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HIGHWAY TRANSPORTATION AGENCY
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EFFECT OF TRAFFIC VOLUMES AND NUMBER OF LANES ON FREEWAY ACCIDENT RATES

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EFFECT OF TRAFFIC VOLUMES AND NUMBER OF LANES ON FREEWAY ACCIDENT RATES

Synopsis

Three years of experience on 659 miles of 4-lane, 6-lane, and 8-lane freeways revealed that the accident rates for each classification will normally increase with an increasing ADT. The rate of increase is:

(1) 4-lane: 0.240 accidents/MVM.

(2) 6-lane: 0.094 accidents/MVM.

(3) 8-lane: 0.078 accidents/MVM.

per 10,000 vehicle increase in ADT. For any given ADT the 4-lane freeways have a higher accident rate than the 6-lane, and 6-lane freeways a higher rate than the 8-lane. Therefore, as the ADT increases, the difference in rates between the three classifications becomes greater.

This relationship introduces the possibility of significantly reducing the total number of freeway accidents by increasing the number of traffic lanes, even though the increase is not required by traffic volumes.

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A recent report* by the California Division of Highways presented a concept which indicated that the accident rates on freeways increase as the traffic volumes increase; and for a given traffic volume, the accident rates decrease as the number of lanes increase. The concept was not fully explored in that report and a follow-up study was promised.

The study reported herein is a more detailed analysis of the accident rate vs. volume relationship reported in the comparative freeway study report. The study is based on a three year (1960 - 1962) accident experience on 659 miles of freeway which experienced 35,675 accidents and which generated 26,152 million vehicle miles of travel.

All freeway sections in existence during the study period were classified into three categories; namely, 4 lanes, 6 lanes, and 8 lanes. Those sections which had more lanes in one direction of travel than the other were eliminated. Also eliminated were those sections which had less than 30 million vehicle miles of travel per year. The requirement of a minimum amount of travel of 30 MVM was imposed since it was felt that with this amount of travel, the element of chance variation in the accident rate would be significantly reduced and fairly stable accident rates would result.

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* The Comparative Freeway Study
California Division of Highways, April 1964

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The number of sections that met the above requirements are shown in the table below:

	4 lanes	6 lanes	8 lanes	Total
1960	24	21	10	55
1961	35	30	17	82
1962	42	35	20	97
Totals	101	86	47	234

For each of the above lane classifications, the curve which best represented the accident rate vs. ADT relationship was calculated by the method of least squares, using each individual freeway segment as a pair of coordinates (y= accident rate, x= ADT). "Group average" accident rates for several ADT groups (or class intervals of ADT) were superimposed on these curves for purposes of inspection.

Tables I through III are group average accident rates for each volume class and number of lanes. Each year is tabulated separately and then the three years are combined in Table IV.*

Figures I through III illustrate the linear fits which were obtained through the results of a computer program. The program used also provided fits for four other types of curves along with the standard error of estimate for each

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* The ADT class intervals shown in Tables I through IV are the same class intervals used in "Accidents on Freeways in California," a paper presented at the World Traffic Engineering Conference in 1961. The original selection of the class intervals was such as to present six uniform intervals on the logarithmic scale between traffic volumes of 10,000 - 100,000 vehicles per day.

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type. Table V is a tabulation of the curve types and the standard errors. For all practical purposes, the linear fit proved as good as any other type and is by far the easiest to understand and work with.

The original curve* showing Accident Rate vs. ADT was a Log-Log equation ($y = a x^{b}$) that lumped the 4, 6, and 8 lane data (1957-59) into one package and provided the single curve shown in Figure V. The (1960-62) Log-Log equation is also plotted on Figure V along with the (1960-62) 4, 6, and 8 lane linear fits. Note how the lines tilt up when sorted by number of lanes, yet as a group they still approximate the original log-log form.

Figure VI is, in effect, a summary or a one package look at all three years of experience. The two most significant points of interest are apparent here; they are:

(1) All other things being equal, the accident rate for a 4, 6, or 8-lane freeway will normally increase with an increasing ADT.

(2) For any given ADT, a 4-lane freeway would be expected to have a higher accident rate than a 6-lane and a 6-lane a higher rate than an 8-lane.

This phenomenon is apparently characteristic of total accident rates, but not of fatal accident rates. The curves, or relationship between fatal accident rates and

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* "Accidents on Freeways in California"
Theme IV, World Traffic Engineering Conference, 1961.

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traffic volumes are not yet available. However, the trends seem to show a slight decrease in the fatal accident rate as the ADT increases.

If the future relationship remains consistent with the past, a sizable reduction in total accidents could be realized by providing more lanes. For example, if a proposed freeway has an estimated future ADT of 60,000 vehicles per day, it would generate about 22 MVM's per mile per year. Figure VI shows a probable accident rate of 2.00 accidents per MVM for a 4-lane freeway at this ADT. In raw numbers, this reduces to (22 x 2)=44 accidents per mile per year. The 6 lane accident rate at 60,000 would be about 1.23 or (1.23 x 22) about 27 accidents per mile per year. In other words, 17 accidents per mile per year could be prevented by building a 6-lane freeway instead of a 4-lane freeway. At this rate, the extra lanes would prevent (20 x 17)=340 accidents per mile in 20 years.

In this study alone, there were 92 miles of 4-lane freeway in the 31,600 to 68,500 ADT range by the year 1962. If these freeways had been 6-lane and if Figure VI may be used to predict the probable accident rate, there would have been 1425 accidents in 1962 as compared to the 2269 accidents which actually occurred. If this rate were to continue for 20 years (it is more likely to increase since the ADT is constantly increasing), there may be a possibility of preventing 16,880 accidents in the twenty-year period by adding two lanes to the 92 miles of 4-lane freeways.

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The number of traffic lanes of a freeway is only one of many factors which affect the accident rate on the freeway. However, as shown above, increasing the number of lanes, although not necessarily initially required by traffic volume demands, does reduce significantly the number of accidents on the freeway during its lifetime. Therefore, the possibility of providing the ultimate number of lanes on freeways should always be considered for initial construction whenever stage type construction is contemplated.

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APPENDIX

NO.	DIST.	LOCATION	No. OF LANES	Length (Miles)	1962 Acc.	1962 MVM	1962 ADT in Thousand	1962 Acc. MVM	1961 Acc.	1961 MVM	1961 ADT in Thousand	1961 Acc. MVM	1960 Acc.	1960 MVM	1960 ADT in Thousand	1960 Acc. MVM
1.	III	U.S. 40-Putah Cr. to W. end Yolo Causeway	6	6.62	28	40.038	22.7	0.70								
2.	III	U.S. 40-Yolo Causeway U.C. to Sacramento R.	4	3.78	69	34.456	25.0	2.00	44	32.120	21.8	1.06	43	36.340	24.7	1.18
3.	III	U.S. 40-American Riv. to Jct. Rte. 98 Elvas Fwy.	4	2.33									98	36.250	42.6	2.70
4.	III	U.S. 40-Marconi Ave. to Jct. U.S. 99E	4	4.98									102	108.490	29.7	0.94
4a.	III	U.S. 40-Marconi Ave. to Watt Ave.	4	2.50	55	42.282	46.3	1.30	51	42.223	46.3	1.21				
4b.	III	U.S. 40-Watt Ave. to Jct. U.S. 99E at Roseville.	4	7.80	72	76.328	26.8	0.94	60	68.992	24.2	0.87				
5.	III	U.S. 40-Jct. U.S. 99E to Jct. Rte. 91	4	14.68									54	81.480	15.2	0.66
5a.	III	U.S. 40-E. Roseville O.C. to Auburn Ravine U.C.	4	13.68	51	74.038	14.8	0.69	36	72.978	14.6	0.49				
6.	III	U.S. 99-Galt to Stevenson Rd.	4	16.85	69	91.992	15.0	0.75	53	77.061	12.5	0.69	48	73.070	11.8	0 66
7.	III	U.S. 99-Florin Rd. to Broadway.	6	4.38	47	45.190	28.3	1.04								
8.	III	U.S. 99W (Elvas Fwy)-C St. in Sac. to Jct. U.S. 40	4	1.97	57	31.718	44.1	1.80								
9.	IV	U.S. 101 Bypass (Bayshore Fwy)-San Antonio St. to Guadalupe Riv. Br.	4	4.51	178	67.045	42.1	2.65	91	53.816*	38.0	1.69	42	22.760*	25.5	1.85
10.	IV	U.S. 101 Bypass (Bayshore Fwy)-Guadalupe Riv. Br. to San Mateo Co. Line.	6	12.4	286	209.851	52.1	1.36	68	72.474*	60.7	0.94	47	43.650*	56.0	1.08
11.	IV	U.S. 101 Bypass (Bayshore Fwy)-San Mateo Co. Line to 3rd St. in San Mateo.	6	13.48									260	341.330	69.3	0.76
11a.	IV	U.S. 101 Bypass (Bayshore Fwy)-San Mateo Co. Line to Ralston Ave.	6	9.50	305	249.198	71.9	1.22	181	255.763	73.8	0.71				
11b.	IV	U.S. 101 Bypass (Bayshore Fwy)-Ralston Ave. to 3rd Ave. in San Mateo.	6	3.93	183	140.739	98.1	1.30	148	123.362	86.0	1.20				
12	IV	U.S. 101 Bypass (Bayshore Fwy)-3rd Ave. in San Mateo to 3rd St. in San Francisco.	6	13.12									526	391.580	81.7	1.34
12a.	IV	U.S. 101 Bypass (Bayshore Fwy)-3rd St. in San Mateo to Broadway in Burlingame	6	3.05	128	114.719	103.0	1.11	119	107.565	96.6	1.11				
12b.	IV	U.S. 101 Bypass (Bayshore Fwy)-Broadway in Burlingame to San Bruno Ave.	8	3.57	143	140.748	108.0	1.02	128	131.775	101.0	0.97				
12c	IV	U.S. 101 Bypass (Bayshore Fwy)-San Bruno Ave. to 3rd St. in San Francisco.	6	6.65	376	238.365	98.2	1.58	268	208.747	86.0	1.28				
13	IV	U.S. 101 Bypass (Bayshore Fwy)-3rd St. in San Francisco to Jct. Southern Fwy.	6	1.60	168	61.332	105.0	2.74	140	53.144	91.0	2.63	152	52.560	96.0	2.89
14	IV	S.S.R. 17 (Los Gatos Fwy)-Santa Cruz Ave. to Jct. Rte. 69.	4	11.93									160	101.140	25.2	1.58
14a	IV	S.S.R. 17 (Los Gatos Fwy)-Santa Cruz Ave. to Camden Ave. in Campbell.	4	4.51	40	37.234	22.6	1.07	42	37.617	22.9	1.12				
14b	IV	S.S.R. 17 (Los Gatos Fwy)-Camden Ave. to Moorpark Ave.	4	3.26	78	53.604	45.0	1.45	56	49.764	41.3	1.12				
14c	IV	S.S.R. 17 (Los Gatos Fwy)-Moorpark Ave. to Jct. U.S. 101 Bypass (Bayshore Fwy).	4	4.16	198	80.389	52.9	2.46	128	70.849	47.0	1.81				

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15	IV	S.S.R.17 (Nimitz Fwy)-Jct. U.S. 101 Bypass (Bayshore Fwy) to Warm Springs Cut-off in Fremont.	4	8.43	121	86.151	28.0	1.40	86	80.604	26.2	1.07				
15a	IV	S.S.R.17 (Nimitz Fwy)-Jct. Rte. 68 to Alameda Co. Line.	4	6.42									54	47.470	20.2	1.14
16	IV	S.S.R.17 (Nimitz Fwy)-Alameda Co. Line to Jct. Rte. 105.	4	16.43									183	161.020	26.8	1.14
16a	IV	S.S.R.17 (Nimitz Fwy)-Warm Springs Cut-off to Alvarado Blvd.	4	9.20	102	107.690	32.1	0.95	78	90.666	27.0	0.86				
16b	IV	S.S.R.17 (Nimitz Fwy)-Beard Rd. to Jackson St. in Hayward.	4	5.22	169	97.086	51.0	1.74	98	87.393	45.9	1.12				
17	IV	S.S.R.17 (Nimitz Fwy)-Jackson St. to Washington Ave.	4	4.27	263	106.557	68.4	2.47	199	98.189	63.0	2.03	172	95.360	62.6	1.80
18	IV	S.S.R.17 (Nimitz Fwy)-Washington Ave. to Fallon St. in Oakland.	6	9.95	932	341.083	93.9	2.73	884	363.241	100.0	2.32	761	357.370	97.0	2.13
19	IV	S.S.R.17 (Nimitz Fwy)-Fallon St. to 8th St.	8	1.60	110	51.217	87.7	2.15	90	47.888	82.0	1.88	89	38.330	70.0	2.32
20	IV	U.S. 40 (Eastshore Fwy)-Distribution Structure to El Cerrito O.H.	8	4.00	272	152.304	104.0	1.78	250	143.079	98.0	1.75	269	135.270	94.8	1.99
21	IV	U.S. 40 (Richmond Fwy)-El Cerrito O.H. to Hilltop Rd. at Richmond	6	6.71	225	142.442	58.2	1.58	136	132.594	54.1	1.02	108	108.150	53.6	1.00
22	IV	U.S. 40 (Richmond Fwy)-Hilltop Rd. to Carquinez Bridge.	6	8.14	125	109.923	37.0	1.14	94	116.950	39.4	0.80	76	96.970	32.1	0.78
23	IV	U.S. 50 (Rte. 5)-Jct. Rte. 228 to Eden Canyon Rd. W. of Dublin.	4	4.84	43	44.505	25.2	0.97	47	40.632	23.0	1.16				
24	IV	U.S.101 (Rte. 1)-Golden Gate Bridge to San Rafael Viaduct.	6	10.78									305	183.540	46.7	1.66
24a	IV	U.S.101 (Rte. 1)-Golden Gate Bridge to Sir Francis Drake Blvd.	6	8.40	293	173.802	56.7	1.68	260	171.193	56.5	1.52				
25	IV	U.S.101 (Rte. 1)-Sir Francis Drake O.C. to San Rafael Viaduct.	6	2.29	78	39.195	46.9	1.99	53	36.930	42.4	1.43				
26	IV	U.S.101 (Rte. 1)-So. Petaluma U.C. to Barham Ave. Conn.	4	16.79	91	99.603	16.3	0.91	74	94.222	15.4	0.78	61	79.100	12.9	0.77
27	IV	S.S.R.21 (Rte. 107, 75)-S.C.L. Walnut Creek to Monument.	4	4.99	57	58.062	31.9	0.98	34	61.020	33.2	0.56				
28	IV	S.S.R.24 (Rte. 75)-Upper Happy Valley Rd. to Pleasant Hill Rd.	4	3.10	56	45.215	40.0	1.24	53	42.997	38.0	1.23	36	36.010	33.0	1.00
29	V	U.S. 101-Sheffield Rd. to Montecito St. in Santa Barbara.	4	4.65	20	43.393	25.6	0.46	18	35.996	21.2	0.50	23	36.140	21.3	0.64
30	V	U.S.101-Junipero St. in Santa Barbara to Fairview Ave.	4	6.62	36	58.159	25.2	0.62								

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31	VI	U.S.99-Pond Rd. So. of Delano to Tulare-Lindsay Interchange.	4	34.88	99	121.702	13.7	0.81	98	106.873*	13.2	0.92				
31a	VI	U.S.99-Airport Rd. O.C.So. of Delano to Ave. 100 in Tulare Co.	4	16.84									45	79.990	13.0	0.56
32	VI	U.S.99-Tulare-Lindsay Interchange to Kings River Br.	4	23.53	101	90.865	14.0	1.11	84	90.667*	14.1	0.93				
33	VI	U.S.99-Clinton Ave. to Fresno-Madera Co. Line	4	7.49	58	43.513	15.9	1.33	49	47.103	17.3	1.04				
34	VI	U.S.99-Califa Wye to Merced Co. Line.	4	7.02	39	32.326	12.6	1.21	22	28.604	11.4	0.77				
35	VII	U.S.101 (San Diego Fwy)-San Diego Co. Line to Jct. U.S.101A (Rte. 60)	6	7.22	90	66.771	25.3	1.35	40	54.720*	22.4	0.73				
36	VII	U.S.101 (San Diego Fwy)-Jct. U.S.101A to Jct. S.A. Fwy. at Irvine.	4	14.20	139	134.936	25.9	1.03	109	119.420	23.0	1.03	79	81.290	17.1	0.97
37	VII	U.S. 101 (Santa Ana Fwy)-Irvine to 4th St. in Santa Ana.	4	10.20									135	82.700	22.2	1.63
37a	VII	U.S. 101 (Santa Ana Fwy)-Jct. S.A. Fwy. to Jct. S.S.R.55 (Tustin Ave.) in Tustin	4	9.40	192	126.545	36.9	1.52	183	108.486	31.6	1.69				
37b	VII	U.S.101 (Santa Ana Fwy)-Jct. S.S.R.55 to Jct. Rte. 184(Main St.) In Santa Ana.	4	2.79	129	48.658	47.8	2.65	109	45.530	44.7	2.39				
38	VII	U.S.101 (Santa Ana Fwy)-Lincoln Ave. to Jct. Rte. 175 (Riverside Fwy)	6	3.10	154	101.464	89.7	1.52	117	87.755	77.6	1.33				
39	VII	U.S.101(Santa Ana Fwy)-Jct. Rte. 175 to Los Angeles Co. Line.	6	2.30	203	107.603	128.0	1.89	181	96.123	115.0	1.88				
40	VII	U.S. 101 (Santa Ana Fwy)-Los Angeles Co. Line to Jct. S.S.R.15 (Long Beach Fwy)	6	13.80					821	535.927	107.0	1.53	665	51[illegible]	[illegible].3	1.28
40a	VII	U.S.101 (Santa Ana Fwy)-Los Angeles Co. Line to Jct. Rte. 168 (Lakewood Blvd)	6	8.40	664	360.908	117.7	1.84								
40b	VII	U.S. 101 (Santa Ana Fwy)-Juct. Rte. 168(Lakewood Blvd.) to Jct. S.S.R.15(Long Beach Fwy)	6	5.40	531	243.525	123.6	2.18								
41	VII	U.S. 101 (Santa Ana Fwy)-Jct.S.S.R.15 to Jct. Rte. 173 (Santa Monica Fwy)	8	2.72	299	172.374	174.0	1.73	153	128.491	129.0	1.19	138	99.350*	122.6	1.39
42	VII	U.S. 101 (Santa Ana Fwy)-Jct. Rte. 173 to Jct. Rte. 26 (San Bernardino Fwy)	6	1.70	65	50.757	81.8	1.28	78	60.881	98.1	1.28	117	81.760*	112.0	1.43
43	VII	U.S. 101 (Hollywood Fwy)-4-Level Structure to Sunset Blvd.	8	4.60	479	266.994	159.0	1.79	557	269.144	160.0	2.07	568	292.370	177.9	1.94
44	VII	U.S. 101 (Hollywood Fwy)-Sunset Blvd. to Jct. Rte. 160 (Highland Ave.)	6	1.70	114	72.015	116.0	1.58	142	70.116	113.0	2.02	108	88.150	137.9	1.23
45	VII	U.S. 101 (Ventura Fwy)-Jct. Golden State Fwy. to Jct. Hollywood Fwy.	8	5.05	42	40.396	45.0	1.04								
46	VII	U.S. 101 (Ventura Fwy)-Jct. Hollywood Fwy. to Encino Ave.	8	8.30	505	376.961	124.0	1.34	471	341.247	110.0	1.38				

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46a	VII	U.S. 101 (Ventura Fwy)-Jct. Hollywood Fwy. to Jct. S.S.R. 7 (San Diego Fwy)	8	5.75									236	187.940	110.4	1.26
47	VII	U.S. 101 (Ventura Fwy)-Encino Ave. to Winnetka Ave.	8	3.30	90	107.200	89.0	0.84	85	89.571	74.4	0.95				
48	VII	U.S. 101 (Ventura Fwy)-Winnetka Ave. to Jct. S.S.R.27 (Topanga Canyon Blvd.)	8	2.00	42	46.186	63.3	0.91	19	41.008	56.1	0.46				
49	VII	U.S. 101 (Ventura Fwy)-Jct. S.S.R.27 at Mulholland Drive.	6	2.48	24	32.779	36.2	0.73	26	27.937	30.9	0.93	14	33.120	35.8	0.42
50	VII	Rte. 173(Santa Monica Fwy)-Jct. Harbor Fwy. to Jct. Santa Ana Fwy.	6	4.29	98	99.810	72.4	0.98								
51	VII	Rte's. 4,166 (Golden State Fwy)-Jct. Los Angeles River Br. to Jct. Pasadena Fwy.	8	3.96	147	150.669	107.0	0.97	25	37.666*	35.3	0.66				
52	VII	Rte's. 4,166 (Golden State Fwy)-Jct. Ventura Fwy. to Cohasset St. U.C.	8	4.77	108	170.991	98.2	0.63	8	77.116	58.4	0.14				
53	VII	Rte. 4 (Golden State Fwy)-Cohasset St. to Lankershim.	8	3.17	42	84.812	73.3	0.49								
54	VII	U.S.6 (Harbor Fwy)-190th St. to Imperial Hwy.	8	5.25									88	55.850	49.5	1.58
54a	VII	U.S.6(Harbor Fwy)-Jct. San Diego Fwy. to Rosecrans Ave.	8	2.82	86	68.062	66.4	1.26	68	63.119	61.4	1.07				
54b	VII	U.S.6 (Harbor Fwy)-Rosecrans Ave. to Imperial Highway.	8	2.10	108	75.305	98.2	1.43	83	74.209	96.8	1.12				
55	VII	U.S.6 (Harbor Fwy)-Imperial Highway to Manchester Ave.	8	2.00	136	90.520	124.0	1.50	71	97.090	133.0	0.73				
56	VII	U.S.6 (Harbor Fwy)-Manchester Ave. to Olympic Blvd.	8	6.20	892	360.066	159.0	2.48	698	369.774	163.0	1.89				
56a	VII	U.S.6 (Harbor Fwy)-Exposition Blvd. to 11th St.	8	2.00									305	132.860	182.0	2.30
57	VII	U.S.66 (Pasadena Fwy)-Jct. U.S.99 to Glenarm St. in Pasadena.	6	6.27									208	141.930	62.0	1.47
57a	VII	U.S.66(Pasadena Fwy)-Jct. Golden State Fwy. to Ave. 64	6	3.40	133	89.178	71.9	1.49	128	90.841	73.2	1.41				
57b	VII	U.S.66 (Pasadena Fwy)-Ave. 64 to Glenarm St.	6	2.76	81	40.811	40.5	1.98	60	48.133	47.8	1.25				
58	VII	S.S.R.15 (Long Beach Fwy)-U.S.101A(Rte.60) to Jct. U.S.101 Santa Ana Fwy.	6	16.66									312	403.510	66.3	0.77
58a	VII	S.S.R.15 (Long Beach Fwy)-U.S.101A(Rte. 60) to Jct. Rte. 158(San Diego Fwy).	6	2.68	76	54.526	55.7	1.39	38	59.006	60.3	0.64				
58b	VII	S.S.R.15(Long Beach Fwy)-Jct. Rte. 158 to Jct. Rte. 166 (Santa Ana Fwy)	6	14.04	450	390.987	76.3	1.15	353	361.753	70.6	0.97				
59	VII	S.S.R.15(Long Beach Fwy)-Jct. Rte. 166 to Jct. Rte. 26 (San Bernardino Fwy)	6	3.00	51	50.532	46.1	1.01	28	30.604	37.8	0.91				

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NO.	DIST.	LOCATION	No. OF LANES	Length (Miles)	1962 Acc.	1962 MVM	1962 ADT in Thousand	1962 Acc. MVM	1961 Acc.	1961 MVM	1961 ADT in Thousand	1961 Acc. MVM	1960 Acc.	1960 MVM	1960 ADT in Thousand	1960 Acc. MVM
60	VII	U.S.99 (San Bernardino Fwy)-Jct. Rte. 4 to Jct. Rte. 167 (Long Beach Fwy)	6	2.91	253	139.049	131.0	1.82	235	127.534	117.0	1.84	158	106.040	108.0	0.79
61	VII	U.S.99(San Bernardino Fwy)-Jct. Rte. 167 to Francisquito Ave.	8	11.31	719	529.428	128.0	1.36	655	478.993	116.0	1.37				
61a	VII	U.S.99(San Bernardino Fwy)-Jct. Rte. 167 to Baldwin Ave.	8	6.97									385	280.720	110.3	1.37
62	VII	U.S.99(San Bernardino Fwy)-Jct. Rte. 170 to Jct. U.S.60 (Arroyo Ave.)	6	9.11									306	229.330	69.0	1.33
63	VII	U.S.99(San Bernardino Fwy)-Jct. U.S.60 to San Bernardino Co. Line.	6	5.53	98	104.993	52.0	0.93	101	98.252	48.9	1.03	133	89.200	42.4	1.49
64	VII	Rte. 158(San Diego Fwy)-Jct. Harbor Fwy. to Hawthorne Ave.	8	5.42	36	55.416	50.0	0.65								
65	VII	Rte.158 (San Diego Fwy)-Jefferson Blvd. in Culver City to Sunset Blvd. in Los Angeles.	8	6.98	136	117.656	46.2	1.15	133	167.377*	62.6	0.79	75	132.140*	55.3	0.57
66	VII	U.S91 (Riverside Fwy)-Jct. Santa Ana Fwy. to Jct. Rte. 2 (Spadra Rd.)	6	3.36	58	72.840	59.4	0.80	33	51.056*	41.6	0.65	27	30.330*	27.9	0.89
67	VII	Rte.43 (Newport Fwy)-Jct. Santa Ana Fwy. to Jct. S.S.R.14 (Rte. 175)	4	7.75	22	37.955	20.0	0.58								
68	VIII	U.S.70 (San Bernardino Fwy)-Los Angeles Co. Line to Archibald Ave.	4	7.15									149	92.310	35.3	1.61
68a	VIII	U.S.70 (San Bernardino Fwy)-Los Angeles Co. Line to Vineyard Ave. in Ontario.	6	6.19	98	101.808	45.1	0.96	110	97.837	42.8	1.12				
69	VIII	U.S.70 (San Bernardino Fwy)-Vineyard Ave. to U.S.91(Rte.43) in San Bernardino.	4	18.21	439	242.588	36.5	1.81	277	230.573	34.4	1.20	284	183.74[illegible]	28.8	1.55
70	VIII	U.S.70(San Bernardino Fwy)-6th St. to W. Ramsey St. in Banning.	6	5.81	45	43.776	20.6	1.03								
71	VIII	U.S.91 (Rte. 43)-Magnolia Ave. to Spruce St. in Riverside.	4	10.77									59	101.660	26.8	0.58
71a	VIII	U.S.91(Rte. 43)-Maple St. So. of Corona to Van Buren St. in Riverside.	4	10.19	64	81.100	21.8	0.79	45	62.191	20.3	0.72				
71b	VIII	U.S.91 (Rte. 43)-Van Buren St. to Jct. U.S. 60 (Spruce St)	4	7.60	63	97.201	35.0	0.65	95	88.213	31.8	1.08				
72	VIII	U.S.91 (Rte. 43)-Jct. U.S. 60 to Jct. U.S. 70 (Rte. 26)	4	6.06	117	70.118	31.9	1.67	50	48.141	25.2	1.04				
73	VIII	U.S.91 (Rte. 31)- I St. to Devore.	4	9.53	80	54.254	15.6	1.47	50	54.043	15.5	0.92	51	43.510	12.2	1.17
74	VIII	U.S.91 (Rte. 31)-Victorville to 1.0 mile No. of Mojave R.R.U.P.	4	10.40	49	32.855	9.5	1.49								

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NO.	DIST.	LOCATION	No. OF LANES	Length (Miles)	1962 Acc.	1962 MVM	1962 ADT in Thousand	1962 Acc. MVM	1961 Acc.	1961 MVM	1961 ADT in Thousand	1961 Acc. MVM	1960 Acc.	1960 MVM	1960 ADT in Thousand	1960 Acc. MVM
75	VIII	U.S.91 (Rte. 31)-Jct. U.S.66 at Barstow to Yermo.	4	11.06	46	31.773	8.2	1.45								
76	VIII	U.S.91 (Rte. 31)-Baker to Valley Wells.	4	24.14	57	55.069	6.2	1.03								
77	X	U.S.40 (Rte. 7)-Jct. S.S.R.29 to Redwood St.	6	3.70	53	43.743	32.4	1.21	48	38.533	28.5	1.25	31	34.850	25.7	0.89
78	X	U.S.99 (Rte. 4)-Ripon to Jct. S.S.R. 4 Farmington Rd. near Stockton.	4	15.51	84	79.875	14.1	1.05	66	80.660	14.2	0.82	98	71.130	12.5	1.38
79	X	U.S. 99 (Rte. 4)-Mokelumne River to Sacramento County Line.	4	6.99	38	41.578	16.3	0.91	25	34.302	13.4	0.73	24	31.840	12.5	0.75
80	XI	U.S. 101 (Rte. 2)-0.6 mile No. of Mexican Border to S. Sweetwater Riv. in Chula Vista.	4	8.65									115	88.080	27.8	1.31
80a	XI	U.S. 101 (Rte. 2)-0.5 mile No. of International Bdry. to Jct. S.S.R.75 in San Diego.	4	4.01	54	30.883	21.1	1.75	66	30.444	20.8	2.17				
80b	XI	U.S. 101 (Rte. 2)-Jct. S.S.R.75 to So. Sweetwater River Br. near N.S.L. Chula Vista.	4	4.64	116	65.457	38.6	1.77	125	69.086	40.8	1.81				
81	XI	U.S. 101 (Rte. 2)-San Marcus Cr. to Oceanside O.H. (A.T. & S.F.R.R.)	4	10.63	163	104.997	27.1	1.55	169	105.128	27.1	1.61	145	96.440	24.8	1.50
82	XI	U.S. 80 (Rte. 12)-Jct. U.S.101 to Fairmont Ave. in San Diego.	8	5.43	183	136.594	68.9	1.34	150	129.553	65.4	1.16	55	43.020	47.3	1.28
83	XI	U.S. 80 (Rte. 12)-Fairmont Ave. to Baltimore Blvd. in La Mesa.	6	4.70	58	80.831	47.1	0.72	63	73.925	43.4	0.85	20	40.680	31.9	0.49
84	XI	S.S.R. 94 & 67 (Rte's 200 & 198). Wabash Blvd. to Jct. U.S. 67.	6	6.90									79	101.060	40.1	0.78
84a	XI	S.S.R. 94 & 67 (Rte's. 200 & 198)- Wabash Blvd. to College Ave.	6	4.52	94	73.244	44.5	1.28	62	70.474	42.7	0.88				
85	XI	U.S. 70 (Rte. 26)-2.0 miles W. of Edom to Indio Br.	4	10.12	51	31.975	9.0	1.59								

*Only a portion of this section was full freeway during this year. The data represents only the Freeway portion.

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TABLE I

ACCIDENTS, MILLION VEHICLE MILES of TRAVEL, and ACCIDENT RATES for FREEWAYS

Classified by Number of Lanes and Traffic Volumes

1960

GROUP NO.	ADT CLASS INTERVAL	4 LANES					6 LANES					8 LANES				
		Miles	No of Acc.	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*
I	Less than 7,000															
II	7,000 to 9,999															
III	10,000 to 14,999	82.79	327	379	0.86	12.5										
IV	15,000 to 21,499	40.03	210	246	0.85	18.5										
V	21,500 to 31,599	103.96	1268	982	1.29	26.2	6.69	58	65	0.89	26.8					
VI	31,600 to 46,499	12.47	283	165	1.72	37.0	28.32	322	361	0.89	36.5					
VII	46,500 to 67,999	4.17	172	95	1.81	62.6	43.59	980	881	1.11	56.9	17.78	218	231	0.94	50.7
VIII	68,000 to 99,999						47.30	2005	1372	1.46	82.6	5.51	358	174	2.06	82.4
IX	100,000 to 120,000						18.69	940	706	1.33	107.1	12.72	621	469	1.32	110.4
X	Over 120,000						1.75	108	88	1.23	137.9	8.72	1011	525	1.93	160.8
	TOTALS	243.42	2260	1867	1.21	24.4	146.34	4413	3473	1.27	66.3	44.73	2208	1399	1.58	102.0

*ADT in thousands

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TABLE II

ACCIDENTS, MILLION VEHICLE MILES of TRAVEL, and ACCIDENT RATES for FREEWAYS

Classified by Number of Lanes and Traffic Volumes

1961

GROUP NO.	ADT CLASS INTERVAL	4 LANES					6 LANES					8 LANES				
		Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*
I	Less than 7,000															
II	7,000 to 9,999															
III	10,000 to 14,999	99.93	384	491	0.78	13.3										
IV	15,000 to 21,499	52.66	302	324	0.93	18.4										
V	21,500 to 31,599	69.70	685	623	1.10	24.5	12.88	114	121	0.94	27.3					
VI	31,600 to 46,499	62.75	1172	879	1.33	38.7	32.37	443	478	0.93	41.4	3.27	25	38	0.66	35.3
VII	46,500 to 67,999	8.43	327	169	1.94	55.0	29.25	663	582	1.14	54.7	22.35	378	478	0.79	60.8
VIII	68,000 to 99,999						46.97	1532	1350	1.13	83.7	11.00	508	355	1.43	87.8
IX	100,000 to 120,000						30.75	2263	1194	1.90	110.4	23.38	1254	952	1.32	109.0
X	Over 120,000											15.52	1479	864	1.71	146.3
	TOTALS	293.47	2870	2486	1.15	27.4	152.22	5015	3725	1.35	66.8	75.52	3644	2687	1.36	94.2

*ADT in thousands

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TABLE III

ACCIDENTS, MILLION VEHICLE MILES of TRAVEL, and ACCIDENT RATES for FREEWAYS

Classified by Number of Lanes and Traffic Volumes

1962

GROUP NO.	ADT CLASS INTERVAL	4 LANES					6 LANES					8 LANES				
		Miles	No. of Acc	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc	MVM	Acc./MVM	Avg. ADT for Group*
I	Less than 7,000	24.14	57	55	1.04	6.2										
II	7,000 to 9,999	31.58	146	97	1.51	8.9										
III	10,000 to 14,999	94.62	374	399	0.94	13.8										
IV	15,000 to 21,499	69.41	412	400	1.03	17.2	5.81	45	44	1.02	20.8					
V	21,500 to 31,599	75.65	767	701	1.09	25.3	18.22	165	152	1.09	25.4					
VI	31,600 to 46,499	75.44	1510	1008	1.50	38.4	30.79	526	453	1.16	40.3	12.03	178	158	1.13	45.6
VII	46,500 to 67,999	12.17	496	226	2.19	50.6	46.07	1172	878	1.33	53.5	10.24	164	170	0.96	59.9
VIII	68,000 to 99,999	4.27	263	107	2.46	68.4	56.56	2696	1702	1.58	83.8	20.37	641	626	1.02	85.9
IX	100,000 to 120,000						14.75	1074	609	1.76	110.4	11.53	562	444	1.27	106.3
X	Over 120,000						10.61	987	490	2.01	127.5	35.13	3030	1796	1.69	144.7
	TOTALS	387.28	4025	2993	1.34	27.5	182.81	6665	4328	1.54	68.2	89.30	4575	3194	1.43	98.7

*ADT in thousands

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TABLE IV

ACCIDENTS, MILLION VEHICLE MILES of TRAVEL, and ACCIDENT RATES for FREEWAYS

Classified by Number of Lanes and Traffic Volumes

1960 - 1961 - 1962

GROUP NO.	ADT CLASS INTERVAL	4 LANES					6 LANES					8 LANES				
		Miles	No of Acc.	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*	Miles	No. of Acc.	MVM	Acc./MVM	Avg. ADT for Group*
I	Less than 7,000	24.14	57	55	1.04	6.2										
II	7,000 to 9,999	31.58	146	97	1.51	8.9										
III	10,000 to 14,999	277.34	1085	1269	0.86	13.2										
IV	15,000 to 21,499	162.10	924	970	0.95	17.9	5.81	45	44	1.02	20.8					
V	21,500 to 31,599	249.31	2720	2306	1.18	25.4	37.79	337	338	1.00	26.5					
VI	31,600 to 46,499	150.66	2965	2051	1.45	38.4	91.48	1291	1292	1.00	39.7	15.30	203	196	1.04	42.1
VII	46,500 to 67,999	24.77	995	491	2.03	54.1	118.91	2815	2341	1.20	54.8	50.37	760	879	0.86	57.8
VIII	68,000 to 99,999	4.27	263	107	2.46	68.4	150.83	6233	4424	1.41	83.5	36.88	1507	1155	1.30	85.9
IX	100,000 to 120,000						64.19	4277	2509	1.70	109.6	47.63	2437	1865	1.31	108.3
X	Over 120,000						12.36	1095	578	1.89	130.1	59.37	5520	3185	1.73	148.9
	TOTALS	924.17	9155	7346	1.25	26.7	481.37	16,093	11,526	1.40	67.2	209.55	10,427	7280	1.43	97.8

* *ADT in thousands*

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TABLE V
STANDARD ERROR of ESTIMATE for ACCIDENT RATE vs AVERAGE DAILY TRAFFIC CURVES
(least squares program)

YEAR	NUMBER of LANES	TYPE of CURVE				
		Linear $y = a + bx$	Exponential $y = a(b)^x$	Semi Log 1 $\log_e y = a + bx$	Semi Log 2 $y = a + b \log_e x$	Log Log $y = a(x)^b$
1960	4 Lanes	0.397	0.410	0.422	0.395	0.398
1961	4 Lanes	0.358	0.360	0.364	0.363	0.364
1962	4 Lanes	0.463	0.447	0.464	0.510	0.519
1960-1962	4 Lanes	0.419	0.415	0.422	0.446	0.447
1960	6 Lanes	0.495	0.481	0.498	0.463	0.473
1961	6 Lanes	0.359	0.353	0.357	0.378	0.374
1962	6 Lanes	0.412	0.412	0.415	0.420	0.421
1960-1962	6 Lanes	0.424	0.426	0.430	0.430	0.431
1960	8 Lanes	0.455	0.479	0.487	0.480	0.489
1961	8 Lanes	0.391	0.395	0.412	0.392	0.403
1962	8 Lanes	0.401	0.395	0.401	0.415	0.414
1960-1962	8 Lanes	0.438	0.436	0.446	0.447	0.451

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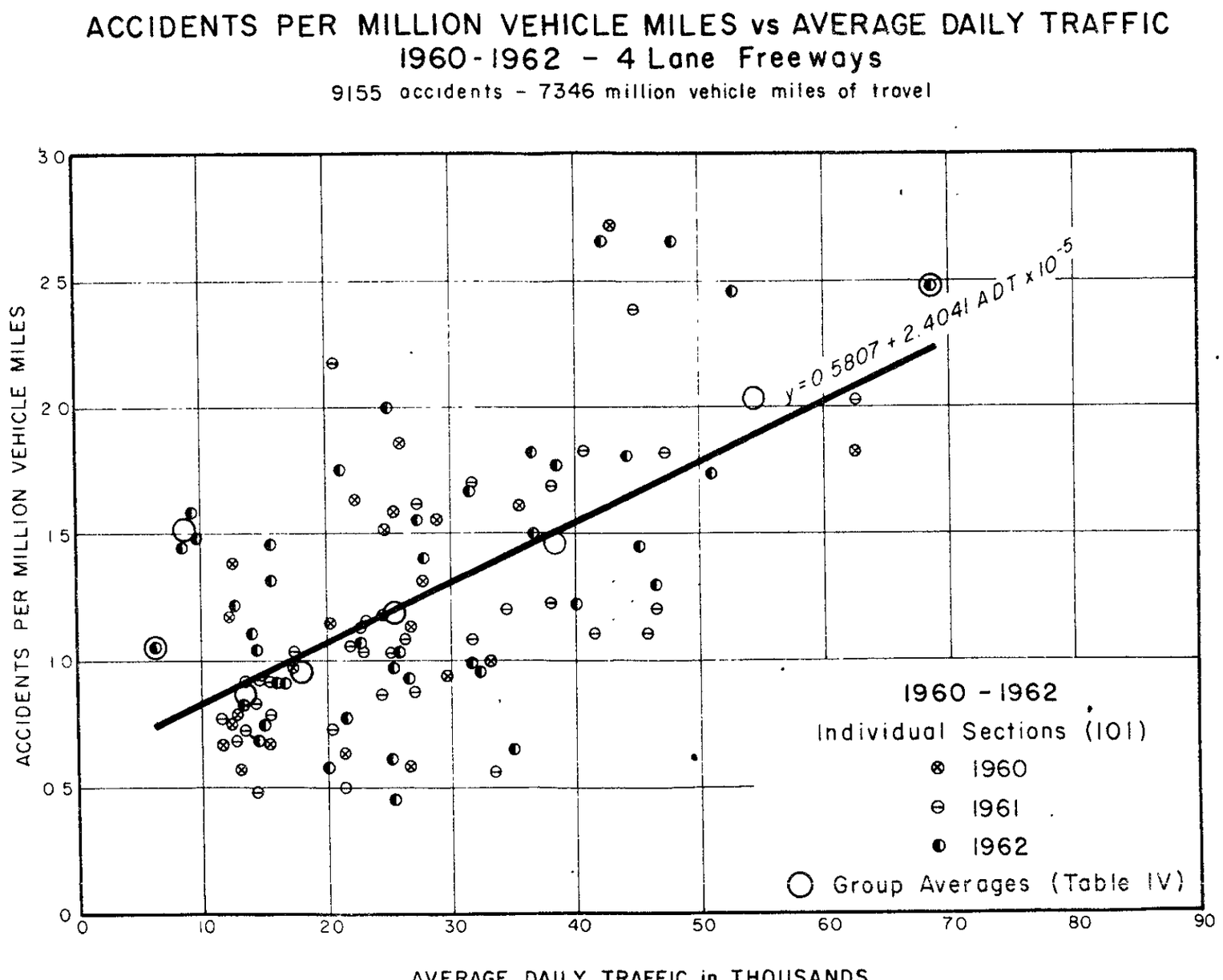
FIGURE 1



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