

Public Review Draft

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Appendix 3

Emission Inventories

The development of emission estimates for each of the fuel scenarios involved a number of steps. This appendix briefly outlines the procedures used and presents detailed emission inventories for all the scenarios.

1 County Level Emission Inventories

The inventories for the 1997 and 2003 baseline fuels (MTBE blends) were obtained from the ARB emission inventory database -- California Emissions Forecasting System (CEFS). These inventories are available at the county level. The inventories are the ozone planning inventories which reflect emissions on a summer day with high ozone. Since the official ARB inventory is updated regularly as better information becomes available, it is important to document the date of data retrieval. Area sources, including on-road and other mobile sources, were produced on May 26, 1999. Point sources were produced on June 10, 1999.

The on-road motor vehicle portion of the inventory was based on the Motor Vehicle Emission Inventory model MVEI7G(version 1.0c) because EMFAC99 was not available. The off-road mobile source emissions were prepared with methodologies used previous to the development of ARB's new off-road emissions model.

These inventories represent mass emissions of principal criteria pollutants in units of tons per day. The pollutants include total organic gases, oxides of nitrogen, oxides of sulfur, carbon monoxide, and particulate matter. Estimates of emissions of individual organic gas constituents such as benzene were developed by combining the mass emissions from the inventory with the speciation profiles described in Appendix 1.

Tables 1 through 7 present the summer ozone planning inventories for the South Coast Air Basin for each of the fuel scenarios. The pollutants of major interest include carbon monoxide (CO), nitrogen oxides (NO_x), reactive organic gases (ROG), benzene, 1,3-butadiene, acetaldehyde, formaldehyde, ethanol, and methyl tert-butyl ether (MTBE). In addition, emission inventory data for four alkylates and five additional VOCs are presented in Table 8 for the SCAQS modeling region. These latter compounds were judged to be of minimal concern as discussed in Appendix 5.

Table 1 -- 1997 Baseline Inventory (MTBE)

Table 2 -- 2003 Baseline Inventory (MTBE)

Table 3 -- 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen

Table 4 -- 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen

Table 5 -- 2003 Inventory with Fully Complying Non-Oxygenated Fuel

Table 6 -- 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen, Harley Version

Table 7 -- 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen, Harley Version

Table 8 -- Emission Inventory Data of Selected Compounds in 1997 Baseline and 2003 Scenarios.

The county level inventories were subsequently gridded for use in air quality modeling. That process is described in Section 2.

Table 1. 1997 Baseline Inventory (MTBE)

Scenario: MTBE Summer 1997	South Coast Air Basin Emissions				Tons/Day				
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES									
FUEL COMBUSTION									
ELECTRIC UTILITIES	3.87	16.58	.88	.061	.	.011	.146	.	
COGENERATION	2.79	6.89	.61	.007	.	.002	.053	.	
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	10.66	.81	.031	.	.002	.095	.	
PETROLEUM REFINING (COMBUSTION)	8.56	17.72	1.4	.02	.002	.002	.139	.	.004
MANUFACTURING AND INDUSTRIAL	16.78	43.99	4.94	.211	.004	.071	.625	.	.002
FOOD AND AGRICULTURAL PROCESSING	.46	1.21	.2	.016	.	.	.033	.	.
SERVICE AND COMMERCIAL	12.78	26.27	3.48	.103	.002	.044	.394	.	.002
OTHER (FUEL COMBUSTION)	4.14	2.89	.6	.016	.004	.003	.032	.	.007
FUEL COMBUSTION - Subtotal	50.95	126.21	12.92	.466	.011	.136	1.518	.	.014
WASTE DISPOSAL									
SEWAGE TREATMENT	.03	.	.09				.014		
LANDFILLS	.55	.54	1.32				.044		
INCINERATORS	.12	.34	.01	.006			.		
OTHER (WASTE DISPOSAL)	.	.01	.79	.					
WASTE DISPOSAL - Subtotal	.7	.89	2.21	.006			.058		
CLEANING AND SURFACE COATINGS									
LAUNDERING	.	.	.64						
DEGREASING	.	.	85.53						
COATINGS AND RELATED PROCESS SOLVENTS	.22	.36	92.98	.069				1.965	.001
PRINTING	.02	.07	5.05					.53	
OTHER (CLEANING AND SURFACE COATINGS)	.	.	13.38	.003				.003	
CLEANING AND SURFACE COATINGS - Subtotal	.24	.43	197.56	.071			.	2.498	.001
PETROLEUM PRODUCTION AND MARKETING									
OIL AND GAS PRODUCTION	.02	.06	12.4	.187			.		.001
PETROLEUM REFINING	6.28	10.93	8.99	.13			.014		.134
PETROLEUM MARKETING	.08	.	23.57	.145					3.197
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004					.001
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.43	11.01	45.16	.466			.014		3.334
INDUSTRIAL PROCESSES									
CHEMICAL	.04	.57	13.75	.001			.	.001	
FOOD AND AGRICULTURE	.21	.12	3.19					1.04	
MINERAL PROCESSES	2.67	9.93	.58						
METAL PROCESSES	1.74	.69	.65						
WOOD AND PAPER	.	.	.04						
GLASS AND RELATED PRODUCTS	.	1.48	.03						
OTHER (INDUSTRIAL PROCESSES)	1.4	1.15	2.61	.			.335		.
INDUSTRIAL PROCESSES - Subtotal	6.06	13.94	20.84	.001			.336	1.041	.

Table 1. 1997 Baseline Inventory (MTBE)

Scenario: MTBE Summer 1997	South Coast Air Basin Emissions				Tons/Day				
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal	64.38	152.49	278.71	1.011	.011	.136	1.926	3.539	3.349
AREA-WIDE SOURCES									
SOLVENT EVAPORATION									
CONSUMER PRODUCTS	.	.	87.13				.029	25.241	
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	.	.	68.02	.067				.252	
PESTICIDES/FERTILIZERS	.	.	13.81	.596			.002	1.557	
ASPHALT PAVING	.	.	.48						
OTHER (SOLVENT EVAPORATION)	.	.	.17	.002					
SOLVENT EVAPORATION - Subtotal	.	.	169.61	.665			.031	27.05	
MISCELLANEOUS PROCESSES									
RESIDENTIAL FUEL COMBUSTION	40.78	22.65	2.75	.068		.173	.322		
FARMING OPERATIONS	.	.	10.92					2.731	
FIRES	7.54	.18	.53						
WASTE BURNING AND DISPOSAL	17.7	.74	1.39		.021				
UTILITY EQUIPMENT	229.58	.3	14.74	.55	.133	.12	.499	.002	.297
OTHER (MISCELLANEOUS PROCESSES)	.04	.24	1.7						
MISCELLANEOUS PROCESSES - Subtotal	295.65	24.11	32.03	.618	.153	.293	.821	2.732	.297
AREA-WIDE SOURCES - Subtotal	295.65	24.11	201.64	1.283	.153	.293	.852	29.782	.297
MOBILE SOURCES									
ON-ROAD MOTOR VEHICLES									
CATALYST COLD EXHAUST	1150.4	90.72	117.17	3.091	.876	.501	1.639	.113	3.779
CATALYST HOT EXHAUST	1832.7	327.43	107.86	3.55	.742	.326	2.289	.092	2.615
NON-CATALYST COLD EXHAUST	90.02	1.96	15.49	.461	.131	.059	.245	.01	.637
NON-CATALYST HOT EXHAUST	402.33	37.09	46.22	1.725	.416	.376	1.564	.005	.933
HOT SOAK EVAPORATIVES	.	.	34.59	1.188					4.489
DIURNAL EVAPORATIVES	.	.	29.48	.106					4.962
RUNNING EVAPORATIVES	.	.	42.51	1.46					5.517
RESTING EVAPORATIVES	.	.	19.4	.07					3.265
DIESEL EXHAUST	128.07	201.46	20.98	.478	.045	1.756	3.514	.002	
ON-ROAD MOTOR VEHICLES - Subtotal	3603.59	658.65	433.7	12.128	2.21	3.017	9.251	.221	26.195

Table 1. 1997 Baseline Inventory (MTBE)

Scenario: MTBE Summer 1997	South Coast Air Basin Emissions				Tons/Day				
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
OTHER MOBILE SOURCES									
AIRCRAFT	87.08	15.13	15.56	.438	.312	.776	2.482		.008
TRAINS	5.02	31.38	2.08	.047	.004	.174	.348	.	
SHIPS AND COMMERCIAL BOATS	4.49	40.81	5.17	.12	.012	.417	.836	.001	.002
RECREATIONAL BOATS	246.18	2.15	41.74	1.554	.374	.359	1.446	.005	.837
OFF-ROAD RECREATIONAL VEHICLES	70.65	.41	9.4	.351	.085	.076	.318	.001	.19
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT	885.	152.65	38.92	.88	.157	1.506	4.187	.003	.27
FARM EQUIPMENT	7.15	2.7	.51	.014	.002	.029	.061	.	.004
OTHER MOBILE SOURCES - Subtotal	1305.57	245.23	113.37	3.404	.946	3.337	9.679	.009	1.311
MOBILE SOURCES - Subtotal	4909.16	903.89	547.08	15.532	3.156	6.354	18.93	.231	27.507
NATURAL (NON-ANTHROPOGENIC) SOURCES									
NATURAL SOURCES									
WILDFIRES	170.39	2.6	9.41		.14				
NATURAL SOURCES - Subtotal	170.39	2.6	9.41		.14				
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal	170.39	2.6	9.41		.14				
ALL SOURCES - Total	5439.59	1083.09	1036.83	17.826	3.46	6.783	21.709	33.552	31.154

Table 2. 2003 Baseline Inventory (MTBE)

Scenario: MTBE Summer 2003	South Coast Air Basin Emissions				Tons/Day					MTBE
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol		
STATIONARY SOURCES										
FUEL COMBUSTION										
ELECTRIC UTILITIES	1.71	6.51	.39	.027	.	.005	.064	.	.	.
COGENERATION	2.81	5.71	.61	.007	.	.002	.053	.	.	.
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	7.9	.81	.031	.	.002	.095	.	.	.
PETROLEUM REFINING (COMBUSTION)	8.56	7.73	1.4	.02	.002	.002	.139	.	.	.004
MANUFACTURING AND INDUSTRIAL	17.39	38.74	5.43	.244	.004	.072	.701	.	.	.003
FOOD AND AGRICULTURAL PROCESSING	.48	.9	.21	.017	.	.	.035	.	.	.
SERVICE AND COMMERCIAL	14.06	21.83	3.72	.117	.002	.048	.427	.	.	.002
OTHER (FUEL COMBUSTION)	4.41	1.85	.64	.018	.004	.004	.033	.	.	.008
FUEL COMBUSTION - Subtotal	51.	91.17	13.21	.481	.012	.136	1.547	.	.	.016
WASTE DISPOSAL										
SEWAGE TREATMENT	.03	.	.07	.	.	.	.006	.	.	.
LANDFILLS	.6	.59	1.35	.	.	.	.048	.	.	.
INCINERATORS	.13	.34	.02	.007	.	.	.	.	.	.
OTHER (WASTE DISPOSAL)	.	.01	.8	.	.	.	.	.	.	.
WASTE DISPOSAL - Subtotal	.77	.95	2.24	.007	.	.	.055	.	.	.
CLEANING AND SURFACE COATINGS										
LAUNDERING	.	.01	.71	.	.	.	.	.	.	.
DEGREASING	.	.	99.98	.	.	.	.	.	.	.
COATINGS AND RELATED PROCESS SOLVENTS	.26	.42	96.4	.071	.	.	.	1.771	.	.001
PRINTING	.02	.08	5.08	.	.	.	.	.643	.	.
OTHER (CLEANING AND SURFACE COATINGS)	.	.	12.08	.002	.	.	.	.003	.	.
CLEANING AND SURFACE COATINGS - Subtotal	.29	.51	214.26	.074	.	.	.	2.417	.	.001
PETROLEUM PRODUCTION AND MARKETING										
OIL AND GAS PRODUCTION	.02	.06	10.76	.164	.	.	.	.	.	.001
PETROLEUM REFINING	6.33	5.32	8.03	.104	.	.	.014	.	.	.136
PETROLEUM MARKETING	.09	.	24.1	.15	.	.	.	.	.	3.245
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004	.	.	.	.	.	.001
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.5	5.39	43.09	.422	.	.	.014	.	.	3.384
INDUSTRIAL PROCESSES										
CHEMICAL	.04	.54	17.19	.001	.	.	.	.001	.	.
FOOD AND AGRICULTURE	.22	.11	3.28	.	.	.	.	1.091	.	.
MINERAL PROCESSES	2.84	6.49	.65	.	.	.	.	.	.	.
METAL PROCESSES	1.96	.75	.75	.	.	.	.	.	.	.
WOOD AND PAPER	.	.	.04	.	.	.	.	.	.	.
GLASS AND RELATED PRODUCTS	.	.26	.03	.	.	.	.	.	.	.
OTHER (INDUSTRIAL PROCESSES)	1.67	.94	2.94	.	.	.	.357	.	.	.
INDUSTRIAL PROCESSES - Subtotal	6.74	9.09	24.89	.001	.	.	.357	1.091	.	.

Table 2. 2003 Baseline Inventory (MTBE)

Scenario: MTBE	Summer 2003	South Coast Air Basin Emissions			Tons/Day					
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal		65.29	107.12	297.69	.986	.012	.136	1.974	3.508	3.401
AREA-WIDE SOURCES										
SOLVENT EVAPORATION										
CONSUMER PRODUCTS		.	.	83.19				.028	24.1	
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS		.	.	72.77	.072				.27	
PESTICIDES/FERTILIZERS		.	.	13.42	.595			.002	1.464	
ASPHALT PAVING		.	.	.55						
OTHER (SOLVENT EVAPORATION)		.	.	.19	.002					
SOLVENT EVAPORATION - Subtotal		.	.	170.12	.669			.029	25.834	
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION		43.99	23.68	2.95	.071		.187	.344		
FARMING OPERATIONS		.	.	10.38					2.596	
FIRES		8.06	.19	.56						
WASTE BURNING AND DISPOSAL		30.89	1.44	2.34		.035				
UTILITY EQUIPMENT		204.59	.41	11.91	.444	.107	.097	.403	.001	.24
OTHER (MISCELLANEOUS PROCESSES)		.05	.28	1.81						
MISCELLANEOUS PROCESSES - Subtotal		287.57	26.	29.96	.515	.142	.284	.747	2.597	.24
AREA-WIDE SOURCES - Subtotal		287.57	26.	200.08	1.185	.142	.284	.776	28.431	.24
MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
CATALYST COLD EXHAUST		757.45	71.4	82.09	2.164	.62	.349	1.152	.079	2.653
CATALYST HOT EXHAUST		1290.2	223.04	62.26	2.05	.428	.187	1.321	.053	1.509
NON-CATALYST COLD EXHAUST		27.12	.59	4.78	.142	.04	.018	.075	.003	.196
NON-CATALYST HOT EXHAUST		143.27	12.97	16.84	.628	.152	.137	.57	.002	.34
HOT SOAK EVAPORATIVES		.	.	19.83	.681					2.574
DIURNAL EVAPORATIVES		.	.	18.85	.068					3.173
RUNNING EVAPORATIVES		.	.	35.02	1.203					4.545
RESTING EVAPORATIVES		.	.	10.93	.039					1.84
DIESEL EXHAUST		141.72	177.19	15.82	.36	.034	1.324	2.649	.002	
ON-ROAD MOTOR VEHICLES - Subtotal		2359.79	485.2	266.42	7.336	1.273	2.015	5.768	.138	16.83

Table 2. 2003 Baseline Inventory (MTBE)

Scenario: MTBE Summer 2003	South Coast Air Basin Emissions						Tons/Day			MTBE
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol		
OTHER MOBILE SOURCES										
AIRCRAFT	92.63	17.24	16.92	.472	.343	.858	2.745			.008
TRAINS	4.79	30.01	1.99	.045	.004	.166	.333	.		
SHIPS AND COMMERCIAL BOATS	4.85	44.48	5.59	.129	.013	.451	.904	.001		.002
RECREATIONAL BOATS	297.9	2.6	50.51	1.88	.453	.434	1.75	.005		1.013
OFF-ROAD RECREATIONAL VEHICLES	62.44	.46	3.84	.143	.035	.031	.13	.		.078
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT	941.55	132.63	41.63	.947	.17	1.595	4.446	.003		.295
FARM EQUIPMENT	7.73	2.78	.56	.016	.003	.032	.068	.		.004
OTHER MOBILE SOURCES - Subtotal	1411.89	230.2	121.05	3.633	1.02	3.568	10.377	.01		1.4
MOBILE SOURCES - Subtotal	3771.68	715.39	387.47	10.969	2.293	5.583	16.144	.148		18.23
NATURAL (NON-ANTHROPOGENIC) SOURCES										
NATURAL SOURCES										
WILDFIRES	170.39	2.6	9.41		.14					
NATURAL SOURCES - Subtotal	170.39	2.6	9.41		.14					
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal	170.39	2.6	9.41		.14					
ALL SOURCES - Total	4294.94	851.11	894.65	13.14	2.587	6.003	18.894	32.088		21.872

Table 3. 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen

Scenario: ET20 Summer 2003	South Coast Air Basin Emissions				Tons/Day					
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE	
STATIONARY SOURCES										
FUEL COMBUSTION										
ELECTRIC UTILITIES	1.71	6.51	.39	.027	.	.005	.064	.	.	
COGENERATION	2.81	5.71	.61	.007	.	.002	.053	.	.	
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	7.9	.81	.031	.	.002	.095	.	.	
PETROLEUM REFINING (COMBUSTION)	8.56	7.73	1.4	.02	.002	.003	.138	.004	.	
MANUFACTURING AND INDUSTRIAL	17.39	38.74	5.43	.244	.004	.072	.7	.003	.	
FOOD AND AGRICULTURAL PROCESSING	.48	.9	.21	.017	.	.	.035	.	.	
SERVICE AND COMMERCIAL	14.06	21.83	3.72	.117	.002	.048	.427	.002	.	
OTHER (FUEL COMBUSTION)	4.41	1.85	.64	.017	.004	.005	.032	.008	.	
FUEL COMBUSTION - Subtotal	51.	91.17	13.21	.481	.012	.138	1.546	.016	.	
WASTE DISPOSAL										
SEWAGE TREATMENT	.03	.	.07	.	.	.	.006	.	.
LANDFILLS	.6	.59	1.35	.	.	.	.048	.	.
INCINERATORS	.13	.34	.02	.007	.	.	.	.	.
OTHER (WASTE DISPOSAL)	.	.01	.8	.	.	.	.	.	.
WASTE DISPOSAL - Subtotal	.77	.95	2.24	.007	.	.	.055	.	.	
CLEANING AND SURFACE COATINGS										
LAUNDERING	.	.01	.71	.	.	.	.	.	.
DEGREASING	.	.	99.98	.	.	.	.	.	.
COATINGS AND RELATED PROCESS SOLVENTS	.26	.42	96.4	.071	.	.	.	1.772	.	
PRINTING	.02	.08	5.08	.	.	.	.	.643	.
OTHER (CLEANING AND SURFACE COATINGS)	.	.	12.08	.002	.	.	.	.003	.
CLEANING AND SURFACE COATINGS - Subtotal	.29	.51	214.26	.074	.	.	.	2.418	.	
PETROLEUM PRODUCTION AND MARKETING										
OIL AND GAS PRODUCTION	.02	.06	10.76	.164	.	.	.	.001	.
PETROLEUM REFINING	6.33	5.32	8.03	.104	.	.	.014	.089	.	
PETROLEUM MARKETING	.09	.	24.1	.15	.	.	.	2.033	.	
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004	.	.	.	.001	.
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.5	5.39	43.09	.422	.	.	.014	2.124	.	
INDUSTRIAL PROCESSES										
CHEMICAL	.04	.54	17.19	.001	.	.	.	.001	.
FOOD AND AGRICULTURE	.22	.11	3.28	.	.	.	.	1.091	.
MINERAL PROCESSES	2.84	6.49	.65	.	.	.	.	.	.
METAL PROCESSES	1.96	.75	.75	.	.	.	.	.	.
WOOD AND PAPER	.	.	.04	.	.	.	.	.	.
GLASS AND RELATED PRODUCTS	.	.26	.03	.	.	.	.	.	.
OTHER (INDUSTRIAL PROCESSES)	1.67	.94	2.94	.	.	.	.357	.	.
INDUSTRIAL PROCESSES - Subtotal	6.74	9.09	24.89	.001	.	.	.357	1.092	.	

Table 3. 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen

Scenario: ET20	Summer 2003	South Coast Air Basin Emissions			Tons/Day					
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal		65.29	107.12	297.69	.986	.012	.138	1.973	5.649	.
AREA-WIDE SOURCES										
SOLVENT EVAPORATION										
CONSUMER PRODUCTS		.	.	83.19	.	.	.	.028	24.1	.
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS		.	.	72.77	.072	.	.	.	.27	.
PESTICIDES/FERTILIZERS		.	.	13.42	.595	.	.	.002	1.464	.
ASPHALT PAVING		.	.	.55	.	.	.	.	.	.
OTHER (SOLVENT EVAPORATION)		.	.	.19	.002	.	.	.	.	.
SOLVENT EVAPORATION - Subtotal		.	.	170.12	.669	.	.	.029	25.834	.
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION		43.99	23.68	2.95	.071	.	.187	.344	.	.
FARMING OPERATIONS		.	.	10.38	.	.	.	.	2.596	.
FIRES		8.06	.19	.56	.	.	.	.	.	.
WASTE BURNING AND DISPOSAL		30.89	1.44	2.34	.	.035	.	.	.	.
UTILITY EQUIPMENT		204.59	.41	11.88	.437	.108	.126	.388	.241	.
OTHER (MISCELLANEOUS PROCESSES)		.05	.28	1.81	.	.	.	.	.	.
MISCELLANEOUS PROCESSES - Subtotal		287.57	26.	29.93	.508	.142	.313	.732	2.837	.
AREA-WIDE SOURCES - Subtotal		287.57	26.	200.05	1.177	.142	.313	.761	28.671	.
MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
CATALYST COLD EXHAUST		757.45	71.4	81.36	2.021	.638	.353	1.084	.	.
CATALYST HOT EXHAUST		1290.2	223.04	61.93	2.009	.428	.243	1.267	1.51	.
NON-CATALYST COLD EXHAUST		27.12	.59	4.77	.14	.041	.023	.07	.155	.
NON-CATALYST HOT EXHAUST		143.27	12.97	16.8	.618	.152	.178	.549	.34	.
HOT SOAK EVAPORATIVES		.	.	19.83	.681	.	.	.	3.572	.
DIURNAL EVAPORATIVES		.	.	18.85	.068	.	.	.	2.074	.
RUNNING EVAPORATIVES		.	.	35.02	1.203	.	.	.	6.309	.
RESTING EVAPORATIVES		.	.	10.93	.039	.	.	.	1.202	.
DIESEL EXHAUST		141.72	177.19	15.82	.36	.034	1.324	2.649	.002	.
ON-ROAD MOTOR VEHICLES - Subtotal		2359.79	485.2	265.31	7.14	1.293	2.122	5.62	15.165	.

Table 3. 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen

Scenario: ET20	Summer 2003	South Coast Air Basin Emissions			Tons/Day					
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
OTHER MOBILE SOURCES										
AIRCRAFT		92.63	17.24	16.92	.472	.343	.858	2.745	.	.008
TRAINS		4.79	30.01	1.99	.045	.004	.166	.333	.	.
SHIPS AND COMMERCIAL BOATS		4.85	44.48	5.59	.129	.013	.451	.904	.003	.
RECREATIONAL BOATS		297.9	2.6	50.4	1.85	.454	.557	1.687	1.015	.
OFF-ROAD RECREATIONAL VEHICLES		62.44	.46	3.84	.141	.035	.041	.125	.078	.
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT		941.55	132.63	41.6	.938	.17	1.631	4.428	.297	.
FARM EQUIPMENT		7.73	2.78	.56	.016	.003	.033	.068	.004	.
OTHER MOBILE SOURCES - Subtotal		1411.89	230.2	120.89	3.591	1.022	3.737	10.291	1.396	.008
MOBILE SOURCES - Subtotal		3771.68	715.39	386.21	10.731	2.315	5.858	15.91	16.561	.008
NATURAL (NON-ANTHROPOGENIC) SOURCES										
NATURAL SOURCES										
WILDFIRES		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
ALL SOURCES - Total		4294.94	851.11	893.35	12.894	2.609	6.309	18.644	50.881	.008

Table 4. 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen

Scenario: ET35 Summer 2003	South Coast Air Basin Emissions			Tons/Day					
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES									
FUEL COMBUSTION									
ELECTRIC UTILITIES	1.71	6.51	.39	.027	.	.005	.064	.	.
COGENERATION	2.81	5.71	.61	.007	.	.002	.053	.	.
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	7.9	.81	.031	.	.002	.095	.	.
PETROLEUM REFINING (COMBUSTION)	8.56	7.73	1.4	.02	.002	.004	.138	.006	.
MANUFACTURING AND INDUSTRIAL	17.39	38.74	5.43	.244	.004	.073	.7	.005	.
FOOD AND AGRICULTURAL PROCESSING	.48	.9	.21	.017	.	.	.035	.	.
SERVICE AND COMMERCIAL	14.06	21.83	3.72	.117	.002	.049	.427	.004	.
OTHER (FUEL COMBUSTION)	4.41	1.85	.64	.018	.004	.008	.032	.013	.
FUEL COMBUSTION - Subtotal	51.	91.17	13.21	.482	.012	.144	1.545	.028	.
WASTE DISPOSAL									
SEWAGE TREATMENT	.03	.	.07	.	.	.	.006	.	.
LANDFILLS	.6	.59	1.35	.	.	.	.048	.	.
INCINERATORS	.13	.34	.02	.007	.	.	.	.	.
OTHER (WASTE DISPOSAL)	.	.01	.8	.	.	.	.	.	.
WASTE DISPOSAL - Subtotal	.77	.95	2.24	.007	.	.	.055	.	.
CLEANING AND SURFACE COATINGS									
LAUNDERING	.	.01	.71	.	.	.	.	.	.
DEGREASING	.	.	99.98	.	.	.	.	.	.
COATINGS AND RELATED PROCESS SOLVENTS	.26	.42	96.4	.071	.	.	.	1.772	.
PRINTING	.02	.08	5.08	.	.	.	.	.643	.
OTHER (CLEANING AND SURFACE COATINGS)	.	.	12.08	.002	.	.	.	.003	.
CLEANING AND SURFACE COATINGS - Subtotal	.29	.51	214.26	.074	.	.	.	2.418	.
PETROLEUM PRODUCTION AND MARKETING									
OIL AND GAS PRODUCTION	.02	.06	10.76	.164	.	.	.	.001	.
PETROLEUM REFINING	6.33	5.32	8.03	.104	.	.	.014	.154	.
PETROLEUM MARKETING	.09	.	24.1	.15	.	.	.	3.521	.
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004	.	.	.	.002	.
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.5	5.39	43.09	.422	.	.	.014	3.677	.
INDUSTRIAL PROCESSES									
CHEMICAL	.04	.54	17.19	.001	.	.	.	.001	.
FOOD AND AGRICULTURE	.22	.11	3.28	.	.	.	.	1.091	.
MINERAL PROCESSES	2.84	6.49	.65	.	.	.	.	.	.
METAL PROCESSES	1.96	.75	.75	.	.	.	.	.	.
WOOD AND PAPER	.	.	.04	.	.	.	.	.	.
GLASS AND RELATED PRODUCTS	.	.26	.03	.	.	.	.	.	.
OTHER (INDUSTRIAL PROCESSES)	1.67	.94	2.94	.	.	.	.357	.	.
INDUSTRIAL PROCESSES - Subtotal	6.74	9.09	24.89	.001	.	.	.357	1.092	.

Table 4. 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen

Scenario: ET35	Summer 2003	South Coast Air Basin Emissions			Tons/Day					
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal		65.29	107.12	297.69	.986	.012	.144	1.972	7.215	.
AREA-WIDE SOURCES										
SOLVENT EVAPORATION										
CONSUMER PRODUCTS		.	.	83.19	.	.	.	.028	24.1	.
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS		.	.	72.77	.072	.	.	.	.27	.
PESTICIDES/FERTILIZERS		.	.	13.42	.595	.	.	.002	1.464	.
ASPHALT PAVING		.	.	.55	.	.	.	.	.	.
OTHER (SOLVENT EVAPORATION)		.	.	.19	.002	.	.	.	.	.
SOLVENT EVAPORATION - Subtotal		.	.	170.12	.669	.	.	.029	25.834	.
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION		43.99	23.68	2.95	.071	.	.187	.344	.	.
FARMING OPERATIONS		.	.	10.38	.	.	.	.	2.596	.
FIRES		8.06	.19	.56	.	.	.	.	.	.
WASTE BURNING AND DISPOSAL		30.89	1.44	2.34	.	.035	.	.	.	.
UTILITY EQUIPMENT		182.75	.41	11.91	.446	.106	.225	.372	.418	.
OTHER (MISCELLANEOUS PROCESSES)		.05	.28	1.81	.	.	.	.	.	.
MISCELLANEOUS PROCESSES - Subtotal		265.73	26.	29.95	.516	.141	.413	.716	3.014	.
AREA-WIDE SOURCES - Subtotal		265.73	26.	200.08	1.186	.141	.413	.745	28.848	.
MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
CATALYST COLD EXHAUST		643.83	71.4	81.81	2.124	.596	.799	1.037	4.606	.
CATALYST HOT EXHAUST		1096.7	223.04	62.23	2.053	.425	.436	1.218	2.689	.
NON-CATALYST COLD EXHAUST		23.05	.59	4.78	.142	.04	.042	.069	.273	.
NON-CATALYST HOT EXHAUST		121.78	12.97	16.83	.63	.151	.319	.526	.591	.
HOT SOAK EVAPORATIVES		.	.	19.81	.722	.	.	.	6.152	.
DIURNAL EVAPORATIVES		.	.	18.85	.068	.	.	.	3.582	.
RUNNING EVAPORATIVES		.	.	34.99	1.275	.	.	.	10.865	.
RESTING EVAPORATIVES		.	.	10.93	.039	.	.	.	2.077	.
DIESEL EXHAUST		141.72	177.19	15.82	.36	.034	1.324	2.649	.002	.
ON-ROAD MOTOR VEHICLES - Subtotal		2027.08	485.2	266.05	7.413	1.245	2.919	5.499	30.837	.

Table 4. 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen

Scenario: ET35	Summer 2003	South Coast Air Basin Emissions			Tons/Day					
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
OTHER MOBILE SOURCES										
AIRCRAFT		92.63	17.24	16.92	.472	.343	.858	2.745	.	.008
TRAINS		4.79	30.01	1.99	.045	.004	.166	.333	.	.
SHIPS AND COMMERCIAL BOATS		4.73	44.48	5.59	.129	.013	.452	.904	.005	.
RECREATIONAL BOATS		253.27	2.6	50.49	1.885	.449	.976	1.618	1.762	.
OFF-ROAD RECREATIONAL VEHICLES		53.08	.46	3.84	.144	.034	.073	.12	.135	.
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT		865.92	132.63	41.62	.948	.169	1.753	4.408	.515	.
FARM EQUIPMENT		6.73	2.78	.56	.016	.003	.035	.068	.007	.
OTHER MOBILE SOURCES - Subtotal		1281.15	230.2	121.02	3.64	1.015	4.312	10.196	2.424	.008
MOBILE SOURCES - Subtotal		3308.24	715.39	387.07	11.053	2.26	7.231	15.694	33.261	.008
NATURAL (NON-ANTHROPOGENIC) SOURCES										
NATURAL SOURCES										
WILDFIRES		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
ALL SOURCES - Total		3809.66	851.11	894.25	13.226	2.553	7.788	18.411	69.323	.008

Table 5. 2003 Inventory with Fully Complying Non-Oxygenated Fuel

Scenario: UNOX Summer 2003	South Coast Air Basin Emissions				Tons/Day					
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE	
STATIONARY SOURCES										
FUEL COMBUSTION										
ELECTRIC UTILITIES	1.71	6.51	.39	.027	.	.005	.064	.	.	
COGENERATION	2.81	5.71	.61	.007	.	.002	.053	.	.	
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	7.9	.81	.031	.	.002	.095	.	.	
PETROLEUM REFINING (COMBUSTION)	8.56	7.73	1.39	.02	.002	.002	.138	.	.	
MANUFACTURING AND INDUSTRIAL	17.39	38.74	5.43	.244	.004	.072	.7	.	.	
FOOD AND AGRICULTURAL PROCESSING	.48	.9	.21	.017	.	.	.035	.	.	
SERVICE AND COMMERCIAL	14.06	21.83	3.72	.116	.002	.048	.427	.	.	
OTHER (FUEL COMBUSTION)	4.41	1.85	.64	.017	.004	.004	.032	.	.	
FUEL COMBUSTION - Subtotal	51.	91.17	13.21	.479	.012	.136	1.545	.	.	
WASTE DISPOSAL										
SEWAGE TREATMENT	.03	.	.07	.	.	.	.006	.	.
LANDFILLS	.6	.59	1.35	.	.	.	.048	.	.
INCINERATORS	.13	.34	.02	.007	.	.	.	.	.
OTHER (WASTE DISPOSAL)	.	.01	.8	.	.	.	.	.	.
WASTE DISPOSAL - Subtotal	.77	.95	2.24	.007	.	.	.055	.	.	
CLEANING AND SURFACE COATINGS										
LAUNDERING	.	.01	.71	.	.	.	.	.	.
DEGREASING	.	.	99.98	.	.	.	.	.	.
COATINGS AND RELATED PROCESS SOLVENTS	.26	.42	96.4	.071	.	.	.	1.771	.	
PRINTING	.02	.08	5.08	.	.	.	.	.643	.
OTHER (CLEANING AND SURFACE COATINGS)	.	.	12.08	.002	.	.	.	.003	.
CLEANING AND SURFACE COATINGS - Subtotal	.29	.51	214.26	.074	.	.	.	2.417	.	
PETROLEUM PRODUCTION AND MARKETING										
OIL AND GAS PRODUCTION	.02	.06	10.76	.164	.	.	.	.	.
PETROLEUM REFINING	6.33	5.32	8.03	.104	.	.	.014	.	.	
PETROLEUM MARKETING	.09	.	24.1	.141	.	.	.	.	.
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004	.	.	.	.	.
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.5	5.39	43.09	.413	.	.	.014	.	.	
INDUSTRIAL PROCESSES										
CHEMICAL	.04	.54	17.19	.001	.	.	.	.001	.
FOOD AND AGRICULTURE	.22	.11	3.28	.	.	.	.	1.091	.
MINERAL PROCESSES	2.84	6.49	.65	.	.	.	.	.	.
METAL PROCESSES	1.96	.75	.75	.	.	.	.	.	.
WOOD AND PAPER	.	.	.04	.	.	.	.	.	.
GLASS AND RELATED PRODUCTS	.	.26	.03	.	.	.	.	.	.
OTHER (INDUSTRIAL PROCESSES)	1.67	.94	2.94	.	.	.	.357	.	.
INDUSTRIAL PROCESSES - Subtotal	6.74	9.09	24.89	.001	.	.	.357	1.091	.	

Table 5. 2003 Inventory with Fully Complying Non-Oxygenated Fuel

Scenario: UNOX	Summer 2003	South Coast Air Basin Emissions			Tons/Day					
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal		65.29	107.12	297.68	.974	.012	.136	1.972	3.508	.
AREA-WIDE SOURCES										
SOLVENT EVAPORATION										
CONSUMER PRODUCTS		.	.	83.19	.	.	.	.028	24.1	.
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS		.	.	72.77	.072	.	.	.	.27	.
PESTICIDES/FERTILIZERS		.	.	13.42	.595	.	.	.002	1.464	.
ASPHALT PAVING		.	.	.55	.	.	.	.	.	.
OTHER (SOLVENT EVAPORATION)		.	.	.19	.002	.	.	.	.	.
SOLVENT EVAPORATION - Subtotal		.	.	170.12	.669	.	.	.029	25.834	.
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION		43.99	23.68	2.95	.071	.	.187	.344	.	.
FARMING OPERATIONS		.	.	10.38	.	.	.	.	2.596	.
FIRES		8.06	.19	.56	.	.	.	.	.	.
WASTE BURNING AND DISPOSAL		30.89	1.44	2.34	.	.035	.	.	.	.
UTILITY EQUIPMENT		211.87	.41	11.86	.413	.111	.097	.379	.	.
OTHER (MISCELLANEOUS PROCESSES)		.05	.28	1.81	.	.	.	.	.	.
MISCELLANEOUS PROCESSES - Subtotal		294.85	26.	29.9	.483	.146	.284	.722	2.596	.
AREA-WIDE SOURCES - Subtotal		294.85	26.	200.03	1.153	.146	.284	.752	28.43	.
MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
CATALYST COLD EXHAUST		795.32	71.4	81.36	2.021	.638	.353	1.084	.	.
CATALYST HOT EXHAUST		1354.7	223.04	61.5	1.889	.439	.187	1.232	.	.
NON-CATALYST COLD EXHAUST		28.47	.59	4.75	.133	.042	.018	.072	.	.
NON-CATALYST HOT EXHAUST		150.43	12.97	16.76	.584	.157	.137	.535	.	.
HOT SOAK EVAPORATIVES		.	.	19.83	.722	.	.	.	.	.
DIURNAL EVAPORATIVES		.	.	18.85	.068	.	.	.	.	.
RUNNING EVAPORATIVES		.	.	35.02	1.275	.	.	.	.	.
RESTING EVAPORATIVES		.	.	10.93	.039	.	.	.	.	.
DIESEL EXHAUST		141.72	177.19	15.82	.36	.034	1.324	2.649	.002	.
ON-ROAD MOTOR VEHICLES - Subtotal		2470.7	485.2	264.82	7.091	1.31	2.02	5.572	.002	.

Table 5. 2003 Inventory with Fully Complying Non-Oxygenated Fuel

Scenario: UNOX	Summer 2003	South Coast Air Basin Emissions				Tons/Day				
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
OTHER MOBILE SOURCES										
AIRCRAFT		92.63	17.24	16.92	.472	.343	.858	2.745	.	.008
TRAINS		4.79	30.01	1.99	.045	.004	.166	.333	.	.
SHIPS AND COMMERCIAL BOATS		4.89	44.48	5.59	.129	.013	.451	.904	.001	.
RECREATIONAL BOATS		312.78	2.6	50.28	1.746	.468	.435	1.647	.	.
OFF-ROAD RECREATIONAL VEHICLES		65.56	.46	3.83	.133	.036	.031	.122	.	.
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT		966.76	132.63	41.56	.908	.174	1.595	4.416	.002	.
FARM EQUIPMENT		8.06	2.78	.56	.015	.003	.032	.068	.	.
OTHER MOBILE SOURCES - Subtotal		1455.47	230.2	120.73	3.449	1.041	3.569	10.235	.003	.008
MOBILE SOURCES - Subtotal		3926.16	715.39	385.55	10.54	2.351	5.589	15.806	.004	.008
NATURAL (NON-ANTHROPOGENIC) SOURCES										
NATURAL SOURCES										
WILDFIRES		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
ALL SOURCES - Total		4456.7	851.11	892.67	12.668	2.648	6.009	18.53	31.943	.008

Table 6. 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen, Harley Version

Scenario: ET20H Summer 2003	South Coast Air Basin Emissions				Tons/Day					
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE	
STATIONARY SOURCES										
FUEL COMBUSTION										
ELECTRIC UTILITIES	1.71	6.51	.39	.027	.	.005	.064	.	.	
COGENERATION	2.81	5.71	.61	.007	.	.002	.053	.	.	
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	7.9	.81	.031	.	.002	.095	.	.	
PETROLEUM REFINING (COMBUSTION)	8.56	7.73	1.4	.02	.002	.003	.138	.004	.	
MANUFACTURING AND INDUSTRIAL	17.39	38.74	5.43	.244	.004	.072	.7	.003	.	
FOOD AND AGRICULTURAL PROCESSING	.48	.9	.21	.017	.	.	.035	.	.	
SERVICE AND COMMERCIAL	14.06	21.83	3.72	.117	.002	.048	.427	.002	.	
OTHER (FUEL COMBUSTION)	4.41	1.85	.64	.017	.004	.005	.032	.008	.	
FUEL COMBUSTION - Subtotal	51.	91.17	13.21	.481	.012	.138	1.546	.016	.	
WASTE DISPOSAL										
SEWAGE TREATMENT	.03	.	.07	.	.	.	.006	.	.
LANDFILLS	.6	.59	1.35	.	.	.	.048	.	.
INCINERATORS	.13	.34	.02	.007	.	.	.	.	.
OTHER (WASTE DISPOSAL)	.	.01	.8	.	.	.	.	.	.
WASTE DISPOSAL - Subtotal	.77	.95	2.24	.007	.	.	.055	.	.	
CLEANING AND SURFACE COATINGS										
LAUNDERING	.	.01	.71	.	.	.	.	.	.
DEGREASING	.	.	99.98	.	.	.	.	.	.
COATINGS AND RELATED PROCESS SOLVENTS	.26	.42	96.4	.071	.	.	.	1.772	.	
PRINTING	.02	.08	5.08	.	.	.	.	.643	.
OTHER (CLEANING AND SURFACE COATINGS)	.	.	12.08	.002	.	.	.	.003	.
CLEANING AND SURFACE COATINGS - Subtotal	.29	.51	214.26	.074	.	.	.	2.417	.	
PETROLEUM PRODUCTION AND MARKETING										
OIL AND GAS PRODUCTION	.02	.06	10.76	.164	.	.	.	.	.
PETROLEUM REFINING	6.33	5.32	8.03	.108	.	.	.014	.076	.	
PETROLEUM MARKETING	.09	.	24.1	.221	.	.	.	1.771	.	
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004	.	.	.	.001	.
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.5	5.39	43.09	.496	.	.	.014	1.847	.	
INDUSTRIAL PROCESSES										
CHEMICAL	.04	.54	17.19	.001	.	.	.	.001	.
FOOD AND AGRICULTURE	.22	.11	3.28	.	.	.	.	1.091	.
MINERAL PROCESSES	2.84	6.49	.65	.	.	.	.	.	.
METAL PROCESSES	1.96	.75	.75	.	.	.	.	.	.
WOOD AND PAPER	.	.	.04	.	.	.	.	.	.
GLASS AND RELATED PRODUCTS	.	.26	.03	.	.	.	.	.	.
OTHER (INDUSTRIAL PROCESSES)	1.67	.94	2.94	.	.	.	.357	.	.
INDUSTRIAL PROCESSES - Subtotal	6.74	9.09	24.89	.001	.	.	.357	1.092	.	

Table 6. 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen, Harley Version

Scenario: ET20H	Summer 2003	South Coast Air Basin Emissions						Tons/Day		
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal		65.29	107.12	297.69	1.06	.012	.138	1.973	5.373	.
AREA-WIDE SOURCES										
SOLVENT EVAPORATION										
CONSUMER PRODUCTS		.	.	83.19	.	.	.	.028	24.1	.
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS		.	.	72.77	.072	.	.	.	.27	.
PESTICIDES/FERTILIZERS		.	.	13.42	.595	.	.	.002	1.464	.
ASPHALT PAVING		.	.	.55	.	.	.	.	.	.
OTHER (SOLVENT EVAPORATION)		.	.	.19	.002	.	.	.	.	.
SOLVENT EVAPORATION - Subtotal		.	.	170.12	.669	.	.	.029	25.834	.
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION		43.99	23.68	2.95	.071	.	.187	.344	.	.
FARMING OPERATIONS		.	.	10.38	.	.	.	.	2.596	.
FIRES		8.06	.19	.56	.	.	.	.	.	.
WASTE BURNING AND DISPOSAL		30.89	1.44	2.34	.	.035	.	.	.	.
UTILITY EQUIPMENT		204.59	.41	11.88	.437	.108	.126	.388	.241	.
OTHER (MISCELLANEOUS PROCESSES)		.05	.28	1.81	.	.	.	.	.	.
MISCELLANEOUS PROCESSES - Subtotal		287.57	26.	29.93	.508	.142	.313	.732	2.837	.
AREA-WIDE SOURCES - Subtotal		287.57	26.	200.05	1.177	.142	.313	.761	28.671	.
MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
CATALYST COLD EXHAUST		757.45	71.4	81.36	2.021	.638	.353	1.084	.	.
CATALYST HOT EXHAUST		1290.2	223.04	61.93	2.009	.428	.243	1.267	1.51	.
NON-CATALYST COLD EXHAUST		27.12	.59	4.77	.14	.041	.023	.07	.155	.
NON-CATALYST HOT EXHAUST		143.27	12.97	16.8	.618	.152	.178	.549	.34	.
HOT SOAK EVAPORATIVES		.	.	19.85	.198	.	.	.	1.141	.
DIURNAL EVAPORATIVES		.	.	18.86	.151	.	.	.	1.763	.
RUNNING EVAPORATIVES		.	.	35.05	.35	.	.	.	2.015	.
RESTING EVAPORATIVES		.	.	10.93	.087	.	.	.	1.022	.
DIESEL EXHAUST		141.72	177.19	15.82	.36	.034	1.324	2.649	.002	.
ON-ROAD MOTOR VEHICLES - Subtotal		2359.79	485.2	265.36	5.936	1.293	2.122	5.62	7.949	.

Table 6. 2003 Inventory with Fully Complying Ethanol Blend at 2% Oxygen, Harley Version

Scenario: ET20H	Summer 2003	South Coast Air Basin Emissions						Tons/Day		
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
OTHER MOBILE SOURCES										
AIRCRAFT		92.63	17.24	16.92	.472	.343	.858	2.745	.	.008
TRAINS		4.79	30.01	1.99	.045	.004	.166	.333	.	.
SHIPS AND COMMERCIAL BOATS		4.85	44.48	5.59	.129	.013	.451	.904	.003	.
RECREATIONAL BOATS		297.9	2.6	50.4	1.85	.454	.557	1.687	1.015	.
OFF-ROAD RECREATIONAL VEHICLES		62.44	.46	3.84	.141	.035	.041	.125	.078	.
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT		941.55	132.63	41.6	.938	.17	1.631	4.428	.297	.
FARM EQUIPMENT		7.73	2.78	.56	.016	.003	.033	.068	.004	.
OTHER MOBILE SOURCES - Subtotal		1411.89	230.2	120.89	3.591	1.022	3.737	10.291	1.396	.008
MOBILE SOURCES - Subtotal		3771.68	715.39	386.26	9.527	2.315	5.858	15.91	9.345	.008
NATURAL (NON-ANTHROPOGENIC) SOURCES										
NATURAL SOURCES										
WILDFIRES		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
ALL SOURCES - Total		4294.94	851.11	893.41	11.764	2.609	6.309	18.644	43.388	.008

Table 7. 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen, Harley Version

Scenario: ET35H Summer 2003	South Coast Air Basin Emissions				Tons/Day					
	CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE	
STATIONARY SOURCES										
FUEL COMBUSTION										
ELECTRIC UTILITIES	1.71	6.51	.39	.027	.	.005	.064	.	.	
COGENERATION	2.81	5.71	.61	.007	.	.002	.053	.	.	
OIL AND GAS PRODUCTION (COMBUSTION)	1.57	7.9	.81	.031	.	.002	.095	.	.	
PETROLEUM REFINING (COMBUSTION)	8.56	7.73	1.4	.02	.002	.003	.138	.006	.	
MANUFACTURING AND INDUSTRIAL	17.39	38.74	5.43	.244	.004	.072	.7	.005	.	
FOOD AND AGRICULTURAL PROCESSING	.48	.9	.21	.017	.	.	.035	.	.	
SERVICE AND COMMERCIAL	14.06	21.83	3.72	.117	.002	.048	.427	.004	.	
OTHER (FUEL COMBUSTION)	4.41	1.85	.64	.018	.004	.005	.032	.013	.	
FUEL COMBUSTION - Subtotal	51.	91.17	13.21	.482	.012	.138	1.546	.028	.	
WASTE DISPOSAL										
SEWAGE TREATMENT	.03	.	.07	.	.	.	.006	.	.
LANDFILLS	.6	.59	1.35	.	.	.	.048	.	.
INCINERATORS	.13	.34	.02	.007	.	.	.	.	.
OTHER (WASTE DISPOSAL)	.	.01	.8	.	.	.	.	.	.
WASTE DISPOSAL - Subtotal	.77	.95	2.24	.007	.	.	.055	.	.	
CLEANING AND SURFACE COATINGS										
LAUNDERING	.	.01	.71	.	.	.	.	.	.
DEGREASING	.	.	99.98	.	.	.	.	.	.
COATINGS AND RELATED PROCESS SOLVENTS	.26	.42	96.4	.071	.	.	.	1.772	.	
PRINTING	.02	.08	5.08	.	.	.	.	.643	.
OTHER (CLEANING AND SURFACE COATINGS)	.	.	12.08	.002	.	.	.	.003	.
CLEANING AND SURFACE COATINGS - Subtotal	.29	.51	214.26	.074	.	.	.	2.417	.	
PETROLEUM PRODUCTION AND MARKETING										
OIL AND GAS PRODUCTION	.02	.06	10.76	.164	.	.	.	.	.
PETROLEUM REFINING	6.33	5.32	8.03	.108	.	.	.014	.077	.	
PETROLEUM MARKETING	.09	.	24.1	.221	.	.	.	2.016	.	
OTHER (PETROLEUM PRODUCTION AND MARKETING)	.05	.01	.2	.004	.	.	.	.001	.
PETROLEUM PRODUCTION AND MARKETING - Subtotal	6.5	5.39	43.09	.496	.	.	.014	2.095	.	
INDUSTRIAL PROCESSES										
CHEMICAL	.04	.54	17.19	.001	.	.	.	.001	.
FOOD AND AGRICULTURE	.22	.11	3.28	.	.	.	.	1.091	.
MINERAL PROCESSES	2.84	6.49	.65	.	.	.	.	.	.
METAL PROCESSES	1.96	.75	.75	.	.	.	.	.	.
WOOD AND PAPER	.	.	.04	.	.	.	.	.	.
GLASS AND RELATED PRODUCTS	.	.26	.03	.	.	.	.	.	.
OTHER (INDUSTRIAL PROCESSES)	1.67	.94	2.94	.	.	.	.357	.	.
INDUSTRIAL PROCESSES - Subtotal	6.74	9.09	24.89	.001	.	.	.357	1.092	.	

Table 7. 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen, Harley Version

Scenario: ET35H	Summer 2003	South Coast Air Basin Emissions				Tons/Day				
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE
STATIONARY SOURCES - Subtotal		65.29	107.12	297.69	1.06	.012	.138	1.973	5.632	.
AREA-WIDE SOURCES										
SOLVENT EVAPORATION										
CONSUMER PRODUCTS		.	.	83.19	.	.	.	.028	24.1	.
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS		.	.	72.77	.072	.	.	.	.27	.
PESTICIDES/FERTILIZERS		.	.	13.42	.595	.	.	.002	1.464	.
ASPHALT PAVING		.	.	.55	.	.	.	.	.	.
OTHER (SOLVENT EVAPORATION)		.	.	.19	.002	.	.	.	.	.
SOLVENT EVAPORATION - Subtotal		.	.	170.12	.669	.	.	.029	25.834	.
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION		43.99	23.68	2.95	.071	.	.187	.344	.	.
FARMING OPERATIONS		.	.	10.38	.	.	.	.	2.596	.
FIRES		8.06	.19	.56	.	.	.	.	.	.
WASTE BURNING AND DISPOSAL		30.89	1.44	2.34	.	.035	.	.	.	.
UTILITY EQUIPMENT		182.75	.41	11.91	.446	.106	.225	.372	.418	.
OTHER (MISCELLANEOUS PROCESSES)		.05	.28	1.81	.	.	.	.	.	.
MISCELLANEOUS PROCESSES - Subtotal		265.73	26.	29.95	.516	.141	.413	.716	3.014	.
AREA-WIDE SOURCES - Subtotal		265.73	26.	200.08	1.186	.141	.413	.745	28.848	.
MOBILE SOURCES										
ON-ROAD MOTOR VEHICLES										
CATALYST COLD EXHAUST		643.83	71.4	81.81	2.124	.596	.799	1.037	4.606	.
CATALYST HOT EXHAUST		1096.7	223.04	62.23	2.053	.425	.436	1.218	2.689	.
NON-CATALYST COLD EXHAUST		23.05	.59	4.78	.142	.04	.042	.069	.273	.
NON-CATALYST HOT EXHAUST		121.78	12.97	16.83	.63	.151	.319	.526	.591	.
HOT SOAK EVAPORATIVES		.	.	19.85	.198	.	.	.	2.004	.
DIURNAL EVAPORATIVES		.	.	18.86	.151	.	.	.	1.803	.
RUNNING EVAPORATIVES		.	.	35.05	.35	.	.	.	3.54	.
RESTING EVAPORATIVES		.	.	10.93	.087	.	.	.	1.045	.
DIESEL EXHAUST		141.72	177.19	15.82	.36	.034	1.324	2.649	.002	.
ON-ROAD MOTOR VEHICLES - Subtotal		2027.08	485.2	266.15	6.096	1.245	2.919	5.499	16.553	.

Table 7. 2003 Inventory with Fully Complying Ethanol Blend at 3.5% Oxygen, Harley Version

Scenario: ET35H	Summer 2003	South Coast Air Basin Emissions						Tons/Day			
		CO	NOx	ROG	Benzene	Butadiene	Acetaldehyde	Formaldehyde	Ethanol	MTBE	
OTHER MOBILE SOURCES											
AIRCRAFT		92.63	17.24	16.92	.472	.343	.858	2.745	.	.008	
TRAINS		4.79	30.01	1.99	.045	.004	.166	.333	.	.	
SHIPS AND COMMERCIAL BOATS		4.73	44.48	5.59	.129	.013	.452	.904	.005	.	
RECREATIONAL BOATS		253.27	2.6	50.49	1.885	.449	.976	1.618	1.762	.	
OFF-ROAD RECREATIONAL VEHICLES		53.08	.46	3.84	.144	.034	.073	.12	.135	.	
COMMERCIAL/INDUSTRIAL MOBILE EQUIPMENT		865.92	132.63	41.62	.948	.169	1.753	4.408	.515	.	
FARM EQUIPMENT		6.73	2.78	.56	.016	.003	.035	.068	.007	.	
OTHER MOBILE SOURCES - Subtotal		1281.15	230.2	121.02	3.64	1.015	4.312	10.196	2.424	.008	
MOBILE SOURCES - Subtotal		3308.24	715.39	387.17	9.736	2.26	7.231	15.694	18.976	.008	
NATURAL (NON-ANTHROPOGENIC) SOURCES											
NATURAL SOURCES											
WILDFIRES		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
NATURAL (NON-ANTHROPOGENIC) SOURCES - Subtotal		170.39	2.6	9.41	.	.14	.	.	.	.
ALL SOURCES - Total		3809.66	851.11	894.35	11.982	2.553	7.781	18.412	53.456	.008	

Table 8. Emission Inventory Data of Selected Compounds in 1997 Baseline and 2003 Scenarios for the SCAQS Modeling Region (tons/day).

Compound	1997 MTBE	2003 MTBE	2003 2%	2003 3.5%	2003 UNOX	2003 2.0% H	2003 3.5% H
Toluene	86.4	73.5	73.6	70.9	76.3	67.0	65.8
m & p-Xylene	35.4	25.8	26.0	24.3	27.5	22.9	22.1
o-Xylene	14.4	11.4	11.4	10.9	11.9	10.7	10.4
n-hexane	26.2	23.7	23.8	23.3	24.4	22.6	22.3
Isobutene	17.4	12.0	6.9	8.0	7.1	6.7	7.8
Alkylates							
2-Methylpentane	25.7	17.7	18.0	16.8	19.4	16.5	16.0
3-Methylpentane	15.0	10.3	10.5	9.8	11.2	9.5	9.2
Methylcyclopentane	17.8	12.2	12.5	11.7	13.2	10.7	10.3
2,2,4-Trimethylpentane	14.4	10.8	11.3	10.7	11.7	17.9	17.3

2 Gridded Emission Inventories

The photochemical modeling was performed for the Southern California Air Quality Study (SCAQS) grid region which is the inner grid shown in Figure 1. This region is somewhat larger than the South Coast Air Basin. As a result, there is about 10 to 40% more emissions in the modeling region than the Air Basin depending on the year and pollutant.

The 1997 and 2003 baseline MTBE gridded inventories were developed using ARB countywide inventory estimates for ozone precursors (CO, NO_x, and TOG). All countywide area source emissions were gridded using the same area source surrogates used to grid the 1990 Southern California Ozone Study (SCOS) gridded inventory (SYSAPP 1997). Both the spatial and temporal distributions for 1997 and 2003, for each area source category are the same for each county as in the SCOS gridded inventory.

Vegetative emissions used in the 1997 SCAQMD SIP update modeling were incorporated into the ARB's area source emissions to complete the area source inventory and were assumed constant for all simulations. All the area source emissions are modeled as surface sources.

All other emissions sources are contained in ARB's point source emission inventory and have associated UTM coordinates. Emissions for these sources are allocated to the proper grid cells and are also modeled as surface sources unless there are associated stack records, in which case the point source is modeled as an elevated source with calculated plume rise.

The ozone precursor inventory contains estimates of CO, NO_x (as NO₂), and TOG. Both NO_x and TOG emissions must be resolved to individual chemical species before processing further to SAPRC model species. NO_x emissions are assumed to be 88% NO, 10% NO₂, and 2% HONO. TOG is resolved to chemical species through the use of organic gas species profiles. Species profiles for all gasoline related sources have been discussed in Appendix 1 and vary with each alternate gasoline. Species profiles for all other organic gas emission sources are constant for all simulations.

Emission totals within the modeling region for ozone precursors are shown in Table 9, for the MTBE gasoline scenarios for 1997 and 2003. NO_x and TOG emissions are constant for all 2003 scenarios. ROG emissions vary only slightly between the 2003 scenarios due to minor variations in methane emissions estimated to occur in vehicle exhaust. Motor vehicle CO emissions are the same for the MTBE and 2% oxygen ethanol scenarios. Motor vehicle CO emissions are increased by 5% for the unoxgenated gasoline scenario and reduced by 15% for the 3.5% oxygen ethanol scenario (relative to the MTBE fleet emissions).

Figure 1 SCOS and SCAQS Modeling Regions

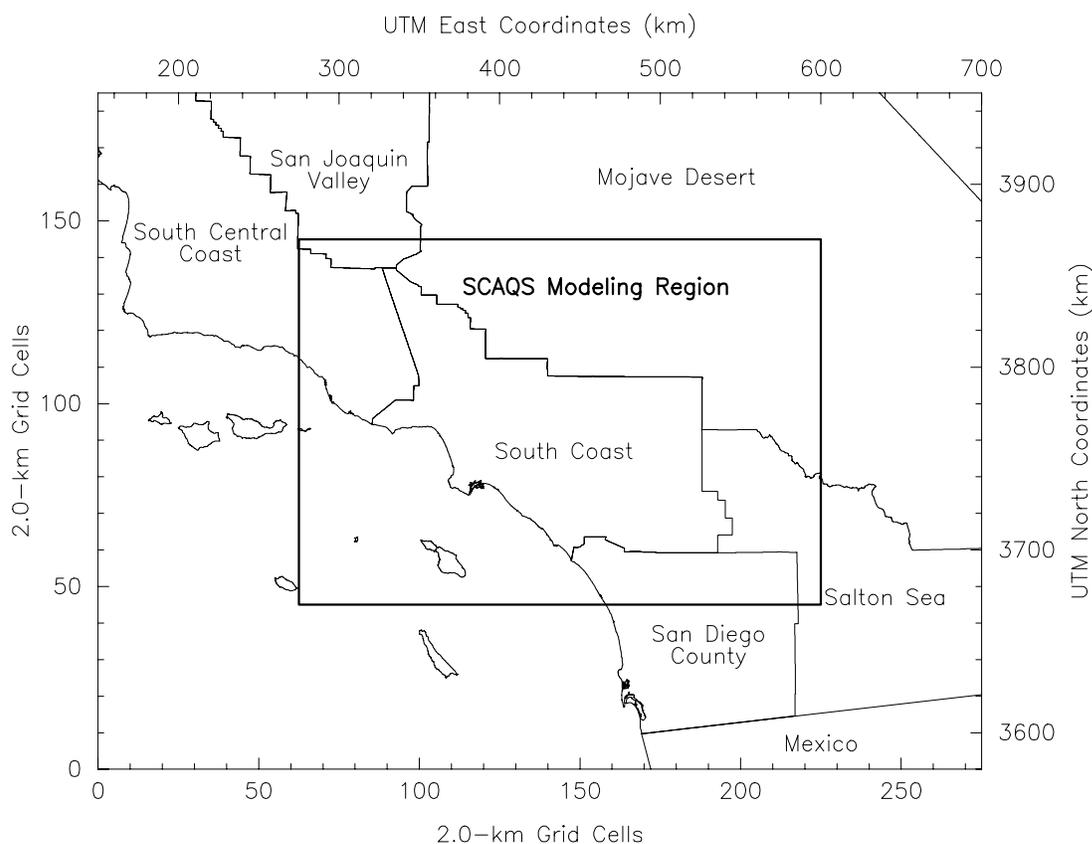


TABLE 9. CO, NO_x, and ROG Emissions for the SCAQS Modeling Region
(CO is for MTBE Scenarios)

YEAR	CO (tons/day)	NO _x (tons/day)	ROG (tons/day)
1997	6,400	1,300	2,100
2003	5,000	1,050	1,900

The change in total emissions for a given pollutant from 1997 to 2003, may be different for the South Coast Air Basin than the modeling region. Both growth rates and emission controls are different inside and outside the Air Basin. The organic gas speciation profiles prepared for the oxygen free gasolines are applied to source categories using the same category to profile assignment scheme as the baseline 2003 MTBE inventory. All organic gas emission categories associated with gasoline combustion or evaporation are speciated with the gasoline specific profiles discussed in Appendix 1. Emission sources that were speciated with gasoline specific profiles include gasoline marketing, distribution, storage, on and off-road mobile sources, and utility equipment. Besides the change in CO emissions discussed above, the only significant change between 2003 simulations is from the changing gasoline composition.

The organic gas speciation process results in emission estimates for over 450 separate compounds. The modeling is done with a more consolidated set of compounds. While this detailed inventory is available, it is easier to understand in terms of the SAPRC97 model species. The mechanism used in this study,

which we refer to as the SAPRC97 toxics mechanism, includes several compounds not modeled explicitly in the base SAPRC97 mechanism. Organic gas emissions are partitioned into 9 important lumped organic gas model species and 17 explicit compounds as shown in Table 10.

Table 10. SAPRC97 Toxic Mechanism Model Species	
Explicit Species	Lumped species
Acetone	ALK1 – lower alkanes
MEK - Methyl ethyl ketone	ALK2 – higher alkanes
BALD - benzaldehyde	ARO1 – lower aromatics
Glyoxal	ARO2 – higher aromatics
MGLYOX – methylglyoxal	OLE1 – external alkenes
CH4- methane	OLE2 – internal alkenes
Ethene	OLE3 – biogenic alkenes
ISOP - isoprene	RCHO – higher aldehydes
BUTD - 1,3-butadiene	CRES - cresols
Benzene	
PDCB - p-dichlorobenzene	
DICM - dichloromethane	
PERC - Perchloroethylene	
FORM - formaldehyde	
CCHO - Acetaldehyde	
ETOH - ethanol	
MTBE	

The airshed model requires two emission files, a surface level emission file and an elevated emission file. The surface emission file contains all the organic gas emissions from gasoline related sources. Surface emissions include emissions from on and off-road motor vehicles, gasoline utility equipment, gasoline distribution, gasoline storage, and vehicle refueling. The majority of elevated sources are NOx emissions from large boilers. The SCAQS region surface emission totals for each of the above model species is shown in Table 11.

The largest change in regional emissions is for ethanol and MTBE. The use of Harley’s recommended profiles for evaporative emissions tends to reduce ethanol emissions compared to ARB’s estimates, especially for the 3.5% oxygen gasoline case. Harley’s profiles also tend to reduce evaporative emissions of benzene and other aromatics compared to ARB’s ethanol gasoline emission inventories.

The unoxygenated gasoline scenario emission estimates are significantly higher in reactive aromatics (ARO1 and ARO2) than any other emission scenario especially when compared to the inventories using Harley’s evaporative profiles.

Table 11. 2003 SCAQS Region Emission Comparisons – (kilogram moles/day)						
Species	MTBE	UNOX	ET 2%	ET 2% H	ET 3.5%	ET 3.5% H
ETOH	757	754	1,198	1,018	1,632	1,257
CCHO	119	119	127	127	163	163
MTBE	265	0	0	0	0	0
FORM	557	544	548	548	540	540
CH4	29,833	29,951	29,911	29,911	29,857	29,857
BUTD	70	72	71	71	70	70
BENZENE	189	183	186	169	190	172
DICM	37	37	37	37	37	37
PERC	129	129	129	129	129	129
ETHENE	1,555	1,599	1,581	1,574	1,550	1,545
GLYOXAL	1.2	1.2	1.2	1.2	1.2	1.2
MGLYOX	0.8	0.8	0.8	0.8	0.8	0.8
BALD	13	14	14	14	13	13
ISOP	1,114	1,114	1,114	1,114	1,114	1,114
PDCB	13	13	13	13	13	13
MEK	168	168	168	168	168	168
ACETONE	305	306	306	306	305	305
RCHO	81	82	82	82	81	81
ALK1	3,987	4,124	4,005	3,916	3,895	3,882
ALK2	2,005	2,054	2,025	2,195	1,990	2,166
ARO1	851	884	852	781	821	767
ARO2	616	645	620	587	591	571
OLE1	780	722	711	707	711	709
OLE2	182	197	186	176	175	169
OLE3	561	561	561	561	561	561
CRESOLS	1	1	1	1	1	1