions categories are not affected by the measure to the same degree. However, due to the small size of this portion of the inventory, the inclusion of EICs from the third column (reflecting resting and diurnal evaporative emissions) is unlikely to reduce the accuracy of the emission reduction results.

3-digit EIC	10-digit EICs equally affected by the measure	10-digit EICs excluded
710	7107011100, 7107061100, 7107081100, 7107121100, 7107141100, 7107180248, 7107205410, 7107311100, 7107341100, 7107361100, 7107401100, 7107421100, 7107440248, 7107465410, 7107611210, 7107641210, 7107660248, 7107685410	7107101100, 7107381100
722	7227011100, 7227061100, 7227081100, 7227121100, 7227141100, 7227180248, 7227205410, 7227311100, 7227341100, 7227361100, 7227401100, 7227421100, 7227440248, 7227465410, 7227611210, 7227641210, 7227660248, 7227685410	7227101100, 7227381100
723	7237011100, 7237061100, 7237081100, 7237121100, 7237141100, 7237180248, 7237205410, 7237311100, 7237341100, 7237361100, 7237401100, 7237421100, 7237440248, 7237465410, 7237611210, 7237641210, 7237660248, 7237685410	7237101100, 7237381100
750	7507011100, 7507061100, 7507081100, 7507121100, 7507141100, 7507180248, 7507205410, 7507311100, 7507341100, 7507361100, 7507401100, 7507421100, 7507440248, 7507465410, 7507611210, 7507641210, 7507660248, 7507685410	7507101100, 7507381100

2018

EIC Code	EIC Description	Fuel	Nonattainment Planning Inventory	
			NO_X (tpd)	**ROG (tpd)**
710	Light Duty Passenger	All	4.16	7.27
722	Light Duty Truck 1	All	1.82	2.89
723	Light Duty Truck 2	All	4.36	5.72
750	Motorcycle	All	0.93	3.53
		Total	**11.27**	**19.40**

Emission Reductions

The current program (as surveyed in 2005) resulted in 1% of drivers decreasing their activity by 3.0 trips each due to outreach. The assessment of the benefits is made using the quantification methodology developed in consultation with the California Air Resources Board. This analysis uses public opinion surveys to estimate the number of drivers who purposefully reduced driving as a result of this program. The reductions here use survey results from 2005. We expect that the program will generate the same level of activity reduction in the future as the effectiveness noted above is consistent with the effectiveness in the 6 years prior to 2005. A formal methodology for conducting the surveys and quantifying the emission benefits is expected to be subject to public review in 2009 and submitted as part of the State Implementation Plan.

From the California Highway Patrol website and the census bureau, the number of licensed drivers in the SFNA counties and partial counties was determined. The number of licensed drivers in SFNA is approximately 1,400,000 in 2004 based on CHP county estimates and apportioned counties in SFNA. Knowing the number of trips avoided, percent of drivers participating, and total number of drivers in the SFNA, we can calculate the number of trips avoided under the current program.

Year	Number of Licensed Drivers in SFNA	Avoided Trips under Current Program
2018	1,847,503	55,425

The emissions benefits are estimated based on the program's total avoided trips compared to total trips in each year and applying this ratio to the appropriate emission events (such as hot starts). Emission reductions are shown below for 2018 for light duty passenger vehicles, light duty trucks 1, light duty trucks 2, and motorcycles.

2018

	NO_X		ROG	
EIC Code	**Tpd**	**%**	**Tpd**	**%**
710	0.017	0.40%	0.021	0.29%
722	0.007	0.40%	0.009	0.31%
723	0.018	0.40%	0.018	0.31%
750	0.004	0.40%	0.011	0.31%
TOTAL	**0.046**	**0.40%**	**0.059**	**0.30%**

Timeframe

Measure is implemented 2008-2018.

Cost and Cost Effectiveness

The cost effectiveness of the current program was estimated based on the 2006 budget of approximately $600,000.

	2018
	X
Pollutant	**Lifetime Cost Effectiveness ($/ton)**
NO_X	$ 1,293,071
ROG	$ 1,007,279
NO_X + ROG	$ 566,211

Note that this cost effectiveness is much higher than would generally be acceptable. This measure provides other valuable benefits including; 1) education to motivate behavior changes which result in longer term benefits that aren't quantified here 2) protection of public health by providing tools to media, businesses, and individuals to take action during high pollution episodes, and 3) building and maintaining public support for other emission-reducing measures such as Blueprint, rules and ordinances that air district Boards, the SACOG Board, and local jurisdictions will consider to fulfill their SIP obligations.

Needed Resources and Authority

Potential Implementing Agency	Agency Type	Authority Origin
SMAQMD	Local	Coordinates the program on behalf of the air districts in the SFNA. **§ 41014. Programs or projects to control transportation emission** The Sacramento district may conduct public education, marketing, demonstration, monitoring, research, and evaluation programs or projects with respect to transportation emission control measures. www.arb.ca.gov/bluebook/bb06/hea41014/hea_41014.htm
All SFNA districts and SACOG	Local/Regional	These agencies provide funding for the program. SACOG is the regional agency that coordinates flow of federal transportation funding (currently Congestion Management and Air Quality) that supports this program. Air districts provide the local match funding required by the funding source.

References

Lori Kobza, SMAQMD staff. August 2006.

CA CHP. 2004 Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions: Statewide Integrated Traffic Records System (SWITRS). http://www.chp.ca.gov/switrs/#section3. Viewed July 2006.

"Sacramento Region Air Quality Basin: "Spare the Air" Campaign 2005 Evaluation Final Research Report", Aurora Research Group 2006.

U.S. Census Bureau Data.

Sacramento MTP 2006 List of Projects.

Cleaner Air Partnership letter, "Test Comparison of ARB and CAP Method for Quantifying Emission Reductions from Spare the Air Program, Jude Lamare, February 5, 2003.

Regional Funding Programs

In July 2002, SACOG adopted the Metropolitan Transportation Plan for 2025 (MTP 2025). This 23-year, $22 billion plan for the region included four federally funded programs to be used for regional transportation and related priorities that implement the goals of the MTP. The four programs, with 23-year funding amounts are:

- Air Quality $180 million
- Bicycle and Pedestrian $350 million
- Transportation Demand Management $ 44 million
- Community Design $500 million

When the MTP 2025 was adopted, it was the intent of SACOG to continue these four regional funding programs into the foreseeable future in each successive MTP. Since the adoption of the MTP 2025, SACOG has adopted several other MTPs, and the funding programs have been continued.

Air Quality Funding Program (FP-1)

The SACOG region is within a non-attainment area for ozone under federal air quality laws. Because the region must meet stringent federal air quality requirements in the Rate of Progress SIP, SACOG will place highest priority on the selection of cost-effective transportation projects that contribute the most to reaching attainment.

This air quality funding program includes funding air quality programs: Freeway Service Patrol, SECAT, and Spare The Air.

Bicycle and Pedestrian Funding Program (FP-2)

The purpose of this funding program is to provide facilities for walking and biking in the cities and towns of the region, or to provide connections between them. Bicycle and pedestrian facilities in new developments are expected to be paid for by developers in cooperation with cities and counties. Facilities that serve strictly recreational trips or equestrians are also expected to obtain other funding.

List of projects include:

TCM ID	SACOG ID	Measure Title	Cost
FP-2	Adopted Projects from SACOG's Regional Bike/Pedestrian Funding Program		
	6	City of Sacramento: I-80 Bike/Ped Bridge at the West Canal	$6,600,000
	12	City of Folsom Bikestation and "Bikelink" On-Demand Long-Term Class I Bike Parking at Transit Stations	$178,000
	14	City of Elk Grove: Elk Grove Creek Bike/Ped Bridge Crossing at SR 99	$5,600,000
	13	Retrofit Yolobus bus fleet with higher capacity bike racks	$67,500

CONTROL MEASURE NUMBER: FP-2A

TCM ID: FP-2A
Control Measure Title: I-80 Bike/Ped Bridge at the West Canal

Control Measure Description

Construct bike/pedestrian bridge across I-80 at the West Canal, as well as across the West Canal.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2012.

Cost

The total budget for this measure is $6,600,000

Needed Resources and Authority

City of Sacramento Department of Transportation

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

CONTROL MEASURE NUMBER: FP-2B

TCM ID: FP-2B
Control Measure Title: City of Folsom Bikestation and "Bikelink" On-Demand Long-Term Class I Bike Parking at Transit Stations

Control Measure Description

To retrofit and install on-demand long-term bike parking at Folsom Light Rail stations and new parking garage.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2010.

Cost

The total budget for this measure is $178,000

Needed Resources and Authority

City of Folsom Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

CONTROL MEASURE NUMBER: FP-2C

TCM ID: FP-2C
Control Measure Title: City of Elk Grove: Elk Grove Creek Bike/Ped Bridge Crossing at SR 99

Control Measure Description

Extend the existing Class I bikeway from Laguna Springs Dr cross over W. Stockton Blvd/SR-99 and E Stockton Blvd and connect to Emerald Park Drive. Project includes a bike/pedestrian overcrossing at State Route 99.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2014.

Cost

The total budget for this measure is $5,600,000

Needed Resources and Authority

City of Elk Grove

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

CONTROL MEASURE NUMBER: FP-2D

TCM ID: FP-2D
Control Measure Title: Retrofit Yolobus bus fleet with higher capacity bike racks.

Control Measure Description

Replace bike racks with higher capacity (3 bicycle) bike racks on 40-45 buses; plus a slide out double bike rack on up to two over-the-road coaches.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2011.

Cost

The total budget for this measure is $67,500

Needed Resources and Authority

Yolo County Transportation District

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

Transportation Demand Management Funding Program (FP-3)

Transportation Demand Management (TDM) is composed of strategies that can lower the demands made on the road and highway system and improve air quality by encouraging the use of carpooling, vanpooling, public transit, bicycling and walking. SACOG currently operates the regional ridesharing database and performs a number of marketing activities that publicize TDM strategies to the general public. SACOG also sponsors the TDM Task Force, a group of Transportation Management Associations (TMAs) and other organizations that perform or promote TDM services for employers and residents of the region.

The goal of this funding program is to reduce single-occupant vehicle trips in the Sacramento region using TDM strategies and measure the effects of these strategies.

List of projects include:

TCM ID	SACOG ID	Measure Title	Cost
FP-3	VAR56025	SACOG Regional Rideshare Program	$1,200,000 annually through 2018

CONTROL MEASURE NUMBER: FP-3

TCM ID: FP-3
Control Measure Title: SACOG Regional Rideshare Program

Control Measure Description

Provide ride matching services for the Sacramento metropolitan area; cooperate with local agencies in El Dorado and Placer counties on outreach efforts; manage regional programs supporting alternatives to driving alone; provide funding for 12 Transportation Management Organizations (TMOs) in region through grants.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe
This measure is implemented continuously through 2018.

Cost

$1,200,000 per year through 2018.

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (vii & xiv)

Community Design Funding Programs (FP-4)

The overall purpose of the Community Design program is to provide support for planning and capital development projects that promote the Blueprint Project principles.

The Community Design Program supports implementation of the Blueprint Project with financial incentives to local governments. Grants are awarded to projects sponsored by qualified public agencies in the SACOG region. These projects must support specific development or planning projects that conform to the seven Blueprint Principles:

- Transportation choices;
- Housing diversity;
- Compact development;
- Mixed land uses;
- Use of existing assets;
- Natural resource protection; and
- Quality design.

The MTP for 2025 authorized the program through 2025. The intent of the Community Design program is to use regional transportation funding to promote the construction of land use developments (or land use and projects) that lead to fewer vehicle miles traveled and more walking, biking and transit usage. The program results from the recognition that land use influences travel behavior and can be a powerful tool to improve the efficiency and effectiveness of the regional transportation system. If it is convenient for people to travel to common destinations by walking, biking, or public transit, we can reap air quality and congestion-relief benefits at the local and regional scale.

List of projects include:

TCM ID	SACOG ID	Measure Title	Cost
FP-4	Adopted Projects from SACOG's Regional Community Design Funding Program		
	5	City of Marysville: East 10th Street and Ramirez Street Intersection Improvement	$510,000
	6	City of Rancho Cordova: Folsom Boulevard Complete Streets	$12,200,000
	11	Sacramento County: Complete Streets for Freedom Park Drive and North Watt Avenue	$6,400,000
	16	City of Woodland: Lemen, North, East Streets Intersection Realignment	$2,600,000

CONTROL MEASURE NUMBER: FP-4A

TCM ID: FP-4A
Control Measure Title: City of Marysville: East 10th Street and Ramirez Street Intersection Improvement

Control Measure Description

Install a new traffic signal, complete pedestrian improvements and landscaping improvements (community design portion), complete a road rehabilitation in and adjacent to the intersection and complete channelization changes to the East 10th and Ramirez Intersection in Marysville.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2011.

Cost

The total budget for this measure is $510,000

Needed Resources and Authority

City of Marysville Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

CONTROL MEASURE NUMBER: FP-4B

TCM ID: FP-4B
Control Measure Title: City of Rancho Cordova: Folsom Blvd. Enhancements & SR2S Phase 2

Control Measure Description

Safe Routes to School (SR2S) Install landscaping and streetscaping on Folsom Blvd., between Rod Beaudry Dr. and Sunrise Blvd.: to provide safe bicycle and pedestrian access to transit from Bradshaw Road to Rio Del Oro Parkway. The CMAQ and RSTP funding in 2009/10 is to provide complete street improvements at the east end of Folsom Blvd accommodating Kinney High School and the light rail station. Improvements include bicycle lanes and pedestrian facilities.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2012.

Cost

The total budget for this measure is $12,200,000.

Needed Resources and Authority

City of Rancho Cordova

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

CONTROL MEASURE NUMBER: FP-4C

TCM ID: FP-4C
Control Measure Title: Sacramento County: Complete Streets for Freedom Park Drive and North Watt Avenue

Control Measure Description

In Sacramento County, Freedom Park Drive, from 32nd St. to Watt Ave and Watt Ave, from Don Julio Blvd to Karl Dr on the west side of the roadway in the community of North Highlands. Construct pedestrian and streetscape improvements to serve as a gateway into adjacent McClellan Park.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2013.

Cost

The total budget for this measure is $6,400,000.

Needed Resources and Authority

Sacramento County Department of Transportation

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

CONTROL MEASURE NUMBER: FP-4D

TCM ID: FP-4D
Control Measure Title: City of Woodland: Lemen, North, East Streets Intersection Realignment

Control Measure Description

In Woodland, Lemen Avenue and North Street at East Street: realign Lemen Avenue to connect with North Street at East Street (Phase 1).

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2012.

Cost

The total budget for this project is $2,600,000.

Needed Resources and Authority

City of Woodland Department of Public Works

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

Miscellaneous

CONTROL MEASURE NUMBER: M-2

TCM ID: M-2
Control Measure Title: Light Rail Grade Separation at Watt Avenue and Folsom Boulevard

Control Measure Description

In Sacramento County, Regional Transit Light Rail tracks south of Folsom Blvd on Watt Ave, grade separate the rail tracks over Watt Ave.

Emissions Reductions

ROG: 8,203 lbs per year
NO_X: 2,958 lbs per year
Cost Effectiveness: $12 per lb

Timeframe

This project is expected to be completed in 2009.

Cost

The total budget for this measure is $25,149,715.

Needed Resources and Authority

Sacramento County Department of Transportation

Eligible per the Clean Air Act as Amended, Section 108 (f) (v)

Research and Policy Development Further Study Measures

These studies are included as TCMs because they are expected to eventually result in policies that are likely to help improve the region’s air quality. Exactly what those policies will be or to what extent they will lead to improved air quality is unknown at this time. Because of this, and since these are included as studies only, no associated emissions reduction benefits are included as part of this SIP. Emissions reductions for future adopted policies would be accounted for in future SIPs. The only Research and Policy Development TCMs intended to be implemented as policies for the purposes of the SIP are those that identify “adopting” a policy. The following are the recommended research and policy development TCMs:

- Blueprint Implementation & Planning Technical Assistance
- Develop Rural-Urban Connections Strategy & Best Practices Toolkit
- Research a Transportation Pricing Policy
- Research a Regional Parking Regulation Policy to Provide Incentives for Use of Alternative Modes
- Adopt a Complete Streets Policy
- Initiate a Complete Streets Technical Assistance Program
- Adopt a Safe Routes to School Policy and Implement Pilot Program

CONTROL MEASURE NUMBER: RP-1

TCM ID: RP-1
Control Measure Title: Blueprint Implementation & Planning Technical Assistance

Control Measure Description

SACOG has no land use authority and cannot directly affect the pattern that future land uses will take. However, it can strive to implement the Blueprint Vision through existing and new programs. SACOG will continue to fund the regional Community Design Grant Program which funds transportation projects that are part of mixed-use, higher density developments. The Community Design component of the MTP for 2035 could encourage growth patterns that promote alternatives to the automobile by creating mixed-use developments that would include residences, shops, parks, and civic institutions linked to pedestrian-and-bicycle friendly public transportation centers. Projects would be awarded a Community Design grant if they incorporate design features such as improved street connectivity, public amenities, and a concentration of residences and jobs in proximity to transit routes. Implementation of this strategy could result in more balanced land use conditions throughout the region and less land converted to urban uses due to the higher-density, infill focus of the grant program.

SACOG's other Blueprint Implementation Programs include development of a Form-Based Code handbook, Blueprint Development Reviews, and Technical Assistance to Local Governments.

- *Form-Based Code Handbook.* Form-based zoning codes are an approach to regulate development through the use of graphics and standards to define the form and scale of new development, while at the same time making the uses allowed in any given area much more flexible than a typical zoning code. This is in contrast to conventional development regulations, which primarily utilize only narrative descriptions. Form-based codes (FBCs) typically provide for significant public input during their creation. The handbook will assist local jurisdictions in implementing form-based codes in areas where they are trying to encourage Smart Growth development (mixed-use, compact development with high street connectivity).

- *Blueprint Development Review.* At the request of a local government SACOG will evaluate a proposed development project for its consistency with the Blueprint Principles and Vision Map.

- *Technical Assistance to Local Governments.* At the request of a local government, SACOG will provide technical planning assistance in the development or update of general plans, community plans, specific plans, etc.

This assistance can include analysis of the Blueprint Vision map or training in use of modeling tools.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2012.

Cost

The total budget for this measure is $450,000

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (xiv)

CONTROL MEASURE NUMBER: RP-2

TCM ID: RP-2
Control Measure Title: Rural Urban Connections Strategy & Best Practices Toolkit

Control Measure Description

Within 3 years of adoption of the MTP 2035, SACOG will develop a Rural-Urban Connections Strategy, to expand on and help to support implementation of, the Blueprint growth strategy and the MTP. The Rural-Urban Connections Strategy will utilize state-of-the-practice data collection, modeling, research and participation practices to develop a toolkit of best practices to promote land use practices in rural areas that are economically viable for land owners and local governments and environmentally sustainable. Issues to be addressed include, but are not limited, to: agricultural practices, natural resource protection, development practices that support agricultural and natural resource values, infrastructure needs in rural areas, energy production, and methods to promote jobs-housing balance (with a specific emphasis on effective jobs-generating practices in appropriate areas.) The toolkit of best practices will include assessment of vehicle miles traveled and air emissions, including greenhouse gases. Building on local conservation efforts, the strategy will identify areas where mitigation for development should be directed to maximize the benefit of such acquisitions. It is also expected that this project will result in programs that will help reduce the need for single-occupant vehicle travel, relative to commuting in particular. Another important outcome will be the identification of environmental services, such as flood control, groundwater recharge, and carbon sequestration, which are enhanced through a comprehensive approach to urban and rural planning. It is anticipated that the Rural-Urban Connections Strategy effort will be completed within 3 years.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed by 2012.

Cost

The total budget for this measure is $1,000,000

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (xiv)

CONTROL MEASURE NUMBER: RP-3

TCM ID: RP-3
Control Measure Title: Research a Transportation Pricing Policy

Control Measure Description

SACOG will prepare an analysis on the impacts and viability of using pricing policies with the transit system and selected portions of the road network to encourage people to drive less and use transit, walking and bicycling modes more. This study will identify strategies to reduce emissions that will include, but are not limited to, free or reduced transit fares during "spare the air" days; fare-free zones on the transit system; transit vouchers; days on which transit is free; congestion pricing options for portions of the road system, such as tolls on freeways and highways; and congestion-pricing to enter certain high-traffic areas served by public transit (e.g., downtown Sacramento).

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed by 2012.

Cost

The total budget for this measure is $300,000.

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (vii)

CONTROL MEASURE NUMBER: RP-4

TCM ID: RP-4
Control Measure Title: Research a Regional Parking Regulation Policy to Provide Incentives for Use of Alternative Modes

Control Measure Description

SACOG will prepare an analysis and perform travel modeling and air emissions analysis to identify a range of alternatives for local governments to use to modify current parking regulations to create incentives for people to use available transit, walking and biking options and neighborhood electric vehicles. The analysis will address impacts of parking maximum and minimum requirements, shared parking systems, and parking pricing on travel behavior and air emissions. The study will also include the potential for application of alternative energy technologies, such as solar shading and power generation, at both structured and surface parking facilities. The I-PLACE^{3}S energy module will be used to support this research. This study will be conducted cooperatively with key partners such as the air districts and local governments within the region.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2012.

Cost

The total budget for this measure is $350,000.

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (vi)

CONTROL MEASURE NUMBER: RP-5

TCM ID: RP-5
Control Measure Title: Adopt a "Complete Streets" Policy

Control Measure Description

SACOG will adopt a "Complete Streets" policy to require that applicants for SACOG regional funding programs demonstrate that the planning, design, construction and maintenance of roadway and transit facilities include the needs of all transportation users – pedestrians, bicyclists, the disabled, transit users, and motorists. Examples include facilities (sidewalks, bike lanes, etc.) that allow for safe walking, biking and wheelchair access along roadways. Through its Complete Streets policy, SACOG will require that applicants for local funding programs administered by SACOG demonstrate that their project is multi-modal and will consider the needs of bicyclists, pedestrians and disabled travelers. SACOG's policy will be consistent with current, adopted regional and local plans, and in accordance with locally adopted policies such as Sacramento County's Measure A program that earmarks funds for multi-modal improvements (highway, street, and road construction; highway, street, and road maintenance; bus and light rail capital and operations; improved transportation services for elderly and handicapped persons; and transportation-related air quality programs). In the absence of such plans, federal, state, and local standards and guidelines should be used to determine appropriate accommodations for pedestrians, bicyclists, and disabled travelers.

The policy will also require applicants for State funding programs to ensure that projects are consistent with *Caltrans Directive 64*, which states that the California Department of Transportation, "fully considers the needs of non-motorized travelers (including pedestrians, bicyclists and persons with disabilities) in all programming, planning, maintenance, construction, operations and project development activities and products." The policy will also require that applicants for federal funding programs ensure that projects are consistent with the United States Department of Transportation Policy Statement on "Accommodating Bicyclists and Pedestrians in Transportation Projects".

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2012.

Cost

The total budget for this measure is $50,000.

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (x)

CONTROL MEASURE NUMBER: RP-6

TCM ID: RP-6
Control Measure Title: Initiate a "Complete Streets" Technical Assistance Program

Control Measure Description

To implement the Complete Streets policy, SACOG will review and analyze the practices of local governments within the SACOG region and around the nation to identify appropriate "Best Practices" for complete street design within the SACOG region. "Complete Streets" means design of the right-of-way for all relevant modes of travel, including pedestrian, bicyclists and transit as well as automobiles. The best practices will address the functional needs of different types of streets, including arterials, major and minor collectors, and local streets. SACOG will develop a curriculum, conduct educational seminars/workshops to disseminate the best practices information and provide technical assistance for local governments (public works and planning staff, planning commissioners and elected officials) and members of the private land use development, planning, engineering and design communities to assist the design and construction of "Complete Streets" throughout the MTP Plan Area. SACOG will also provide technical assistance to local governments on a case-by-case basis, as requested, to help them to successfully implement this concept.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2012.

Cost

The total budget for this measure is $100,000.

Needed Resources and Authority

Sacramento Area Council of Governments

Eligible per the Clean Air Act as Amended, Section 108 (f) (x)

CONTROL MEASURE NUMBER: RP-7

TCM ID: RP-7
Control Measure Title: Adopt a "Safe Routes to School" Policy and Implement a Pilot Program

Control Measure Description

Within 3 years from the adoption of the MTP 2035, SACOG will adopt a Safe Routes to Schools (SRTS) policy to promote the practice of safe bicycling and walking to and from schools throughout the MTP Plan Area in order to reduce traffic congestion, improve air quality, and enhance neighborhood safety. There are both federal and state funding programs for SRTS. As a regional agency, SACOG is an eligible applicant under the Federal program for both infrastructure and non-infrastructure projects. Under the state program, only cities and counties are eligible applicants for infrastructure projects (Caltrans, 2007). With the passage of the Safe Routes to School bill (AB 1475), a "one-third" distribution formula for federal safety funds to be allocated in equal amounts to: state highways, local roads, and Safe Routes to School (SRTS) construction program was established.

SACOG will also join the Safe Routes to School National Partnership, a network of more than 300 nonprofit organizations, government agencies, schools, and professionals working together to advance the Safe Routes to School movement in the United States.

In addition, SACOG will host a regional workshop for all cities, counties, school districts and transit operators within the region to identify other potential opportunities for collaboration that would reduce greenhouse gas impacts. At a minimum, the issues discussed will include the findings from the Safe Routes to School activities described above, opportunities to increase the number of students with bus or other transit options to get to and from school, and integrating school siting practices with goals of promoting walkable neighborhoods with a wide range of easily accessible services. This workshop will be patterned after the "Stretching Community Dollars Guidebook" and workshop series that the SACOG Executive Director wrote for the California City, County, Schools (CCS) Partnership (a non-profit organization of the League of California Cities, California State Association of Counties and California School Boards Association). That workshop series is specifically designed to help these three local government entities to take maximum advantage of opportunities for collaboration. SACOG will ask the CCS Partnership to co-host the event, and offer to make the materials prepared for the event available to the CCS Partnership for use in its on-going workshop series around the state.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is estimated to be completed in 2012.

Cost

The total budget for this measure is $200,000.

Needed Resources and Authority

Sacramento Area Council of Governments

The federal Safe Routes to School program (SRTS) was authorized by Section 1404 of the *SAFETEA-LU (the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users*). SACOG will also obtain federal funds from the Federal Highway Administration through Caltrans to implement at least one SRTS pilot program within the MTP Plan Area.

The State-legislated Safe Routes to School program (SR2S) is contained in Streets & Highways Code Section 2330-2334. SACOG will encourage its member agencies to apply for funds available through the State Highway Safety Improvement fund for eligible infrastructure projects in order to improve bicycle and pedestrian safety for schoolchildren.

Eligible per the Clean Air Act as Amended, Section 108 (f) (xiv)

Attachment A

Potential Transportation Control Measures
Clean Air Act, Section 108 (f)

i) Programs for improved public transit;

ii) Restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high-occupancy vehicles (HOV);

iii) Employer-based transportation management plans, including incentives;

iv) Trip-reduction ordinances;

v) Traffic flow improvement programs that achieve emissions reductions;

vi) Fringe and transportation corridor parking facilities serving multiple-occupancy vehicle programs or transit service;

vii) Programs to limit or restrict vehicle use in downtown areas or other areas of emissions concentration particularly during periods of peak use;

viii) Programs for the provision of all forms of high-occupancy, shared-rides;

ix) Programs to limit portions of road surfaces or certain sections of the metropolitan area to the use of non-motorized vehicles or pedestrian use, both as to time and place;

x) Programs for secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas;

xi) Programs to control extended idling of vehicles;

xii) Reducing emissions from extreme cold-start conditions;

xiii) Employer-sponsored programs to permit flexible work schedules;

xiv) Programs and ordinances to facilitate non-automobile travel, provision and utilization of mass transit, and to generally reduce the need for single-occupant vehicle travel, as part of transportation planning and development efforts of a locality, including programs and ordinances applicable to new shopping centers, special events, and other centers of vehicle activity;

xv) Programs for new construction and major reconstruction of paths, tracks, or areas solely for use by pedestrian or other non-motorized means of transportation when economically feasible and in the public interest. For purposes of this clause, the Administrator shall also consult with the Secretary of the Interior; and

xvi) Programs to encourage removal of pre-1980 vehicles.

Attachment A-1

Substitution of Transportation Control Measures

SAFETEA-LU section 6011(d) reads as follows:

(d) Substitution of Transportation Control Measures.--Section 176(c) of the Clean Air Act (42 U.S.C. 7506(c)) (as amended by subsection (c)) is amended by inserting after paragraph (7) the following:

"(8) Substitution of transportation control measures.—

- "(A) In general.--Transportation control measures that are specified in an implementation plan may be replaced or added to the implementation plan with alternate or additional transportation control measures-
    - "(i) if the substitute measures achieve equivalent or greater emissions reductions than the control measure to be replaced, as demonstrated with an emissions impact analysis that is consistent with the current methodology used for evaluating the replaced control measure in the implementation plan;
    "(ii) if the substitute control measures are implemented-
        - "(I) in accordance with a schedule that is consistent with the schedule provided for control measures in the implementation plan; or
        "(II) if the implementation plan date for implementation of the control measure to be replaced has passed, as soon as practicable after the implementation plan date but not later than the date on which emission reductions are necessary to achieve the purpose of the implementation plan;

    "(iii) if the substitute and additional control measures are accompanied with evidence of adequate personnel and funding and authority under State or local law to implement, monitor, and enforce the control measures;
    "(iv) if the substitute and additional control measures were developed through a collaborative process that included-
        - "(I) participation by representatives of all affected jurisdictions (including local air pollution control agencies, the State air pollution control agency, and State and local transportation agencies);
        "(II) consultation with the Administrator; and
        "(III) reasonable public notice and opportunity for comment; and

"(v) if the metropolitan planning organization, State air pollution control agency, and the Administrator concur with the equivalency of the substitute or additional control measures.

- "(B) Adoption.-
  - "(i) Concurrence by the metropolitan planning organization, State air pollution control agency and the Administrator as required by subparagraph (A)(v) shall constitute adoption of the substitute or additional control measures so long as the requirements of subparagraphs (A)(i), (A)(ii), (A)(iii) and (A)(iv) are met.
    "(ii) Once adopted, the substitute or additional control measures become, by operation of law, part of the state implementation plan and become federally enforceable.
    "(iii) Within 90 days of its concurrence under subparagraph (A)(v), the State air pollution control agency shall submit the substitute or additional control measure to the Administrator for incorporation in the codification of the applicable implementation plan. Notwithstanding any other provision of this Act, no additional State process shall be necessary to support such revision to the applicable plan.

- "(C) No requirement for express permission.--The substitution or addition of a transportation control measure in accordance with this paragraph and the funding or approval of such a control measure shall not be contingent on the existence of any provision in the applicable implementation plan that expressly permits such a substitution or addition.

- "(D) No requirement for new conformity determination.--The substitution or addition of a transportation control measure in accordance with this paragraph shall not require-
  - "(i) a new conformity determination for the transportation plan; or "(ii) a revision of the implementation plan.

- "(E) Continuation of control measure being replaced.--A control measure that is being replaced by a substitute control measure under this paragraph shall remain in effect until the substitute control measure is adopted by the State pursuant to subparagraph (B).

- "(F) Effect of adoption.--Adoption of a substitute control measure shall constitute rescission of the previously applicable control measure."

Reasonably Available Control Measure (RACM) Analysis

Background

The Sacramento region has been designated by the U.S. Environmental Protection Agency (EPA) as a non-attainment area under the federal 8-hour ozone standard. The region is currently in the process of preparing a new state implementation plan (SIP) to demonstrate how it will reach attainment of the 8-hour ozone standard. Section 172 (c)(1) of the Clean Air Act requires that state implementations plans include an analysis of what are known as reasonably available control measures (RACM). The purpose of this analysis is to ensure that the Sacramento Region is implementing all reasonably available control measures, as required to demonstrate attainment of the 8-hour ozone standard as expeditiously as practicable. The Sacramento Area Council of Governments (SACOG) conducted this RACM analysis in conjunction with the Sacramento Metropolitan Air Quality Management District (SMAQMD).[38]

RACM Analysis Overview and Criteria

In its 1992 General Preamble for implementation of the 1990 Clean Air Act Amendments, EPA explains that it interprets Section 172 (c)(1) as a requirement that states incorporate in a SIP all reasonably available control measures that would advance a region's attainment date. However, regions are obligated to adopt only those measures that are reasonably available for implementation in light of local circumstances. In the Preamble, EPA laid out guidelines to help states determine which measures should be considered reasonably available. These guidelines are summarized in the sections that follow.

Implementation Date

Implementation of a measure or a group of measures is typically expected to assist the region in advancing the date of attainment at least one year. With the current attainment demonstration year set at 2018, this would require a reduction in ozone levels by 2017.

Enforceability

Once a transportation control measure is added to a SIP, it becomes legally binding. If the state or local government does not have the authority necessary to implement or enforce a measure, the measure is not creditable in the SIP and therefore cannot be declared a RACM. A measure is considered enforceable when all state or local government agencies responsible for funding, implementation and enforcement of the measure have committed in writing to its implementation and enforcement.

[38] Yolo-Solano AQMD staff consulted with the Association of Bay Area Governments (ABAG) to identify any TCMs that might be implemented in the YSAQMD portion of Solano County, and determined that ABAG is not committing to any TCMs in that area. (YSAQMD, Matt Jones e-mail 12-10-08)

Technological Feasibility

All technology-based control measures must include technologies that have been verified by EPA. The region cannot take SIP credit for technologies that do not produce EPA-verifiable results.

Economic Feasibility and Cost Effectiveness

Another key RACM test is whether or not the measures are economically feasible. This test analyzes both the cost-effectiveness of the proposed measure, as well as the overall availability of funding to fully implement the measure as proposed. In many cases, a finding of "not economically feasible" is a result of insufficient resources to fully implement the measure as proposed. The Transportation Research Board in recent research set a range of $10,000-$20,000 per ton of pollution reduced (in 2000 dollars), below which measures can be considered to be economically feasible.[39] The Washington D.C. Metropolitan Area set a threshold of $3,500-$5,000 per ton as part of their 2007 RACM analysis. The Sacramento Area Metropolitan Air Quality Management District has imposed a variety of rules whose cost-effectiveness has ranged from $2,000-$34,000 per ton. For the purposes of this RACM analysis, $34,000 per ton will be used as the cost-effectiveness threshold.

Substantial and Widespread Adverse Impacts

The potential exists for some candidate control measures to cause substantial and widespread adverse impacts to a particular social group or sector of the economy. From an environmental justice standpoint, any measures that are found to cause substantial or widespread adverse impacts will not be considered RACM.

Advancing the Attainment Date

Another test is whether or not the collective total of available regional and local control measures that are considered but not proposed to be adopted (including stationary, area, land use, and mobile source measures) would be sufficient to advance the attainment date by one year (one full ozone season earlier than expected). This analysis was conducted by the air districts using information supplied by SACOG staff. If the test results would not advance the attainment date, then the measures not being proposed for adoption would not be considered RACM.

[39] Transportation Research Board: The Congestion Mitigation and Air Quality Improvement Program, Assessing 10 Years of Experience, Special Report 264. TRB, National Research Council, Washington D.C., 2002.

Intensive and Costly Effort

Considered altogether, the cost of implementing the proposed measures cannot exceed the resources available to the region.[40]

Analysis Methodology

SACOG and the Sacramento Metropolitan Air Quality Management District (SMAQMD) have jointly compiled a list of potential control measures from the following sources:

- Clean Air Act Section 108(f) measures
- Measures considered in the San Francisco Bay Area, San Joaquin Valley and South Coast Air Quality Management District RACM analyses
- Air District Workshop
- The MTP 2035 Draft Project List

TCM Development Process

The first step was to develop a list of transportation control measures for possible consideration. This list was developed from a variety of sources: prior Sacramento Area RACM processes, TCM-eligible projects from the draft MTP for 2035, other regions' SIPs and measures suggested by partner agencies and the public through the interagency consultation process. SACOG staff reviewed over 1,400 projects from the draft MTP 2035 project list and considered those that met the CAA TCM eligibility requirements as part of the potential list of TCMs.

In addition, other area's 8-hour ozone SIPs were reviewed and cross-referenced against measures already on the list. The other 8-hour ozone SIPs reviewed includes the following:

2005 Bay Area Ozone Strategy
2007 South Coast 8-Hour Ozone Plan
2007 San Joaquin Valley 8-Hour Ozone Plan
2007 San Diego County 8-Hour Ozone Attainment Plan
2007 Metropolitan Washington 8-Hour Ozone SIP
2007 Cecil County MD 8-Hour Ozone SIP

The TCM development process and draft lists of potential TCMs were presented at public meetings on ten different dates from September 10, 2007 – March 6, 2008. These included discussions at SACOG's Regional Planning Partnership (RPP), Land Use, Housing and Air Quality Committee (subsequently the Climate and Air Quality Committee), the Transportation Committee, the Flood Management Committee and the Government Relations and Public Affairs Committee, as well as the SACOG Board of

[40] RACM Analysis for Four Serious Areas Designated Nonattainment for 1-hr Ozone NAAQS. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, and Office of Transportation and Air Quality, Ann Arbor. October 12, 2000.

Directors. This process resulted in a thorough list of control measures for consideration as potential TCMs, which could be considered as a Reasonably Available Control Measure or RACM.

These measures were evaluated using the criteria noted above, and are documented in Attachment A-2.

RACM Determination and Analysis Results

Attachment A-2 lists the potential control measures, organized by category, and notes whether they are considered RACM, and if not, the reasons they were not found to be RACM. The measures that have been determined to be RACM will be included in the SIP as TCMs.

Attachment A-2

Control Measure Number	Control Measure Title and Strategy Type	Conclusions, Comments, and Status
Recommended and Proposed Transportation Control Measures		
ITS-1	Arden Way "Smart Corridor" from Del Paso to Watt	Expected to be completed in 2008
ITS-2	Sacramento Traffic Operations Center	Expected to be completed in 2009
ITS-4	Sacramento Transportation Area Network (STARNET) Implementation	Expected to be operational in 2008 and be completed in 2009
TF-1	El Dorado Central Park and Ride Facility	Expected to be completed in 2009
TF-2	Improvements to Loomis Multimodal Center	Expected to be completed in 2010
TF-3	13^{th} and 16^{th} Light Rail Station Improvements	Expected to be completed in 2009
TR-1	Transit Vehicle Acquisitions – Bus Replacement	This task divided into 8 components. See below.
TR-1A	Auburn Transit Bus Replacement	Expected to be completed in 2008
TR-1B	Roseville Transit Bus Purchase	Expected to be completed in 2009
TR-1C	Roseville Transit Bus Replacement	Expected to be completed in 2008
TR-1D	Replacement Neighborhood Ride Buses	Expected to be completed in 2012
TR-1E	E-Tran Replacement Buses	Expected to be completed in 2010
TR-1F	SRTD Neighborhood Ride Vehicle Replacement	Expected to be completed in 2010
TR-1G	Yuba Sutter Transit Bus Expansion	Expected to be completed in 2010
TR-1H	YCTD Bus Replacement	Expected to be completed in 2010
TR-2	Transit Operations – Fund Transit operators	This task divided into 8 components. See below.
TR-2A	El Dorado Transit Operating Assistance	Expected to be completed in 2009
TR-2B	Roseville Operating Assistance	Implemented in 2012
TR-2C	Elk Grove Operating Assistance	Implemented in 2011
TR-2D	Folsom Operating Assistance	Implemented in 2011
TR-2E	Paratransit Operating Assistance	Implemented in 2008
TR-2F	Sacramento County Operating Assistance	Implemented in 2008
TR-2G	Regional Transit Operating Assistance	Implemented in 2010
TR-2H	YCTD Operating Assistance	Implemented in 2008
AQ-1	Freeway Service Patrol – provide motorist assistance and towing for disable vehicles during peak hours	Implemented in 2008 to 2018

AQ-2	Sacramento Emergency Clean Air & Transportation (SECAT) Program	Implemented in 2008 to 2018
TCM-ONMS-ED-1 (AQ-3)	Notification of Spare The Air	Implemented in 2008 to 2108
FP-1	Air Quality Funding Program	Fund AQ-1, AQ-2, and AQ-3
FP-2	Bicycle and Pedestrian Funding Program	This task divided into 4 components. See below.
FP-2A	I-80 Bike/Ped Bridge at the West Canal	Expected to be completed in 2012
FP-2B	City of Folsom Bikestation and "Bikelink" On-Demand Long-Term Class I Bike Parking at Transit Stations	Expected to be completed in 2010
FP-2C	City of Elk Grove: Elk Grove Creek Bike/Ped Bridge	Expected to be completed in 2014
FP-2D	Retrofit Yolobus bus fleet with higher capacity bike racks	Expected to be completed in 2011
FP-3	Transportation Demand Management Funding Program	Implemented in 2008 to 2018
FP-4	Community Design Funding Program	This task divided into 4 components. See below.
FP-4A	City of Marysville: East 10th Street and Ramirez Street Intersection Improvement	Expected to be completed in 2011
FP-4B	City of Rancho Cordova: Folsom Blvd. Enhancements & SR2S Phase 2	Expected to be completed in 2012
FP-4C	Sacramento County: Complete Streets for Freedom Park Drive and North Watt Avenue	Expected to be completed in 2013
FP-4D	City of Woodland: Lemen, North, East Streets Intersection Realignment	Expected to be completed in 2012
M-2	Light Rail Grade Separation at Watt and Folsom Boulevard	Expected to be completed in 2009
RP-1	Blueprint implementation and Planning Technical Assistance	Expected to be completed in 2012
RP-2	Development Rural-Urban Connections Strategy and Create Best Practices Toolkit	Expected to be completed in 2012
RP-3	Research a Transportation Pricing Policy	Expected to be completed in 2012
RP-4	Research a Regional Parking Regulation to Provide Incentives for Use of Alternative Modes	Expected to be completed in 2012
RP-5	Adopt "Complete Streets" Policy	Expected to be completed in 2012
RP-6	Initiate a "Complete Streets" Technical Assistance Program	Expected to be completed in 2012
RP-7	Adopt a Safe Routes to School Policy and Implement Pilot Program	Expected to be completed in 2012

Other Control Measures Considered – Bike/Walk Communities Control Measure		
TCM-201	Increase Bike/Walk Trips	Not Recommended – Not economically feasible; some implementation will occur through TCM FP-2 and TCMs RP-5, RP-6 and RP-7.
TCM-15	Increased Walk-to-School Programs	Subset of TCM-201
TCM-177	Bicycle stations	Subset of TCM-201
TCM-217	Expanded Pedestrian and Bicycle Infrastructure	Subset of TCM-201
TCM-22	Bike Access at Transit Stations	Subset of TCM-201
TCM-276	More Bike Parking	Subset of TCM-201
TCM-277	Wide Road Shoulders and Narrow Gutters	Subset of TCM-201
TCM-284	Minimize Bollards Use	Subset of TCM-201
TCM-286	Debris-free Roads – swept bikeway frequently	Subset of TCM-201
TCM-292	Underground Utilizes – Place utilities close to street centerline	Subset of TCM-201
TCM-315	Require More Bike Trips	Subset of TCM-201
TCM-318	Showers and Lockers at Work	Subset of TCM-201
TCM-319	More River and Railroad Crossings	Subset of TCM-201
TCM-320	More Freeway Crossings and Modified Interchange	Subset of TCM-201
TCM-323	Bicycle-friendly Streets	Subset of TCM-201
TCM-324	Increase Funding of Cycling Programs	Subset of TCM-201
TCM-327	Treatment of Cyclists with Respect	Subset of TCM-201
TCM-280	Police Enforcement of Bike Law	Subset of TCM-201
TCM-283	Motorists Share Roads	Subset of TCM-201
TCM-285	Promote Cycling	Subset of TCM-201
TCM-288	Universal Bike Education	Subset of TCM-201
TCM-289	Minimize Traffic Lanes	Subset of TCM-201
TCM-296	Cycling Incentives like for Carpoolers or Transit Users	Subset of TCM-201
TCM-298	Increase Bike Deliveries	Subset of TCM-201
TCM-301	Bike Cars on Train	Subset of TCM-201
TCM-317	Info on Bike Access	Subset of TCM-201
TCM-330	Bike Use by Government Employees	Subset of TCM-201
TCM-88	Walking and Bicycling Events	Subset of TCM-201
TCM-329	Education of Road Users	Subset of TCM-201
TCM-314	Subsidize Purchase of Bike Accessories	Subset of TCM-201
Other Control Measures Considered – Educational/Voluntary Control Measures		
TCM-113	Displaying air quality data on billboards	Not Recommended – Minimal Emissions Reductions
TCM-145	Public Education on NO_X and ROG sources in Schools and Small Businesses	Not Recommended – Minimal Emissions Reductions
TCM-153	Public Education to School	Subset of TCM-145
TCM-166	Increase outreach efforts to small businesses	Subset of TCM-145
TCM-195	Public Information about the total costs of gasoline use	Not Recommended – Minimal Emissions Reductions

Other Control Measures Considered – Episodic Control Measures		
TCM-104	Reduce Work-Related Trips	Not Recommended – No authority to implement; not economically feasible.
TCM-205	More Episodic Controls	Subset of TCM-104
TCM-97	Increase fees for parking garages and meters during episodes	Not Recommended – No authority to implement; not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
TCM-86	Provide free public transit during episodes	Not Recommended – Not economically feasible.
Other Control Measures Considered – HOV Lane Control Measures		
TCM-107	Dedicated Bus Lanes	Not Recommended – Not economically feasible.
Other Control Measures Considered – Work Related Trip Reduction Control Measures		
TCM-123	Work-Related Trip Reduction Program	Partially Implemented (See below)
TCM-184	Regional Guaranteed Ride Home	Subset of TCM-123; to be implemented through TCM FP-3.
TCM-297	Bike Use at Businesses	Subset of TCM-123 Not Recommended – No authority to implement.
TCM-302	Government Staff Dedicate to Cycling	Subset of TCM-123 Not Recommended – No authority to implement.
TCM-373	Carpool program	Subset of TCM-123; to be implemented through TCM FP-3.
TCM-124	Telework/Alternative Work Schedule	Subset of TCM-123 Not Recommended – Not Enforceable
TCM-186	Increase telecommuting	Subset of TCM-123 Not Recommended – No authority to implement.
TCM-229	Various Traffic Reduction Strategies – Address the transportation to the public and reduce emissions from automobile by encouraging and supporting carpool and use of public transportation	Subset of TCMs-123 and 174; to be partially implemented through TCM FP-3.
TCM-100	Reduce business/government hours of operation	Subset of TCM-123; no authority to implement.
TCM-94	Close Government on Pollution Days	Subset of TCMs-100 and 123; no authority to implement.
TCM-174	Regional Rideshare Program	Implemented as TCM FP-3.
TCM-208	Regional alternatives work schedules	Not Recommended – No authority to implement.
TCM-143	Stagger work schedules	Not Recommended – No authority to implement.

Other Control Measures Considered – Traffic Information Control Measure		
TCM-179	Enhance real time traffic information to allow drivers to make better decisions about when and where to travel	Not Recommended – Not economically feasible; to be partially implemented through TCMs ITS-1 through 4.
TCM-273	Road Hazard Reporting	Subset of TCM-179; not economically feasible.

Other Control Measures Considered – Parking Control Measures		
TCM-199	Reduce the number of public parking spaces in the City of Sacramento by 25%	Not Recommended – No authority to implement and not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
TCM-306	Parking Cash Out	Not Recommended – No authority to implement and not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
TCM-310	Charge City-owned parking garage pass-holders a fee for more than one entrance and exit each day	Not Recommended – No authority to implement and not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
TCM-311	Refunds to Parking Garage Pass-Holders	Not Recommended – No authority to implement and not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
TCM-316	Eliminate Timed Parking	Not Recommended – No authority to implement and not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
TCM-76	Extended the Parking Cash-Out law to employer-owned parking spaces	Not Recommended – No authority to implement and not economically feasible. Some elements of this considered measure will be analyzed as part of TCM RP-4.
Other Control Measures Considered – Pay to Pollute Control Measures		
TCM-57	Require passenger vehicles not meeting the standards of passenger cars to pay an annual fee and/or a fee upon purchase	Not Recommended – No authority to implement.
TCM-247	Tax on Inefficient Vehicles	Subset of TCM-57
TCM-261	Tax SUVs	Subset of TCM-57
TCM-359	Pricing strategies to affect Consumer Demand	Subset of TCM-57
TCM-118	Increase Vehicle Registration Fee and Traffic and Parking Violation Fines	Not Recommended – No authority to implement.
TCM-196	Ticket Surcharges	Not Recommended – No authority to implement.
TCM-157	Require a surcharge to be paid by drivers during the summer season based on the number of driving miles	Not Recommended – No authority to implement.

TCM-78	Emission-based registration fees	Not Recommended – No authority to implement.
TCM-192	Tailpipe emissions	Subset of TCM-78
TCM-36	Vehicle Smog Impact Fee	Subset of TCM-78
TCM-56	Increase gasoline sales tax in the Sacramento Federal Nonattainment Area	Not Recommended – No authority to implement.
TCM-200	Increase Gasoline	Subset of TCM-56
TCM-241	Fuel Tax During Summer Months	Subset of TCM-56
TCM-304	Increase the price of gasoline to pay for damage of pollutions, cost of global warming, and cost of petroleum dependency	Not Recommended – No authority to implement; not economically feasible.
TCM-39	Sell Clean Air License Plates to fund air quality programs	Not Recommended – No authority to implement.
Other Control Measures Considered – Traffic Calming Control Measures		
TCM-294	Implement traffic calming measures to reduce vehicle speed and encourage bicycle and pedestrian activity	Not Recommended – Not economically feasible.
TCM-169	Install traffic circles at intersections	Not Recommended – Not economically feasible.

Other Control Measures Considered – Traffic Expansion Control Measures		
TCM-111	Improve safety and security on public transit	Not Recommended – Not economically feasible.
TM-154	Implement public transit discounts and incentives for employees	Not Recommended – Not economically feasible.
TCM-185	Community-based shuttle system	Not Recommended – Not economically feasible.
TCM-187	Bus Traffic-Signal Pre-emption	Not Recommended – Not economically feasible.
TCM-368	Light Rail Access to Airport	Not Recommended – Not economically feasible.
TCM-84	Provide free public transit	Not Recommended – Not economically feasible.
TCM-146	Special RT fares for certain groups	Subset of TCM-84
TCM-89	Employers provide free transit passes to all employees	Subset of TCM-84
Other Control Measures Considered – Airport Control Measures		
TCM-83	Eliminate government employee airport parking reimbursement	Not Recommended – No authority to implement; not economically feasible; Regional Parking Regulation and incentives will be further analyzed through implementation of TCM RP-4.

Addendum to Transportation Control Measures

Substitute Control Measure

CONTROL MEASURE NUMBER:

TCM ID:
Control Measure Title: Dry Creek Parkway Trail, Phase 1

Control Measure Description

In Sacramento County, Rio Linda-Dry Creek Parkway, from Dry Creek Road at Dry Creek Ranch to the Cherry Island Soccer Complex: Construct a 3-mile Class I shared-use bicycle/pedestrian trail.

Emission Reductions

No emission reductions are being claimed for this measure in the SIP.

Timeframe

This project is expected to be completed in 2011.

Cost

The total budget for this measure is $ 1,110,099.26.

Needed Resources and Authority

County of Sacramento

Eligible per the Clean Air Act as Amended, Section 108 (f) (x & xv)

Appendix E: Weight-of-Evidence Analyses

Attainment demonstrations based on photochemical modeling can be strengthened by supplemental evidence from additional modeling analyses and from considering modeling outputs other than the attainment test results. More diverse non-modeling and observational methods analyzing air quality, meteorological, and emissions data can also be used to corroborate the modeling predictions. EPA guidance[41] specifies that a comprehensive weight-of-evidence approach should be undertaken to support the modeled attainment demonstration.

The following information for the weight-of-evidence analyses in this appendix was provided by CARB and was summarized in Chapter 10 – Weight-of-Evidence Determination.

SACRAMENTO METRO AREA: OZONE

Introduction

The Sacramento Metro Area[42] is currently classified as a Serious nonattainment area for the federal 8-hour ozone standard and has a nominal attainment date of June 15, 2013. ARB staff completed photochemical modeling indicating the area will not attain the standard by the 2013 deadline. However, results show the area could reach attainment in 2018 with additional NO_X emissions reductions resulting from State and local measures. Therefore, on February 14, 2008, ARB forwarded to U.S. EPA a request to reclassify the area from Serious to Severe-15, with an attainment date of June 15, 2019, as allowed by U.S. EPA. This action was approved by the governing boards of the five air districts, and U.S. EPA is expected to approve the request. The following sections contain the supplemental air quality and emissions analyses supporting the overall conclusion that Sacramento will attain the federal 8-hour standard by the 2019 deadline for Severe-15 ozone nonattainment areas.

U.S. EPA Attainment Demonstration Requirements

The attainment demonstration portion of a SIP consists of the analyses used to determine whether a proposed control strategy provides the reductions necessary to meet the federal standard by the attainment year. This attainment demonstration includes photochemical modeling, which predicts that projected new controls will result in an 8-hour ozone design value of less than 0.085 parts per million (ppm) for the Sacramento Metro Area in 2018. (note: because the design value is based on a three-year average, an area must have a design value that meets the standard at the

[41] "Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze" (EPA, April 2007, p. 98-109).
[42] Sacramento Metro Area is the same region as the Sacramento federal nonattainment area as shown in Figure 1.

end of the year prior to the attainment year; for example, if an area has an attainment date of June 15, 2019, it must have a design value that meets the standard at the end of 2018). Because of the uncertainties inherent in photochemical modeling, the U.S. EPA allows states to supplement the modeling results with a “Weight of Evidence” (WOE) demonstration if the model predicts ozone levels of 0.082 ppm to 0.087 ppm.

The WOE assessment provides a set of complementary analyses that supplement the SIP-required modeling. These analyses can include consideration of measured air quality, emissions, and meteorological data, evaluation of other air quality indicators, and additional air quality modeling. Because all analysis methods have inherent strengths and weaknesses, examining an air quality problem in a variety of ways helps offset the limitations and uncertainties that are inherent in any particular method.

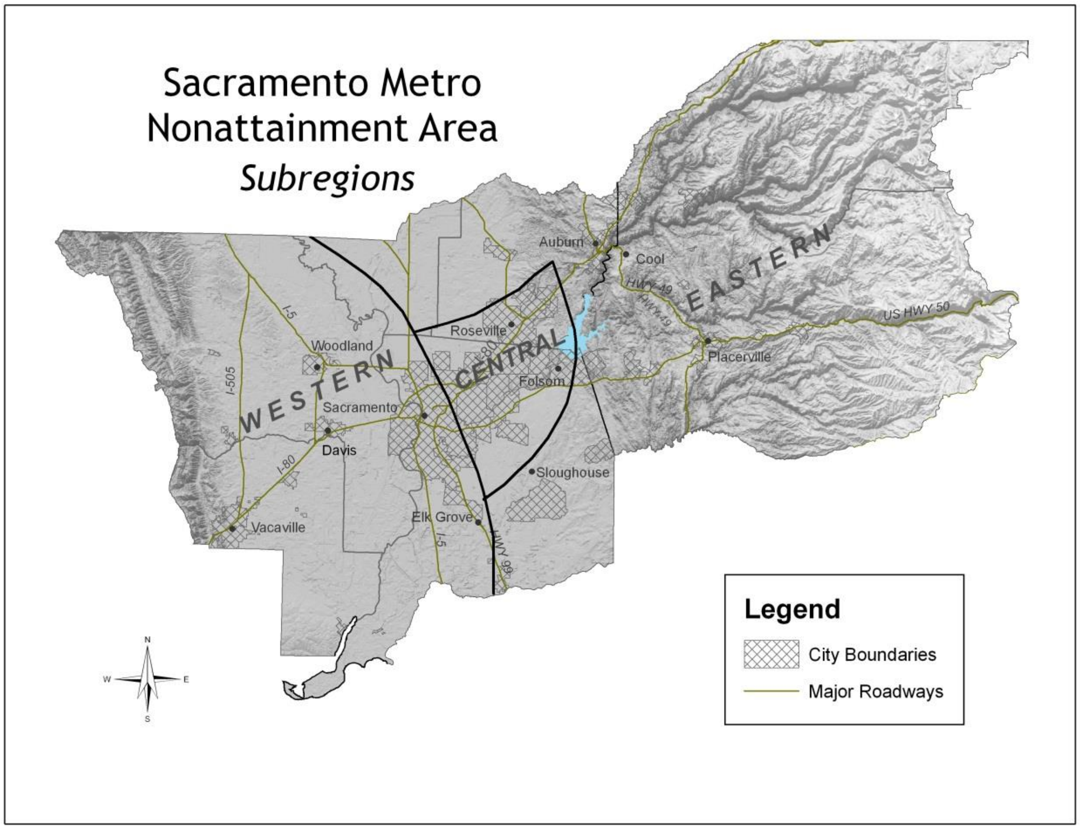
The scope of the WOE analysis is different for each nonattainment area. The level of detail appropriate for each area depends upon the complexity of the air quality problem, how far into the future the attainment deadline is, and the amount of data and modeling available. This document summarizes the analyses that comprise the WOE assessment for the Sacramento Metro Area.

Physical Context

The Sacramento Metro Area comprises all of Sacramento and Yolo counties, the eastern portion of Solano County, the southern portion of Sutter County, and the portions of El Dorado and Placer counties that are not part of the Lake Tahoe Air Basin. Geographically, the area occupies the southern portion of the Sacramento Valley, extending from the foothills of the Coast Ranges in the west to the Sierra Nevada in the east and from the Sacramento River delta in the south to the northern borders of Yolo and Placer counties.

There are no large emissions sources in the Sacramento Metro Area. Instead, the region is characterized by a number of smaller emissions sources that are widespread throughout the area. On-road motor vehicles and other mobile sources account for the majority of the area’s ozone precursor emissions. To simplify the following analyses and better characterize ozone air quality, the Sacramento Metro Area is divided into three subregions: the “western” subregion, the “central” subregion, and the “eastern” subregion. Each subregion shares similar ozone air quality, source-receptor relationships, and geography (refer to Figure 1).

Figure 1: Sacramento Metro Area Subregions



As shown in Figure 1, the western subregion includes Yolo and Solano counties and the downtown Sacramento area. While ozone concentrations are low in the western subregion, prevailing winds during the summer ozone season generally flow from the south/southwest to the north/northeast. As a result, ozone and ozone precursor emissions from the western subregion can be transported to the other two subregions, contributing to problems in these areas.

The central subregion includes the suburban areas of Sacramento County that are east of downtown Sacramento, as well as the urbanized portions of Placer County. This area has experienced rapid growth over the last decade. In the central subregion, local emissions combine with emissions and pollutants transported from the western subregion to produce higher ozone concentrations.

Finally, the eastern subregion comprises the eastern portion of the Sacramento Metro Area and the areas to the north and south of the central subregion. The eastern subregion includes the Placer and El Dorado county foothill communities of Auburn, Cool, and Placerville, as well as the area around Sloughouse in southeastern Sacramento County. While not urban in nature, these communities are closely linked to downtown Sacramento by employment, housing, and travel patterns. In addition, the eastern subregion is impacted by pollutants and emissions from both the western and central subregions. As a result, sites in this area generally have more severe ozone problems.

Historical Perspective

Ozone concentrations in the Sacramento Metro Area have posed a persistent problem over the years. However, evaluating historical progress is difficult, because long-term monitoring data are not available for several high sites. While long-term data for the high sites are not available, there are long-term data available for other sites representing the different subregions of the Sacramento Metro Area. Figures 2 and 3 show exceedance days and design values for four sites with long-term data: Sacramento-Del Paso Manor, Sacramento-T Street, and Folsom in Sacramento County, as well as Placerville in El Dorado County. The T Street site is located in downtown Sacramento, while the other three sites are located east of downtown (in the central and eastern subregions) where higher ozone concentrations typically occur.

The graphs in Figures 2 and 3 show three-year averages, because the annual values are quite variable, making it difficult to determine the general overall trends. Like many other areas of the State, the number of exceedance days at sites in the Sacramento Metro Area has decreased more rapidly than the design value. Overall, since the early 1990s, the number of exceedance days decreased about 60 percent at Del Paso Manor, 35 percent at Folsom, and 30 percent at Placerville (since 1994). The decrease at T Street, a site that meets the federal 8-hour standard, was much smaller (about 10 percent). In contrast, the decreases in design value have been more modest, between about 2 and 12 percent at all four sites. It is important to note that sites in the western subregion of the Sacramento Metro Area now meet the federal 8-hour standard, while sites in the central and eastern subregions still pose air quality challenges.

Figure 2: Federal 8-Hour Ozone Exceedance Days for Selected Long-Term Sacramento Metro Area Sites 1990 to 2006

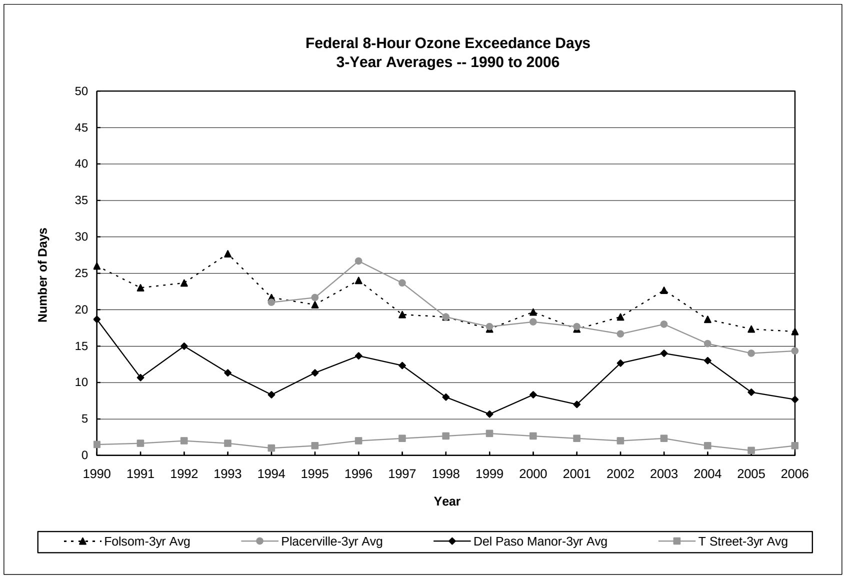
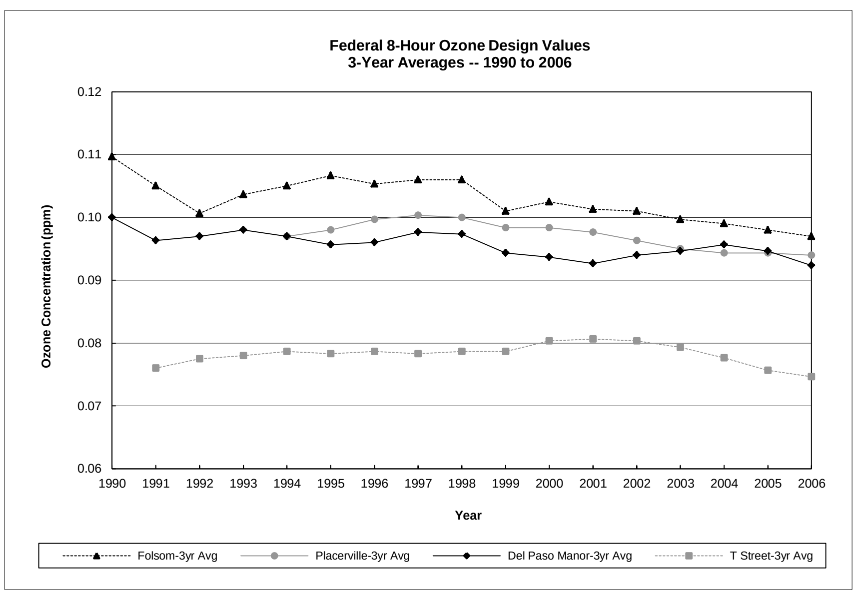


Figure 3: Federal 8-Hour Ozone Design Values for Selected Long-Term Sacramento Metro Area Sites 1990 to 2006



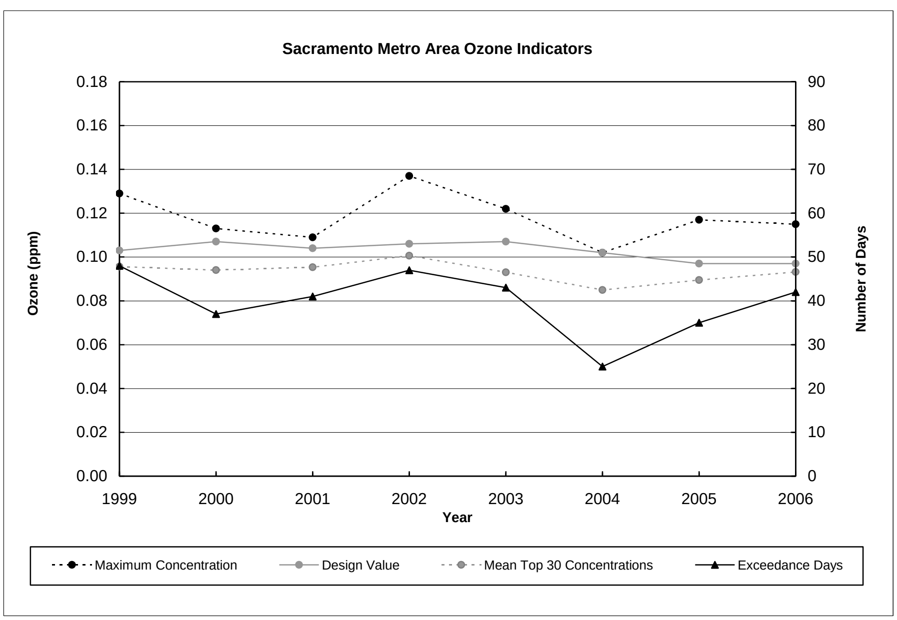
Assessment of Recent Air Quality Trends

General Areawide Perspective

Although a number of sites in the Sacramento Metro Area show long-term progress, many sites show progress over the more recent years, as well. When assessing air quality trends, it is important to include data for the high sites in an area. Until recently (2005 through 2007), the Cool site in El Dorado County had the highest design value in the Sacramento Metro Area. Therefore, it is important to include this site in any trends evaluation. Ozone monitoring began at Cool in 1996, and the site had its first valid design value in 1998, after three years of operation. Given this, as well as consideration of the completeness of data records for other sites in the Sacramento Metro Area, ARB staff selected 1999 as the start year for the evaluation of recent air quality trends.

Figure 4 shows ozone trends for the Sacramento Metro Area for 1999 through 2006. The graph includes four air quality indicators: maximum 8-hour concentration, federal 8-hour design value, mean of the Top 30 concentrations each year, and number of federal 8-hour exceedance days. Over the last eight years, the decrease in the number of exceedance days has been similar to the decrease in the maximum concentration (a little more than 10 percent reduction in each). Because these two statistics reflect values for individual years, the trend lines are variable, reflecting year-to-year changes in meteorology. In contrast, the other two indicators, the mean of the Top 30 and the design value, are less variable because they are more robust. These more stable indicators show less change over the eight-year period, although they reflect modest reductions of about 3 to 6 percent from 1999 to 2006.

Figure 4: Sacramento Metro Area Ozone Indicators 1999 to 2006



The trend lines in Figure 4 all show some improvement. Another measure of improvement is that although a number of sites still exceed the standard in the central and eastern areas, more than 50 percent of the region's population lives in areas that have design values meeting the standard. This compares favorably to 1990, when only 35 percent of the people lived in clean areas. However, despite this progress in reducing population exposure, the overall rate of progress in reducing the design value has been modest. The current (2007) design value of 0.098 ppm is still about 15 percent above the level of the federal standard.

Ozone air quality during 2007 showed some improvement over 2006. Although the maximum concentration was slightly higher (0.122 ppm in 2007 compared with 0.115 ppm in 2006), the design value is comparable during both years (0.098 ppm in 2007 compared with 0.097 ppm in 2006). The largest change was in the number of exceedance days. During 2006, there were 42 areawide exceedance days, but only 16 during 2007. Despite the small increase in maximum concentration and design value, ozone indicator values for 2007 were still lower than during the early 2000s. While some portions of the Sacramento Metro Area already attain the standard, additional emissions reductions will be needed to attain the federal 8-hour ozone standard throughout the area.

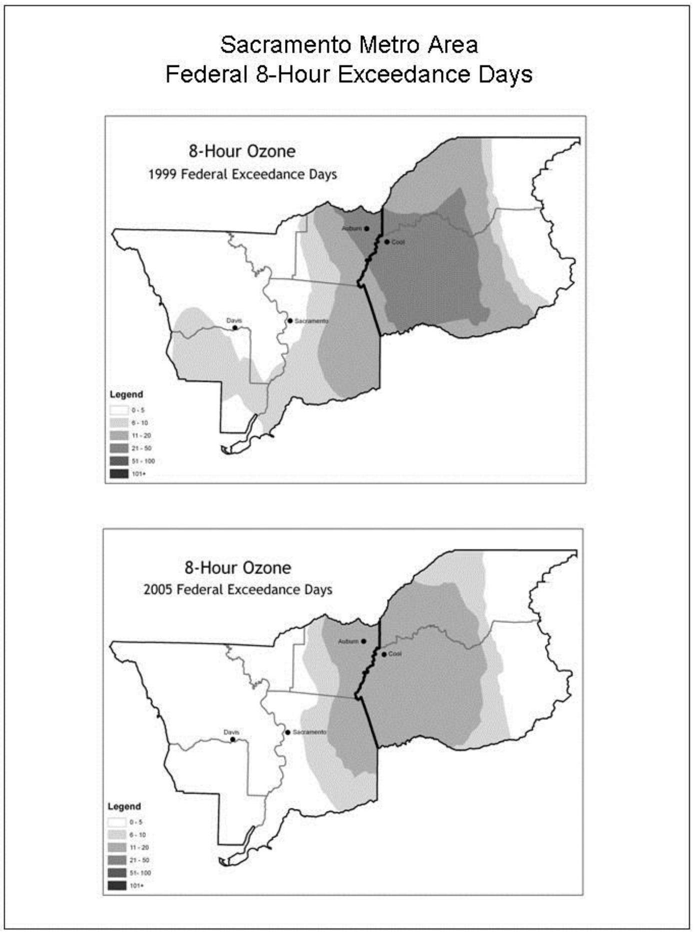
Spatial Ozone Trends

The trends described above represent an areawide perspective, and they generally reflect the worst sites in the Sacramento Metro Area. As a result, they do not show how air quality varies throughout the region. One way to assess the spatial change in ozone air quality is to look at the change in the spatial extent of the ozone problem. The maps in Figure 5 provide an estimate of the number of exceedance days, based on available monitoring data. They show contour maps of federal 8-hour exceedance days in the Sacramento Metro Area during two different years -- 1999 and 2005. During this time period, the spatial extent of the "clean" areas increased substantially, while the size of the areas with the worst air quality decreased.

During 1999, about a third of the Sacramento Metro Area had five or fewer federal 8-hour exceedance days. These relatively clean areas were generally restricted to the northern portion of the western subregion (Yolo and southern Sutter counties and the central Sacramento downtown area), along with the mountainous portion of the eastern subregion that extends to the Lake Tahoe Air Basin. About half of the Sacramento Metro Area had at least 11 exceedance days. Finally, less than a fourth of the area had more than 21 exceedance days, with 35 days at Cool, the worst site in the region. The areas with the highest counts were located in the eastern subregion of the Sacramento Metro Area.

In contrast to the 1999 map, the 2005 map shows a fair amount of improvement. While most areas show improvement, the rate of improvement differs. The clean areas (those with five or fewer days) now cover a much larger extent. Although the clean area in the far eastern portion of the region is not much different in size, the clean area to the west now covers all of the western subregion, including Solano County. The maps show that the number of exceedance days in the central and eastern subregions also decreased, and the areas with the highest number of exceedance days now fall in the range of 11 to 20 days per year, compared with 21 to 50 days in 1999.

Figure 5: Sacramento Metro Area Change in Federal Exceedance Days 1999 to 2005

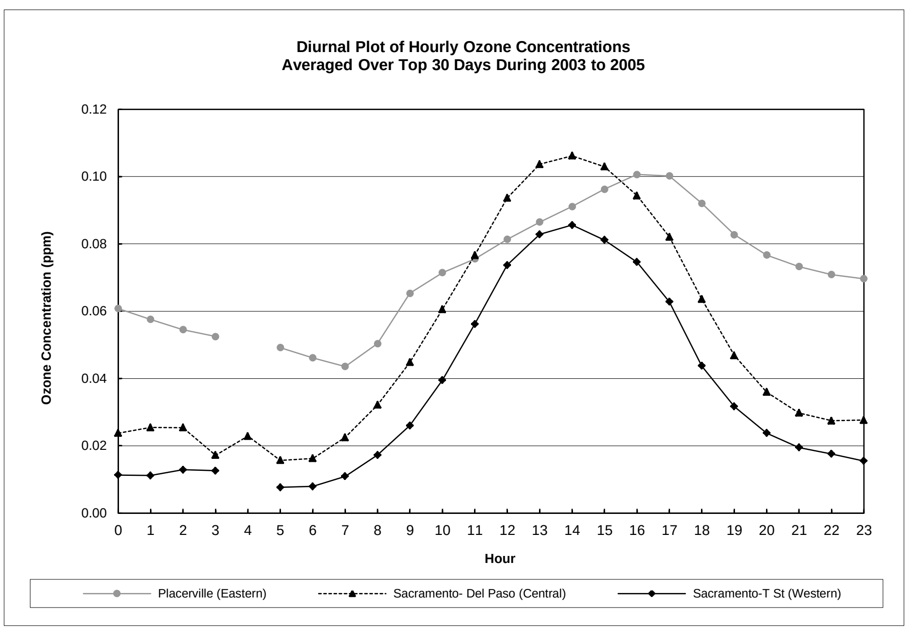


Regional Analysis

As described previously, the Sacramento Metro Area can be divided into three subregions: the western subregion, the central subregion, and the eastern subregion (refer to Figure 1). The western subregion includes sites in Vacaville, Davis, Woodland, Elk Grove, and downtown Sacramento. Ozone air quality at all of these sites is relatively clean, and 2006 design values are below the federal standard. A diurnal plot of hourly ozone concentrations at the Sacramento-T Street site shows a typical bell-shaped pattern, with concentrations peaking in the early afternoon (refer to Figure 6). This type of pattern is typical of sites in urban areas that are located close to emissions sources.

The central subregion lies to the east of downtown Sacramento and generally includes the suburban portions of Sacramento County and the urbanized portions of Placer County. Sites in this area include Del Paso Manor, North Highlands, Roseville, and Folsom. 2006 design values for sites in this area were generally above the federal 8-hour standard, and the number of exceedance days ranged from 9 to 25, with an average of 14 days. Much of this subregion has seen substantial growth over the last decade, especially the Roseville/Rocklin and Folsom areas. Similar to the western subregion, hourly ozone concentrations for the central subregion show a bell-shaped diurnal pattern, but with a slightly longer duration of the peaks (refer to Figure 6).

Figure 6: Diurnal Plot of Hourly Ozone Concentrations

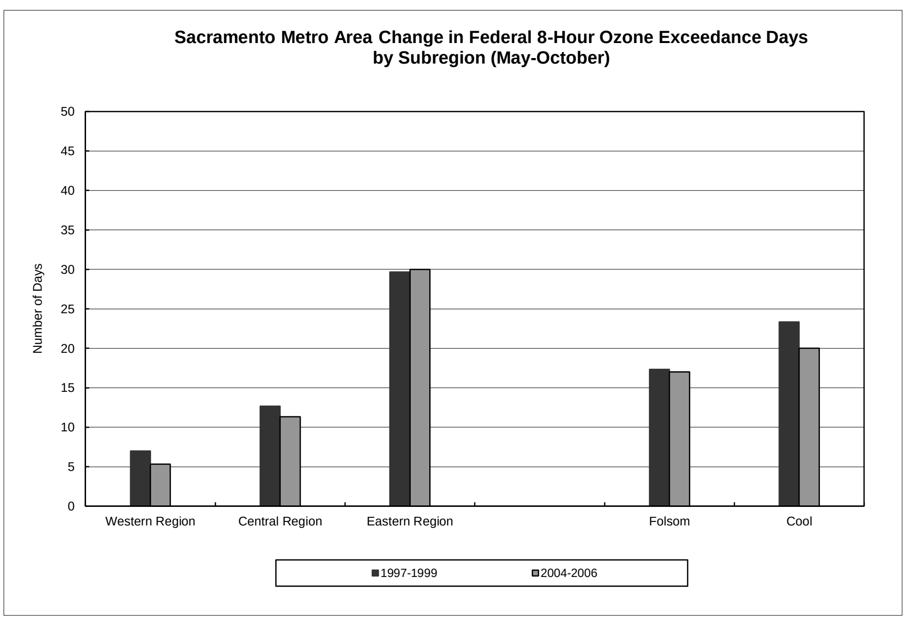


The eastern subregion of the Sacramento Metro Area includes sites in the foothill communities of Auburn, Colfax, Cool, Placerville, and Sloughouse, along with the Echo Summit site, which is located on the crest of the mountains separating the Sacramento Metro Area and the Lake Tahoe Air Basin. Ozone design values at all sites in the eastern subregion except Echo Summit are above the federal 8-hour standard. As shown in Figure 6, the hourly ozone concentrations in this subregion have a diurnal pattern that is characteristic of transport-impacted sites. Compared with the other two subregions, the 24-hour profile for the eastern subregion site (Placerville) shows a longer duration of high concentrations with the peak occurring later in the day. In addition, the overnight ozone concentrations remain elevated.

Figure 7 shows the number of federal 8-hour ozone exceedance days for each of the three subregions in the Sacramento Metro Area during 1999 and 2006. The graph is based on exceedance days during the May through October ozone season and uses three-year averages to help even out some of the year-to-year variation caused by meteorology. The high sites of Folsom and Cool are plotted separately, and values for these sites are not included in the subregional totals, which represent a composite of all other sites in the respective areas. Although ozone data for the Sacramento Metro Area generally show considerable year-to-year variability, the area has made progress in reducing the number of exceedance days.

The greatest amount of progress occurred in the western subregion, where the number of exceedance days decreased 25 percent between 1999 and 2006. Sites in this subregion were relatively clean during 1999 and are even cleaner now. During 2006 and 2007, all sites in the western subregion had design values that met the standard.

Figure 7: Sacramento Metro Area Change in Number of Federal 8-Hour Exceedance Days by Subregion 1999 to 2006



There was also moderate improvement in the central region, with sites other than Folsom showing an overall decrease of 10 percent. In contrast, sites other than Cool in the eastern subregion showed little change, with about 30 exceedances during both years. Looking at the two high sites in the central and eastern subregions shows some difference between values for 1999 and 2006. Folsom, located at the eastern edge of the central subregion, continues to be the high site in that subregion and shows only a slight improvement when comparing 1999 and 2006. Given its location and growth rates in the central subregion over the last decade, the Folsom site is likely the most impacted by emissions within the central subregion, as well as by emissions and pollutants transported from the western subregion. The improvement at Cool was more substantial, with a 15 percent decrease in exceedance days from 1999 to 2006.

Like exceedance days, other ozone air quality indicators such as the mean of the Top 30, the 4th high concentration, and the design value show generally similar trends. Between 1999 and 2006, ozone air quality improved in the western subregion, although there is some year-to-year variability in the indicator values. As mentioned previously, design values for sites in this subregion continue to be lower than the federal standard. In contrast, ozone indicators for the central subregion, including Folsom, have been relatively flat or show a slight increase since 1999. The eastern subregion, including Cool, still presents a substantial challenge, despite some improvement since 1999. At almost all sites in the Sacramento Metro Area, ozone indicators increased in 2005, following unusually low values in 2004. Many showed additional increases in 2006 and 2007. However, values for the last two years are still below levels during the early 2000s. Without additional analyses related to the amounts, as well as the spatial and temporal patterns of emissions, the mix of available precursor emissions, and meteorological conditions, it is difficult to evaluate the direction of the overall trend during the last several years. However, on a regional level, there has been progress.

In general, the modest improvement in ozone air quality in the Sacramento Metro Area since 1999 is accompanied by large year-to-year variations which reflect fluctuations in meteorological conditions. Most of the improvement in the ozone indicators has occurred since 2002. The areawide trend lines would appear to suggest that ozone has gotten worse over the last couple of years, but it is important to recognize that concentrations were uncharacteristically low during 2004. Although values for some indicators for 2005, 2006, and 2007 are higher when compared with the 2004 values, they are still generally lower than values for 2002 and 2003. Because ozone concentrations in the Sacramento Metro Area are much closer to the level of the federal standard than in other areas of the State such as the South Coast or San Joaquin Valley air basins, small changes in meteorology can result in substantial year-to-year changes in the air quality indicators. The next section examines trends after accounting for meteorological variability.

Meteorology and Air Quality Trends

Ozone in the ambient air is the result of several factors, two of the most important being pollutant emissions and meteorology. The meteorological and photochemical processes leading to ozone formation are complex, involving interactions both at the surface and in the upper air. However, they can be characterized in very general terms. In general, strong sunlight and weak dispersion generate relatively high ozone levels, while weak sunlight and strong dispersion generate relatively low ozone levels. Meteorology, or weather conditions, can vary widely, and these day-to-day conditions strongly influence ambient ozone concentrations.

The previous trends discussion looked at air quality as measured at ambient monitoring sites, without any consideration of or adjustment for meteorological variability. The following discussions consider trends that account in varying degrees for the meteorological conditions affecting ozone concentrations. These analyses advance our understanding of the impact of meteorology on ozone air quality and our ability to track ozone improvements attributable to emissions reductions. Another goal of these analyses is to determine the role meteorology has played in the Sacramento Metro Area, where ozone improvement has been more modest than in other areas of the State. The following analyses show that after accounting for meteorological variability, real progress has occurred.

The analyses described below are based on air quality and meteorological data for 1996 through 2005. The meteorological data were drawn from the same statewide dataset used in the WOE analyses for the South Coast and San Joaquin Valley air basins. Although it would have been desirable to include data for 2006 and 2007, these data are still preliminary, and therefore not available for the analysis.

High Ozone Forming Potential

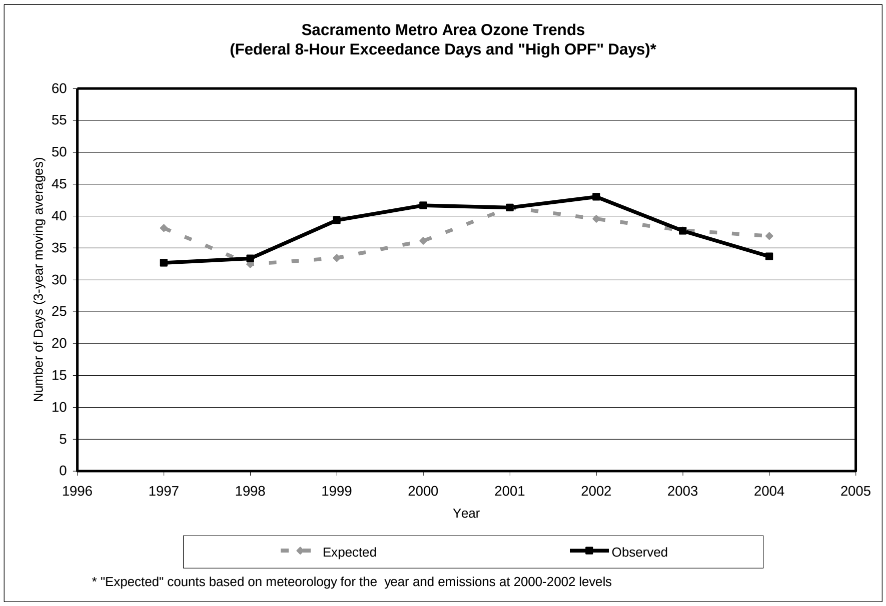
As one approach to help understand the types of meteorological conditions leading to high ozone concentrations, ARB staff completed an analysis of ozone and meteorology using Classification and Regression Tree (CART) techniques. The CART analysis determined rules that separated days into 14 groups with varying degrees of ozone forming potential (OFP), or the degree to which weather conditions favor ozone formation in the Sacramento Metro Area. The CART rules used daily data for surface air temperature, air temperature at 1500 meters[43], the speed and direction of surface winds, and other factors related to daily maximum 8-hour ozone concentrations. Three years, 2000 through 2002, were used to prepare the classification rules and determine the rate (percent) of exceedance days within each of the 14 groups. For the group with the lowest ozone forming potential (OFP), the rate of exceedance days was 0 percent. For the group with the highest OFP, the rate was 100 percent. On that basis, ARB staff calculated the expected number of days exceeding the federal 8-hour ozone standard for each year from 1996 through 2005. While this method is somewhat different from that used in the WOE analyses for the South Coast and San Joaquin Valley air basins, ARB staff believes it improves on the previous method.

The Sacramento Metro Area analysis, presented in Figure 8, shows the expected number and the observed number of days exceeding the federal 8-hour ozone standard

[43] Above sea level

each year (three-year moving averages). The changes in exceedance days relative to changes in high OFP days helps distinguish the changes due to meteorology from changes due to other factors, such as emissions reductions. Progress is shown when the number of exceedance days decreases in relation to the number of high OFP days.

Figure 8: Sacramento Metro Area Analysis of Observed and Expected* Exceedance Days (moving three-year means)

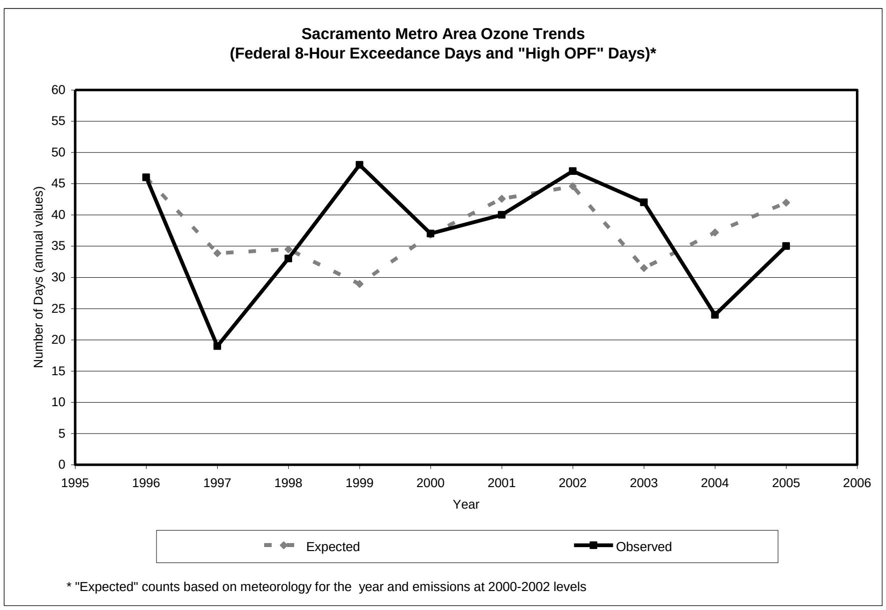


The two lines in Figure 8 generally track each other, indicating that year-to-year changes in exceedance days have been largely attributable to year-to-year changes in weather, rather than changes in emissions. The observed mean for 1996 to 1998 includes an extremely low value for 1997, especially with respect to the expected value -- 19 observed compared with 34 expected (refer to the annual values plotted in Figure 9). As a result, the beginning point on Figure 8 is questionable. It is important to note that Sloughhouse, one of the high exceedance day sites in the Sacramento Metro Area, operated only during a portion of 1997, and this may explain, in part, the low 1997 value. Another possible reason for the low 1997 value is that it was an El Niño year, with likely greater than normal cloud cover and thus less solar radiation and solar heating, resulting in lower ozone concentrations. Regardless of the reason, because the 1997 observed value is questionable, we will focus our evaluation of trends on the 1998 through 2004 timeframe.

Although the subsequent changes (from 1998 through 2004) are not large, two patterns shown in Figure 8 are worth noting. From 1998 through 2002, observed exceedances increased by 10 (from 33 to 43), while expected exceedances increased by 8 (from 32 to 40). During these years, the observed increase generally coincides with the expected increase. However, from 2002 to 2004, observed exceedances decreased by 9 (from 43 to 34), while expected exceedances decreased by only 3 (from 40 to 37). During these years, the decrease in the observed exceedances is greater than the improved meteorology would lead one to expect, suggesting the improvement in ozone is attributable to emissions reductions. However, the difference is modest (only 6 days, 9 expected days versus 3 observed days).

Figure 9 shows the same trends as Figure 8, graphed as annual values, rather than three-year moving averages. It is interesting to note that the observed exceedances average 1.7 days more than expected from 1996 to 2003, but average 10.1 days less than expected for 2004 and 2005. Although ARB staff has not yet formally integrated 2006 and 2007 ozone and meteorological data, preliminary results indicate that the observed exceedances increased to 42 in 2006 before dropping to a new low of 16 in 2007. If these two years continue the recent trend of observed exceedances being lower than expected exceedances, it would more firmly establish a pattern of progress in the Sacramento Metro Area.

Figure 9: Sacramento Metro Area Analysis of Observed and Expected* Exceedance Days (annual values)

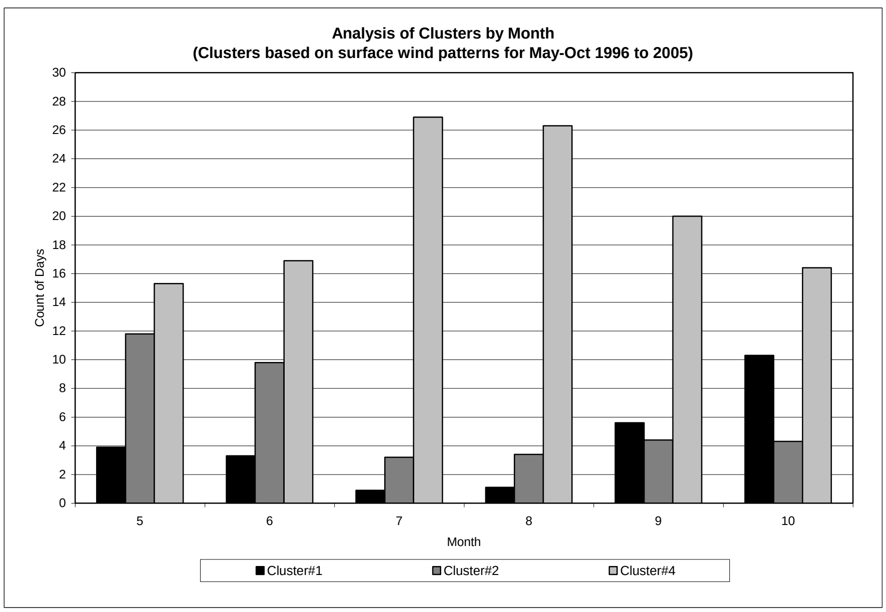


Meteorologically Adjusted Trends

As discussed above, meteorological parameters such as temperature and wind speed are correlated with sunlight and dispersion, which play a large role in determining daily ozone levels. As a second method to address the effects of meteorology on ozone, a statistical model that predicts daily maximum ozone on the basis of daily meteorological data was used to adjust daily ozone observations. Specifically, the model was used to predict daily maximum 8-hour ozone concentrations and then adjust the observed ozone concentrations to compensate for differences between the predicted values and a standard baseline for expected ozone levels throughout the ozone season.

First, a clustering procedure was used to assign days from the May through October ozone season for the years 1996 to 2005 to separate groups based on the daily speed and direction of surface winds at 14 stations in and around the Sacramento Metro Area. Three groups of days were created. These three groups accounted for all but two of the 1840 days in the trend period. Figure 10 shows that the first group of days (Cluster #1) was weighted toward the months of September and October. The second group (Cluster #2) was weighted towards May and June. The third group (Cluster #4) was the most common throughout the ozone season, but was most prevalent for July and August (note that Cluster #3, which is not shown in Figure 10, accounted only 2 of the 1840 days, and therefore, was not significant to the analysis). Each of the clusters shown in Figure 10 represents different general source-receptor scenarios, based on wind summaries.[44]

Figure 10: Sacramento Metro Area Analysis of Clusters by Month (1996 to 2005)

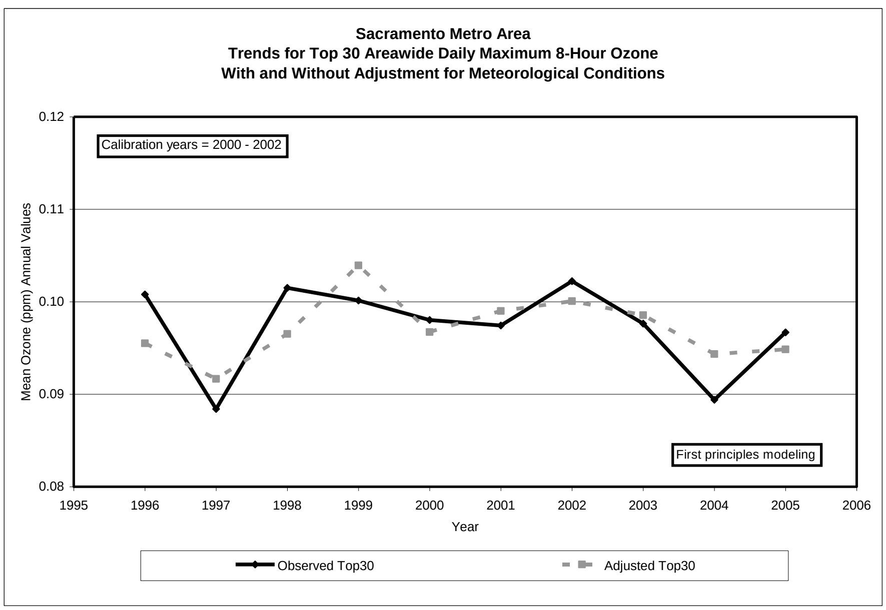


For each of the three clusters, ARB staff used data from 2000 through 2002 to calibrate a within-group model to predict daily maximum 8-hour ozone from daily weather data. A limited span of years was used for calibration so that when the model was applied to the meteorological data for all days from 1996 through 2005, it would provide a level playing field for meteorological effects, apart from the influence of changes in emissions.

[44] North and east components of daily surface winds were averaged by subregion in and around the Sacramento Metro Area. The wind summaries show that the three different clusters shown in Figure 10 represent differences in generalized source-receptor scenarios.

Figure 11 shows observed and met-adjusted trends for the annual mean of the 30 highest daily maximum 8-hour ozone values (Top30; the top 16 percent).[45] Figure 12 shows the same trends as Figure 11, smoothed using a three-year moving average because the process of met-adjustment does not remove all meteorological effects perfectly, and other factors may affect the year-to-year changes. Similar to the air quality trends discussed previously, the met-adjusted trend is downward since 2002. Although maximum concentrations and design values generally increased in 2007, compared with 2006, the mean of the Top 30, as well as the number of exceedance days, decreased. With respect to the met-adjusted analysis, which is based on the mean of the Top 30 ozone concentrations, the combined response for 2006 and 2007 would seem to be a net downturn in ozone concentrations. Therefore, results of these analyses suggest that the Sacramento Metro Area has made a moderate amount of progress over the last several years, and this progress should continue, given continued emissions reductions.

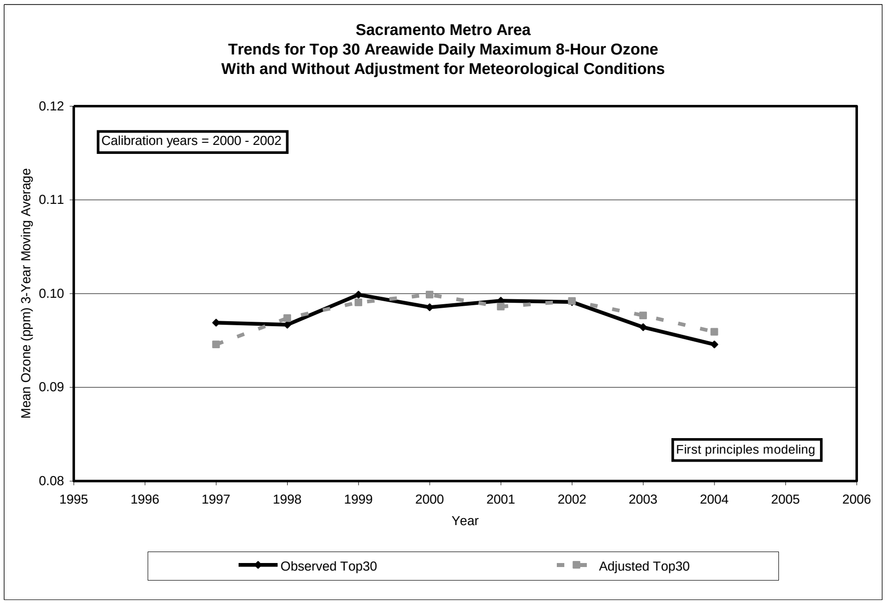
Figure 11: Sacramento Metro Area Analysis of Observed and Met-Adjusted Trends for the Mean of the Top 30 Concentrations (annual values)*



** see footnote under Figure 12.*

[45] The May – October ozone season has 184 days, of which 30 is 16%.

Figure 12: Sacramento Metro Area Analysis of Observed and Met-Adjusted Trends for the Mean of the Top 30 Concentrations (3-year moving averages)*



*As indicated on the graphs, Figures 11 and 12 are based on "first principles modeling" of the relationship between ozone and meteorology. A common alternative is to use stepwise model building methods in which the data during the calibration period determine which parameters are included and which are excluded. The ARB staff chose to work with 18 models, one for each combination of cluster and month (May-Oct). Each model was based on scientific first principles to determine its content. Therefore, temperatures at the surface and aloft were represented by linear and quadratic terms, with the inverse of the wind speed included as a linear term. When a cluster-month combination lacked sufficient data to fit a model reliably, a generic model for the ozone season was applied. In addition, additive offsets for Saturday and Sunday were included to account for potential "ozone weekend effects." The overall performance of this approach achieved an R^2 value greater than 80 percent.

Emissions and Precursor Trends

Reactive organic gases (ROG) and oxides of nitrogen (NO_X) are precursors to ozone. Emissions controls have substantially reduced the amounts of these precursors in the ambient air, despite increases in population and the number of vehicle miles traveled each year. These reductions have resulted in improved ozone air quality. The following sections describe the ROG and NO_X emissions trends in the Sacramento Metro Area since 1994, as well as the amounts of these precursors measured in the ambient air.

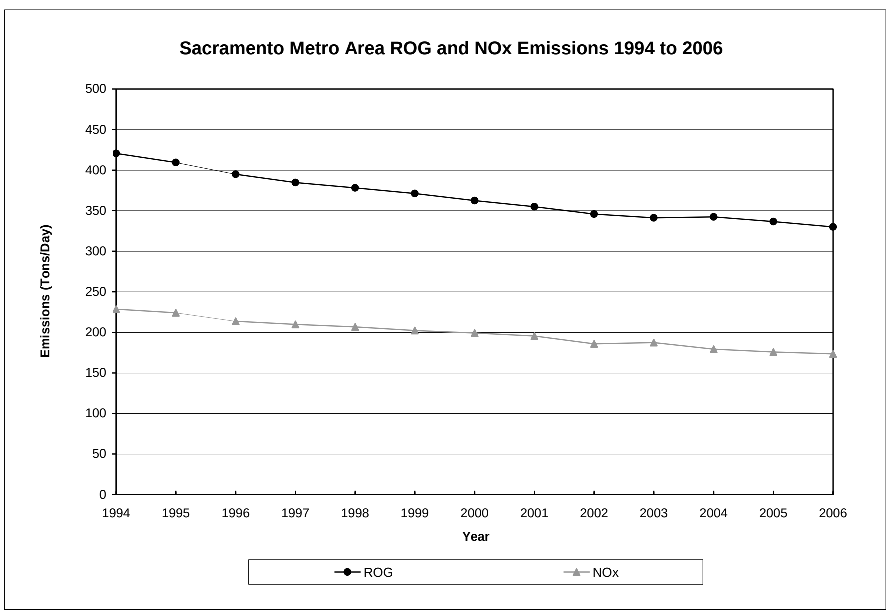
Emissions Trends

Population numbers have been increasing steadily in every county of the Sacramento Metro Area. With the exception of Placer County, the percent growth in each individual county ranges from 20 to 30 percent between 1994 and 2006. For example, the total population in Sacramento County increased from about 1.1 million in 1994 to about 1.4 million in 2006 (a 25 percent increase over the 13 years). The growth rate in Placer

County was about twice the general rate – a 60 percent increase between 1994 and 2006. Furthermore, close to 95 percent of that growth occurred in the western portion of Placer County (in the central subregion), which is east of the Sacramento urban area.

Despite the rapid growth in population, ozone precursor emissions in the Sacramento Metro Area decreased from 1994 to 2006. Figure 13 shows the estimated areawide precursor emissions for an average summer day from 1994 to 2006. It is important to note that the ROG estimates include both anthropogenic (man-made) and biogenic emissions. While the anthropogenic portion changes from year-to-year, the biogenic portion is constant over the entire time period (194 tons/day during each year). On a percentage basis, biogenic emissions account for about 45 percent of the ROG emissions during 1994, increasing to about 60 percent in 2006. Based on the estimates in Figure 13, ROG emissions from anthropogenic and biogenic sources decreased 20 percent between 1994 and 2006 (for comparison, the reduction in only the anthropogenic portion of the ROG emissions was 40 percent). During the same time period, NO_X emissions decreased about 25 percent. These ROG and NO_X reductions occurred in all counties of the Sacramento Metro Area except Placer County, where ROG decreased over the time period, but there was little change in NO_X. The ratio of total ROG to NO_X is relatively constant over the entire time period, varying between 1.8 and 1.9. While ROG and NO_X reductions are generally distributed throughout the Sacramento Metro Area, the anthropogenic emissions are dominated by sources in Sacramento County.

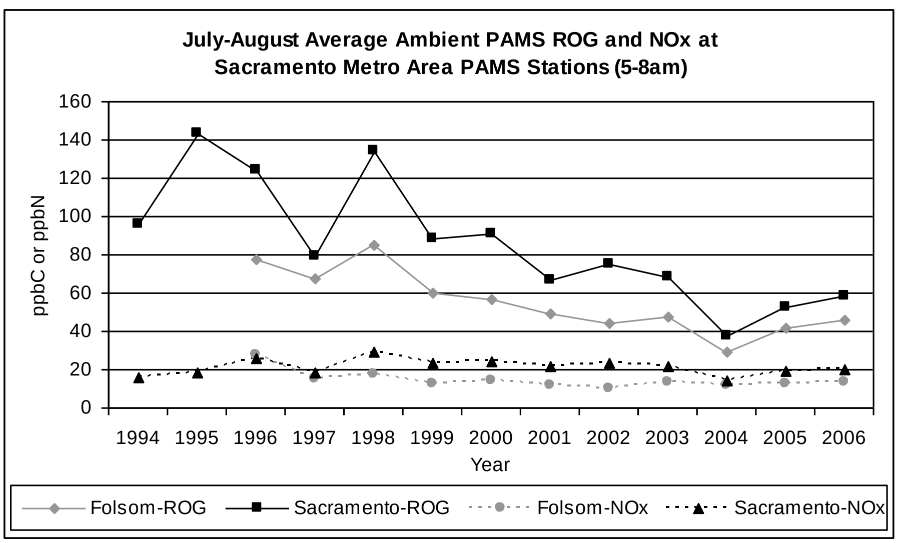
Figure 13: Sacramento Metro Area ROG and NO_X Emissions Estimates 1994 to 2006



Precursor Trends

The decreases seen in the estimated emissions trends are supported by the ambient trends, as well. Figure 14 shows average levels of ROG and NO_X measured in the ambient air at Sacramento-Del Paso Manor and Folsom-Natoma Street, two sites with relatively complete long-term measurement records for both precursors. The data plotted were collected from the Photochemical Assessment Monitoring Stations or PAMS sites, and they reflect measurements collected from 5 a.m. to 8 a.m. during July and August. The trend lines for both sites show overall reductions of about 40 percent, consistent with the decrease in estimated anthropogenic ROG emissions. Although not plotted, ROG reactivity also dropped over the time period, with a 50 percent decrease at each site. Ambient NO_X at Folsom-Natoma Street also decreased 50 percent. In contrast, ambient NO_X concentrations at Sacramento-Del Paso Manor show little change. Because the spatial and temporal scales of the trends are very dissimilar, it is difficult to resolve the differences between the emissions estimates and the ambient PAMS measurements. The important point is that the emissions trends and the ambient trends generally indicate that ROG and NO_X precursors have decreased over time, and these decreases have resulted in improved ozone air quality.

Figure 14: Summer Morning Average ROG and NO_X Measurements from Sacramento Metro Area PAMS Network Stations



Modeling Results

The ozone modeling domain for the Sacramento Metro Area is the same as that used for the San Joaquin Valley and is based on the domain defined for the year 2000 Central California Ozone Study or CCOS. This domain includes not only the Central Valley, but the San Francisco Bay area, as well. It comprises a grid measuring 185 by 185 cells, with a horizontal resolution of four kilometers. The required meteorological fields were generated using the MM5 prognostic meteorological model, and the required emissions inventories were developed by ARB staff. The ozone air quality modeling utilized the Comprehensive Air Quality Model with Extensions (CAMx) air quality model, with initial and boundary conditions based on estimates of clean-air concentrations.

To support modeling for the Sacramento Metro Area and the San Joaquin Valley, ARB staff completed ozone modeling for two episode periods: one during July 1999 and the other during July/August 2000. During these episodes, 8-hour ozone concentrations exceeding the federal standard occurred throughout the region. Analysis of the model outputs included the estimation of 1-hour and 8-hour ozone concentrations for each ozone monitoring site within the domain, as well as statistical measures comparing observed and simulated ozone concentrations. These analyses were used to evaluate model performance by subregion within the domain.

As required by U.S. EPA guidance, a relative reduction factor (RRF) approach was used in projecting future year design values. The RRF reflects the ratio between the future year model prediction (in this case the end of 2018) and the reference year model prediction (in this case 2002). A reference year design value is then multiplied by the RRF to project a future year design value.

Results of the modeling analyses indicate that NO_X reductions will be more effective than ROG reductions in reducing ozone concentrations in the Sacramento Metro Area. Because the magnitude of the ozone problem varies throughout the Sacramento Metro Area, the amounts of emissions reductions needed to reach attainment also vary. Overall, the attainment strategy relies on a 10 percent or more reduction in NO_X that will bring the worst-case site, Cool, down to a level of less than 0.085 ppm at the end of 2018. Modeling results show Folsom, which had the highest design value in 2007, at a level of less than 0.083 ppm at the end of 2018, with the same level of control.

Summary

As allowed by U.S. EPA guidance, this weight of evidence (WOE) package comprises a set of complementary analyses that supplement the SIP-required modeling, thereby providing additional support for the attainment demonstration. Currently, the Sacramento Metro Area is classified as a Serious ozone nonattainment area with an attainment date of June 15, 2013. Photochemical modeling results indicate that reducing NO_X emissions will be the most effective strategy for bringing the Sacramento Metro Area into attainment. These reductions will not be in place by the 2013 deadline. However, they should be implemented by 2018. Therefore, districts in the Sacramento Metro Area have approved reclassification, and ARB has requested that U.S. EPA reclassify the Sacramento Metro Area as Severe-15, with a required attainment date of June 15, 2019.

The ARB staff's modeling results indicate that NO_X emissions reductions will be critical for bringing sites in the Sacramento Metro Area into attainment. Given the timeframe over which these reductions are expected to occur, the Sacramento Metro Area should be attainment by June 15, 2019, with a 10 percent or more reduction in NO_X emissions. Based on modeling, as well as supporting analyses included in this WOE evaluation, attainment by 2019 is anticipated because of the following factors:

- Since 1999, the number of areawide exceedance days decreased a little more than 10 percent. The maximum concentration and design value show more modest reductions, with decreases of about 10 and 5 percent, respectively, from 1999 to 2006. Because these are areawide numbers, they reflect the “worst case” sites. Although 2007 data show a slightly higher maximum concentration and a design value comparable with 2006, they show the number of areawide exceedance days at an all-time low of 16 days for the entire year.

- While the amount of progress varies on a subregional basis, there has been a substantial reduction in the number of exceedance days in the western subregion. Since 1999, exceedance days decreased 25 percent, and all sites in this subregion now attain the federal 8-hour ozone standard.

- Between 1999 and 2006, the central subregion shows a 10 percent decrease in the three-year average of exceedance days at all sites but Folsom, which shows only a slight reduction in days. Although progress at Folsom appears to have slowed over the last several years, the central subregion has demonstrated long-term progress. Sites with long-term data, including Folsom, show a 35 to 50 percent decrease in exceedance days since 1990, based on three-year averages. The decrease in design values has been more modest, averaging about 5 percent since 1990.

- Although sites in the eastern subregion still have some of the highest ozone concentrations, the three-year average of exceedance days at Cool, the worst site in this area, decreased about 15 percent between 1999 and 2006. Other sites in the subregion showed little change in the average number of exceedance days between 1999 and 2006.

- During the late-1990s, the ozone problem was more widespread throughout the Sacramento Metro Area. Since then, all areas have improved, although at differing rates. All of the western subregion and the easternmost portion of the eastern region now meet the federal standard. The ozone problem is now confined to the central subregion and the more urbanized portions of the eastern subregion. However, even at the worst sites in these subregions (Cool and Folsom), 60 to 65 percent of the days during the 2006 ozone season were below the more stringent State 8-hour ozone standard.

- Ozone indicator values for many sites in the Sacramento Metro Area were higher for 2005, 2006, and 2007 than for 2004. However, the 2004 values were uncharacteristically low. When compared with values for 2002 and 2003, the values for 2005 through 2007 are generally lower, indicating progress. The Sacramento Metro Area is much closer to attainment than other areas of the State, such as the South Coast and San Joaquin Valley air basins. Because the Sacramento Metro Area values are closer to the standard, small variations in meteorology can result in relatively large year-to-year changes in the trends. These variations can make it difficult to interpret the trends. However, in the Sacramento Metro Area, it appears there has been overall improvement, despite this variability.

- Analyses suggest that recent ozone improvements are linked to emissions reductions. The decline in the number of exceedance days relative to the number of days with a high potential for ozone formation indicates that the modest improvements in ozone over the last few years were related to emissions reductions rather than favorable meteorological conditions. A more detailed adjustment of ozone trends for the annual mean of the Top 30 produced similar results. Results of these analyses also indicate that increasingly adverse meteorological conditions are now needed to create ozone levels exceeding the federal 8-hour standard.

- Estimated ROG and NO_X emissions trends, as well as ambient measurements, indicate reductions in both precursors since the mid-1990s. These reductions have resulted in modest ozone improvements. Emissions estimates indicate a continuing decline in ROG and NO_X emissions. However, photochemical modeling results show that NO_X reductions will be critical to attainment. As a result, a control strategy relying on a 10 percent or more reduction in NO_X emissions is proposed as the most efficient path to attainment by June 15, 2019.

- Photochemical modeling results show a design value of less than 0.085 ppm with proposed new controls for the Sacramento Metro Area by the end of 2018. Many sites will reach attainment before this date. Coupled with the analyses completed for the WOE, it is reasonable to conclude that the entire Sacramento Metro Area will reach attainment within this timeframe, consistent with the June 15, 2019, attainment deadline.

Taken together, all of these factors indicate that the Sacramento Metro Area can expect to attain the federal 8-hour ozone standard by June 15, 2019, the required attainment date for a Severe-15 ozone nonattainment area.

Appendix F: Motor Vehicle Emissions Budgets and Vehicle Miles Traveled Offset Analysis

The motor vehicle emissions budgets (MVEB) for VOC and NO_X were calculated for reasonable further progress (RFP) milestone years (2014, and 2017) and the 2018 attainment demonstration year. On-road motor vehicle emission estimates were developed using the latest available transportation data and California's EMFAC2011 model. The forecasted vehicle miles traveled (VMT) and speed distributions used are based on the Sacramento region's 2013/2016 Metropolitan Transportation Improvement Plan (2013/16 MTIP)[46] and the Plan Bay Area Preferred Land Use Scenario/Transportation Investment Strategy[47]. The latest adjustments for recent ARB baseline controls were subtracted from the EMFAC2011 emissions. Finally, reductions from proposed new regional incentive measures affecting on-road motor vehicle emissions were subtracted. Additionally, the transportation budgets incorporate a "safety margin" needed primarily to allow flexibility to adjust for uncertainties in rate of growth and other factors that may affect actual emission estimates. The resulting SIP control forecasted motor vehicle emissions were rounded up to whole numbers to get the MVEB.

Tables F-1, F-2, and F-3 document the MVEB calculations for 2014, 2017, and 2018, respectively. Table F-4 contains the SACOG and Bay Area's Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC) planning assumptions for human population forecasts and vehicle miles traveled by county areas that were used to derive motor vehicle emissions.

[46] Final 2013/16 Metropolitan Transportation Improvement Program (MTIP), Amendment #1 to the MTP/SCS 2035, and Air Quality Conformity Analysis. (August 16, 2012), FHWA approval December 14, 2012.

[47] Joint MTC Planning/ABAG Administrative Committees, *Plan Bay Area Preferred Land Use and Transportation Investment Strategy*. Oakland, CA: Bay Area Metropolitan Transportation Commission. [May 11, 2012.]

Table F-1

Sacramento Federal Nonattainment Area
Transportation Conformity Budgets for 8-hour Ozone
Summer Planning Emissions in Tons per Day

	2014	
	ROG	**NO_X**
On-Road Emissions from EMFAC2011	**23.43**	**47.70**
Adjustments to Baseline*	**-02.63**	**-2.15**
Regional Strategy Reductions	**-0.10**	**-0.53**
Net Inventory	**20.70**	**45.02**
Safety Margin	**2**	**3**
Conformity Budget**	**23**	**49**

* Reductions from adopted rules not reflected in EMFAC.
** Budget is obtained by rounding up to the nearest ton.

Table F-2

Sacramento Federal Nonattainment Area
Transportation Conformity Budgets for 8-hour Ozone
Summer Planning Emissions in Tons per Day

	2017	
	ROG	**NO_X**
On-Road Emissions from EMFAC2011	**18.98**	**37.12**
Adjustments to Baseline*	**-2.37**	**-0.60**
Regional Strategy Reductions	**-0.03**	**-0.41**
Net Inventory	**16.58**	**36.11**
Safety Margin	**1**	**2**
Conformity Budget**	**18**	**39**

* Reductions from adopted rules not reflected in EMFAC.
** Budget is obtained by rounding up to the nearest ton.

Table F-3

Sacramento Federal Nonattainment Area
Transportation Conformity Budgets for 8-hour Ozone
Summer Planning Emissions in Tons per Day

	2018	
	ROG	**NO_X**
On-Road Emissions from EMFAC2011	**17.75**	**34.34**
Adjustments to Baseline*	**-2.26**	**-0.66**
Regional Strategy Reductions	**-0.03**	**-0.49**
Net Inventory	**15.46**	**33.19**
Safety Margin	**1**	**3**
Conformity Budget**	**17**	**37**

* Reductions from adopted rules not reflected in EMFAC.
** Budget is obtained by rounding up to the nearest ton.

Table F-5
Population and Vehicle Miles Traveled (VMT) Forecasts
Sacramento Region

Population (Household only)	2002	2014	2017	2018	2035
El Dorado County (MC)	138,432	156,493	159,180	160,086	187,843
Placer County (SV and MC)	272,187	366,440	382,575	388,110	500,957
Sacramento County	1,284,789	1,459,969	1,503,352	1,518,097	1,888,375
South Sutter	4,914	3,200	3,200	3,200	12,879
Yolo County	177,179	206,282	215,243	218,316	277,086
Solano (SV)	118,900	133,560	136,820	137,980	161,100
Regional Total	**1,996,402**	**2,325,944**	**2,400,370**	**2,425,789**	**3,028,240**

Notes:
1. SACOG household population forecasts based on MTP/SCS2035 (adopted on 4-19-2012) are from SACOG's Tina Glover 1-15-2013 email.
2. El Dorado County and Placer County population data exclude the Tahoe Basin.
3. 2002 population is from CEPAM growth database and is based on DOF data.
4. Solano population for all years is from CEPAM growth database and is based on DOF data and forecast.
5. SV = Sacramento Valley portion, MC = Mountain Counties portion
6. Sacramento Nonattainment Area fraction for South Sutter is estimated at 6% of Sutter County.
7. Regional Total represents the Sacramento Nonattainment Area.

Daily VMT (1000)	2002	2014	2017	2018
El Dorado (MC)	3,541	3,853	4,025	4,022
Placer (MC)	1,215	1,589	1,690	1,700
Placer (SV)	6,101	8,656	9,247	9,398
Sacramento County	31,598	35,861	37,340	37,644
South Sutter	495	666	684	680
Yolo County	4,733	5,996	6,263	6,338
Solano (SV)	4,913	4,829	4,902	4,927
Regional Total	**52,595**	**61,449**	**64,152**	**64,709**

Notes:
1. 2014, 2017, 2018 VMT data (except Solano) are based on SACOG's 2013/2016 MTIP (August 16, 2012), transmitted to SMAQMD on 12/5/2012.
2. 2014, 2017, 2018 VMT Solano VMT data are based on Plan Bay Area Preferred Land Use Scenario/ Transportation Investment Strategy (May 11, 2012), transmitted to SACOG in May 2012.
3. 2011 VMT is extrapolated using 2014, 2017 and 2018 VMT activities.
4. 2002 VMT is default 2002 VMT in EMFAC2011 model.
5. Sacramento Nonattainment Area VMT fraction for South Sutter is estimated at 30% of Sutter County.
6. SV = Sacramento Valley portion, MC = Mountain Counties portion

7. Unlike 2011 Revision, 2035 VMT is not presented because it not used in the plan.
8. Regional Total represents the Sacramento Nonattainment Area.

Appendix F-1: Vehicle Miles Travelled Offset Demonstration

Introduction

CAA Section 182(d)(1)(A) applies to areas classified as severe or extreme nonattainment of the National Ambient Air Quality Standard (NAAQS) for ozone. The Sacramento Federal Ozone Nonattainment Area is currently designated as Severe-15, and is subject to this requirement. This demonstration is included as part of the 2013 update to the Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan to address the requirements of Section 182(d)(1)(A).

CAA Section 182(d)(1)(A) states that

> *"Within 2 years after November 15, 1990, the State shall submit a revision [to their state implementation plans (SIPs)] that identifies and adopts specific enforceable transportation control strategies and transportation control measure to offset any growth in emissions from growth in vehicle miles traveled or numbers of vehicle trips in such area and to attain reduction in motor vehicle emissions as necessary, in combination with other emission reduction requirements of this subpart, to comply with the requirements of subsection (b)(2)(B) and (c)(2)(B) of this section (pertaining to periodic emissions reduction requirements). The State shall consider measures specified in section 108(f) of this title, and choose from among and implement such measures as necessary to demonstrate attainment with the national ambient air quality standards; in considering such measures, the State should ensure adequate access to downtown, other commercial and residential areas and should avoid measures that increase or relocate emissions and congestion rather than reduce them."*

This vehicle miles travelled (VMT) emissions offset demonstration was prepared in accordance with U.S. EPA's August 2012 guidance entitled "Implementing Clean Air Act Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Travelled." U.S. EPA updated the guidance in response to a decision of the Ninth Circuit Court of Appeals in *Association of Irritated Residents v EPA,* (9th Cir. 2011, reprinted as amended on January 27, 2012, 632 F. 3d 584, at 596-597) which required severe and extreme nonattainment regions to resubmit the VMT emissions offset demonstrations in their ozone State Implementation Plans (SIPs or plans).

In 2009, CARB submitted the 8-hour ozone reasonable further progress plan for the Sacramento region, as required by the 1990 Amendments to the Clean Air Act. The 2009 plan addressed the requirements of Section 182(d)(1)(A) according to EPA's longstanding interpretation that "no further TCMs are necessary if aggregate motor vehicle emissions are projected to decline each year from the base year of the plan to the attainment year."

In early 2011, the Ninth Circuit Court of Appeals ruled that EPA should have required regions to offset any growth in emissions resulting from increased VMT. This ruling effectively requires regions, including Sacramento, to resubmit the VMT offset demonstrations.

In August 2012, EPA released guidance in response to the Court Opinion. This guidance indicates that technology improvements such as vehicle technology improvements, motor vehicle fuels, and other control strategies that are transportation-related could be used to offset increases in emissions due to VMT. This guidance also sets out a methodology for demonstrating achievement of the VMT offset requirement. The projected attainment year emissions, assuming no new control measures and no VMT growth, are compared with projected actual attainment year emissions that include new control measures and VMT growth. If the latter number is smaller than the former, no additional transportation control measures or transportation control strategies would be required.

The first step is identifying the base year. The guidance recommends that areas use the same base year used in the attainment demonstration. But the guidance does not address which attainment demonstration should be used. This analysis uses two base years. 1990 is used since Section 182(d)(1)(A) was part of the 1990 Amendments and clearly contemplated the use of 1990 as a base year. However, for the 8-hour attainment demonstration, 2002 is the base year as provided in the 2009 SIP. Since U.S. EPA's guidance is not specific, two analyses are provided, one using 1990, and a second alternative using 2002 as the base year.

Transportation Control Strategies And Transportation Control Measures

By listing them separately, the Clean Air Act [CAA §182(d)(1)(A)] differentiates between transportation control strategies (TCS) and transportation control measures (TCM), and thus provides for a wide range of strategies and measures as options to offset increased emissions from growth in vehicle miles traveled (VMT). Based on the provisions in Section 182(d)(1)(A) and the clarifications provided in the U.S. EPA guidance, any combination of transportation control strategies and TCMs may be used to meet the requirement to offset growth in emissions resulting from VMT growth. Since 1990 when this requirement was established, California has adopted a substantial number of enforceable transportation strategies – more than enough to meet the requirement to offset the growth in emissions from VMT growth. A list of the state's mobile source control program adopted since 1990 is provided in Attachment F-1. This list is as complete as possible and includes strategies that may have only a marginal impact on ozone. SACOG has also developed a number of TCMs to provide emission reductions; a list of SACOG TCMs implemented in the Sacramento Ozone Nonattainment Area is provided in Attachment F-2.

Methodology

The following calculations are based on the U.S. EPA guidance. As discussed above, two sets of calculations are provided. The first set uses 1990 as the base year, and a second alternative analysis is presented using 2002 as the base year. In both analyses, the attainment year is 2018, as specified in the 8-hour ozone attainment demonstration.

Analysis Using 1990 as the Base Year

Step 1. Provide the emissions levels for the base year.

The base year assumed for the demonstration is 1990. The following table shows the ROG and NO_X emissions for calendar year 1990 from the EMFAC2011 model.

		Emissions	
Description	VMT (miles/day)	ROG (tons/day)	NO_X (tons/day)
1990 Data	38,997,622	163	142

Step 2. Calculate three emissions levels in the attainment year.

For the attainment year of 2018,

Calculation 1: calculate emissions levels with the motor vehicle control program frozen at 1990 levels and with projected VMT in the attainment year. This represents what the emissions in the attainment year would have been if transportation control strategies and TCMs had not been implemented after 1990;

Calculation 2: calculate emission levels with the motor vehicle control program frozen at 1990 levels and assuming VMT do not increase; and

Calculation 3: calculate an emissions level that represents emissions with full implementation of all transportation control strategies and TCMs since 1990 and growth in VMT at levels projected for 2018. This represents the projected future year baseline emissions inventory in the attainment year.

Step 3. Compare emission levels

Compare calculation 2 results to calculation 3 results. If the emission results in calculation 3 are lower than calculation 2, then the growth in emissions from growth in VMT has been offset, and the area has met the requirements in 182 (d)(1)(A).

Calculation 1: Calculate the emissions in the attainment year assuming no new measures since the base year with growth in VMT

To perform this calculation, the California Air Resources Board (CARB) staff identified the on-road motor vehicle control programs adopted since 1990 and adjusted the EMFAC2011 to reflect the ROG and NO_X emissions levels in 2018 without the benefits of the post-1990 control programs. The projected ROG and NO_X emissions are 115 and 159 tons/day, respectively.

Calculation 2: Calculate the emissions with no new measures and no_growth in VMT

For this calculation, EMFAC 2011 was run for calendar year 2018 with the 1990 VMT level of 38,997,622 miles per day. The ROG and NO_X emissions associated with the 1990 VMT level are 102 and 99 tons/day, respectively.

Calculation 3: Calculate emission reductions with full implementation of Transportation Control Strategies and TCMs and projected VMT growth

The ROG and NO_X emission levels for 2018 assuming the benefits of the post-1990 motor vehicle control program and the projected VMT levels in 2018 are calculated using EMFAC2011. The projected ROG and NO_X emissions levels are 18 and 34 tons/day, respectively.

ROG and NO_X emissions for the three sets of calculations described above are provided in the following table.

			Emissions	
Calculation	Description	VMT (miles/day)	ROG (tons/day)	NO_X (tons/day)
1	Motor Vehicle Control Program Frozen at 1990 Levels (VMT at 2018 Projected Levels)	65,438,841	115	159
2	Motor Vehicle Control Program Frozen at 1990 Levels (VMT at 1990 Levels)	38,997,622	102	99
3	Full Motor Vehicle Control Program in Place (VMT at 2018 Projected Levels)	65,438,841	18	34

As provided in the U.S. EPA guidance, to determine compliance with the provisions of Section 182(d)(1)(A) of the federal Clean Air Act, the emissions levels in Calculation 3 should be less than the emissions levels in Calculation 2:

ROG: 18 < 102 tons/day
NO_X: 34 < 99 tons/day

Analysis Using 2002 as the Base Year

This alternative analysis is for the base year of 2002.

Step 1. Provide the emissions levels for the base year.

The following table shows the ROG and NO_X emissions for calendar year 2002 from the EMFAC2011 model.

		Emissions	
Description	VMT (miles/day)	ROG (tons/day)	NO_X (tons/day)
2002 Data	52,594,743	52	100

Step 2. Calculate three emissions levels in the attainment year.

For the attainment year of 2018,

Calculation 1: calculate emissions levels with the motor vehicle control program frozen at 2002 levels and with projected VMT in the attainment year. This represents what the emissions in the attainment year would have been if transportation control strategies and TCMs had not been implemented after 2002;

Calculation 2: calculate emission levels with the motor vehicle control program frozen at 2002 levels and assuming VMT do not increase; and

Calculation 3: calculate an emissions level that represents emissions with full implementation of all transportation control strategies and TCMs since 2002. This represents the projected future year baseline emissions inventory in the attainment year.

Step 3. Compare emission levels

Compare calculation 2 results to calculation 3 results. If the emission results in calculation 3 are lower than calculation 2, then the growth in emissions from growth in VMT has been offset, and the area has met the requirements in 182 (d)(1)(A).

Calculation 1. Calculate the emissions in the attainment year assuming no new measures since the base year with growth in VMT

To perform this calculation, the California Air Resources Board (CARB) staff identified the on-road motor vehicle control programs adopted since 2002 and adjusted the EMFAC2011 output to reflect the ROG and NO_X emissions levels in 2018 without the benefits of the post-2002 control programs. The projected ROG and NO_X emissions are 33 and 93 tons/day, respectively.

Calculation 2. Calculate the emissions with no new measures and no growth in VMT

EMFAC2011 allows the user to input different vehicle miles travelled. As such, for this calculation, EMFAC 2011 was run for calendar year 2018 with the 2002 VMT level of 52,594,743 miles per day. The ROG and NO_X emissions associated with the 2002 VMT level are 31 and 79 tons/day, respectively.

Calculation 3. Calculate emission reductions with full implementation of Transportation Control Strategies & TCMs and projected VMT growth

The ROG and NO_X emission levels for 2018 assuming the benefits of the post-2002 motor vehicle control program and the projected VMT levels in 2018 are calculated using EMFAC2011. The projected ROG and NO_X emissions levels are 18 and 34 tons/day, respectively. ROG and NO_X emissions for the three sets of calculations described above are provided in the following tables.

	Description	VMT (miles/day)	ROG (tons/day)	NO_X (tons/day)
1	Motor Vehicle Control Program Frozen at 2002 Levels (VMT at 2018 Projected Levels)	65,440,841	33	93
2	Motor Vehicle Control Program Frozen at 2002 Levels (VMT at 2002 Levels)	52,594,743	31	79
3	Full Motor Vehicle Control Program in Place (VMT at 2018 Projected Levels)	65,440,841	18	34

As provided in the U.S. EPA guidance, to determine compliance with the provisions of Section 182(d)(1)(A) of the federal Clean Air Act, the emissions levels in Calculation 3 should be less than the emissions levels in Calculation 2:

$$\text{ROG: } 18 < 31 \text{ tons/day}$$
$$\text{NOX: } 34 < 79 \text{ tons/day}$$

Summary

The previous sections provide an analysis to demonstrate compliance with the provisions of Section 182(d)(1)(A) of the federal Clean Air Act. To further illustrate the demonstration, Figures F-1 and F-2 below graphically display the emissions benefits of the motor vehicle control programs in offsetting ROG and NO_X emissions due to VMT increases in the Sacramento Ozone Nonattainment Area.

- Purple Bar: Shows the emissions associated with the base year (1990 or 2002) VMT;

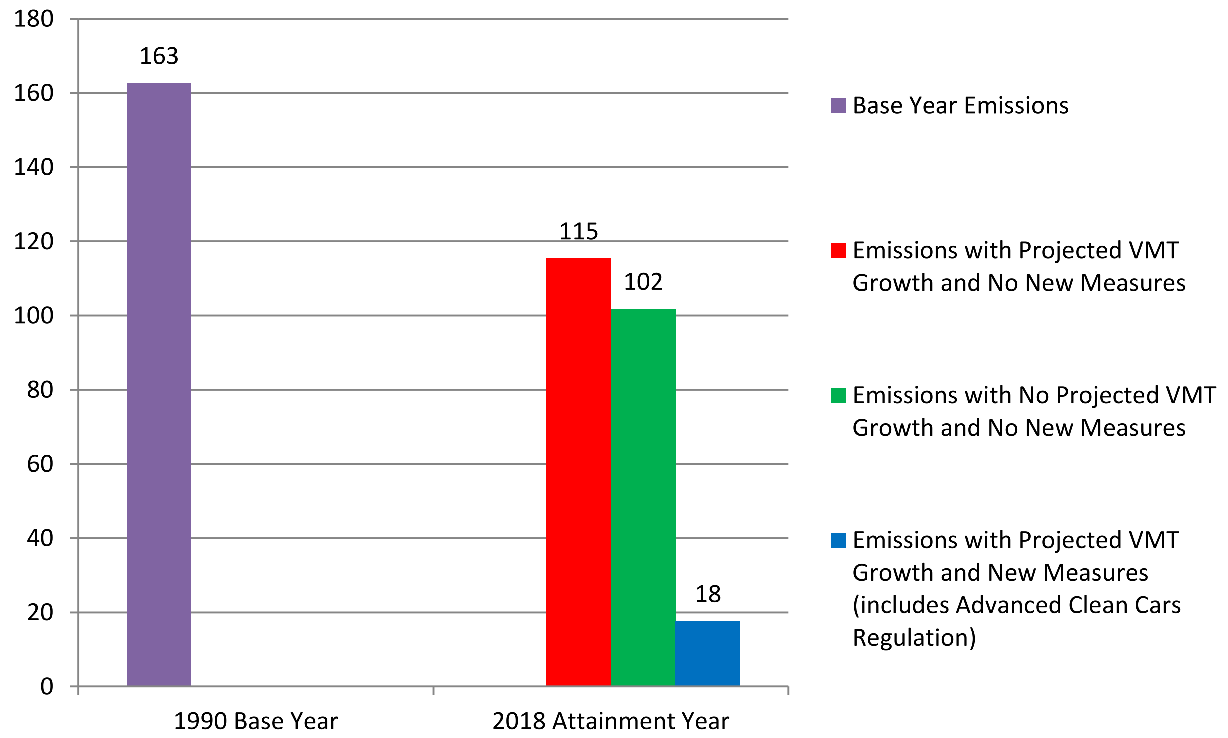
The three sets of bars on the right in each figure show: the emission levels in 2018

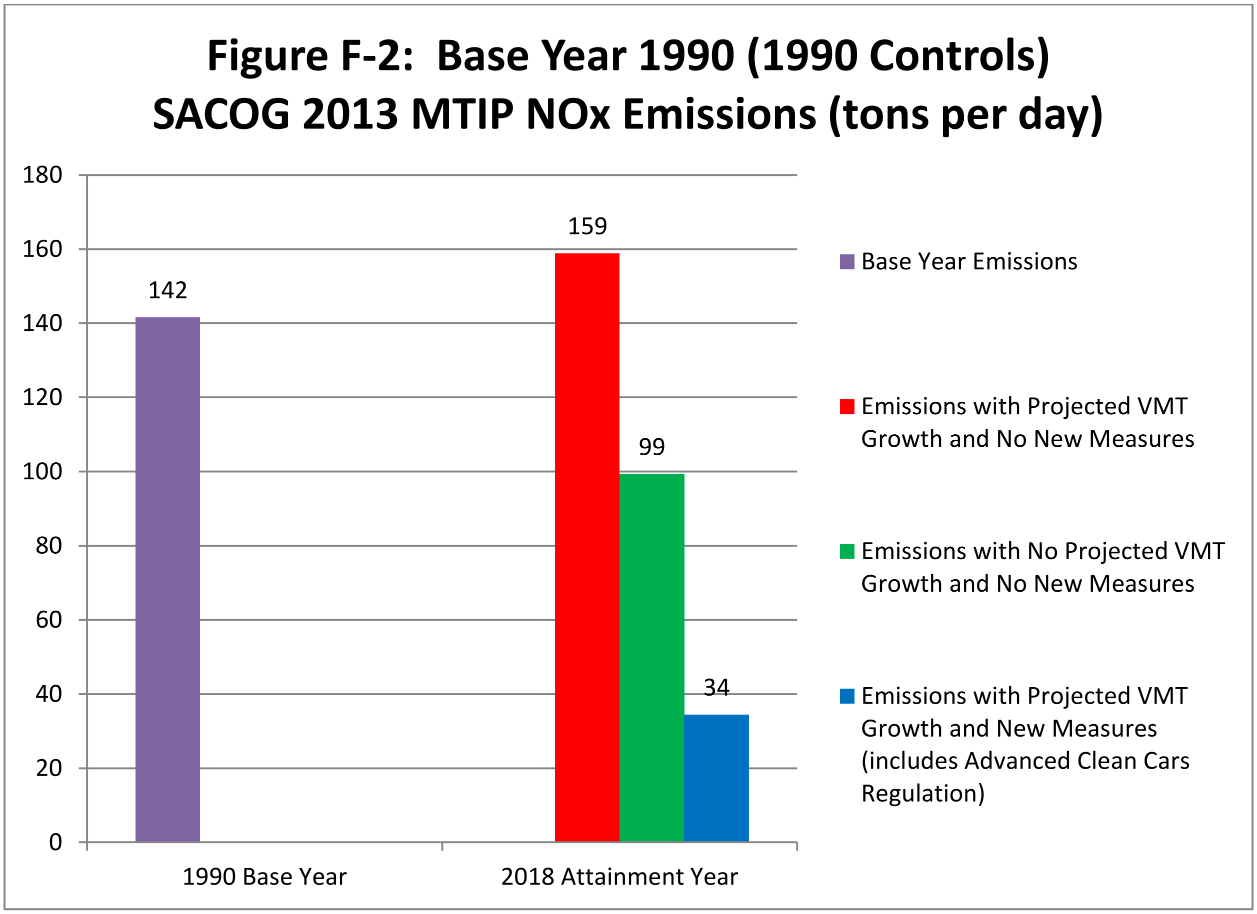
- Red Bar: Shows the emission levels if there were no further motor vehicle controls after 1990 and with projected VMT increases

- Green Bar: Shows the emissions if VMT does not increase from 1990 levels and there are no transportation control strategies or TCMs after 1990
- Blue Bar: Shows the emission levels with the post-1990 motor vehicle control program in place and with projected VMT growth

Based on the U.S. EPA guidance, if the blue bar is lower than the green bar, then the identified transportation control strategies and TCMs are sufficient to offset the growth in emissions.

Figure F-1: Base Year 1990 (1990 Controls) SACOG 2013 MTIP ROG Emissions (tons per day)





A similar set of calculations are made using 2002 as the base year. Figures F-3 and F-4 illustrate the results of the calculation for ROG and NO_X, respectively. As with the first analysis, the blue bar is lower than the green bar, the identified transportation control strategies and TCMs are sufficient to offset the growth in emissions.

Figure F-3: Base Year 2002 (2002 Controls) SACOG 2013 MTIP ROG Emissions (tons per day)

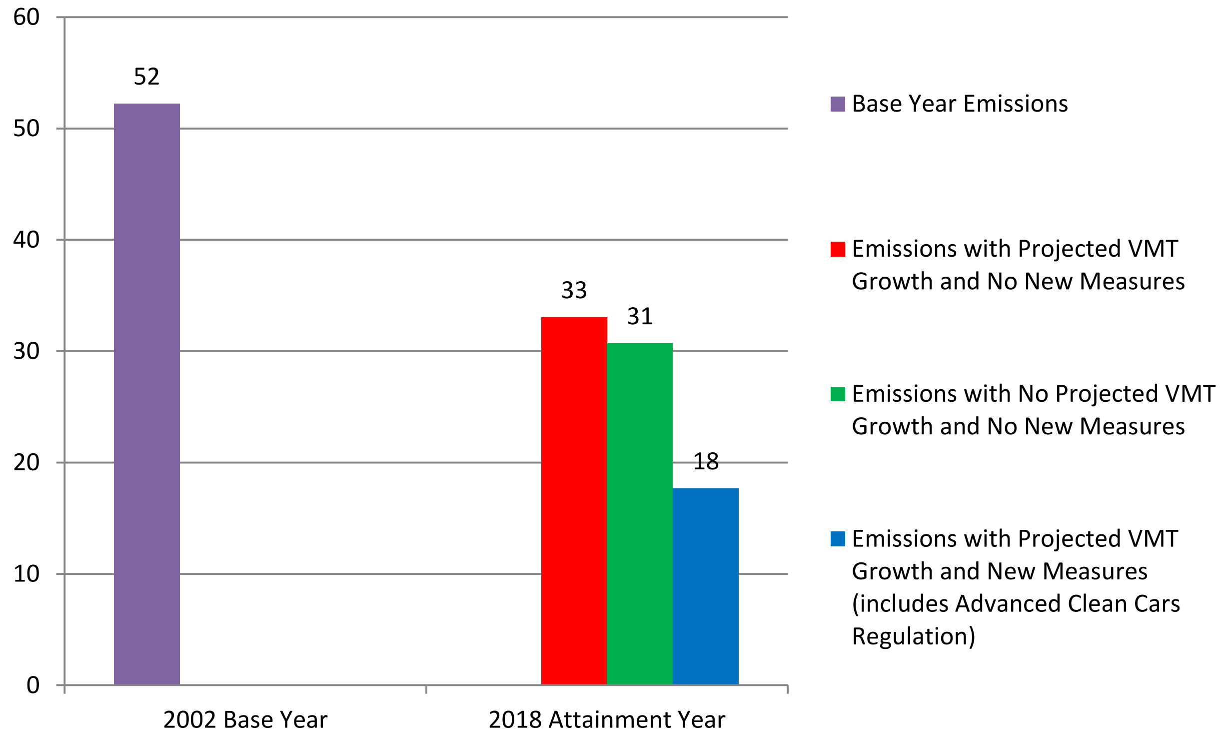
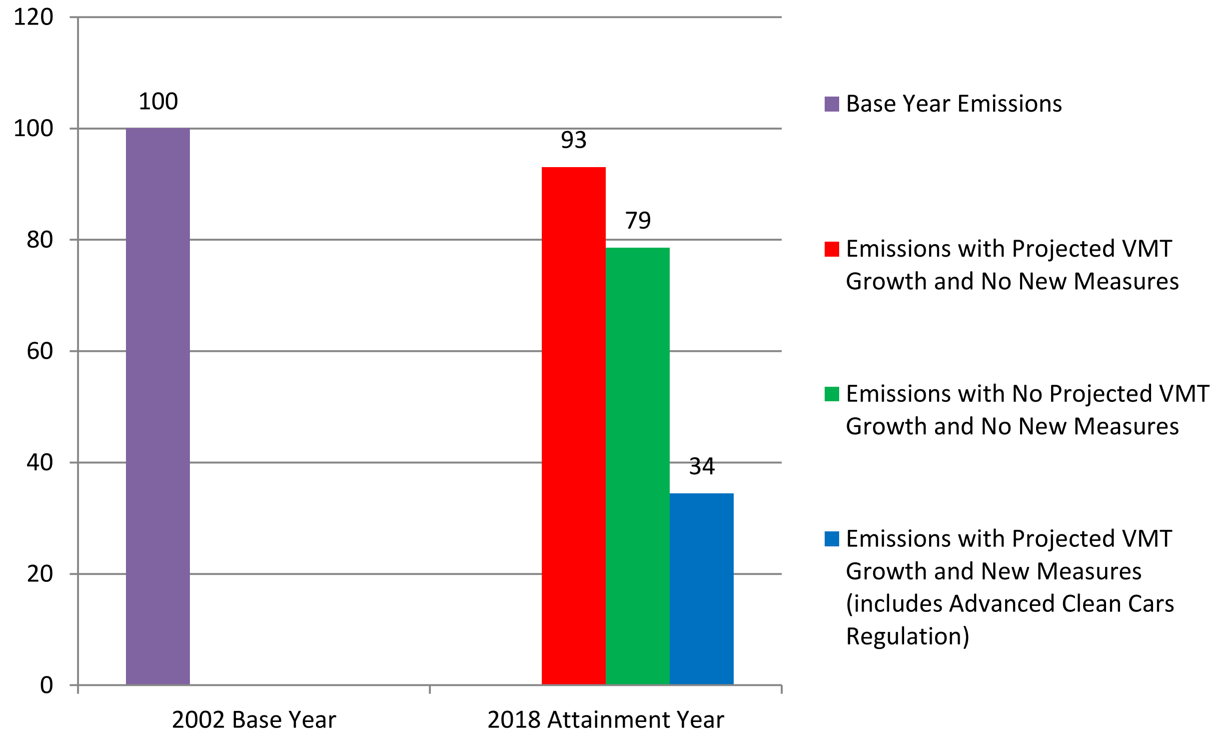


**Figure F-4: Base Year 2002 (2002 Controls)
SACOG 2013 MTIP NOx Emissions (tons per day)**



In both analyses, there are sufficient transportation control strategies and TCMs to offset the emissions increase due to growth in VMT. This demonstrates compliance with the requirements of Section 182(d)(1)(A) of the federal Clean Air Act.

Attachment F-1 State of California Motor Vehicle Control Program (1990-Present)

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
Emission Control System Warranty. T 13, CCR, 2035-2041, 1977	12/14/89	On-road
Certification Procedure for Aftermarket Parts. VC 27156 & 38391	02/08/90	On-road
Emission Standards for Medium Duty Vehicles. T 13, CCR, 1900, 1956.8, 1960.1, 1968.1, 2061, 2112, 2139	06/14/90	On-road
Wintertime Limits for Sulfur in Diesel Fuel. T 13, CCR, 2255 06/21/90 Fuels		
Evaporative Emission Standards. T 13,CCR, 1976	08/09/90	On-road
California Reformulated Gasoline (CaRFG), Phase I. T 13, CCR, 2251.5	09/27/90	Fuels
Low Emission Vehicles and Clean Fuels. T 13, CCR, 1900, 1904, 1956.8, 1960.1, 1960.1.5, 1960.5 and 2111, 2112, 2125, and 2139, 2061.	09/28/90	On-road
Heavy Duty Diesel Smoke Emission Testing. T 13, CCR, 2180-2187	11/08/90	On-road
Limit on Aromatic Content of Diesel Fuel. T 13, CCR, 2256	12/13/90	Fuels
Onboard Diagnostics for Light-Duty Trucks and Light & Medium-Duty Motor Vehicles. T 13, CCR, 1977, 1968.1	09/12/91	On-road
Onboard Diagnostic, Phase II. T 13, CCR, 1968.1, 1977	11/12/91	On-road
Low Emission Vehicles amendments revising reactivity adjustment factor (RAF) provisions and adopting a RAF for M85 transitional low emission vehicles. T 13, CCR, 1960.1	11/14/91	On-road
California Reformulated Gasoline, Phase II. T 13, CCR, 2250, 2255.1, 2252, 2260 - 2272, 2295	11/21/91	Fuels
Wintertime Gasoline Program. T 13, CCR, 2258, 2298, 2251.5, 2296	11/21/91	Fuels
Specifications for Alternative Motor Vehicle Fuel. T 13, & 26, CCR, 2290, 2291, 2292.1, 2292.2, 2292.3, 2292.5, 2292.6, 2292.7, 1960.1(k), 1956.8(b), 1956.8(d)	12/12/91	Fuels
Specifications for Alternative Motor Vehicle Fuels. T 13, & 26, CCR, 2290- 2292.7, 1960.1(k), 1956.8(b), 1956.8(d)	03/12/92	On-road
Standards and Test Procedures for Alternative Fuel Retrofit Systems. T 13, CCR, 2030, 2031	05/14/92	On-road
Phase 2 RFG certification fuel specifications. T 13, CCR, 1960.1, 1956.8(d)	08/13/92	On-road

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
Substitute Fuel or Clean Fuel Incorporated Test Procedures. T 13, CCR, 1960.1(k), 2317	11/12/92	On-road
Smoke Self Inspection Program for Heavy Duty Diesel & Gasoline Engines. T 13, CCR, 21902194, 2180-2187, 1956.8(b)	12/10/92	On-road
Certification Requirements for Low Emission Passenger Cars, Light-Duty Trucks & Medium Duty Vehicles. T 13, CCR, 1960.1, 1976, 2061, 1900	01/14/93	On-road
Urban Transit Buses. T 13, CCR, 1956.8, 1965, 2112	06/10/93	On-road
Onboard Diagnostic, Phase II. T 13, CCR, 1968.1	07/09/93	On-road
Wintertime Oxygenate Program. T 13, CCR, 2258, 2251.5, 2263(b), 2267, 2298, 2259, 2283, 2293.5	09/09/93	Fuels
Diesel Fuel Regulations -Emergency. T 13, CCR, 2281(h), 2282(1)	10/15/93	Fuels
Evaporative Emission Standards and Test Procedures. T 13, CCR, 1976	02/10/94	On-road
Predictive Model for Phase II CaRFG. T13, CCR, 2261, 2262-2270	06/09/94	Fuels
Small Refiner Diesel. T 13, CCR, 2282(e)(1)	07/24/94	Fuels
Diesel Fuel Certification. T 13, CCR,1956.8(b)&(d), 1960.1(k), 2292.6	09/22/94	Fuels
Self Inspection Program for Heavy Duty Diesel & Gasoline Engines. T 13, CCR, 2190-2194, 21802187, 1956.8(b)	11/09/94	On-road
Onboard Diagnostics, Phase II. T 13, CCR,1963.1, & Certification Procedures	12/08/94	On-road
Periodic Smoke Inspection Program. T 13, CCR, 2190	12/08/94	On-road
Specification for Alternative Motor Vehicle Fuels (M100). T 13 CCR, 2292.1	12/08/94	Fuels
Heavy Duty Vehicle Exhaust Emission Standards. T 13, CCR, 1956.8 and incorporate test procedures.	06/29/95	On-road
Onboard Refueling Vapor Recovery Standards. T 13, CCR, 1976, 1978 and incorporate test procedures	06/29/95	On-road
Test Method for Oxygen in Gasoline. T 13, CCR, 2251.5(c), 2258(c), 2263(b)	06/29/95	Fuels
Retrofit Emission Standards. T 13, CCR, 1956.9, 2030, 2031, and incorporate test procedures	07/27/95	On-road
Low Emission Vehicle Standards 3 (LEV 3). T 13, CCR, 1956.8, 1960.1, 1965, 2101, 2061, 2062, and incorporate test procedures	09/28/95	On-road

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
Test Methods for CaRFG 13, CCR, 2263(b)	10/26/95	Fuels
Required Additives in Gasoline (Deposit Control Additives). T 13, CCR, 2257 and incorporates testing procedures.	11/16/95	Fuels
CaRFG Housekeeping & CARBOB. T 13, CCR, 2263.7, 2266.5, 2260, 2262.5, 2264, 2265, 2272	12/14/95	Fuels
Exemption of Military Tactical Vehicles. T13, CCR, 1905, 2400, 2420	12/14/95	On Road/Off Road
CaRFG Variance Requirements. T 13, CCR, 2271 (Emergency)	01/25/96	Fuels
Postpone Zero Emission Vehicle Requirements. T 13, CCR, 1900, 1960.1, 1976	03/28/96	On-road
Regulation Improvements and Repeals (fuel additives). T 13, CCR, 2201, 2202	05/30/96	Fuels
Diesel Fuel Certification Test Methods . T13, CCR, 1956.8(b), 1960.1(k), 2281(c), 2282(b), (c) and (g)	10/24/96	Fuels
Diesel Fuel Test Methods. T 13, CCR, 1956.8(b), 1960.1(k), 2281(c), 2282(b), (c) and (g)	10/24/96	Fuels
Onboard Diagnostics, Phase II, Technical Status. T 13, CCR, 1968.1, 2030, 2031	12/12/96	On-road
Liquefied Petroleum Gas Propane Limit Specification Delay. T 13, CCR, 2292.6	03/27/97	Fuels
Postpone Enhanced Evaporative Emission Requirements for Ultra-Small Volume Vehicle Manufacturers. T 13, CCR, 1976 and incorporate test procedures	05/22/97	On-road
Off-Cycle Emissions Supplemental Federal Test Procedures (SFTPs). T 13, CCR, 1960.1, 2101 and incorporate test procedures	07/24/97	On-road
Heavy Duty Vehicle Smoke Inspection Program/Periodic Smoke Inspection Program. T 13, CCR, 2180-2188 and 2190-2194	12/11/97	On-road
Heavy Duty Vehicle Regulations: 2004 Standards. T 13, CCR, 1956.8, 1965, 2036, 2112 and test procedures	04/23/98	On-road
Cleaner Burning Gasoline Model Flexibility. T 13, CCR, Sections 2260, 2262.1, 2262.3, 2262.4, 2262.5, 2262.6, 2262.7 and 2265	08/27/98	Fuels
Gasoline Vapor Recovery Systems. T 17, CCR, 94010-94015 and 94150, 94156, 94157, 94158, 94159, 94160, 94162	08/27/98	Vapor Recovery
Gasoline Deposit Control Additive Regulation. T 13, CCR, 2257, and incorporating test procedures	09/24/98	Fuels

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
Low Emission Vehicles Standards (LEV 2) and Compliance Assurance Program (CAP 2000). T 13, CCR,1961 & 1962 (both new); 1900, 1960.1, 1965, 1968.1, 1976, 1978, 2037, 2038, 2062, 2101, 2106, 2107, 2110, 2112, 2114, 2119, 2130, 2137-2140, 2143-2148	11/05/98	On-road
Exhaust Standards for (On-Road) Motorcycles. T 13, CCR, 1958	12/10/98	On-road
Voluntary Accelerated Light Duty Vehicle Retirement Regulations. T 13, CCR, 2600-2610	12/10/98	On-road
Cleaner Burning Gasoline (Increasing the Oxygen Content). T 13, CCR, sections 2262.5(b) and 2265(a)(2)	12/11/98	Fuel
Specifications for Liquid Petroleum Gas Used as a Motor Vehicle Fuel. T 13, CCR, 2292.6	12/11/98	Fuels
Cleaner Burning Gasoline, Oxygen Requirement for Wintertime In Lake Tahoe Area/Gas Pump Labeling for MTBE. T 13, CCR, 2262.5, and 2273	06/24/99	Fuels
Clean Fuels Regulation Requirements. T13, CCR, sections 2300-2317, and 2303.5, 2311.5	07/22/99	On-road
CaRFG Phase 3 Amendments (Phase out of MTBE, standards, predictive model). T 13, CCR, 2260, 2261, 2262.1, 2262.5, 2263, 2264, 2264.2, 2265, 2266 etc…	12/09/99	Fuels
Transit Bus Standards. T 13, CCR, 1956.1, 1956.2, 1956.3, 1956.4, 1956.8, 1965	02/24/00	On-road
CaRFG Phase 3 Follow-up Amendments. T 13, CCR, sections 2260, 2261, 2262.3, 2262.5, 2263, 2264, 2265, 2266, 2266.5, 2270, 2272, 2273, 2282, 2296, 2297, 2262.9 and incorporated test procedures	11/16/00	Fuels
CaRFG Phase 3 Test Methods. T 13, CCR, sections 2263(b)	11/16/00	Fuels
Heavy Duty Diesel Engines "Not-to-Exceed (NTE)" Test Procedures. T 13 CCR, 1956.8, 2065	12/07/00	On-road
Light-and Medium Duty Low Emission Vehicle Alignment with Federal Standards. Exhaust Emission Standards for Heavy Duty Gas Engines. T 13, CCR, 1956.8 &1961	12/07/00	On-road
Zero Emission Vehicle Regulation Update. T 13, CCR, 1900, 1960.1(k), 1961, 1962 & incorporated Test Procedure	01/25/01	On-road
Zero Emission Vehicle Infrastructure and Standardization of Electric Vehicle Charging Equipment. T 13, CCR, 1900(b), 1962(b) 1962.1	06/28/01	On-road

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
Heavy Duty Diesel Engine Standards for 2007 and Later. T 13, CCR, 1956.8 and incorporated test procedures	10/25/01	On-road
Low Emission Vehicle Regulations. T 13, CCR, 1960.1,1960.5, 1961, 1962 and incorporate test procedures and guidelines	11/15/01	On-road
California Motor Vehicle Service Information Rule. T 13&17, CCR, 1969 & 60060.1 -60060.7	12/13/01	On-road
Voluntary Accelerated Light Duty Vehicle Retirement Regulations. T 13, CCR, 2601-2605, 2606 & appendices C & D, and 2607-2610	02/21/02	On-road
On-Board Diagnostic II Review Amendments. T 13, CCR, 1968.1, 1968.2, 1968.5	04/25/02	On-road
Diesel Retrofit Verification Procedure, Warranty and In-Use Compliance Requirements. T 13, CCR, 2700-2710	05/16/02	On-road
Revision to Transit Bus Regulations Amendments. T 13, CCR, 1956.1, 1956.2, 1956.4,1956.8, and 2112, & documents incorporated by reference	10/24/02	On-road
Airborne Toxic Control Measure for Diesel Particulate from School Bus Idling. T13, CCR, 2480	12/12/02	On-road
Low Emission Vehicles II. Align Heavy Duty Gas Engine Standards with Federal Standards; minor administrative changes. T 13, CCR, 1961, 1965, 1956.8, 1956.1, 1978, 2065 and documents incorporated by reference	12/12/02	On-road
Zero Emission Vehicle Amendments for 2003. T 13, CCR, 1960.1(k), 1961(a) and (d), 1900, 1962, and documents incorporated by reference	03/25/03	On-road
Solid Waste Collection Vehicles. T 13, CCR, 2020, 2021, 2021.1, 2021.2	09/24/03	On-road
Airborne Toxic Control Measure for Diesel Particulate for Transport Refrigeration Units. T 13, CCR, 2022 & 2477	12/11/03	On-road
Diesel Retrofit Verification Procedure, Warranty and In-Use Compliance Requirements (Amendments). T 13, CCR, 2701-2707 & 2709	12/11/03	On-road
CA Motor Vehicle Service Information Rule. T 13, CCR, 1969	01/22/04	On-road
Heavy Duty Diesel Engine-Chip Re-flash. T 13, CCR, 2011, 2180.1, 2181, 2184, 2185, 2186, 2192, and 2194	03/27/04	On-road
Engine Manufacturer Diagnostic System Requirements for 2007 and Subsequent Model Heavy Duty Engines. T 13, CCR, 1971	05/20/04	On-road

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
Urban Bus Engines/Fleet Rule for Transit Agencies. T 13, CCR, 1956.1, 1956.2, 1956.3, and 1956.4,	06/24/04	On-road
Airborne Toxic Control Measure for Diesel Particulate from Diesel Fueled Commercial Vehicle Idling. T 13, CCR, 2485	07/22/04	On-road
Greenhouse Gas. T 13, CCR, 1961.1, 1900, 1961 and Incorporated Test Procedures	09/23/04	On-road
California Reformulated Gasoline, Phase 3. T 13, CCR, 2260, 2262, 2262.4, 2262.5, 2262.6, 2262.9, 2263, 2265 (and the incorporated "California Procedures"), and 2266.5	11/18/04	Fuels
Diesel Fuel Standards for Harbor-craft & Locomotives. T 13, CCR, 2299, 2281, 2282, and 2284, and T 17, CCR, 93117	11/18/04	Fuels
Emergency Regulation for Temporary Delay of Diesel Fuel Lubricity Standard. T 13, CCR, 2284	11/24/04	Fuels
Transit Fleet Rule. T 13, CCR, 2023, 2023.1, 2023.2, 2023.3, 2023.4, 1956.1, 2020, 2021, repeal 1956.2, 1956.3, 1956.4	02/24/05	On-road
On-Board Diagnostic System Requirements for 2010 and Subsequent Model-Year Heavy-Duty Engines (HD OBD). T 13, CCR, 1971.1	07/21/05	On-road
2007-2009 Model-Year Heavy Duty Urban Bus Engines and the Fleet Rule for Transit Agencies. T 13, CCR, 1956.1, 1956.2, and 1956.8	09/15/05	On-road
Requirements to Reduce Idling Emissions from New and In-Use Trucks, Beginning in 2008. T 13, CCR section1956.8 and the incorporated document	10/20/05	On-road
Diesel Particulate Matter Control Measure for On-Road Heavy-Duty Diesel-Fueled Vehicles Owned or Operated by Public Agencies and Utilities. T 13, CCR, 2022 and 2022.1	12/08/05	On-road
AB1009 Heavy-Duty Vehicle Smoke Inspection Program. T 13, CCR, 2180, 2180.1, 2181, 2182, 2183, 2184, 2185, 2186, 2187, and 2188, 2189	01/26/06	On-road
Diesel Verification Procedure, Warranty & In-Use. T 13, CCR, 2702, 2703, 2704, 2706, 2707, and 2709.	03/23/06	On-road
Technical Amendments to Evaporative Exhaust and Evaporative Emissions Test Procedures. T 13, CCR, 1961,1976 and 1978.	05/25/06	On-road
California Motor Vehicle Service Information Rule. T 13, CCR, 1969 and incorporated documents	06/22/06	On-road
Heavy-Duty In-Use Compliance Regulation. T 13, CCR, 1956.1, 1956.8, and documents incorporated by reference	09/28/06	On-road

Table F-6: Transportation Control Strategies Adopted by the California Air Resources Board since 1990		
Measure	**Hearing Date**	**Category**
On-Board Diagnostic II. T 13, CCR, 1968.2, 1968.5, 2035, 2037 and 2038	09/28/06	On-road
Zero Emission Bus Regulation. T13, CCR, 2023.1, 2023.3, & 2023.4	10/19/06	On-road
Voluntary Accelerated Retirement Regulation. T 13, CCR, 2601-2610 and appendices A-D	12/07/06	On-road
Phase 3 Reformulated Gasoline (Ethanol Permeation) T 13, CCR, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2270, 2271, and 2273	06/14/07	On-road
Aftermarket Catalytic Converters and Used Catalytic Converters T 13, CCR, 2222	10/25/07	On-road
Port Truck Modernization T 13, CCR, 2027	12/07/07	On-road
Cleaner In-Use Heavy-Duty Trucks T 13, CCR, 2025	12/11/08	On-road
Enhanced Fleet Modernization Program (formerly “Expanded Vehicle Retirement Program”) T 13, CCR, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, and 2630	06/26/09	On-road
Advanced Clean Cars T 13, CCR, 1900, 1956, 1960, 1961, 1962, 1965, 1968, 1976, 1978, 2037, 2038, 2062,2112, 2139, 2140, 2145, 2147, 2235, 2300, 2302, 2303, 2304, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, and 2318	01/27/12	On-road

Attachment F-2 Transportation Control Measures Adopted

SACOG Transportation Control Measures

Transportation control measures (TCMs) are strategies for reducing vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions. The Sacramento Area Council of Governments (SACOG) is the Metropolitan Planning Organization (MPO) for the greater Sacramento region (includes Sacramento, Yolo, Placer, El Dorado, Sutter, and Yuba counties). SACOG provides transportation planning and funding for the region. SACOG, local governments, and the air districts have worked together over the years to develop and implement TCMs. These TCMs were included in the 2009 Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan.

Summary of SACOG New and Continuing TCM Projects and Funding Programs

Table F-7 contains a summary of SACOG new and continuing transportation control measure (TCM) projects and funding programs that are being included in the federal 8-hour ozone plan. Also listed are the implementing agencies, the predicted implementation, or completion dates.

Table F-7 Summary of SACOG Transportation Control Measures New and Continuing Projects and Funding Programs

TCM Name and (ID)	Implementing Agency	Implement or Completion Date
Intelligent Transportation Systems (ITS) Projects		
Arden Way Smart Corridor (ITS-1)	City of Sac - Dept. of Transportation	2008
Sacramento Traffic Operations Center (ITS-2)	City of Sac - Dept. of Transportation	2009
Watt Ave Phase 3 Smart Corridor (ITS-3)	Sac County - Dept. of Transportation	2009
STARNET Implementation (ITS-4)	SACOG	2009
Park and Ride Lots / Transit Centers		
El Dorado Central Park and Ride Facility (TF-1)	El Dorado County Transit	2009
Improvements to Loomis Multimodal Center (TF-2)	Town of Loomis – Dept. of Public Works	2010
13th and 16th St :Light Rail Station Improvements (TF-3)	Sac Regional Transit District	2009

Transit Service Funding Programs		
Transit Vehicle Acquisitions (TR-1)	Various Agencies	Various Dates
Transit Operations (TR-2)	Various Agencies	Various Dates
Other Specific Funding Programs		
Freeway Service Patrol (AQ-1)	Sac Transportation Authority	Through 2018
SECAT Program (AQ-2)	SMAQMD	Through 2018
Spare The Air Program (AQ-3)	SMAQMD	Through 2018
MTP Regional Funding Programs		
Air Quality Funding Program (FP-1)	Various Agencies	Through 2018
Bicycle and Pedestrian Funding Program (FP-2)	Various Agencies	Through 2018
Transportation Demand Management Funding Program (FP-3)	Various Agencies	Through 2018
Community Design Funding Program (FP-4)	Various Agencies	Through 2018
Miscellaneous Projects		
Light Rail Grade Separation at Watt Ave and Folsom Blvd (M-2)	Sac County – Dept. of Transportation	2009
Total Emission Reductions		

Research and Policy Development TCMs

The research efforts listed below are included as TCMs in the 2009 Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan because they are expected to result in policies that will help improve the region's air quality.

The following Table F-8 lists the recommended research and policy development TCMs:

Table F-8 Summary of SACOG Transportation Control Measures Research and Policy Development Studies

1 Blueprint Implementation & Planning Technical Assistance
2 Develop Rural-Urban Connections Strategy & Best Practices Toolkit
3 Research a Transportation Pricing Policy
4 Research a Regional Parking Regulation Policy
5 Adopt a Complete Streets Policy
6 Initiate a Complete Streets Technical Assistance Program
7 Adopt a Safe Routes to School Policy and Implement a Pilot Program

Appendix G: Reasonable Further Progress Demonstrations

Pre-1990 Motor Vehicle Control Program Adjustments

Section 182(b)(1)(D) of the Clean Air Act stipulates that emission reductions stemming from the federal on-road motor vehicle control program as it existed in 1990 may not be used to help meet minimum emission reduction requirements for reasonable further progress (RFP) purposes. The Clean Air Act also prohibits states from taking credit for emission reductions resulting from using gasoline with a Reid vapor pressure limit specified by 1990. This precludes states from demonstrating satisfactory progress for ozone simply on the merit of the federal motor vehicle and fuels programs as they existed in 1990. States are required to adjust for the benefits of these federal programs in RFP calculations.

Over the years, various methods have been used to estimate the benefits of the pre-1990 federal motor vehicle program. In 2005, the U.S. Environmental Protection Agency (U.S. EPA) released guidance on this subject in Appendix A to the preamble to Phase 2 of the 8-hour ozone implementation rule. Appendix A was written for all 50 states and explains how to calculate the benefits of the 49-state pre-1990 program.

The one-size-fits-all approach found in Appendix A is problematic for California. California's pioneering efforts to set emission standards from motor vehicles resulted in nationwide emission standards adopted by U.S. EPA. In general, California's auto emission standards have been, and still are, more stringent than federal standards, particularly for passenger vehicles. California Air Resources Board (ARB) staff has held ongoing discussions with U.S. EPA staff about the most appropriate way to calculate the benefits of the motor vehicle and fuels control program as it existed in 1990. It was clear to ARB staff that U.S. EPA guidance in Appendix A did not recognize the maturity of California's program in 1990 or provide California a workable means to estimate the benefits of the pre-1990 motor vehicle program.

In September 2007, in response to issues raised by ARB staff, U.S. EPA staff proposed an alternative calculation methodology specifically for use in California. This alternative would allow calculating the benefits from the pre-1990 California program in lieu of those from the pre-1990 49-state federal program. By ARB staff's accounting, using the alternative U.S. EPA method would still result in an underestimation of the progress produced by California's program, although to a lesser extent than would Appendix A. This is due to an overestimation of the residual benefits of the pre-1990 California motor vehicle program. Nevertheless, ARB staff has estimated the benefits of California's pre-1990 motor vehicle program for the Sacramento Metro nonattainment area according to the U.S. EPA-approved alternative methodology.

Benefits of California's Pre-1990 Motor Vehicles and Fuels Programs Within the Sacramento Federal Ozone Nonattainment Area

1990 Technology Fractions
1990 I/M
2002 Population by Vehicle Class
7.8 psi Fuel RVP
1990 Fuels (gasoline + diesel)

Pre-1990 Program Benefits from 2002 levels, VOC, tons per day		
Year	Statewide	Sacramento
2008	103.18	6.5
2011	143.15	9.1
2014	171.20	10.9
2017	186.98	11.9
2018	192.84	12.2

Pre-1990 Program Benefits from 2002 levels, NO_X, tons per day		
Year	Statewide	Sacramento
2008	125.62	7.8
2011	152.68	9.5
2014	167.61	10.4
2017	177.20	11.0
2018	180.65	11.2

Data source: Pre-1990 Motor Vehicle Control Program Adjustments provided by CARB.

RFP Demonstration Calculation in Table 13-1

Line	VOC Emission Calculations - Tons/Day	2002	2014	2017	2018	Description
A	Baseline VOC	146.7	106.0	99.9	98.7	Total summer season daily VOC emissions in SFNA. Total includes befnefits from control measures adopted as of January 2012 for mobile sources and mid-2011 for stationary/area-wide sources. It includes motor vehicle "safety margin" added to transportion conformity budget.
B	Non-Creditable FMVCP/RVP Adjustment	0.0	10.9	11.9	12.2	The reductions from the pre-1990 FMVCP/RVP for on-road that must be excluded in the RFP calculation.
C	RACT Corrections	0	0	0	0	
D	Adjusted 2002 Baseline VOC in milestone year	146.7	135.8	134.8	134.5	Line A (2002) - Line B(current milestone year)
E	RFP commitment for VOC reductions from new measures	0	0	0	0	
F	Future Year VOC with existing and proposed measures		106.0	99.9	98.7	Line A
G	Required % change since previous milestone year (VOC or NOx) compared to 2002		9%	9%	3%	40 CFR 51.910(a)(1)(ii)(B) requires a 18% reduction between 2002 base year and the first milestone year of
H	Target VOC levels		91.5	82.3	79.5	emission reduction is applied to the adjusted 2002 baseline for 2008 milestone year. For the subsequent
I	Apparent shortfall in VOC		14.5	17.6	19.2	Line F - Line H
J	Apparent shortfall in VOC, %		10.7%	13.0%	14.3%	Line I / Line D * 100%
K	VOC shortfall previously provided by NOx substitution, %		0.0%	10.7%	13.0%	Sum of Line U from 2002 to current milestone year.
L	Actual VOC shortfall, %		10.7%	2.3%	1.2%	Line J - Line K

Line	NO_X Emission Calculations - Tons/Day	2002	2014	2017	2018	Description
M	Baseline NOx	164.8	92.6	80.0	76.9	Total summer season daily NOx emissions in SFNA. Total includes befnefits from control measures adopted as of January 2012 for mobile sources and mid-2011 for stationary/area-wide sources. It includes motor vehicle "safety margin" added to transportion conformity budget.
N	CA MVCP Adjustment	0.0	10.4	11.0	11.2	The reductions from the pre-1990 FMVCP/RVP for on-road that must be excluded in the RFP calculation.
O	Adjusted 2002 Baseline NOx in milestone year	164.8	154.4	153.8	153.6	Line M (2002) - Line N(current milestone year)
P	RFP commitment for NOx reductions from new measures	0	0	0	0	
Q	Change in NOx since 2002		61.8	73.8	76.7	Line O - Line M + Line P
R	Change in NOx since 2002, %		40.0%	48.0%	49.9%	Line Q / Line O * 100%
S	NOx reductions since 2002 already used for RFP substitution and contingency through last milestone year, %		0.0%	13.7%	16.0%	Sum (Line S + Line U + Line V) from previous milestone year.
T	NOx reductions since 2002 available for RFP substitution and contingency in this milestone year, %		40.0%	34.3%	33.9%	Line R - Line S
U	Change in NOx since 2002 used for ROG substitution in this milestone year, %		10.7%	2.3%	1.2%	Line L
V	Change in NOx since 2002 available for contingency in this milestone year, %		3.0%	3.0%	3.0%	
W	Change in NOx since 2002 surplus after meeting substitution and contingency needs in this milestone year, %		26.3%	31.9%	32.6%	For 2014, Line T - Line U - Line V. For 2017 and 2018, Line T - Line U.
X	RFP Met?		YES	YES	YES	
Y	Contingency Met?		YES	YES	YES	

Appendix H: Reasonably Available Control Measure Analysis

RACM requirements

Section 172(c)(1) of the Clean Air Act requires a nonattainment plan to:

"provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology) and shall provide for attainment of the national primary ambient air quality standards."

In addition, EPA's final 8-hour ozone implementation rule in 40 CFR 51.912(d) pursuant to section 172(c)(1) of the CAA requires the attainment SIP submittal to include "a SIP revision demonstrating that it has adopted all RACM necessary to demonstrate attainment as expeditiously as practicable and to meet any RFP requirements."

EPA's RACM policy[48,49] indicates that areas should consider all candidate measures that are potentially reasonably available. Sources of potentially reasonable measures include measures adopted in other nonattainment areas, measures that the EPA has identified in guidelines or other documents, and any measures that have been suggested for the particular nonattainment area during a public comment period.

Areas should consider all reasonably available measures for implementation in light of local circumstances. However, areas need only to adopt measures if they are both economically and technologically feasible and cumulatively will advance the attainment date (by one year or more) or are necessary for RFP. "EPA does not believe that Congress intended the RACM requirement to compel the adoption of measures that are absurd, unenforceable, or impracticable."[50]

Process of identifying RACM

To identify all RACM, district staff conducted internal reviews, consulted with California Air Resources Board staff, solicited ideas from technical consultants and, attended a technology forum summit at the South Coast Air Quality Management District. In addition, district staff reviewed the following documents:

- "Final 2007 Air Quality Management Plan", South Coast Air Quality Management District, June 2007

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[48] "Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard – Phase 2" (Federal Register, November 29, 2005, p. 71659-71661).
[49] "Guidance on the Reasonably Available Control Measures (RACM) Requirement and Attainment Demonstration Submissions for Ozone Nonattainment Areas" (EPA, December 1999).
[50] "General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990" (57 FR 13498, April 16, 1992).

- "2007 Ozone Plan", San Joaquin Valley Air Pollution control District, April 30, 2007
- "Bay Area 2005 Ozone Strategy- Appendix C, Stationary and Mobile Source Control Measure Descriptions", Bay Area Air Quality Management District, January 4, 2006

District staff compared adopted rules in the following air districts to requirements in place in the Sacramento region; South Coast Air Quality Management District, Bay Area Air Quality Management District, Ventura County Air Pollution Control District, and San Joaquin Valley Air Pollution control District. Each of the five air districts was responsible for preparing the RACM analysis for the stationary measures in its jurisdiction. The regional mobile source and land use measures were evaluated by technical consultants for the Sacramento Air District on behalf of the region.

From these analyses, staff compiled the proposed control measures, "Sacramento Regional 8-hour Ozone Attainment Plan - Control Measures:, Draft, October 2006. District staff conducted public workshops at four locations throughout the Sacramento region. The purposes of the workshops were:

1. to solicit comments on the proposed control measures, and
2. to solicit ideas for additional control measures to be considered.

Feather River Air Quality Management District
Yuba City, CA - October 31, 2006

Sacramento Metropolitan and Yolo Solano Air Quality Management Districts
West Sacramento, CA - October 31, 2006

Placer County Air Pollution Control District
Auburn, CA - November 1, 2006

El Dorado County Air Quality Management District
Placerville, CA - November 1, 2006

Following the public workshops, staff evaluated public comments and suggestions, reviewed the final plan documents noted above, and compiled the proposed control measures included in this plan.

Conclusion

The following is a summary of the districts staff's findings:

1. District staff has evaluated and analyzed all reasonable control measures that were currently available for inclusion in this plan.
2. District staff has identified new or amended stationary control measures, and mobile source and land use control measures that are included in this plan.
3. This plan includes all RACM provided by the public and experts.
4. The available control measures that are not included collectively would not advance the attainment date or contribute to RFP for the Sacramento region because of the

insignificant or non-quantifiable amount of emissions reductions that they may potentially generate. Tables H-1 through H-6 contain a list of the measures and a brief discussion of the conclusions.

5. The RACM demonstration for transportation control measures was prepared by the Sacramento Area Council of Governments (SACOG) and is discussed separately in Appendix D – Transportation Control Measures.

Regional

Mobile/Land Use Source Control Measure RACM Analysis

Table H-1
Mobile and Land Use Control Measures Considered

Control Measure Number	Control Measure Title and Strategy Type	Conclusion
IS-1	Construction Mitigation	Not Recommended - Evaluated for Attainment Advancement
IS-2	Operational Indirect Source	Not Recommended - Evaluated for Attainment Advancement
MISC-31	Use emulsified diesel fuel in all diesel-burning heavy duty vehicles	Not Recommended – Technology is no longer available
MISC-51	Education to Improve Fueling Practices	Not Recommended – High cost
M-TRAN-1	Employer Based Trip Reduction	Not Recommended – No authority and high cost
OFMS12	Preconditioning of diesel engines to eliminate engine cold start emissions	Not Recommended – Evaluated for Attainment Advancement
OFMS13	Limiting pleasure watercraft and off-road vehicle use during spare the air days	Further Study – Combined in Episodic Controls Further Study Measure
OFMS16	Restricted use of diesel agricultural water pumps to nighttime on Spare The Air Days	Further Study – Combined in Episodic Controls Further Study Measure
OFMS19	Restrict Use of HD Off-Road Construction Equipment -- > 50hp to 4 hours per day	Further Study – Combined in Episodic Controls Further Study Measure
OFMS20	Restrict use of portable engines on Spare The Air Days	Further Study – Combined in Episodic Controls Further Study Measure
OFMS21	Ban or restrict use of recreational vehicles on Spare The Air Days	Further Study – Combined in Episodic Controls Further Study Measure
OFMS24	Limiting pleasure craft/vehicle use on days where the temperature is above 100°F	Further Study – Combined in Episodic Controls Further Study Measure
OFMS32	Reduced idling for Locomotive Emission Reductions	Not Recommended – No Authority, Federally Regulated Source. Implemented as incentive and ARB MOU.
OFMS39	Prohibit 2-stroke off-road engines	Not Recommended – High Cost
OFMS42	Lawn and garden care restrictions – ban commercial mowing on Spare The Air days	Further Study – Combined in Episodic Controls Further Study Measure
OFMS45	Identify and offer incentives for applications where on-road engines can be used in place of off-road certified engines	Not Recommended – No enforceable reductions due to differences in certification procedures
OFMS48	Raise fuel prices	Not Recommended – High Cost, No Authority

Table H-1
Mobile and Land Use Control Measures Considered

Control Measure Number	Control Measure Title and Strategy Type	Conclusion
OFMS66	Encourage faster turnover of locomotive engines to lower emitting engines under new US Tier 0 standards	Control Measure - part of SMAQMD OFMS-HD-1 and State SIP
OFMS68	Require retrofits – NO_X Control Technologies – Locomotives	Not Recommended – No Authority
OFMS8	Ban all off-road construction equipment on spare the air days	Further Study – Combined in Episodic Controls Further Study Measure
OFMS-92	Change existing landscaping to xeriscaping and promotes the installation of xeriscaping in new developments	Not Recommended – High cost
ONMS-176	Develop a station car/low emission vehicle share program.	Not Recommended – High Cost
ONMS-181	Develop and fund a program for neighborhood electric vehicle	Not Recommended – High Cost
ONMS-38	Use remote sensors and license plate photos to identify smoking vehicles	Not Recommended – Evaluated for Attainment Advancement
ONMS-69	Provide free replacement caps to light and medium duty vehicle owners at special events, county fairs, etc.	Not Recommended - Already required as part of SMOG Check program
SMAQMD OFMS-HD-1	Off-road CI Incentive Program	Control Measure
SMAQMD OFMS-SI-1	Zero Emission Lawn and Garden Incentive (Residential)	Control Measure
SMAQMD ONMS-HD-1	SECAT Like Program	Control Measure
SMAQMD ONMS-LD-1	Light Duty Early Retirement	Control Measure
SMAQMD-1	Urban Forest Air Quality Development Program	Control Measure
State SOON Program	Retrofits, repowers, and fleet modernization for off road equipment	Not Recommended – Equivalent or better requirements in place
TCM-ONMS-ED-1	Spare The Air Program – Notification for Spare The Air Days	Control Measure
Further Study-1	Urban Heat Island Mitigation	Further Study
Further Study-2	Alternative Energy	Further Study
Further Study-3	Energy Conservation	Further Study

Table H-1
Mobile and Land Use Control Measures Considered

Control Measure Number	Control Measure Title and Strategy Type	Conclusion
Further Study-6	Episodic Controls (Combination of OFMS8, OFMS13, OFMS16, OFMS19, OFMS20, OFMS21, OFMS24, OFMS42)	Further Study

Sacramento Metropolitan Air Quality Management District

Stationary/Area Source Control Measure Control Measures Considered

Table H-2
SMAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
460	Adhesives and Sealants	VOC limits on adhesives and sealants	Reduce VOC limits on adhesives and sealants to limits used in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
442	Architectural Coatings	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
454/466	Degreasing/ Solvent Cleaning	VOC limits on solvents	Reduce the VOC limits on the solvents to limits adopted by SCAQMD. Including all coating rules with solvent limits.	Control Measure
440	Unspecified Coatings	None	Establish VOC limits on coatings.	Not Recommended - Evaluated for Attainment Advancement
459	Automotive Refinishing	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
	Paper, Fabric, and Film Coating	None	Establish VOC limits on coatings.	Not Recommended - No sources
411	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBtu/hr or greater; 1-5 mmBTU/hr 30 ppm, 5-20 mmBTU/hr 15 ppm, >20 mmBTU/hr 9 ppm	Already adopted	Control Measure
411	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBtu/hr or greater; 1-5 mmBTU/hr 30 ppm, 5-20 mmBTU/hr 15 ppm, >20 9 ppm	Reduce NO_X limit to 6 ppm for >20 mmBTU/hr	Not Recommended - Evaluated for Attainment Advancement
412	IC Engines	NO_X limits on IC Engines located at major stationary source	Require NO_X limits all IC Engines, not just those at major stationary sources of NO_X.	Not Recommended - Evaluated for Attainment Advancement
446	Storage Tanks	Requires use of a pressure tank or use of tank with vapor loss control device	Lower applicability threshold; additional control on fixed roof tank	Not Recommended - Evaluated for Attainment Advancement
	Cap and Trade	None	Establish CAP and Trade Emission Reduction Program similar to SCAQMD's RECLAIM Program	Not Recommended - Evaluated for Attainment Advancement
418	Commercial Cooking	None	Establish standards to control VOC emissions for Commercial Cooking (i.e. char boilers)	Not Recommended - Evaluated for Attainment Advancement
496	Livestock Waste	Implement several practice from a list	Lower applicability threshold; Increase number of practices and control efficiency	Control Measure
496	Livestock Waste	Implement several practices from a list	Lower applicability threshold; Increase number of practices and	Not Recommended - Evaluated for Attainment

Table H-2 SMAQMD Stationary/Area Source Control Measures Considered				
Measure No.	**Title**	**Current Requirements**	**Opportunity for Strengthening**	**Conclusion**
			control efficiency	Advancement
	Wineries	None	Establish standards to reduce evaporative VOC emissions from the fermentation process at wineries	Not Recommended - Evaluated for Attainment Advancement
463	Wood Products Coatings	VOC limits on coatings and strippers	Reduce VOC limits for high solid stains, sealers, strippers and lower the applicability limit to 20 gal/year	Not Recommended - Evaluated for Attainment Advancement
461	Natural Gas Production and Processing	None	Establish requirements to inspect and maintain equipment to reduce fugitive VOC emissions	Control Measure
471	Asphalted Concrete	None	Require limits for NO_X emissions similar to a control measure adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Dryers and Ovens	None	Require limits for NO_X emissions that achieve 50 - 75% reduction similar to proposed measure in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
465	Polyester Resin/Plastic Product Manufacturing	Limits monomer content and use of vapor suppressants	Reduce monomer limits to standards adopted by SCAQMD	Not Recommended - Evaluated for Attainment Advancement
485	Landfills	Collect and control ROG emissions from landfills containing approximately 4 million tons of waste or more	Lower applicability threshold to landfills containing approximately 0.5 million tons of waste or more	Not Recommended - Evaluated for Attainment Advancement
414	Water Heaters	NO_X limits on water heaters with rated heat input capacity less than 75,000 Btu/hr	Require NO_X limits on water heaters/boilers with rated heat input capacity between 75,000 Btu/hr and 1,000,000 Btu/hr, and reduce current NO_X limits from 55 ppm to 15 ppm.	Control Measure
	Roofing Kettles	None	Establish VOC limits from roofing kettles	Not Recommended - Evaluated for Attainment Advancement
	Reactivity Based Standards	None	Require VOC limit of coatings to be based on a reactivity limit instead of a mass-balance limit	Not Recommended - Overlaps with Control Measure 442
	Using Greener Consumer Products	None	Promote the use of Low-VOC Consumer Product especially on Spare-the-Air Day	Not Recommended - Evaluated for Attainment Advancement

Table H-2
SMAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Semiconductor Manufacturing	None	Establish VOC limits for semiconductor manufacturing	Not Recommended - No sources
452	Can Coating	VOC limits on coatings	Reduce VOC limits to be as stringent as SJVUAPCD	Not Recommended - Equivalent or better requirements in place
456	Aerospace Assembly and Component	VOC limits on coatings	Require VOC limits on additional coating categories associated with Aerospace Coating	Not Recommended - Evaluated for Attainment Advancement
444	Petroleum Dry Cleaning	VOC limits on solvents used or use of emission control device	Remove applicability threshold to include all dry cleaning solvents except for perchloroethylene and ban the use of open transfer systems	Not Recommended - Evaluated for Attainment Advancement
451	Metal Parts and Products Coating	VOC limits on coatings, strippers and solvent cleaner	Reduce VOC limits for coatings used in some "baked" applications and coatings considered "specialty coatings"	Not Recommended - Evaluated for Attainment Advancement
450	Graphic Arts	VOC limits on inks, coatings, adhesives or use of emission control system	Reduce VOC limits for ink categories in flexographic for porous substrate, extreme performance, and metallic ink to be as stringent as SCAQMD	Not Recommended - Evaluated for Attainment Advancement
413	Gas Turbines	NO_X limits on stationary gas turbines; 0.3 - 2.9 MW 42 ppmv, >= 2.9 and <877 hours 42 ppmv, 2.9 - 10 MW and >= 877 hours, 25 ppmv, >=10 MW with no SCR and >= 877 hours 15 ppmv, >=10 MW with SCR and >= hours 9 ppmv	Reduce NO_X limits to be as stringent as SCAQMD; 0.3-2.9 MW 25 ppmv, 2.9-10 MW 9 ppmv, 2.9-10 MW with no scar 15 ppmv, 10 MW and over 9 ppmv , 10 MW and over with no SCR 12 ppmv	Not Recommended - Equivalent or better requirements in place
408	Incinerators	Multiple-chamber incinerator or APCO-approved equipment	Require all incinerators demonstrate NO_X emissions of less than 60 lb/mmscf	Not Recommended - Evaluated for Attainment Advancement
	Food and Ag Processing	None	Require VOC limits to be as stringent as a rule adopted in SCAQMD which required the use of low-VOC sterilizing products or controlled by an emission control device	Not Recommended - Overlaps with Control Measure 454/466
458	Bakeries	Control efficiency of at least 95%	Lower applicability threshold	Not Recommended - Evaluated for Attainment Advancement

Table H-2
SMAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
447	Organic Liquid Loading	VOC limits from loading of organic liquids	Require VOC limits to be as stringent as BAAQMD; require leak inspection requirement and repair time requirement similar to the requirements adopted in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
448/449	Gasoline Transfer - Phase I/II	Phase I requires submerged fill pipe & ARB certified systems, pressure relief valve. Phase II requires ARB certified system, periodic self maintenance, periodic inspection	Evaluate SJV proposal	Not Recommended - Already implemented
Further Study - 4	Gasoline Transfer Phase I/II	Phase I requires submerged fill pipe & ARB certified systems, pressure relief valve. Phase II requires ARB certified system, periodic self maintenance, periodic inspection	Improve compliance rates by requiring ISD to provide earlier warning signal at lower degradation rate; change ISD warning and gross failure rates; disallow ISD reset button until fixed; require installation of shut down sensor	Further Study Needed - Current info inadequate
	Storage Tank Degassing	Maintenance/replacement not allowed May - October	Reduce emissions by requiring enhanced control technology, increased control efficiency, establishing concentration limits	Not Recommended - Evaluated for Attainment Advancement
	Aviation Fuel Transfer	None	Reduce VOC from spillage and vapor displacement during Phase 1 operations and from venting through relief valves	Not Recommended - Evaluated for Attainment Advancement
	Marine Coatings	None	Establish VOC limits for marine coatings.	Not Recommended - No sources
	Enhanced Compliance	None	Evaluate permit program change to assess opportunities for further emission reductions; include adjusting permit exemption level, conduct additional inspections and survey to identify potential sources, adding conditions to non-Title V Sources and improving accuracy and enforceability of existing permit	Not Recommended - Evaluated for Attainment Advancement
	Flares	None	Establish standard of NO_X emissions for flares	Not Recommended - Evaluated for Attainment Advancement

Table H-2
SMAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Polystyrene/ Poly Foam Blowing/Other	None	Require reduction of VOC emission from EPS molding by vented the emissions to an emission control device such as a thermal oxidizer	Not Recommended - No sources
	Production of Wood/paper products	None	Require VOC limits for manufacturing wood/paper products.	Not Recommended - No sources
	Industrial Wastewater	None	Require VOC limits and control system from wastewater system	Not Recommended - Evaluated for Attainment Advancement
	Wastewater at Sewage Treatment Plants	None	Require VOC limits and control system for wastewater sewage treatment plant	Not Recommended - Evaluated for Attainment Advancement
201	Lower permit exemption	Permit exemptions and thresholds	Lower permit threshold to bring more sources and equipment under permit program	Not Recommended - Evaluated for Attainment Advancement
	Green Waste Composting	None	Establish VOC limits similar to the rule adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Co-Composting and Biosolids	None	Establish VOC reducing requirements equivalent to SJVUAPCD/SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Glass Furnaces	None	Establish NO_X limits for glass furnaces	Not Recommended - No sources
	Central Furnaces	None	Establish NO_X limits for central furnaces	Not Recommended - Evaluated for Attainment Advancement
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction NO_X emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction VOC emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS-2	ISR Operational	None	Mitigate increased emissions associated with new land use/development projects	Not Recommended - Evaluated for Attainment Advancement
501	Agricultural Burning/Open Burning	Conditions under which burning must be conducted, when allowed, to minimize smoke; Burning is not allowed on days declared No-Burn Day	Prohibit burning of waste	Not Recommended - Evaluated for Attainment Advancement

Table H-2 SMAQMD Stationary/Area Source Control Measures Considered				
Measure No.	**Title**	**Current Requirements**	**Opportunity for Strengthening**	**Conclusion**
	Glycol Dehydration Systems	None	Control VOC emissions from glycol regenerator vents used in natural gas production to remove water vapor	Not Recommended - Evaluated for Attainment Advancement
Further Study - 5	Lubricants	None	Establish VOC limits for lubricant formulations	Further Study Needed - Current info inadequate
	Facility Modernization	None - new equipment with PTE greater than 10 lbs/day install BACT	Establish a pre-determined life span of when equipment would need to be replaced and would then trigger BACT limits	Not Recommended - Evaluated for Attainment Advancement

El Dorado County Air Quality Management District

Stationary/Area Source Control Measures Considered

Table H-3
EDCAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
236	Adhesives and Sealants	VOC limits on coatings	Reduce VOC limits on adhesives and sealants to limits used in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
215	Architectural Coatings	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control measure
225/235	Degreasing/ Solvent Cleaning	VOC limits on solvents	Reduce the VOC limits on the solvents	Control measure
	Unspecified Coatings	None	Establish VOC limits on coatings.	Not Recommended - Evaluated for Attainment Advancement
230	Automotive Refinishing	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Not Recommended - Evaluated for Attainment Advancement
	Paper, Fabric, and Film Coating	None	Establish VOC limits on coatings.	Not Recommended - No sources
229	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 5,000,000 Btu/hr or greater; 30 ppm,	Lower NO_X limits on boiler/steam generators with rated heat input capacity of 1,000,000 Btu/hr or greater; 1-5 mmBTU/hr 30 ppm, 5-20 mmBTU/hr 15 ppm, >20 mmBTU/hr 9 ppm	Not Recommended - High Cost
231, 232, 233, 241	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 5,000,000 Btu/hr or greater; 30 ppm,	Reduce NO_X limit to 6-8 ppm for >20 mmBTU/hr	Not Recommended - High Cost
233	IC Engines	NO_X limits on internal combustion engines	Reduce NO_X limit	Not Recommended - High Cost
244	Storage Tanks	Work practices	Lower applicability threshold: additional control on fixed roof tank	Not Recommended - No sources
	Cap and Trade	None	Establish CAP and Trade Emission Reduction Program similar to SCAQMD's RECLAIM Program	Not Recommended - Evaluated for Attainment Advancement
	Commercial Cooking	None	Establish standards to control VOC emissions for Commercial Cooking (i.e. char boilers)	Not Recommended - Evaluated for Attainment Advancement
	Livestock Waste	None	Lower applicability threshold: increase number of practices and control efficiency	Not Recommended - Evaluated for Attainment Advancement
	Wineries	None	Establish standards to reduce evaporative VOC emissions from the fermentation process at wineries	Not Recommended - Evaluated for Attainment Advancement

Table H-3
EDCAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
237	Wood Products Coatings	VOC limits on coatings	Reduce VOC limits for high solid stains, sealers, strippers and lower the applicability limit to 20 gal/year	Not Recommended - Evaluated for Attainment Advancement
	Natural Gas Production and Processing	None	Establish requirements to inspect and maintain equipment to reduce fugitive VOC emissions	Not Recommended - No sources
	Asphaltic Concrete	None	Require limits for NO_X emissions similar to a control measure adopted by SJVUAPCD	Not Recommended - No sources
	Other Dryers and Ovens	None	Require limits for NO_X emissions that achieve 50 - 75% reduction similar to proposed measure in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Polyester Resin/Plastic Product Manufacturing	None	Reduce monomer limits to standards adopted by SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Landfills	None	Establish rule for landfills	Not Recommended - Evaluated for Attainment Advancement
239	Water Heaters	NO_X limits on water heaters with rated heat input capacity less than 75,000 Btu/hr	Require NO_X limits on water heaters/boilers with rated heat input capacity between 75,000 Btu/hr and 1,000,000 Btu/hr, and reduce current NO_X limits from 55 ppm to 15 ppm.	Control measure
	Roofing Kettles	None	Establish VOC limits from roofing kettles	Not Recommended - Evaluated for Attainment Advancement
	Reactivity Based Standards	None	Require VOC limit of coatings to be based on a reactivity limit instead of a mass-balance limit	Not Recommended - Overlaps with Control Measure 218
	Using Greener Consumer Products	None	Promote the use of Low-VOC Consumer Product especially on Spare-the-Air Day	Not Recommended - Evaluated for Attainment Advancement
	Semiconductor Manufacturing	None	Establish VOC limits for semiconductor manufacturing.	Not Recommended - No sources
	Can Coating	None	Establish VOC limits	Not Recommended - No sources
	Aerospace Coating	None	Establish VOC limits	Not Recommended - No sources
	Petroleum Dry Cleaning	None	Establish VOC limits on solvents used or require use of an emission control device	Not Recommended - Evaluated for Attainment Advancement

Table H-3
EDCAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
246	Metal Parts and Products	None	Establish VOC limits	Control measure
231	Graphic Arts	VOC limits on graphic arts materials	Require VOC limits for ink products in flexographic for porous substrate, extreme performance, and metallic ink to be as stringent as SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Gas Turbines	None	Reduce NO_X limits to be as stringent as SCAQMD; 0.3-2.9 MW 25 ppmv, 2.9-10 MW 9 ppmv, 2.9-10 MW with no scar 15 ppmv, 10 MW and over 9 ppmv , 10 MW and over with no SCR 12 ppmv	Not Recommended - No sources
	Incinerators	None	Require all incinerators demonstrate NO_X emissions of less than 60 lb/mmscf	Not Recommended - No sources
	Food and Ag Processing	None	Require VOC limits to be as stringent as a rule adopted in SCAQMD which required the use of low-VOC sterilizing products or controlled by an emission control device	Not Recommended - No sources
	Bakeries	None	Establish VOC limits for bakeries	Not Recommended - No sources
	Terminal/Bulk Plants	VOC limits from loading of organic liquids	Require VOC limits to be as stringent as BAAQMD; require leak inspection requirement and repair time requirement similar to the requirements adopted in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
238/244	Gasoline Dispensing Phase I/II	Phase I requires submerged fill pipe & ARB certified systems, pressure relief valve. Phase II requires ARB certified system, periodic self maintenance, periodic inspection	Evaluate SJV proposal to include mobile fuelers, increase inspection frequency, lower allowable vapor leak threshold	Not Recommended - Evaluated for Attainment Advancement
238/244	Gasoline Dispensing Phase I/II	Phase I requires submerged fill pipe & ARB certified systems, pressure relief valve. Phase II requires ARB certified system, periodic self maintenance, periodic inspection	Improve compliance rates by requiring ISD to provide earlier warning signal at lower degradation rate; change ISD warning and gross failure rates; disallow ISD reset button until fixed; require installation of shut down sensor	Not Recommended - Evaluated for Attainment Advancement

Table H-3 EDCAQMD Stationary/Area Source Control Measures Considered				
Measure No.	**Title**	**Current Requirements**	**Opportunity for Strengthening**	**Conclusion**
	Storage Tank Degassing	None	Reduce emissions by requiring enhanced control technology, increased control efficiency, establishing concentration limits	Not Recommended - Evaluated for Attainment Advancement
	Aviation Fuel Transfer	None	Reduce VOC from spillage and vapor displacement during Phase 1 operations and from venting through relief valves	Not Recommended - Evaluated for Attainment Advancement
	Marine Coatings	None	Establish VOC limits for marine coatings.	Not Recommended - No sources
	Enhanced Compliance	None	Evaluate permit program change to assess opportunities for further emission reductions; include adjusting permit exemption level, conduct additional inspections and survey to identify potential sources, adding conditions to non-Title V Sources and improving accuracy and enforceability of existing permit	Not Recommended - Evaluated for Attainment Advancement
	Flares	None	Establish standard of NO_X emissions for flares	Not Recommended - Evaluated for Attainment Advancement
	Polystyrene/ Poly Foam Blowing/Other	None	Require reduction of VOC emission from EPS molding by vented the emissions to an emission control device such as a thermal oxidizer	Not Recommended - No sources
	Production of Wood/paper products	None	Require VOC limits for manufacturing wood/paper products.	Not Recommended - No sources
	Industrial Wastewater	None	Require VOC limits and control system from wastewater system	Not Recommended - No sources
	Wastewater Sewage Treatment	None	Require VOC limits and control system for wastewater sewage treatment plant	Not Recommended - No sources
	Lower permit exemption	None	Lower permit threshold to bring more sources and equipment under permit program	Not Recommended - Evaluated for Attainment Advancement
	Composting Green Waste	None	Establish VOC limits similar to the rule adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement

Table H-3
EDCAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Composting and Biosolids	None	Establish VOC reducing requirements equivalent to SJVUAPCD/SCAQMD	Not Recommended - No sources
	Glass Furnaces	None	Establish NO_X limits for glass furnaces	Not Recommended - No sources
	Central Furnaces	None	Establish NO_X limits for central furnaces	Not Recommended - Evaluated for Attainment Advancement
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS-2	ISR Operational	None	Mitigate increased emissions associated with new land use/development projects	Not Recommended - Evaluated for Attainment Advancement
300	Agricultural Burning/Open Burning	Conditions under which burning must be conducted, when allowed, to minimize smoke; Burning is not allowed on days declared No-Burn Day	Prohibit burning of waste	Not Recommended - Evaluated for Attainment Advancement
	Glycol Dehydration Systems	None	Control VOC emissions from glycol regenerator vents used in natural gas production to remove water vapor	Not Recommended - Evaluated for Attainment Advancement
	Lubricants	None	Establish VOC limits for lubricant formulations	Not Recommended - Evaluated for Attainment Advancement
	Facility Modernization	None	Establish a pre-determined life span of when equipment would need to be replaced and would then trigger BACT limits	Not Recommended - Evaluated for Attainment Advancement

Feather River Air Quality Management District

Stationary/Area Source Control Measures Considered

Table H-4
FRAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
1	Adhesives and Sealants	None	Establish VOC limits on adhesives and sealants similar to limits used in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
3.15	Architectural Coatings	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
3.14	Degreasing/ Solvent Cleaning	Keep lid close on tanks greater than 55 gallons.	Require VOC limits on degreasing/solvent cleaning process.	Control Measure
2	Unspecified Coatings	None	Establish VOC limits on coatings that have not been established in another rule.	Not Recommended - Evaluated for Attainment Advancement
3.19	Automotive Refinishing	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
	Paper, Fabric, and Film Coating	None	Establish VOC limits on coatings.	Not Recommended - No sources
3.21	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBtu/hr or greater; 1-5 mmBTU/hr Annual Tune Up, >5 mmBTU/hr using gaseous fuel 30 ppm, >5 mmBTU/hr using non-gaseous fuel 40 ppm	Require NO_X limits for boiler between 1-5 mmBtu/hr, and reduce NO_X limit for boiler >5 mmBtu/hr	Not Recommended - Evaluated for Attainment Advancement
3.21	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBtu/hr or greater; 1-5 mmBTU/hr Annual Tune Up, >5 mmBTU/hr using gaseous fuel 30 ppm, >5 mmBTU/hr using non-gaseous fuel 40 ppm	Reduce NO_X limit to 6 ppm for >20 mmBTU/hr	Not Recommended – No Sources
3.22	IC Engines	None	Establish NO_X limits on engines.	Control Measure
3.8/3.9	Storage Tanks	Requires use of a floating roof or vapor loss control device	Lower applicability threshold	Not Recommended - Evaluated for Attainment Advancement
	Cap and Trade	None	Establish CAP and Trade Emission Reduction Program similar to SCAQMD's RECLAIM Program	Not Recommended - Evaluated for Attainment Advancement
	Commercial Cooking	None	Establish standards to control VOC emissions for Commercial Cooking (i.e. char boilers)	Not Recommended - Evaluated for Attainment Advancement
	Livestock Waste	None	Lower applicability threshold	Not Recommended – No Sources
	Wineries	None	Establish standards to reduce evaporative VOC emissions from the fermentation process at wineries	Not Recommended - Evaluated for Attainment Advancement

Table H-4
FRAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
3.20	Wood Products Coatings	VOC limits on coatings and strippers	Reduce VOC limits for high solid stains, sealers, strippers and lower the applicability limit to 20 gal/year	Not Recommended - Evaluated for Attainment Advancement
	Natural Gas Production and Processing	None	Establish requirements to inspect and maintain equipment to reduce fugitive VOC emissions	Not Recommended - Evaluated for Attainment Advancement
	Asphaltic Concrete	None	Require limits for NO_X emissions	Not Recommended - No sources
	Other Dryers and Ovens	None	Require limits for NO_X emissions that achieve 50 - 75% reduction similar to proposed measure in SCAQMD	Not Recommended – No Sources
	Polyester Resin/Plastic Product Manufacturing	None	Require monomer content limit and use of vapor suppressant	Not Recommended - No sources
3.18	Landfills	Collect and control ROG emissions from landfills	Lower applicability threshold to landfills containing approximately 0.5 million tons of waste or more	Not Recommended - No sources
3.23	Water Heaters	None	Require limits for NO_X emissions for water heaters < 1 mmBtu/hr	Control Measure
	Roofing Kettles	None	Establish VOC limits from roofing kettles	Not Recommended - Evaluated for Attainment Advancement
	Reactivity Based Standards	None	Require VOC limit of coatings to be based on a reactivity limit instead of a mass-balance limit	Not Recommended - Overlaps with Control Measure 3.15
	Using Greener Consumer Products	None	Promote the use of Low-VOC Consumer Product especially on Spare-the-Air Day	Not Recommended - Evaluated for Attainment Advancement
	Semiconductor Manufacturing	None	Establish VOC limits for semiconductor manufacturing	Not Recommended - No sources
	Can Coating	None	Establish VOC limits for can coating	Not Recommended - No sources
	Aerospace Coating	None	Establish VOC limits for aerospace coating	Not Recommended - No sources
	Petroleum Dry Cleaning	None	Establish VOC limits on solvents used or use of control device	Not Recommended - No sources
	Metal Parts and Products	None	Require VOC limits on coatings for metal parts and products	Not Recommended - Evaluated for Attainment Advancement

Table H-4
FRAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Graphic Arts	None	Require VOC limits on inks, coatings, adhesives or use of emission control system	Not Recommended - No sources
	Gas Turbines	None	Establish NO_X limits on stationary gas turbines	Not Recommended - No sources
	Incinerators	None	Establish NO_X limits on incinerators	Not Recommended - No sources
	Food and Ag Processing	None	Require VOC limits to be as stringent as a rule adopted in SCAQMD which required the use of low-VOC sterilizing products or controlled by an emission control device	Not Recommended - Evaluated for Attainment Advancement
	Bakeries	None	Require control device with efficiency of at least 95%	Not Recommended - No sources
	Terminal/Bulk Plants	None	Require VOC limits from loading of organic liquids	Not Recommended - No sources
3.8/3.12	Gasoline Transfer - Phase I/II	Phase I requires submerged fill pipe & ARB certified systems. Phase II requires ARB certified system, periodic self maintenance, periodic inspection	Evaluate SJV proposal to include mobile fuelers, increase inspection frequency, lower allowable vapor leak threshold	Not Recommended - Evaluated for Attainment Advancement
3.8/3.12	Gasoline Transfer - Phase I/II	Phase I requires submerged fill pipe & ARB certified systems. Phase II requires ARB certified system, periodic self maintenance, periodic inspection	Improve compliance rates by requiring ISD to provide earlier warning signal at lower degradation rate; change ISD warning and gross failure rates; disallow ISD reset button until fixed; require installation of shut down sensor	Not Recommended - Evaluated for Attainment Advancement
	Storage Tank Degassing	None	Reduce emissions by requiring enhanced control technology, increased control efficiency, establishing concentration limits	Not Recommended - No sources
	Aviation Fuel Transfer	None	Reduce VOC from spillage and vapor displacement during Phase 1 operations and from venting through relief valves	Not Recommended - No sources
	Marine Coatings	None	Establish VOC limits for marine coatings.	Not Recommended - No sources

Table H-4
FRAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Enhanced Compliance	None	Evaluate permit program change to assess opportunities for further emission reductions; include adjusting permit exemption level, conduct additional inspections and survey to identify potential sources, adding conditions to non-Title V Sources and improving accuracy and enforceability of existing permit	Not Recommended - Evaluated for Attainment Advancement
	Flares	None	Establish standard of NO_X emissions for flares	Not Recommended - No sources
	Polystyrene/ Poly Foam Blowing/Other	None	Require reduction of VOC emission from EPS molding by vented the emissions to an emission control device such as a thermal oxidizer	Not Recommended - No sources
	Production of Wood/paper products	None	Require VOC limits for manufacturing wood/paper products.	Not Recommended - No sources
	Industrial Wastewater	None	Require VOC limits and control system from wastewater system	Not Recommended - No sources
	Wastewater Sewage Treatment	None	Require VOC limits and control system for wastewater sewage treatment plant	Not Recommended - No sources
4.3	Lower permit exemption	Permit exemptions and thresholds	Lower permit threshold to bring more sources and equipment under permit program	Not Recommended - Evaluated for Attainment Advancement
	Composting Green Waste	None	Establish VOC limits	Not Recommended - No sources
	Composting and Biosolids	None	Establish VOC reducing requirements equivalent to SJVUAPCD/SCAQMD	Not Recommended - No sources
	Glass Furnaces	None	Establish NO_X limits for glass furnaces	Not Recommended - No sources
	Central Furnaces	None	Establish NO_X limits for central furnaces	Not Recommended - Evaluated for Attainment Advancement
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction NO_X emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement

Table H-4
FRAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction VOC emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS-2	ISR Operational	None	Mitigate increased emissions associated with new land use/development projects	Not Recommended - Evaluated for Attainment Advancement
2.0	Agricultural Burning/Open Burning	Conditions under which burning must be conducted, when allowed, to minimize smoke; Burning is not allowed on days declared No-Burn Day	Prohibit burning of waste	Not Recommended - Evaluated for Attainment Advancement
	Glycol Dehydration Systems	None	Control VOC emissions from glycol regenerator vents used in natural gas production to remove water vapor	Not Recommended - Evaluated for Attainment Advancement
	Lubricants	None	Establish VOC limits for lubricant formulations	Not Recommended - Evaluated for Attainment Advancement
	Facility Modernization	None - new equipment with PTE greater than 10 lbs/day install BACT	Establish a pre-determined life span of when equipment would need to be replaced and would then trigger BACT limits	Not Recommended - Evaluated for Attainment Advancement

Placer County Air Pollution Control District

Stationary/Area Source Control Measures Considered

Table H-5
PCAPCD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
235	Adhesives and Sealants	VOC limits on adhesives and sealants	Reduce VOC limits on adhesives and sealants to limits used in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
218	Architectural Coatings	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
216, 240	Degreasing/ Solvent Cleaning	VOC limits on solvent	Reduce the VOC limits on the solvents to limits adopted by SCAQMD. Including all coating rules with solvent limits.	Not Recommended - Evaluated for Attainment Advancement
	Unspecified Coatings	None	Establish VOC limits on coatings.	Not Recommended - Evaluated for Attainment Advancement
234	Automotive Refinishing	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
	Paper, Fabric, and Film Coating	None	Establish VOC limits on coatings.	Not Recommended - No sources
231, 232, 233, 241	Boilers and Steam Generators	Required NO_X limits 30 ppm on boiler/steam generators with rated heat input capacity of 5MMBtu/hr or greater;	Lower NO_X limits on boiler/steam generators with rated heat input capacity of 1,000,000 Btu/hr or greater; 1-5 mmBTU/hr 30 ppm, 5-20 mmBTU/hr 15 ppm, >20 mmBTU/hr 9 ppm	Not Recommended - High Cost due to the portion of boilers >5 mmBtu/hr in the county
231, 232, 233, 241	Boilers and Steam Generators	Required NO_X limits 30 ppm on boiler/steam generators with rated heat input capacity of 5,000,000 Btu/hr or greater;	Reduce NO_X limit to 6-8 ppm for >20 mmBTU/hr	Not Recommended - High cost due to the portion of boilers > 5 mmBtu/hr in the county
242	IC Engines	NO_X limits on IC Engines located at stationary sources	Lower NO_X limits on all non-ag stationary engines 25 ppm for rich burn, 65 ppm for lean burn, 80 ppm for diesel	Not Recommended - Evaluated for Attainment Advancement
212	Storage Tanks	Requires use of a pressure tank or use of tank with vapor loss control device	Lower applicability threshold; additional control on fixed roof tank	Not Recommended - Evaluated for Attainment Advancement
	Cap and Trade	None	Establish CAP and Trade Emission Reduction Program similar to SCAQMD's RECLAIM Program	Not Recommended - Evaluated for Attainment Advancement
	Commercial Cooking	None	Establish standards to control VOC emissions for Commercial Cooking (i.e. char boilers)	Not Recommended - Evaluated for Attainment Advancement

Table H-5
PCAPCD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Livestock Waste	None	Lower applicability threshold; Increase number of practices and control efficiency	Not Recommended - Evaluated for Attainment Advancement
	Wineries	None	Establish standards to reduce evaporative VOC emissions from the fermentation process at wineries	Not Recommended - Evaluated for Attainment Advancement
236	Wood Products Coatings	VOC limits on coatings and strippers	Reduce VOC limits for high solid stains, sealers, strippers and lower the applicability limit to 20 gal/year	Not Recommended - Evaluated for Attainment Advancement
	Natural Gas Production and Processing	None	Establish requirements to inspect and maintain equipment to reduce fugitive VOC emissions	Not Recommended - No sources
CM1	Asphaltic Concrete	None	Require limits for NO_X emissions similar to a control measure adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Other Dryers and Ovens	None	Require limits for NO_X emissions that achieve 50 - 75% reduction similar to proposed measure in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
243	Polyester Resin/Plastic Product Manufacturing	Limits monomer content and use of vapor suppressants	Reduce monomer limits to standards adopted by SCAQMD	Not Recommended - Evaluated for Attainment Advancement
237	Landfills	Collect and control ROG emissions from landfills containing approximately 2.75 million tons of waste or more	Lower applicability threshold to landfills containing approximately 0.5 million tons of waste or more	Not Recommended - Evaluated for Attainment Advancement
CM2/246	Water Heaters	NO_X limits on water heaters with rated heat input capacity less than 75,000 Btu/hr	Require NO_X limits on water heaters/boilers with rated heat input capacity between 75,000 Btu/hr and 1,000,000 Btu/hr, and reduce current NO_X limits from 55 ppm to 15 ppm.	Control Measure
	Roofing Kettles	None	Establish VOC limits from roofing kettles	Not Recommended - Evaluated for Attainment Advancement
	Reactivity Based Standards	None	Require VOC limit of coatings to be based on a reactivity limit instead of a mass-balance limit	Not Recommended - Overlaps with Control Measure 218
	Using Greener Consumer Products	None	Promote the use of Low-VOC Consumer Product especially on Spare-the-Air Day	Not Recommended - Evaluated for Attainment Advancement

Table H-5
PCAPCD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
244	Semiconductor Manufacturing	Limit VOC emissions from negative photoresist operations and solvent cleaning processes	Establish VOC limits for semiconductor manufacturing	Not Recommended - Evaluated for Attainment Advancement
233	Can Coating	Limit VOC emissions form coating	Reduce VOC limits to be as stringent as SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Aerospace Coating	None	Establish VOC limits	Not Recommended - No sources
227	Petroleum Dry Cleaning	VOC limits on solvents used or use of emission control device	Remove applicability threshold to include all dry cleaning solvents except for perchloroethylene and ban the use of open transfer systems	Not Recommended - Evaluated for Attainment Advancement
CM3/245	Metal Parts and Products	None	Establish VOC limits	Control Measure
239	Graphic Arts	VOC limits on inks, coatings, adhesives or use of emission control system	Reduce VOC limits for ink categories in flexographic for porous substrate, extreme performance, and metallic ink to be as stringent as SCAQMD	Not Recommended - Evaluated for Attainment Advancement
250	Gas Turbines	NO_X limits on stationary gas turbines; 0.3 - 2.9 MW 42 ppmv, >= 2.9 and <877 hours 42 ppmv, 2.9 - 10 MW and >= 877 hours, 25 ppmv, >=10 MW with no SCR and >= 877 hours 15 ppmv, >=10 MW with SCR and >= hours 9 ppmv	Reduce NO_X limits to be as stringent as SCAQMD; 0.3-2.9 MW 25 ppmv, 2.9-10 MW 9 ppmv, 2.9-10 MW with no scar 15 ppmv, 10 MW and over 9 ppmv , 10 MW and over with no SCR 12 ppmv	Not Recommended - Already implemented
206	Incinerators	Limit NO_X, SO2, CO, PM, THC, and HCL emissions from an incinerator	Require all incinerators demonstrate NO_X emissions of less than 60 lb/mmscf	Not Recommended - Evaluated for Attainment Advancement
	Food and Ag Processing	None	Require VOC limits to be as stringent as a rule adopted in SCAQMD which required the use of low-VOC sterilizing products or controlled by an emission control device	Not Recommended - Evaluated for Attainment Advancement
	Bakeries	None	Lower applicability threshold	Not Recommended - Evaluated for Attainment Advancement

Table H-5
PCAPCD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
213, 215	Terminal/Bulk Plants	VOC limits from loading of organic liquids	Require VOC limits to be as stringent as BAAQMD; require leak inspection requirement and repair time requirement similar to the requirements adopted in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
Further Study – 4	Gasoline Dispensing Phase I/II	Require new and existing retail service stations being in compliance with State ATCM by its deadline	Evaluate SJV proposal to include mobile fuelers, increase inspection frequency, lower allowable vapor leak threshold	Further Study - Current information inadequate to quality benefits and cost effectiveness
Further Study – 4	Gasoline Dispensing Phase I/II	Require new and existing retail service stations being in compliance with State ATCM by its deadline	Improve compliance rates by requiring ISD to provide earlier warning signal at lower degradation rate; change ISD warning and gross failure rates; disallow ISD reset button until fixed; require installation of shut down sensor	Further Study - Current information inadequate to quality benefits and cost effectiveness
	Storage Tank Degassing	None	Reduce emissions by requiring enhanced control technology, increased control efficiency, establishing concentration limits	Not Recommended - Evaluated for Attainment Advancement
	Aviation Fuel Transfer	None	Reduce VOC from spillage and vapor displacement during Phase 1 operations and from venting through relief valves	Not Recommended - Evaluated for Attainment Advancement
	Marine Coatings	None	Establish VOC limits for marine coatings.	Not Recommended - No sources
	Enhanced Compliance	None	Evaluate permit program change to assess opportunities for further emission reductions; include adjusting permit exemption level, conduct additional inspections and survey to identify potential sources, adding conditions to non-Title V Sources and improving accuracy and enforceability of existing permit	Not Recommended - Evaluated for Attainment Advancement
	Flares	None	Establish standard of NO_X emissions for flares	Not Recommended - No sources

Table H-5
PCAPCD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Polystyrene/ Poly Foam Blowing/Other	None	Require reduction of VOC emission from EPS molding by vented the emissions to an emission control device such as a thermal oxidizer	Not Recommended - No sources
229, 238	Production of Wood/paper products	Limit coatings and inks which contain 250 grams or less of VOC per liter	Require VOC limits for manufacturing wood/paper products.	Not recommended - already implemented
	Industrial Wastewater	None	Require VOC limits and control system from wastewater system	Not Recommended - No sources
	Wastewater Sewage Treatment	None	Require VOC limits and control system for wastewater sewage treatment plant	Not Recommended - No sources
	Lower permit exemption	Permit exemptions and thresholds	Lower permit threshold to bring more sources and equipment under permit program	Not Recommended - Evaluated for Attainment Advancement
	Composting Green Waste	None	Establish VOC limits similar to the rule adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Composting and Biosolids	None	Establish VOC reducing requirements equivalent to SJVUAPCD/SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Glass Furnaces	None	Establish NO_X limits for glass furnaces	Not Recommended - No sources
	Central Furnaces	None	Establish NO_X limits for central furnaces	Not Recommended - Evaluated for Attainment Advancement
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction NO_X emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS-1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS-2	ISR Operational	None	Mitigate increased emissions associated with new land use/development projects	Not Recommended - Evaluated for Attainment Advancement

Table H-5
PCAPCD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Agricultural Burning/Open Burning	Conditions under which burning must be conducted, when allowed, to minimize smoke; Burning is not allowed on days declared No-Burn Day, Areas may have more restricted controls based on its Municipal Advisory Councils decision	Prohibit burning of waste	Not Recommended - Evaluated for Attainment Advancement
	Glycol Dehydration Systems	None	Control VOC emissions from glycol regenerator vents used in natural gas production to remove water vapor	Not Recommended - No sources
Further Study – 5	Lubricants	None	Establish VOC limits for lubricant formulations	Further Study - Current information incomplete to quantify benefits and cost effectiveness
	Facility Modernization	None	Establish a pre-determined life span of when equipment would need to be replaced and would then trigger BACT limits	Not Recommended - Evaluated for Attainment Advancement

Yolo-Solano Air Quality Management District

Stationary/Area Source Control Measures Considered

Table H-6 YSAQMD Stationary/Area Source Control Measures Considered				
Measure No.	**Title**	**Current Requirements**	**Opportunity for Strengthening**	**Conclusion**
	Adhesives and Sealants	VOC limits on adhesives and sealants	Reduce VOC limits on adhesives and sealants to limits used in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
2.14	Architectural Coatings	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control Measure
2.24/2.31	Degreasing/ Solvent Cleaning	VOC limits on solvents	Reduce the VOC limits on the solvents to limits adopted by SCAQMD.	Control measure
	Unspecified Coatings	None	Establish VOC limits on coatings.	Not Recommended - No sources
2.26	Automotive Refinishing	VOC limits on coatings	Reduce the VOC limits on the coatings consistent with the SCM	Control measure
	Paper, Fabric, and Film Coating	None	Establish VOC limits on coatings.	Not Recommended - No sources
	Boilers and Steam Generators, <5.0 mmBTU/hr	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBTU/hr 30 ppm	Establish NO_X limits on boiler/steam generators with rated heat input capacity of 1-5 mmBTU/hr 30 ppm	Not Recommended - High cost
2.27	Boilers and Steam Generators, >4.9 mmBTU/hr	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBTU/hr 30 ppm	Lower NO_X limits on boiler/steam generators with rated heat input capacity of 5-20 mmBTU/hr and >20 mmBTU/hr	Control Measure
231, 232, 233, 241	Boilers and Steam Generators	NO_X limits on boiler/steam generators with rated heat input capacity of 1 mmBTU/hr 30 ppm	Reduce NO_X limit to 6-8 ppm for >20 mmBTU/hr	Not Recommended - Evaluated for Attainment Advancement
2.32	IC Engines	Rich burn NO_X limit at 90 ppm. Lean burn NO_X limit for engines > 100 BHP at 150 ppm and NO_X limit for engines > 100 BHP at 300 ppm	Reduce NO_X emission limit for rich burn, lean burn > 100 BHP, and lean burn engines < 100 BHP.	Not Recommended - Evaluated for Attainment Advancement
2.21	Storage Tanks	Requires use of a pressure tank or use of tank with vapor loss control device	Lower applicability threshold; additional control on fixed roof tank	Not Recommended - Evaluated for Attainment Advancement
	Cap and Trade	None	Establish CAP and Trade Emission Reduction Program similar to SCAQMD's RECLAIM Program	Not Recommended - Evaluated for Attainment Advancement
	Commercial Cooking	None	Establish standards to control VOC emissions for Commercial Cooking (i.e. char boilers)	Not Recommended - Evaluated for Attainment Advancement
	Livestock Waste	Best Available Control Technology	Lower applicability threshold; Increase number of practices to control emissions and improve control efficiency	Not Recommended - Evaluated for Attainment Advancement

Table H-6
YSAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Wineries	None	Establish standards to reduce evaporative VOC emissions from the fermentation process at wineries	Not Recommended - Evaluated for Attainment Advancement
	Wood Products Coatings	VOC limits on wood coatings, application equipment requirements	Reduce VOC limits for high solid stains, sealers, strippers and lower the applicability limit to 20 gal/year	Not Recommended - Evaluated for Attainment Advancement
	Natural Gas Production and Processing	Inspections of seals and pressure relief devices, control of fugitive emissions	Establish requirements to inspect and maintain equipment to reduce fugitive VOC emissions	Not recommended - Already implemented
	Asphaltic Concrete	None	Require limits for NO_X emissions similar to a control measure adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Other Dryers and Ovens	None	Require limits for NO_X emissions that achieve 50 - 75% reduction similar to proposed measure in SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Polyester Resin/Plastic Product Manufacturing	VOC limits on polyester resin materials, requirements for application equipment	Reduce monomer limits to standards adopted by SCAQMD	Not Recommended - Evaluated for Attainment Advancement
	Landfills	Compliance with EPA requirements	Lower applicability threshold to landfills containing approximately 0.5 million tons of waste or more	Not Recommended - Evaluated for Attainment Advancement
2.37	Water Heaters	40 nanogram NO_X limit for natural gas-fired water heaters	Require rating specific NO_X limits on water heaters/boilers with rated heat input capacity between 75,000 BTU/hr and 1,000,000 BTU/hr	Control measure
	Roofing Kettles	None	Establish VOC limits from roofing kettles	Not Recommended - Evaluated for Attainment Advancement
	Reactivity Based Standards	None	Require VOC limit of coatings to be based on a reactivity limit instead of a mass-balance limit	Not recommended - Overlaps with Control Measure 2.14
	Using Greener Consumer Products	None	Promote the use of Low-VOC Consumer Product especially on Spare-the-Air Day	Not Recommended - Evaluated for Attainment Advancement
	Semiconductor Manufacturing	None	Establish VOC limits for semiconductor manufacturing	Not Recommended - Evaluated for Attainment Advancement
	Can Coating	None	Reduce VOC limits to be as stringent as SJVUAPCD	Not Recommended - No sources

Table H-6
YSAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Aerospace Coating	None	Establish VOC limits	Not Recommended - No sources
	Petroleum Dry Cleaning	VOC limits on solvents used or use of emission control device	Remove applicability threshold to include all dry cleaning solvents except for perchloroethylene and ban the use of open transfer systems	Not Recommended - No sources
	Metal Parts and Products	VOC limits on metal parts coatings, application methods	Reduce VOC limits for coatings used in some "baked" applications and coatings considered "specialty coatings"	Not Recommended - Evaluated for Attainment Advancement
2.29	Graphic Arts	VOC limits on graphic arts products	Lower rule exemption limit to 60 pounds per month. Revise cleaning solvent ROG limits to match current SMAQMD standards.	Control Measure
	Gas Turbines	NO_X limits on gas turbines	Reduce NO_X limits to be as stringent as SCAQMD; 0.3-2.9 MW 25 ppmv, 2.9-10 MW 9 ppmv, 2.9-10 MW with no scar 15 ppmv, 10 MW and over 9 ppmv , 10 MW and over with no SCR 12 ppmv	Not Recommended - Already implemented
	Incinerators		Require all incinerators demonstrate NO_X emissions of less than 60 lb/mmscf	Not Recommended - Evaluated for Attainment Advancement
	Food and Ag Processing	None	Require VOC limits to be as stringent as a rule adopted in SCAQMD which required the use of low-VOC sterilizing products or controlled by an emission control device	Not Recommended - Evaluated for Attainment Advancement
	Bakeries	None	Lower applicability threshold	Not Recommended - Evaluated for Attainment Advancement
	Terminal/Bulk Plants	Pressure tank or vapor-loss control device required	Require VOC limits to be as stringent as BAAQMD; require leak inspection requirement and repair time requirement similar to the requirements adopted in SCAQMD	Not Recommended - Already implemented

Table H-6
YSAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Gasoline Dispensing Phase I/II	Phase I requires submerged fill pipe and ARB certified systems. Phase II requires ARB certified system, replacement of balance-system nozzle boots once per year	Evaluate SJV proposal to include mobile fuelers, increase inspection frequency, lower allowable vapor leak threshold	Not recommended - Already implemented
Further Study – 4	Gasoline Dispensing Phase I/II	Phase I requires submerged fill pipe and ARB certified systems. Phase II requires ARB certified system, replacement of balance-system nozzle boots once per year	Improve compliance rates by requiring ISD to provide earlier warning signal at lower degradation rate; change ISD warning and gross failure rates; disallow ISD reset button until fixed; require installation of shut down sensor	Further Study Needed - Current information inadequate to quantify benefits or assess cost/feasibility
	Storage Tank Degassing		Reduce emissions by requiring enhanced control technology, increased control efficiency, establishing concentration limits	Not Recommended - Evaluated for Attainment Advancement
	Aviation Fuel Transfer	None	Reduce VOC from spillage and vapor displacement during Phase 1 operations and from venting through relief valves	Not Recommended - Evaluated for Attainment Advancement
	Marine Coatings	None	Establish VOC limits for marine coatings.	Not Recommended - Evaluated for Attainment Advancement
	Enhanced Compliance	None	Evaluate permit program change to assess opportunities for further emission reductions; include adjusting permit exemption level, conduct additional inspections and survey to identify potential sources, adding conditions to non-Title V Sources and improving accuracy and enforceability of existing permit	Not Recommended - Evaluated for Attainment Advancement
	Flares	None	Establish standard of NO_X emissions for flares	Not Recommended - Evaluated for Attainment Advancement
	Polystyrene/ Poly Foam Blowing/Other	None	Require reduction of VOC emission from EPS molding by vented the emissions to an emission control device such as a thermal oxidizer	Not Recommended - Equivalent or better requirements in place

Table H-6
YSAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Production of Wood/paper products	None	Require VOC limits for manufacturing of wood/paper products	Not Recommended - No sources
	Industrial Wastewater	None	Require VOC limits and control system from wastewater system	Not Recommended - Evaluated for Attainment Advancement
	Wastewater Sewage Treatment	None	Require VOC limits and control system for wastewater sewage treatment plant	Not Recommended - Evaluated for Attainment Advancement
	Lower permit exemption	None	Lower permit threshold to bring more sources and equipment under permit program	Not Recommended - Evaluated for Attainment Advancement
	Composting Green Waste	None	Establish VOC limits similar to the rule adopted by SJVUAPCD	Not Recommended - Evaluated for Attainment Advancement
	Composting and Biosolids	None	Establish VOC reducing requirements equivalent to SJVUAPCD/SCAQMD	Not Recommended - No sources
	Glass Furnaces	None	Establish NO_X limits for glass furnaces	Not Recommended - No sources
	Central Furnaces	None	Establish NO_X limits for central furnaces	Not Recommended - Evaluated for Attainment Advancement
IS – 1	ISR Construction	None	Implement construction mitigation rule to reduce off-road construction emissions associated with new land use development	Not Recommended - Evaluated for Attainment Advancement
IS – 2	ISR Operational	None	Mitigate increased emissions associated with new land use/development projects	Not Recommended - Evaluated for Attainment Advancement
	Agricultural Burning/Open Burning	Burning dependent of meteorology, no burning allowed on no-burn days	Prohibit burning of waste	Not Recommended - Evaluated for Attainment Advancement
	Glycol Dehydration Systems	None	Control VOC emissions from glycol regenerator vents used in natural gas production to remove water vapor	Not Recommended - Evaluated for Attainment Advancement
Further Study – 5	Lubricants	None	Establish VOC limits for lubricant formulations	Further Study Needed - Current information inadequate to quantify benefits or assess cost/feasibility

Table H-6
YSAQMD Stationary/Area Source Control Measures Considered

Measure No.	Title	Current Requirements	Opportunity for Strengthening	Conclusion
	Facility Modernization	New equipment with PTE > 10 lbs/day install BACT	Establish a pre-determined life span of when equipment would need to be replaced and would then trigger BACT limits	Not Recommended - Evaluated for Attainment Advancement

Appendix I: Federal Clean Air Act Requirements

Table I-1
General Nonattainment Plan Requirements

Required Plan Element	Description	Location in Plan
Reasonably Available Control Measures (RACM) [Section 172(c)(1)	The plan should provide for the implementation of all reasonably available control measures as expeditiously as practicable, including reduction in emissions from existing sources through the adoption of reasonably available control technology.	Chapter 7 (proposed control measures) Appendix H (RACM analysis)
Reasonable Further Progress [Section 172(c)(2)]	The plan requires reasonable further progress in emission reduction.	Chapter 13 (RFP demonstration)
Inventory [Section 172(c)(3)]	The plan should include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants in such area, including periodic revisions as the Administrator may determine necessary to assure that the requirements of this part are met.	Chapter 5 (emissions inventory) Appendix A (emissions inventory)
Identification and Quantification [Section 172(c)(4)]	The plan should identify and quantify the emissions, if any, of any such pollutant or pollutants, which will be allowed, in accordance with section 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in each such area. The plan shall demonstrate to the satisfaction of the EPA that the emissions quantified for this purpose will be consistent with the achievement of reasonable further progress and will not interfere with attainment of the applicable national ambient air quality standard by the applicable attainment date.	Chapter 5, Sections 5.5 and 5.6 (emissions forecasts) Chapter 8 (attainment demonstration) Chapter13 (RFP demonstration)
Permits for new and modified stationary sources [Section 172(c)(5)]	Such plan provisions shall require permits for the construction and operation of new or modified major stationary sources anywhere in the nonattainment area, in accordance with section 173.	Chapter 3, Section 3.3 (NSR permitting requirements)

Table I-1 (cont.)
General Nonattainment Plan Requirements

Required Plan Element	Description	Location in Plan
Other Measures [Section 172(c)(6)]	Such plan provisions shall include enforceable emission limitations, and such other control measures, means or techniques (including economic incentives such as fees, marketable permits, and auctions of emission rights), as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment by the applicable date.	Chapter 7 (proposed control measures)
Compliance with Section 110(a)(2) [Section 172(c)(7)]	Compliance with section 110(a)(2).- Such plan provisions shall also meet the applicable provisions of section 110(a)(2). Section 110(a)(2) – includes reasonable notice and public hearing requirements for plan adoptions.	Chapters 2, 4, 6, 7, 8
Equivalent Techniques [Section 172(c)(8)]	Upon application by any State, the EPA may allow the use of equivalent modeling, emission inventory, and planning procedures, unless the EPA determines that the proposed techniques are, in the aggregate, less effective than the methods specified by the EPA.	Chapter 5 (emissions inventory) Chapter 6 (air quality modeling)
Contingency Measures [Section 172(c)(9)]	The plan should include specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard by the applicable attainment. Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the EPA	Chapter 7, Section 7.20 (contingency measures) Chapter 8, Section 8.4 Chapter 13, Section 13.3

Table I-2
Severe Area Plan Requirements for Ozone Nonattainment Areas

Required Plan Element	Description	Location in Plan
Inventory [Section 182(a)(1)]	Submit a comprehensive, accurate, current inventory of actual emissions from all sources.	Chapter 5 (emissions inventory) Appendix A (emissions inventory)
General Offset requirements [Section 182(d)(2)]	The ratio of total emission reductions of volatile organic compounds (VOCs) to total increased emissions of such air pollutant shall be at least 1.3 to 1, except that if the State plan requires all existing major sources in a nonattainment area to use best available control technology for the control of VOCs, the ratio shall be at least 1.2 to 1.	Chapter 3, Section 3.3 (NSR permitting requirements)
Reasonably available control technology [Section 182(b)(2)]	Implementation of control technologies for VOC sources covered by control technique guidelines (CTG) documents and all other major stationary sources of VOCs that are located in the area.	Chapter 3, Section 3.4 (RACT requirements)
Attainment demonstration [Section 172(c)(1) and 182(c)(2)(A)]	A demonstration that the plan will provide for attainment of the national ambient air quality standard as expeditiously as practicable by the applicable attainment date. The demonstration must be based on photochemical grid modeling.	Chapter 6 (air quality modeling) Chapter 8 (attainment demonstration) Appendix B (photochemical modeling)
Reasonable Further Progress (RFP) demonstration [Section 182(c)(2)(B) and (C)]	A demonstration that the plan will result in VOC emissions (and/or NO_X emissions) reductions from the baseline emissions of an average of at least three percent each year.	Chapter 13 (RFP demonstration)
Enhanced vehicle inspection and maintenance program [Section 182(c)(3)]	The State shall provide for an enhanced program to reduce hydrocarbon emissions and NO_X emissions from in-use motor vehicles registered in each urbanized area	Chapter 5, Section 5.3.3 (on-road motor vehicle emissions EMFAC2007)
Contingency Provisions [Section 182(c)(9)]	The plan shall provide for the implementation of specific measures to be undertaken if the area fails to meet any applicable milestone. Such measures shall take effect without further action by the State or the EPA upon a failure to meet the applicable milestone.	Chapter 7, Section 7.20 (contingency measures) Chapter 8, Section 8.4 Chapter 13, Section 13.3
Vehicle Miles Traveled [Section 182(d)(1)]	Transportation control strategies/Transportation control measures.	Chapter 7, Section 7.9 (TCMs) Appendix D (TCMs)
Vehicle Miles Traveled Offset [Section 182(d)(1)(A)]	The Plan shall identify and adopt specific enforceable transportation control strategies and transportation control measures to offset any growth in emissions from growth in vehicle miles traveled or numbers of vehicle trips.	Chapter 11, Section 8 (VMT Offset) and Appendix F (VMT Offset)

Required Plan Element	Description	Location in Plan
Milestones [Section 182(g)]	Provide a report every three years after the designation to determine whether the nonattainment area has achieved a reduction in emissions during the preceding interval equivalent to the total emission reductions required to be achieved by the attainment date given in the plan.	Chapter 14, Section 14.13 (milestone reports)