DUNN-EDWARDS CORPORATION
Manufacturer of Fine Architectural and Industrial Finishes
General Offices: 4885 East 52nd Place, Los Angeles, Calif. 90040
Telephone: (213) 771-3330

Paints • Lacquers
Painting Equipment
Brushes and Tools

Wallcoverings
of every type

Dunn-Edwards, 1998

August 19, 1998

Mr. Terry McGuire, Chief
Technical Support Division
CALIFORNIA AIR RESOURCES BOARD
2020 L Street
Sacramento, CA 95814

Dear Terry:

Dunn-Edwards Corporation would like to thank you for attending the meeting on August 6 at Dunn-Edwards headquarters, at which we discussed reactivity issues and looked for a path for an agreed upon regulatory process for the paint industry. As we said, we felt that agreeing upon science was the beginning step of working towards a common future.

During the second half of the meeting, the question of the charts came up as to the negative portion of the reactivity, if the error was typographical or a scaling error. It is in fact a typo, the scaling is correct. We are enclosing corrected charts, and a copy of the charts we received from Dr. Bill Carter of the original data sets as back-up.

I look forward to further discussions on these and other related matters. Again, thank you for attending our meeting and I hope your journey home was safe.

If you desire any further technical information prior to our next meeting, please contact Margaret Clowes at Dunn-Edwards (213)771-3330, Ext. 2203.

Very truly yours,

Edward D. Edwards
Ownership

Enclosure

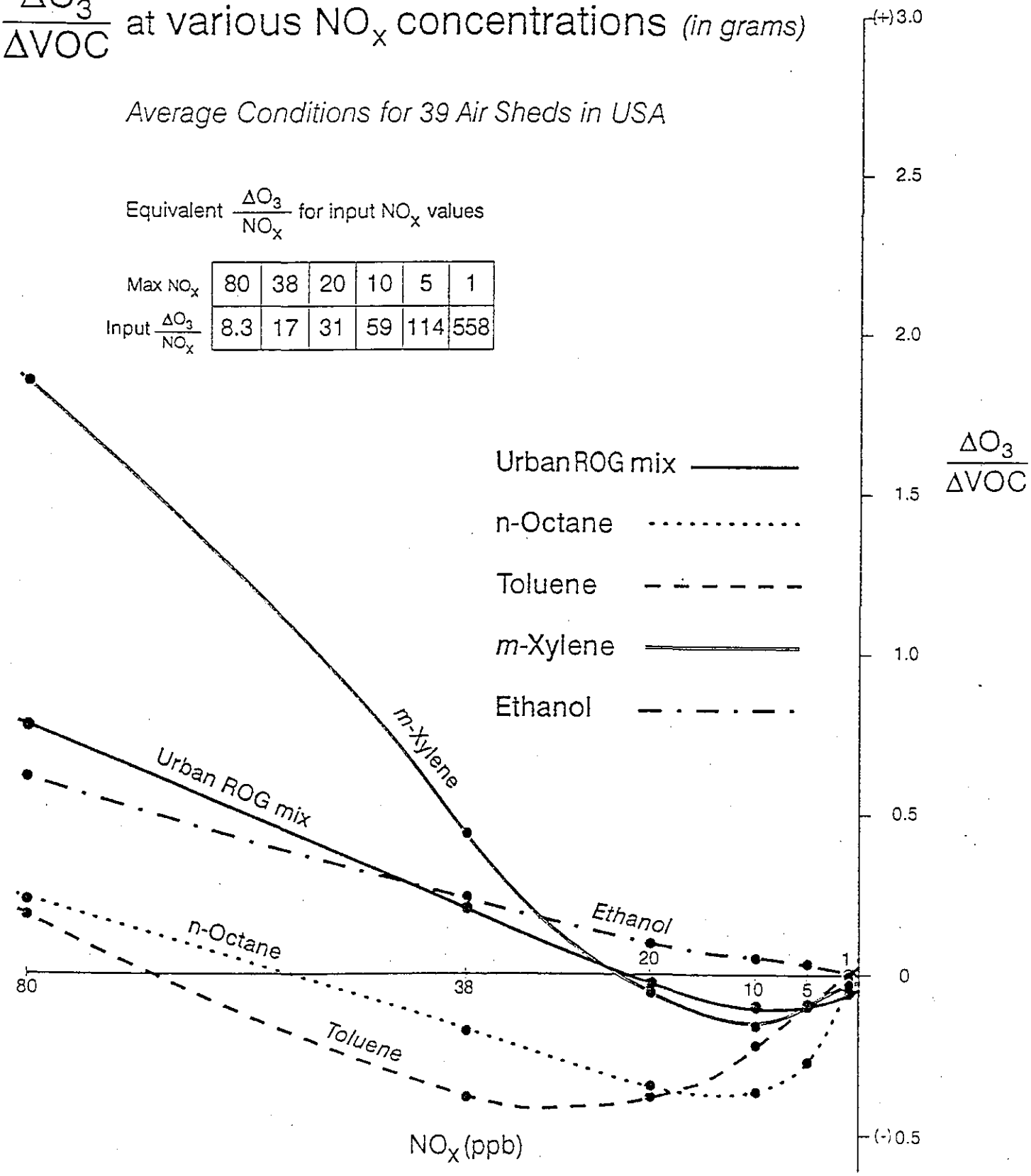
Calculated Incremental Reactivities

$\frac{\Delta O_3}{\Delta VOC}$ at various NO_x concentrations *(in grams)*

Average Conditions for 39 Air Sheds in USA

Equivalent $\frac{\Delta O_3}{NO_x}$ for input NO_x values

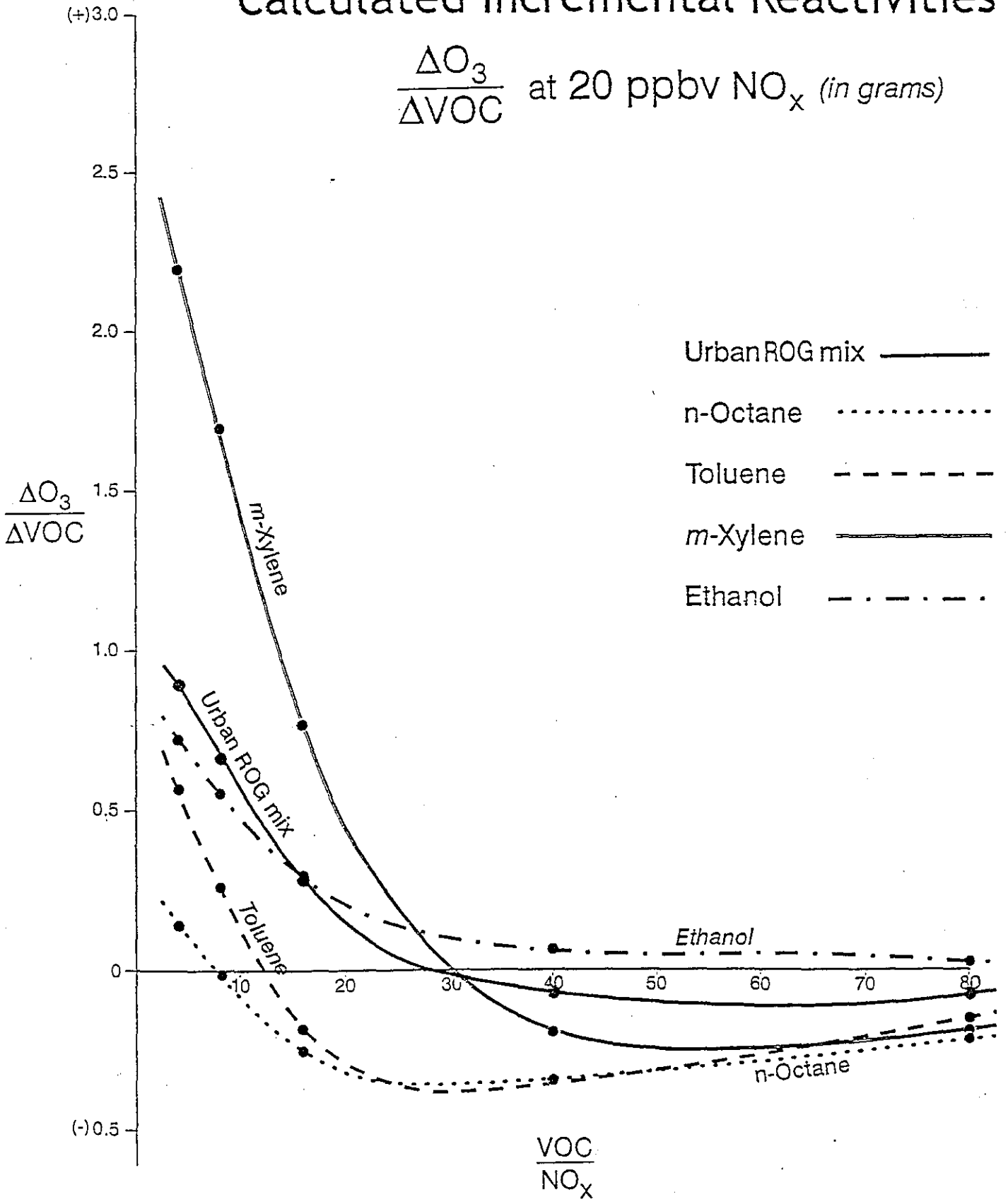
Max NO_x	80	38	20	10	5	1
Input $\frac{\Delta O_3}{NO_x}$	8.3	17	31	59	114	558



Source: William Carter PhD, UC Riverside (1998)

Calculated Incremental Reactivities

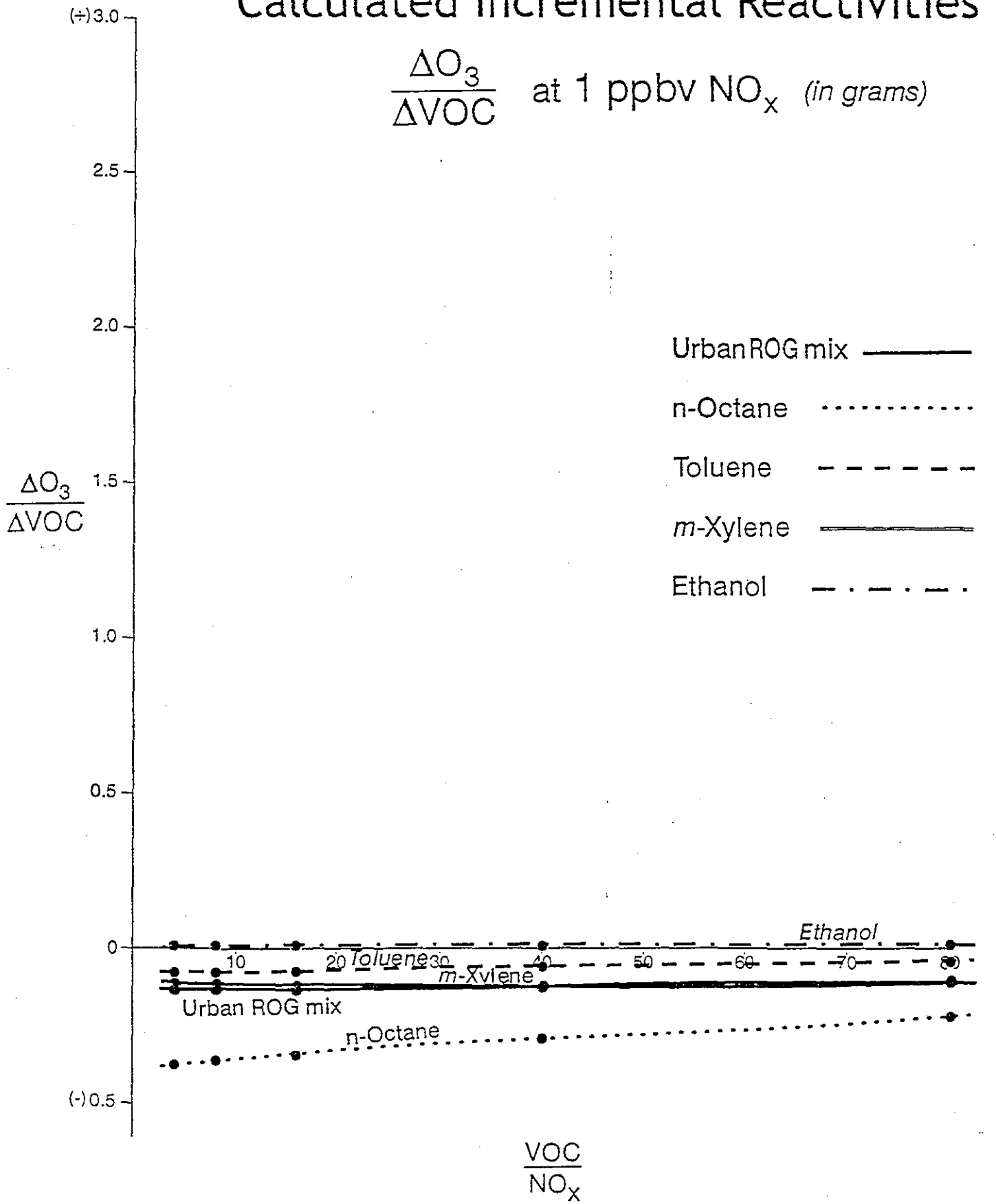
$\frac{\Delta O_3}{\Delta VOC}$ at 20 ppbv NO_x *(in grams)*



Source: William Carter PhD, UC Riverside (1998)

Calculated Incremental Reactivities

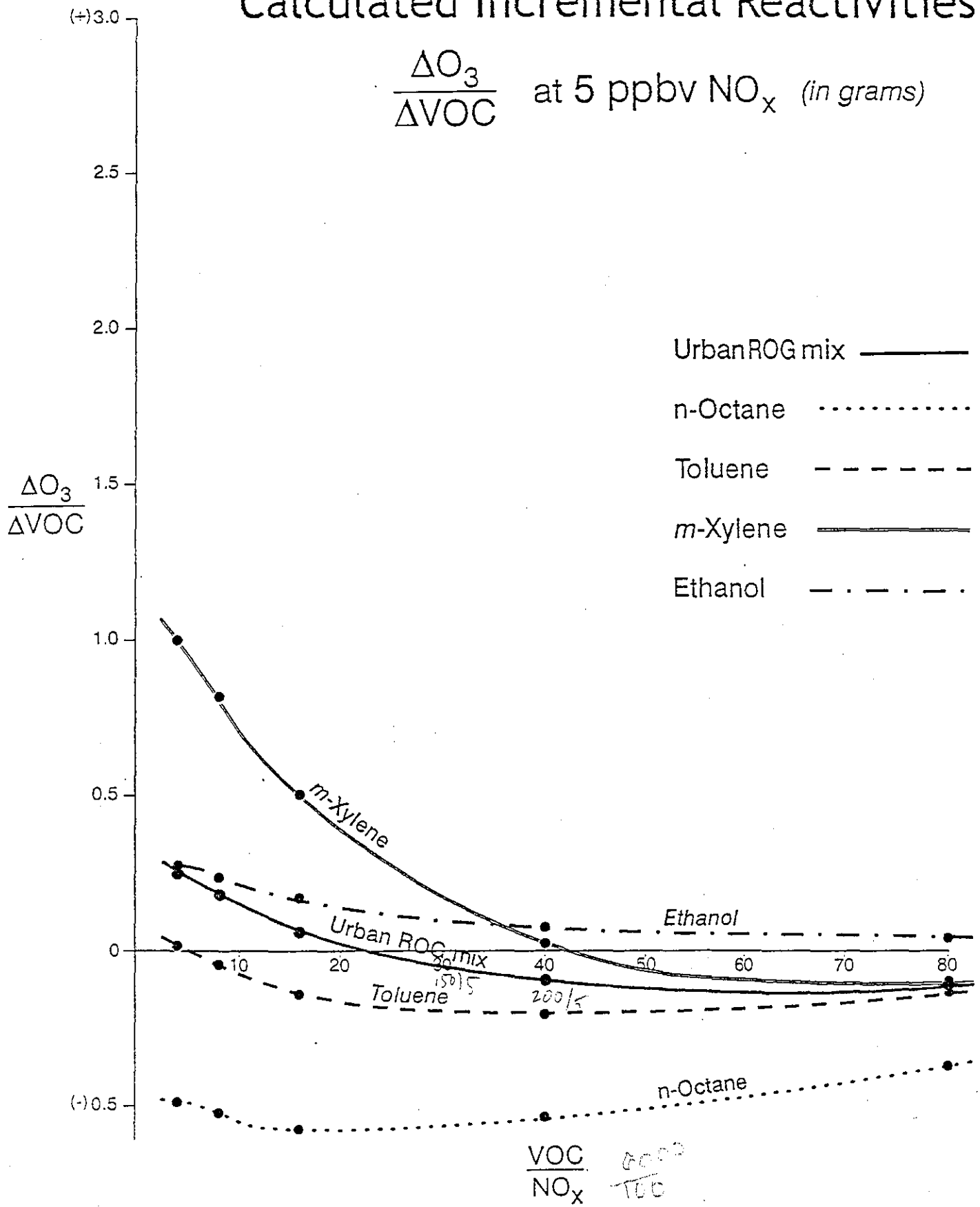
$\frac{\Delta O_3}{\Delta VOC}$ at 1 ppbv NO_x *(in grams)*



Source: William Carter PhD, UC Riverside (1998)

Calculated Incremental Reactivities

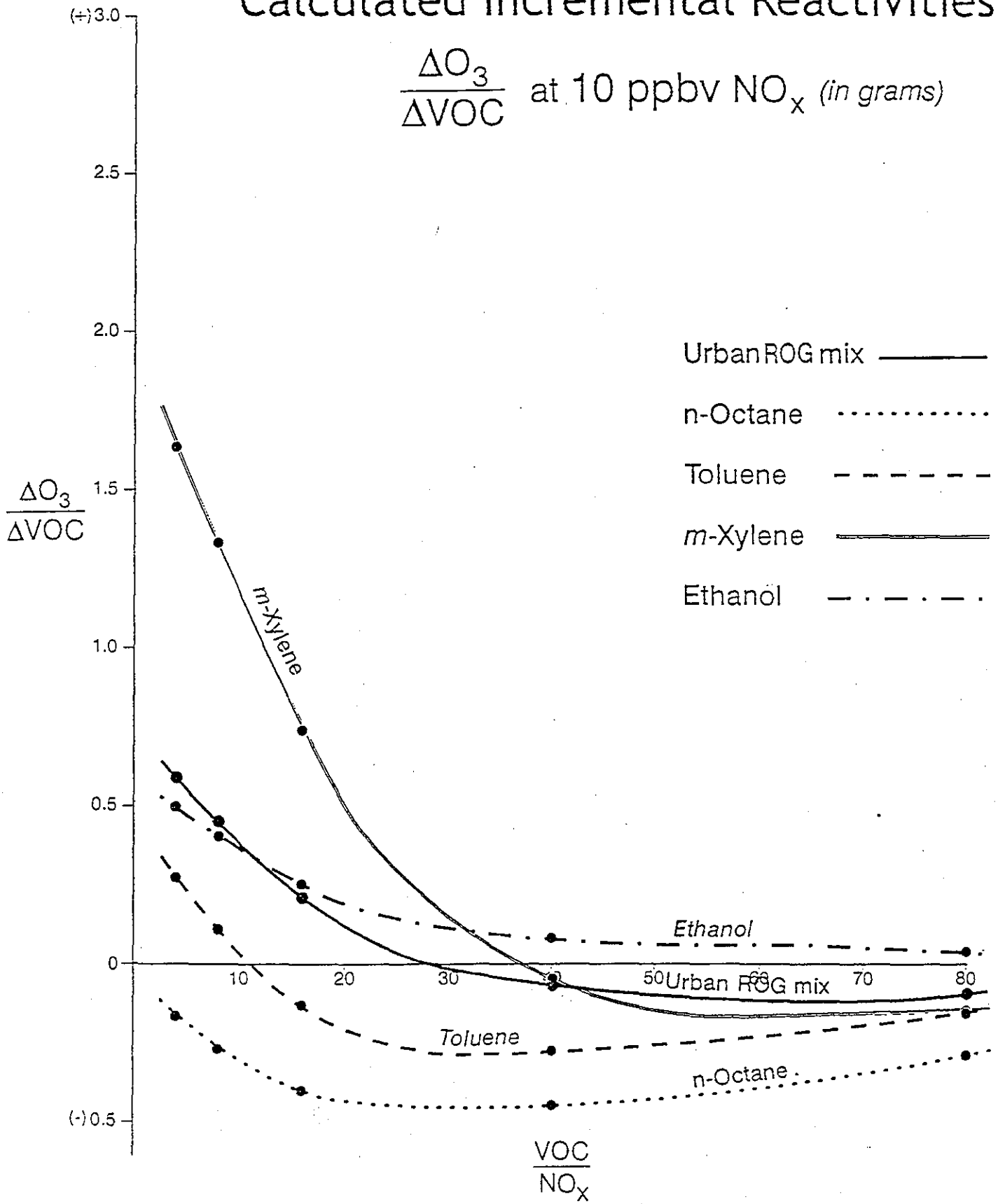
$\frac{\Delta O_3}{\Delta VOC}$ at 5 ppbv NO_x *(in grams)*



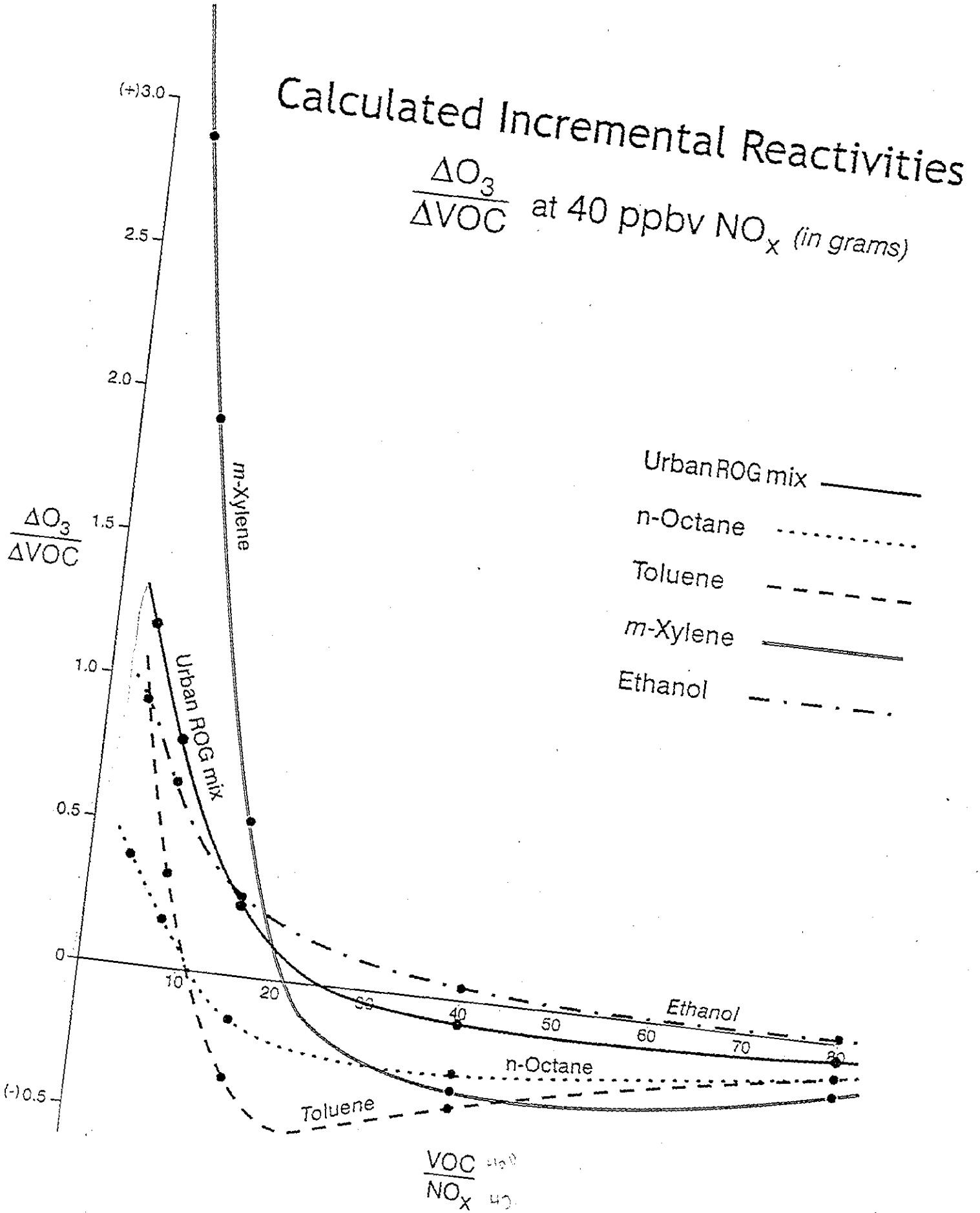
Source: William Carter PhD, UC Riverside (1998)

Calculated Incremental Reactivities

$\frac{\Delta O_3}{\Delta VOC}$ at 10 ppbv NO_x *(in grams)*



Source: William Carter PhD, UC Riverside (1998)



Source: William Carter PhD, UC Riverside (1998)

Incremental reactivities of selected compounds and mixtures as a function of maximum NOx levels or emitted ROG/NOx ratio for the "Averaged Conditions" scenarios. Incremental reactivity is given in units of grams ozone formed per gram VOC emitted. Calculated using the SAPRC-97 Mechanism.

Input ROG/NOx	4	8	16	40	80
		Maximum NOx = 40 ppb			
Base ROG Mixture	1.183	0.791	0.253	-0.081	-0.059
Carbon Monoxide	0.037	0.028	0.016	0.005	0.003
Ethane	0.215	0.155	0.073	0.018	0.008
n-Butane	0.743	0.519	0.217	0.037	0.017
n-Octane	0.380	0.167	-0.153	-0.228	-0.120
n-Pentadecane	0.258	0.084	-0.196	-0.316	-0.196
Ethene	2.789	2.088	1.177	0.359	0.103
Propene	3.627	2.762	1.475	0.327	0.032
Trans-2-Butene	3.764	2.963	1.642	0.320	0.027
Benzene	0.245	0.110	-0.040	-0.044	-0.010
Toluene	0.919	0.326	-0.353	-0.376	-0.127
m-Xylene	2.879	1.910	0.539	-0.315	-0.186
Formaldehyde	1.020	0.734	0.395	0.107	0.047
Acetaldehyde	2.223	1.750	1.013	0.303	0.122
Benzaldehyde	-2.058	-2.647	-3.036	-1.786	-0.738
Methanol	0.232	0.166	0.087	0.024	0.009
Ethanol	0.923	0.646	0.277	0.041	0.018
		Maximum NOx = 20 ppb			
Base ROG Mixture	0.891	0.662	0.284	-0.073	-0.076
Carbon Monoxide	0.030	0.025	0.016	0.007	0.004
Ethane	0.167	0.130	0.076	0.024	0.011
n-Butane	0.552	0.420	0.212	0.037	0.016
n-Octane	0.143	-0.015	-0.249	-0.343	-0.200
n-Pentadecane	0.078	-0.064	-0.278	-0.444	-0.300
Ethene	2.273	1.879	1.277	0.520	0.214
Propene	3.124	2.594	1.667	0.537	0.170
Trans-2-Butene	3.234	2.816	1.872	0.500	0.087
Benzene	0.173	0.096	0.001	-0.034	-0.011
Toluene	0.569	0.265	-0.183	-0.349	-0.152
m-Xylene	2.199	1.700	0.770	-0.193	-0.188
Formaldehyde	0.721	0.636	0.441	0.168	0.078
Acetaldehyde	2.027	1.715	1.142	0.410	0.174
Benzaldehyde	-2.568	-2.925	-3.198	-2.276	-1.095
Methanol	0.174	0.140	0.090	0.033	0.014
Ethanol	0.725	0.554	0.296	0.066	0.028

Incremental reactivities of selected compounds and mixtures as a function of maximum NOx levels or emitted ROG/NOx ratio for the "Averaged Conditions" scenarios. Incremental reactivity is given in units of grams ozone formed per gram VOC emitted. Calculated using the SAPRC-97 Mechanism.

Input ROG/NOx	4	8	16	40	80
		Maximum NOx = 10 ppb			
Base ROG Mixture	0.592	0.452	0.213	-0.070	-0.093
Carbon Monoxide	0.022	0.019	0.014	0.008	0.005
Ethane	0.115	0.095	0.064	0.027	0.014
n-Butane	0.344	0.268	0.149	0.033	0.015
n-Octane	-0.165	-0.268	-0.403	-0.447	-0.288
n-Pentadecane	-0.191	-0.286	-0.461	-0.569	-0.424
Ethene	1.800	1.581	1.198	0.620	0.307
Propene	2.570	2.217	1.612	0.705	0.305
Trans-2-Butene	2.744	2.467	1.817	0.650	0.145
Benzene	0.098	0.065	0.012	-0.019	-0.008
Toluene	0.274	0.112	-0.128	-0.276	-0.154
m-Xylene	1.638	1.335	0.742	-0.049	-0.145
Formaldehyde	0.558	0.532	0.433	0.217	0.114
Acetaldehyde	1.752	1.521	1.098	0.477	0.225
Benzaldehyde	-3.033	-3.229	-3.356	-2.606	-1.453
Methanol	0.123	0.106	0.076	0.037	0.018
Ethanol	0.500	0.406	0.254	0.083	0.040
		Maximum NOx = 5 ppb			
Base ROG Mixture	0.252	0.180	0.062	-0.093	-0.110
Carbon Monoxide	0.015	0.013	0.011	0.007	0.005
Ethane	0.068	0.059	0.046	0.026	0.015
n-Butane	0.149	0.117	0.071	0.016	0.007
n-Octane	-0.487	-0.521	-0.572	-0.535	-0.370
n-Pentadecane	-0.542	-0.597	-0.671	-0.695	-0.532
Ethene	1.283	1.170	0.969	0.606	0.349
Propene	1.844	1.653	1.324	0.739	0.387
Trans-2-Butene	2.050	1.861	1.451	0.671	0.191
Benzene	0.036	0.025	0.005	-0.009	-0.005
Toluene	0.016	-0.044	-0.136	-0.204	-0.134
m-Xylene	1.002	0.821	0.503	0.028	-0.099
Formaldehyde	0.459	0.444	0.384	0.235	0.137
Acetaldehyde	1.284	1.142	0.881	0.462	0.244
Benzaldehyde	-3.388	-3.419	-3.388	-2.739	-1.729
Methanol	0.077	0.069	0.055	0.033	0.019
Ethanol	0.277	0.236	0.171	0.078	0.043

Incremental reactivities of selected compounds and mixtures as a function of maximum NOx levels or emitted ROG/NOx ratio for the "Averaged Conditions" scenarios. Incremental reactivity is given in units of grams ozone formed per gram VOC emitted. Calculated using the SAPRC-97 Mechanism.

Input ROG/NOx	4	8	16	40	80
			Maximum NOx = 1 ppb		
Base ROG Mixture	-0.133	-0.133	-0.132	-0.124	-0.108
Carbon Monoxide	0.002	0.002	0.002	0.002	0.002
Ethane	0.010	0.009	0.009	0.008	0.007
n-Butane	-0.010	-0.009	-0.007	-0.003	0.002
n-Octane	-0.373	-0.363	-0.343	-0.291	-0.219
n-Pentadecane	-0.576	-0.559	-0.536	-0.464	-0.363
Ethene	0.294	0.286	0.271	0.231	0.182
Propene	0.289	0.278	0.260	0.213	0.156
Trans-2-Butene	0.239	0.196	0.116	-0.048	-0.195
Benzene	-0.006	-0.005	-0.005	-0.003	0.000
Toluene	-0.079	-0.077	-0.073	-0.062	-0.044
m-Xylene	-0.112	-0.116	-0.122	-0.124	-0.110
Formaldehyde	0.302	0.283	0.248	0.173	0.107
Acetaldehyde	-0.056	-0.056	-0.056	-0.051	-0.038
Benzaldehyde	-1.786	-1.741	-1.653	-1.403	-1.073
Methanol	0.010	0.010	0.009	0.008	0.006
Ethanol	0.010	0.010	0.010	0.010	0.011

Incremental reactivities of selected compounds and mixtures as a function of maximum NOx levels or emitted ROG/NOx ratio for the "Averaged Conditions" scenarios. Incremental reactivity is given in units of grams ozone formed per gram VOC emitted. Calculated using the SAPRC-97 Mechanism.

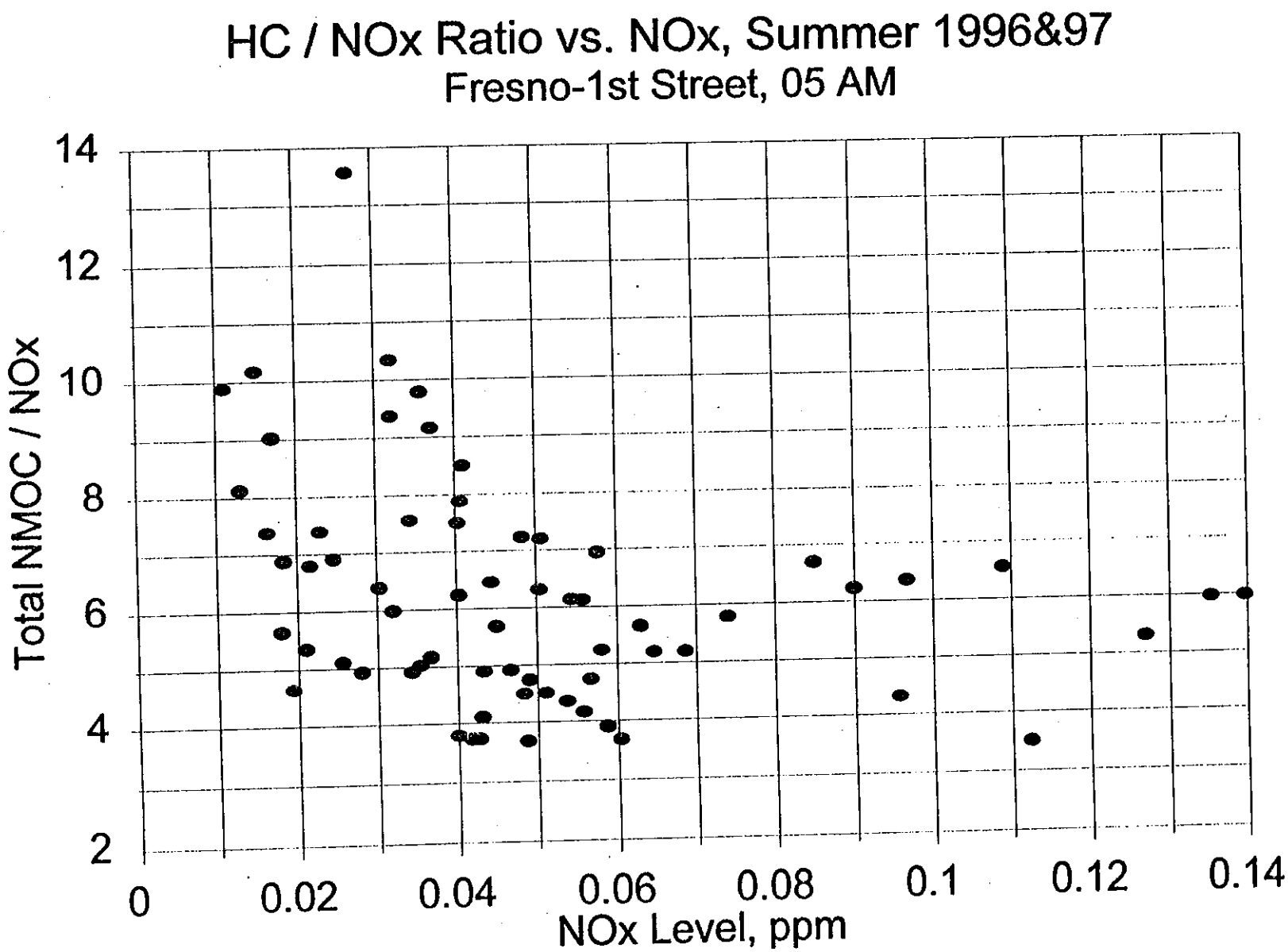
Scenario Type	MIR	MOIR	EBIR	Low NOx Scenarios				
Max NOX (ppb)	182	126	80	38	20	10	5	1
Input ROG/NOx	3.4	5.1	8.3	17	31	59	114	558
Base ROG Mixture	4.055	1.463	0.778	0.208	-0.025	-0.098	-0.096	-0.057
Carbon Monoxide	0.064	0.042	0.029	0.015	0.009	0.006	0.004	0.000
Ethane	0.317	0.221	0.151	0.067	0.033	0.019	0.011	0.002
n-Butane	1.160	0.799	0.532	0.196	0.063	0.017	0.007	0.006
n-Octane	0.696	0.494	0.231	-0.176	-0.346	-0.366	-0.273	-0.032
n-Pentadecane	0.349	0.280	0.124	-0.220	-0.441	-0.512	-0.417	-0.060
Ethene	8.317	3.385	2.040	1.109	0.691	0.424	0.239	0.010
Propene	11.020	4.243	2.645	1.369	0.770	0.452	0.242	-0.079
Trans-2-Butene	13.140	4.585	2.820	1.526	0.790	0.324	0.010	-0.500
Benzene	0.796	0.253	0.057	-0.041	-0.038	-0.015	-0.002	0.002
Toluene	5.105	1.269	0.184	-0.383	-0.379	-0.218	-0.089	-0.004
m-Xylene	14.140	4.015	1.852	0.441	-0.055	-0.158	-0.097	-0.029
Formaldehyde	6.569	1.694	0.783	0.366	0.222	0.153	0.094	0.002
Acetaldehyde	6.255	2.441	1.635	0.952	0.558	0.310	0.172	-0.008
Benzaldehyde	-0.170	-1.459	-2.416	-3.027	-2.707	-1.963	-1.232	-0.176
Methanol	0.638	0.291	0.172	0.082	0.045	0.025	0.014	0.001
Ethanol	1.705	0.969	0.615	0.242	0.100	0.052	0.033	0.004

NMOC to NOx Ratio Summary Plain

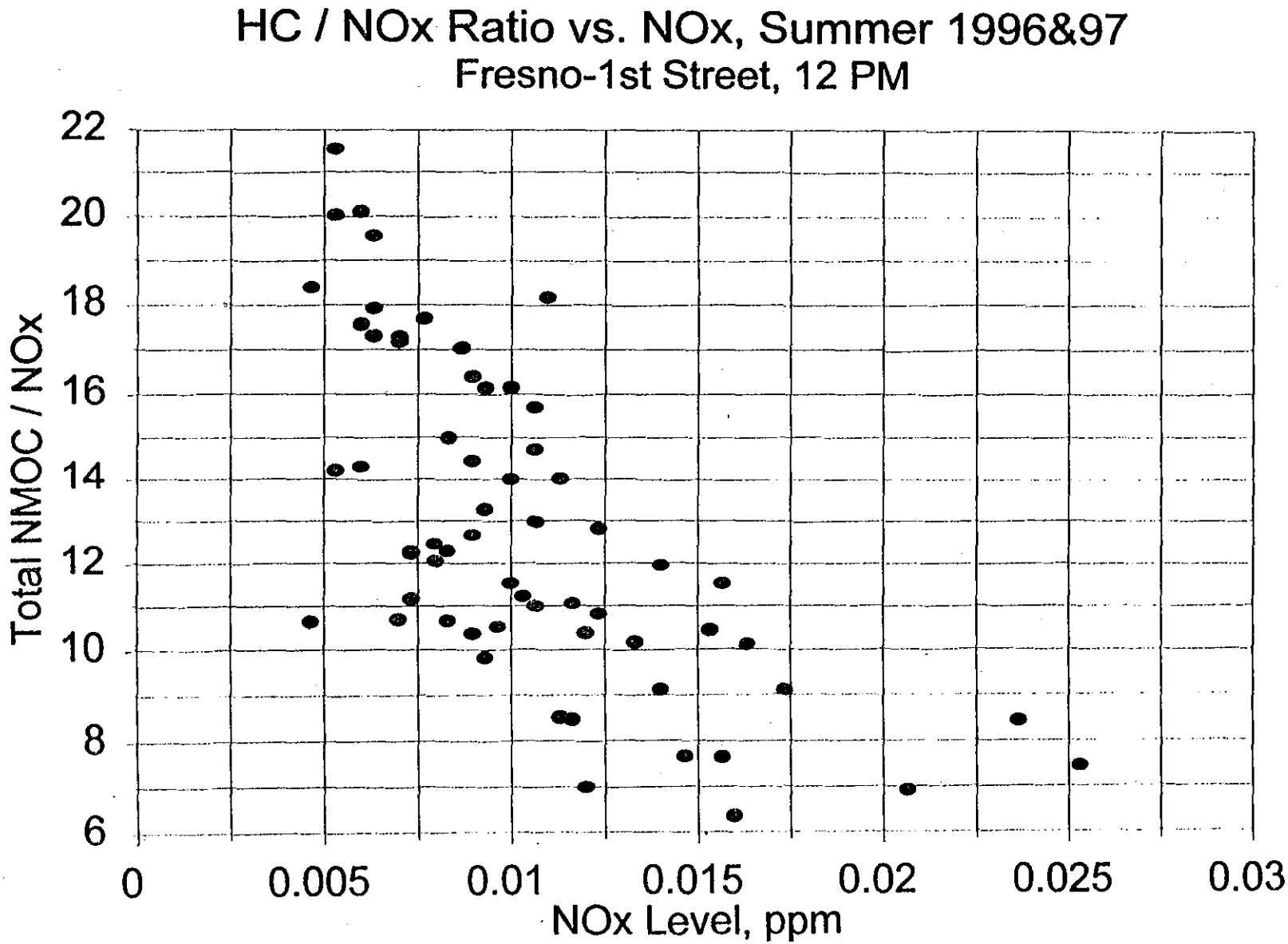
12/10/98

	Start Hour	First Date	Last Date	Avg NOx	Min NOx	Max NOx	St.D. NOx	Avg Ratio	Min Ratio	Max Ratio	SDev Ratio		Count 2 *	%
Fresno-1st Street	05 AM	7/1/96	10/1/97	0.049	0.011	0.1397	0.029	6.208	3.52	13.58	1.96	66	0	0
Fresno-1st Street	12 PM	7/2/96	10/1/97	0.010	0.005	0.0253	0.004	12.89	6.37	21.60	3.75	62	3	5%
Parlier	05 AM	7/3/96	10/1/97	0.031	0.013	0.0527	0.010	6.38	3.72	14.29	1.75	58	0	0
Parlier	12 PM	7/3/96	10/1/97	0.009	0.004	0.019	0.003	9.467	4.68	20.17	3.19	57	1	2%
Clovis-N Villa Avenue	05 AM	7/2/96	10/1/97	0.036	0.008	0.1017	0.018	8.604	2.97	100.7	12.0	63	1	2%
Clovis-N Villa Avenue	12 PM	7/2/96	10/1/97	0.01	0.003	0.0227	0.005	15.55	6.19	43.36	6.31	63	13	21%
Bakersfield-Golden State Highwa	05 AM	7/5/96	10/1/97	0.069	0.016	0.1417	0.032	6.914	3.00	19.37	2.56	64	0	0
Bakersfield-Golden State Highwa	12 PM	7/2/96	10/1/97	0.016	0.006	0.0377	0.006	11.93	5.69	67.64	10.5	62	2	3%
Arvin-Bear Mountain Blvd	05 AM	7/2/96	10/1/97	0.02	0.005	0.054	0.01	14.80	2.59	242.3	33.6	61	6	10%
Arvin-Bear Mountain Blvd	12 PM	7/2/96	10/1/97	0.007	0.004	0.0103	0.002	17.53	7.44	57.00	9.59	60	15	25%
Los Angeles-North Main Street	05 AM	7/26/96	10/1/97	0.145	0.015	0.325	0.095	4.584	1.55	9.533	1.77	41	0	0
Los Angeles-North Main Street	12 PM	7/20/96	10/1/97	0.041	0.010	0.092	0.018	7.936	4.87	18.62	2.98	43	0	0
Madera-Road 29	05 AM	8/23/97	10/1/97	0.025	0.012	0.0337	0.010	4.071	2.91	4.721	0.8	4	0	0
Madera-Road 29	12 PM	8/23/97	10/1/97	0.008	0.007	0.0127	0.003	8.677	6.29	11.1	2.06	4	0	0
Sacramento-Del Paso Manor	05 AM	7/2/96	10/1/97	0.025	0.0007	0.095	0.020	13.7	3.82	160.5	22.5	58	7	12%
Sacramento-Del Paso Manor	12 PM	7/2/96	10/1/97	0.008	0.0007	0.0223	0.006	24.14	6.03	126.0	23.6	54	21	39%
Elk Grove-Bruceville Road	05 AM	7/11/96	10/1/97	0.017	0.002	0.047	0.012	7.9	1.72	35.4	5.89	52	2	4%
Elk Grove-Bruceville Road	12 PM	7/8/96	9/28/97	0.003	0.001	0.0077	0.002	27.41	6.00	96	18.3	49	25	51%
Folsom-Natoma Street	05 AM	7/10/96	10/1/97	0.017	0.004	0.038	0.009	7.783	2.02	20.36	3.97	31	1	3%
Folsom-Natoma Street	12 PM	7/26/96	10/1/97	0.006	0.002	0.0127	0.002	16.5	6.32	66.41	12.2	29	5	17%
San Diego-12th Avenue	05 AM	7/2/96	10/1/97	0.045	0.006	0.17	0.033	7.675	2.21	35.34	6.29	49	2	4%
San Diego-12th Avenue	12 PM	7/14/96	10/1/97	0.017	0.007	0.037	0.007	11.07	4.52	32.11	5.33	45	2	4%

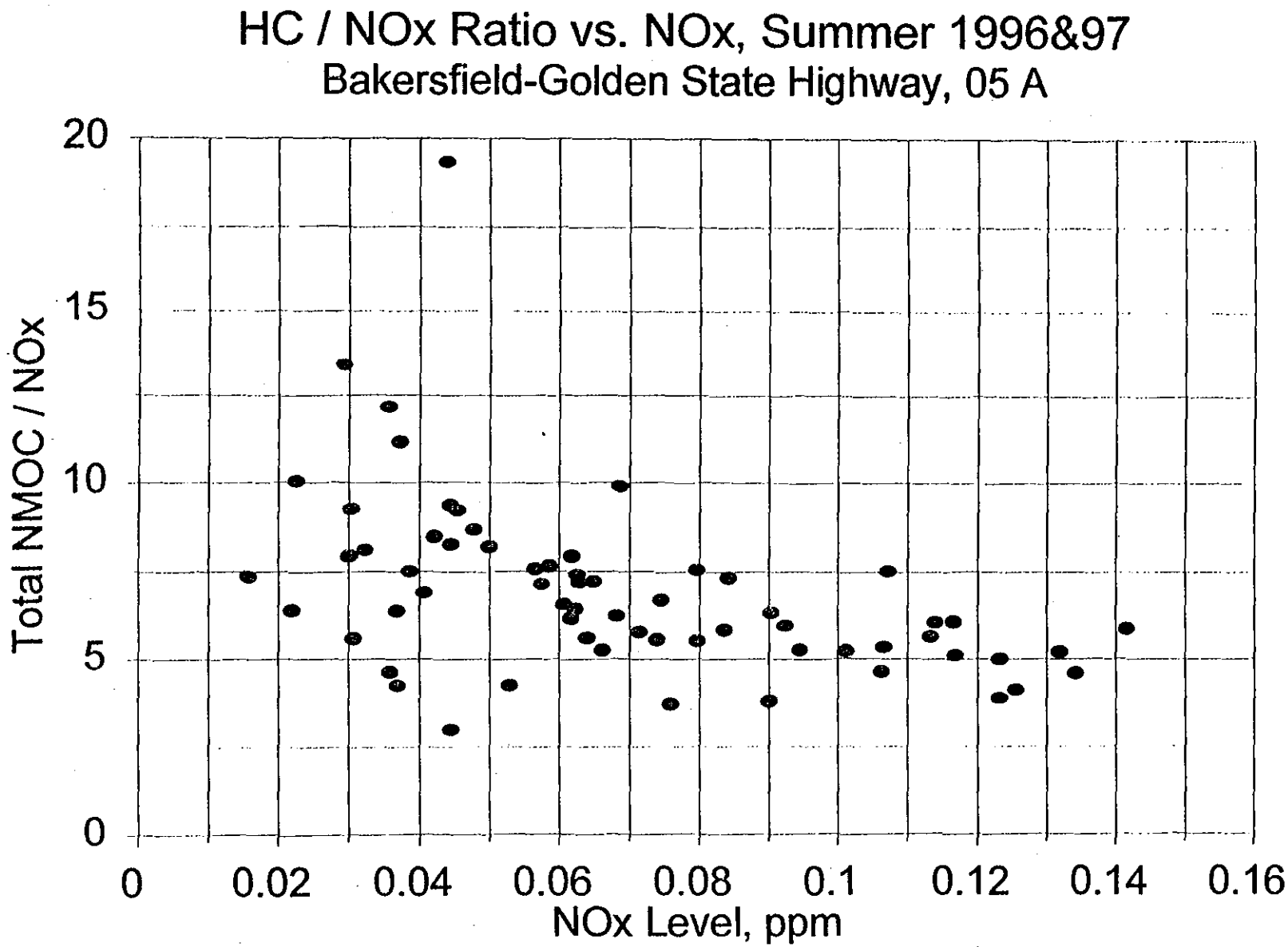
Count 2 = counts for $NOx \leq .040$ and $NMOC/NOx \geq 20$



HCTONOX.WB2 10/22/98 - RAB



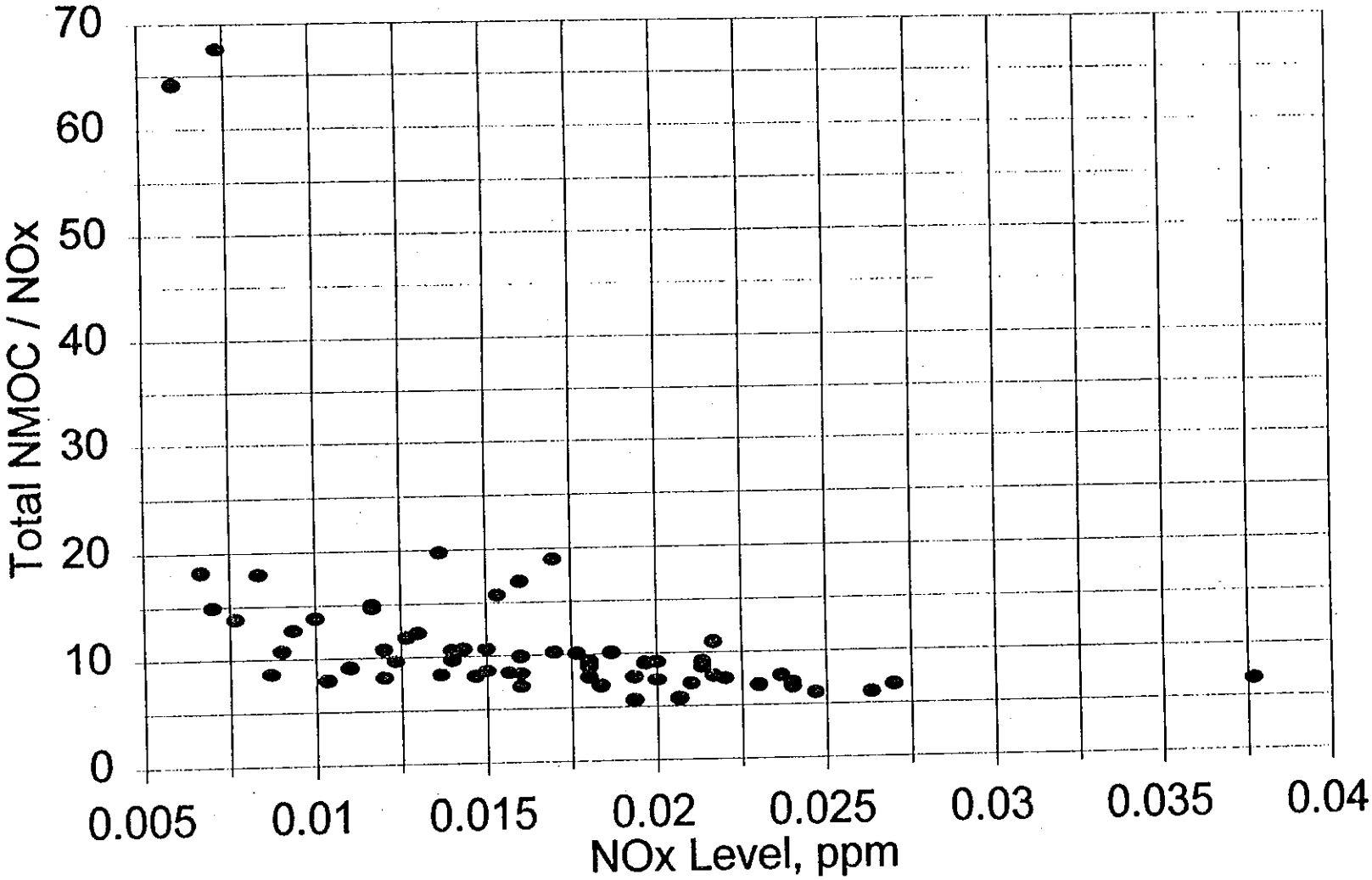
HCTONOX.WB2 10/22/98 - RAB



HCTONOX.WB2 10/22/98 - RAB

HC / NOx Ratio vs. NOx, Summer 1996&97

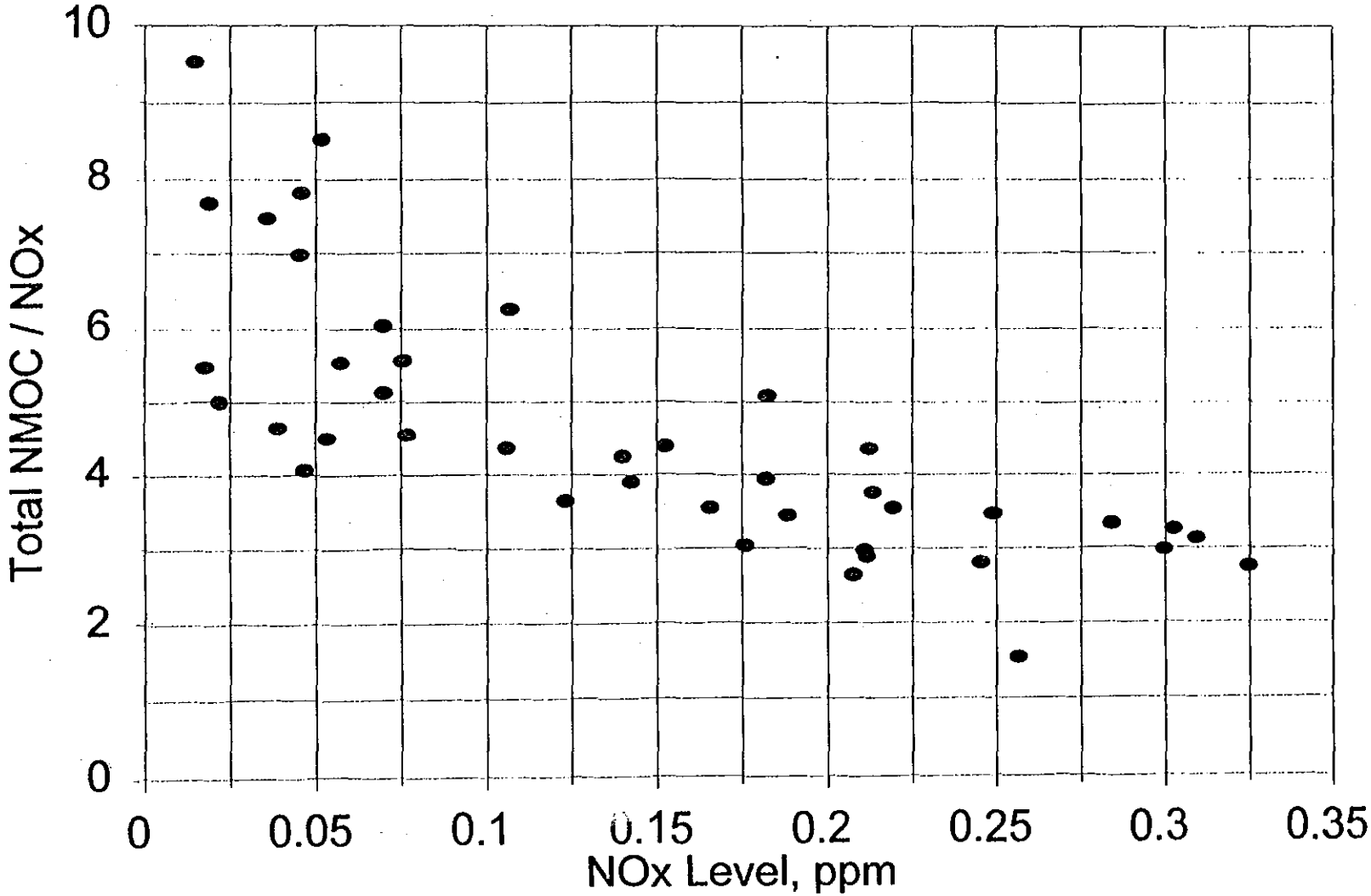
Bakersfield-Golden State Highway, 12 P



HCTONOX.WB2 10/22/98 - RAB

HC / NOx Ratio vs. NOx, Summer 1996&97

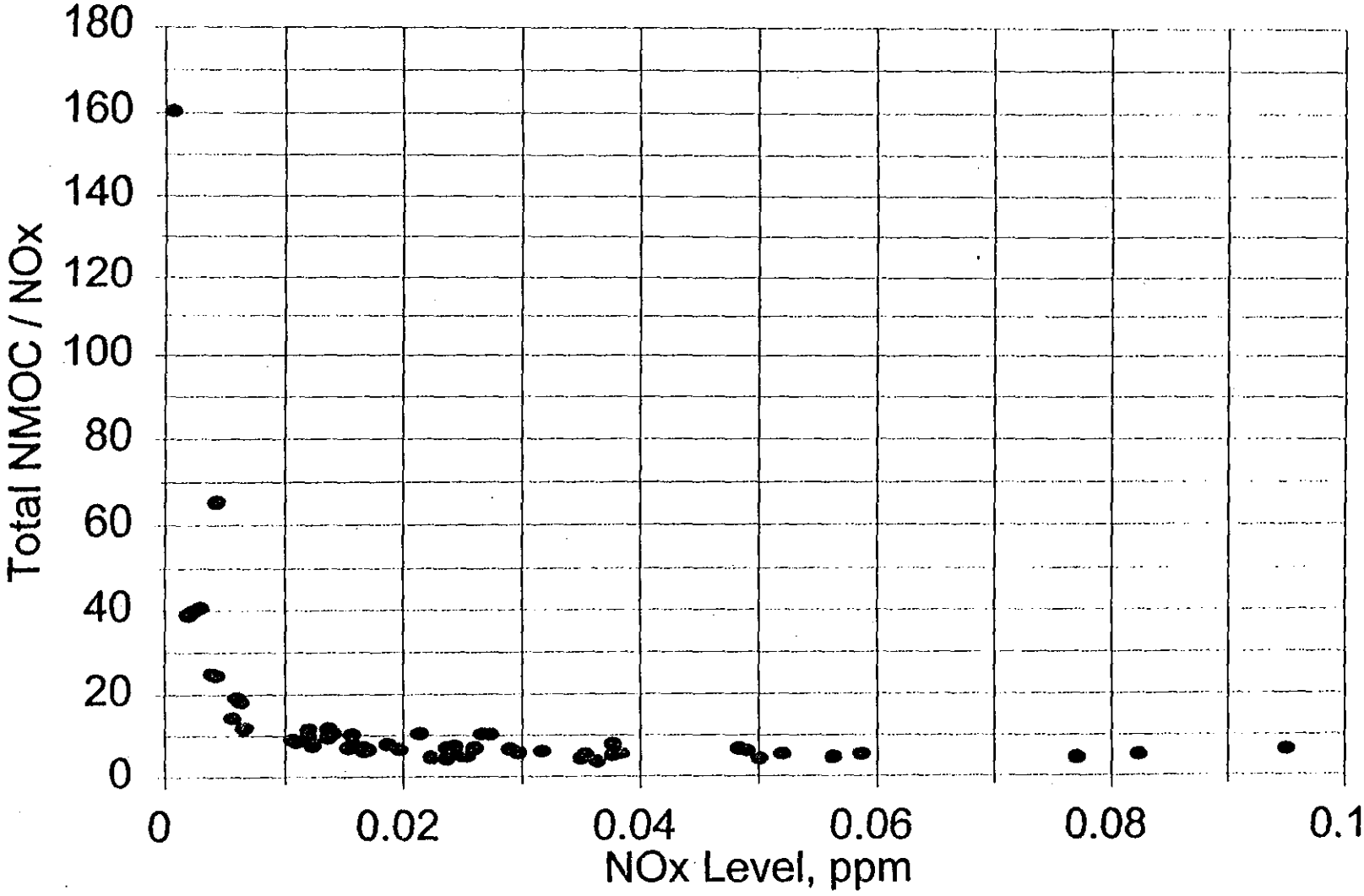
Los Angeles-North Main Street, 05 AM



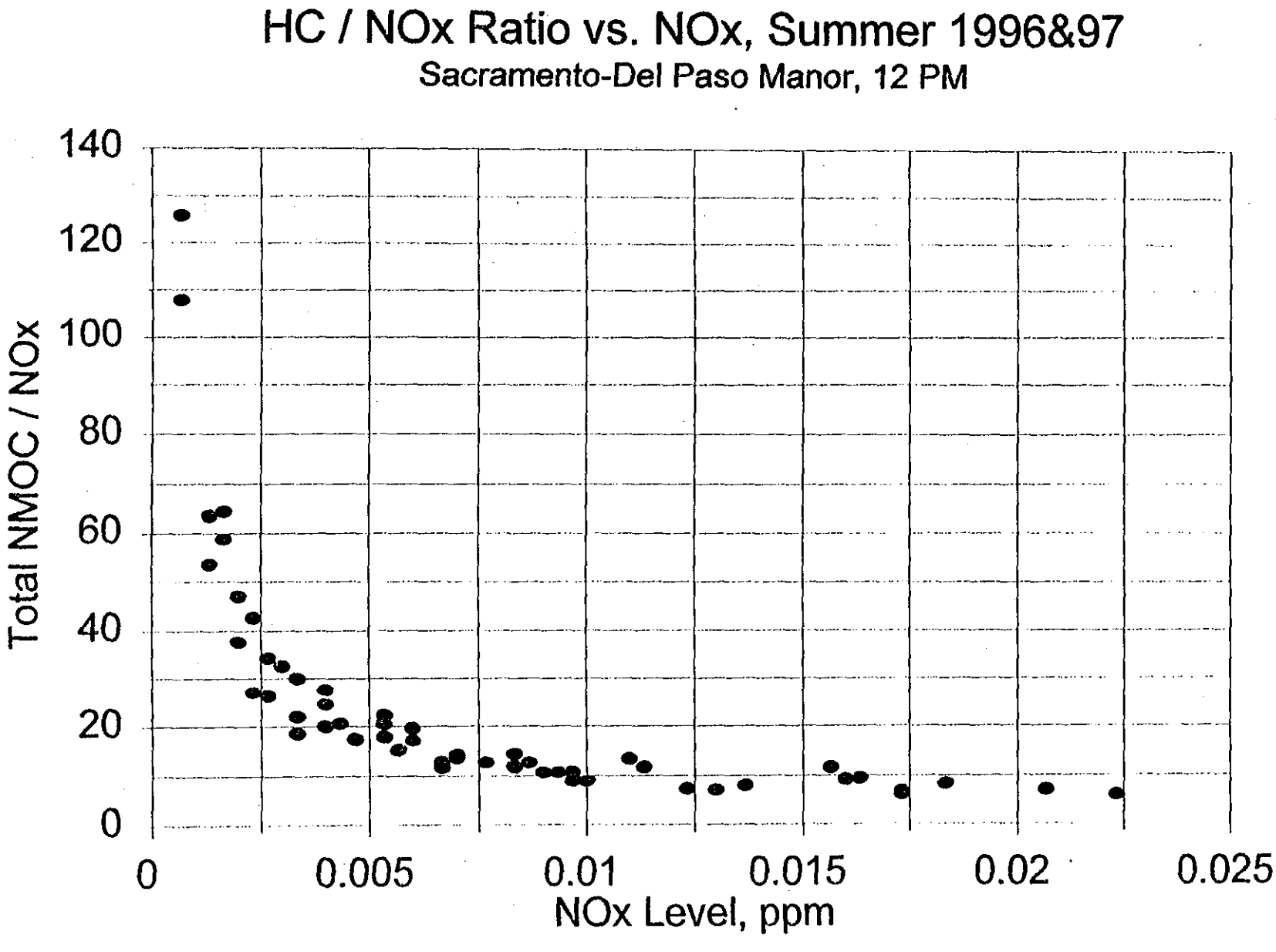
HCTONOX.WB2 10/22/98 - RAB

HC / NOx Ratio vs. NOx, Summer 1996&97

Sacramento-Del Paso Manor, 05 AM



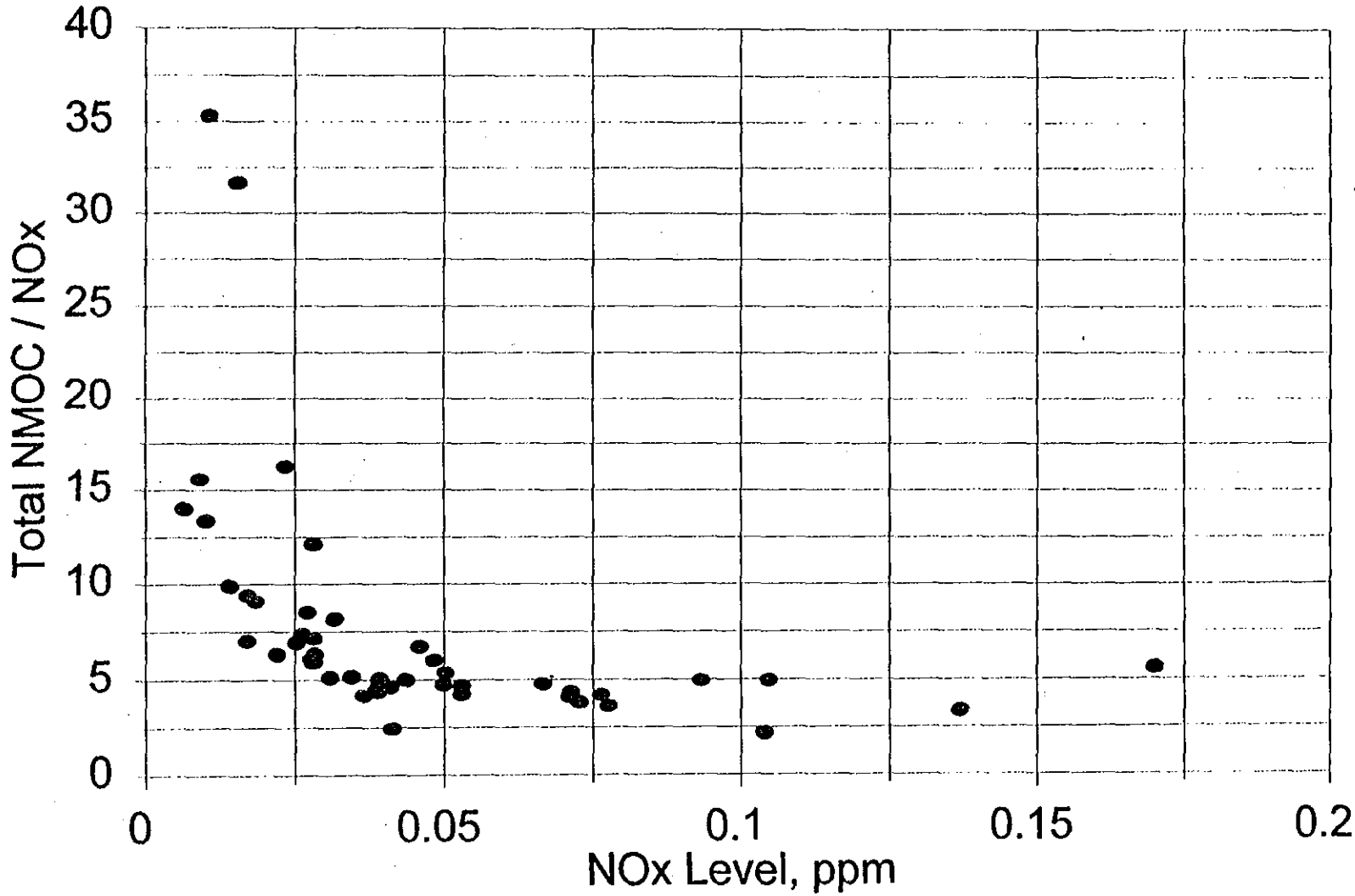
HCTONOX.WB2 10/22/98 - RAB



HCTONOX.WB2 10/22/98 - RAB

HC / NOx Ratio vs. NOx, Summer 1996&97

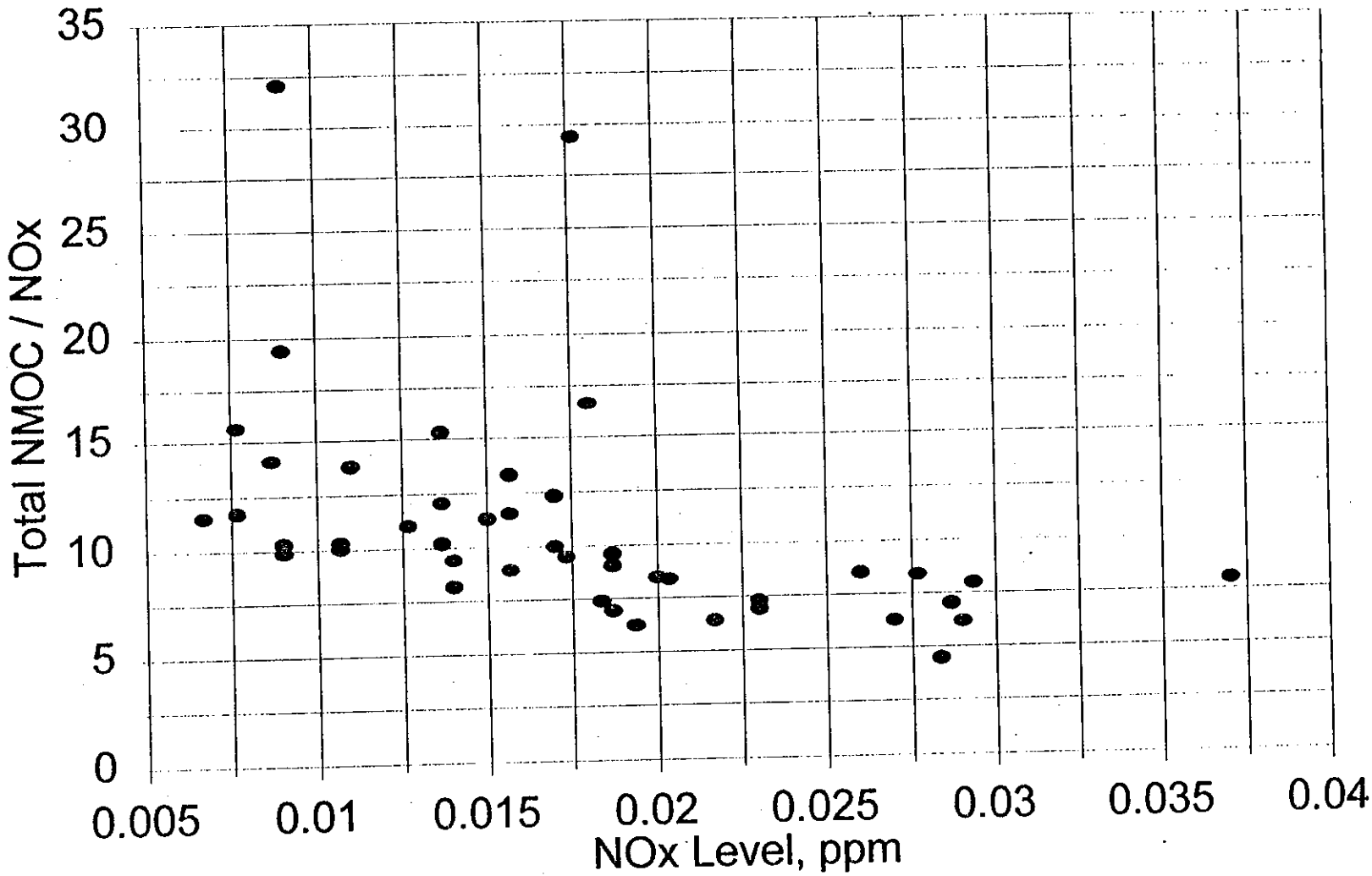
San Diego-12th Avenue, 05 AM



HCTONOX.WB2 10/22/98 - RAB

HC / NOx Ratio vs. NOx, Summer 1996&97

San Diego-12th Avenue, 12 PM



HCTONOX.WB2 10/22/98 - RAB