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1. INTRODUCTION

During 1978 a collection of surveys unique to the West Midlands was established to monitor changes in vehicular movement on county roads and motorways. In order to select sites for the survey, the grid references of one hundred census points (or HP's as they are commonly known) were randomly generated from the computer, although within this random selection proportions of different road classes within each district were taken into consideration.

Each location is counted annually by automatic machines to assess traffic growth, and biennially by manual traffic enumerators to gather information on vehicle compositions. The distribution of sites in each district for the different road classes are shown in Table 1.

Table 1. Distribution of Hundred Point Census Sites

	Motorway	Trunk & Principal	Class. Non. Princ	Un. Class	Total
Birmingham	1	8	7	17	33
Coventry		3	2	7	12
Dudley		2	2	7	11
Sandwell	1	2	2	7	12
Solihull		2	2	5	10
Walsall	1	2	2	7	12
Wolverhmpn		2	1	7	10
West Mids	3	21	19	57	100

Figures show the number of sites in each district authority area and road type shown.

2. COLLECTION OF INFORMATION

Automatic counts (produced by tubes or detector loops across a width of road from which pulses are sent to a machine and counted) are carried out at all sites for at least four separate weeks every year. However, a number of sites are counted more frequently. Four sites are counted for one week in every four and 21 sites are counted permanently. Originally, two motorway sites were counted permanently and cross referenced with an MT prefix. However, as explained in a later section, problems have been encountered with the automatic traffic counters on motorways in the West Midlands.

Manual counts (twelve category passage counts) are carried out at most sites for one 16 hour or 12 hour day every two years. The last complete set of manual counts was carried out in 1990.

3. CALCULATION OF TOTAL TRAVEL

After the information for all automatic sites is complete for the whole year, the results are run through a computer analysis program which works basically as follows:-

(i), Yearly estimating factors for each week in the year are produced from the permanent and quarter permanent (once a month) sites.

(ii), For those sites that are done four times per year, yearly flows using these factors are estimated from the four weeks in which the count was done. An average of these four yearly estimated totals is taken. This produces one hundred estimated yearly flows.

(iii), The average flow (produced from these yearly estimates) for each road type is then calculated.

(iv), Total travel by all vehicles in vehicle-kilometres is calculated as the product of this yearly flow and the total road length of a particular type of road within the county. Lengths of each type of road in the seven districts are shown in Table 2. In this way changes in total travel take into account both changing flow levels and changing network lengths.

Table 2. Road Lengths by District and Road Type 1991

	Motorway	Trunk & Principal	Class. Non Princ.	Un-Class.	Total
Birmingham	14.8*	200.2	237.8	1748.4	2201.2
Coventry	3.6	62.2	93.9	603.1	762.8
Dudley	5.5	86.6	76.3	685.2	853.6
Sandwell	17.8	93.7	88.2	609.0	808.7
Solihull	21.3	62.6	160.9	541.9	786.7
Walsall	8.8	81.7	80.0	524.3	694.8
Wolverhmpn	0.0	61.3	46.3	591.8	699.4
West Mids.	71.8	648.3	783.4	5303.7	6807.2

* Includes A38(M)

Figures show the lengths in kilometres of road type shown in each district authority area and are correct as at 1st April 1991.

4. ANALYSIS

4.1 Traffic Growth or Decline

The hundred point census data is useful to assess overall growth or decline in total travel in the West Midlands and is an estimate of annual total travel in terms of vehicle-kilometres. Since the Department of Transport took over the collection of motorway data in 1986, problems have been encountered with the validity of the data and, as a result, due to incomplete or unreliable data, no estimates of total travel on motorways have been produced for five years.

Table 3 shows the total travel on different types of road in the West Midlands over the twelve years 1980 to 1991 inclusive. Annual traffic in the West Midlands decreased by 0.1% during 1991 on all roads excluding motorways. Nationally, there has been a 3% increase in total traffic compared with 1990. Traffic on all road classes rose, the increases ranging from 1% on minor roads to 7% on trunk roads.

Table 3. Total Travel in 000's vehicle-kilometres 1980-1991 - Annual

Year	Motorway	Trunk & Principal	Class. Non-Principal	Un-Classified	Total Ex. Motorway
1980	1,776,851	4,075,222	2,155,494	3,400,171	9,630,887
1981	1,624,960	3,987,477	2,097,470	3,399,898	9,484,845
1982	1,764,189	4,078,868	2,182,432	3,423,198	9,684,498
1983	1,840,883	4,186,100	2,254,160	3,482,665	9,922,925
1984	1,950,448	4,244,801	2,291,238	3,504,396	10,040,435
1985	1,962,631	4,378,726	2,306,552	3,605,439	10,290,717
1986	2,161,699	4,367,325	2,442,712	3,983,648	10,793,686
1987	N/A	4,638,617	2,520,186	3,973,346	11,132,149
1988	N/A	4,782,598	2,659,802	4,211,134	11,653,536
1989	N/A	5,009,939	2,807,702	4,353,600	12,171,240
1990	N/A	5,073,282	2,876,943	4,613,191	12,563,417
1991	N/A	5,005,381	2,862,662	4,678,833	12,546,878

After steady increases in traffic over the nine year period from 1982 to 1990, there has been no growth in the overall level of traffic on roads excluding motorways in 1991. There has been a small (1.4%) increase in total travel on unclassified roads. It is disappointing that once again we have no continuous, reliable data for motorway traffic in the West Midlands. As a consequence it is difficult to form an overall picture of traffic changes. For instance, traffic excluding motorways has declined by 0.1% but motorway traffic may have risen by

several percent which would compensate for this decrease in other roads, and would mean that overall, traffic in the West Midlands had actually increased.

Table 4. Traffic Growth Indices 1980-1991, West Midlands Roads

	Motorway	Trunk & Principal	Class. Non-Principal	Un-Classified	Total Ex. Motorway
1980	100	100	100	100	100
1981	91	98	97	100	98
1982	99	100	101	101	101
1983	104	103	105	102	103
1984	110	104	106	103	104
1985	110	107	107	106	107
1986	122	107	113	117	112
1987	N/A	114	117	117	116
1988	N/A	117	123	124	121
1989	N/A	123	130	128	126
1990	N/A	124	133	136	130
1991	N/A	123	133	138	130

Table 5. Percentage Change - Overall Traffic Levels (vehicle-kilometres travelled).

Year	All Roads		Motorways	
	Excluding Motorways		% change	
	% change		% change	
	G.B.*	W.Mids	G.B.*	W.Mids
1980/81	+1.9	-1.5	+1.2	-8.5
1981/82	+3.1	+2.1	+4.3	+8.6
1982/83	+1.1	+2.5	+6.8	+4.3
1983/84	+2.6	+1.2	+12.8	+5.9
1984/85	+1.8	+2.5	+4.7	+0.6
1985/86	+4.7	+4.9	+7.3	+10.2
1986/87	+5.6	+3.1	+23.0	N/A
1987/88	+3.6	+4.7	+3.6	N/A
1988/89	+7.1	+4.4	+9.2	N/A
1989/90	-0.3	+3.2	+3.0=	N/A
1990/91	+2.6=	-0.1	+3.0=	N/A
1981/91	+43.1	+32.3	+114.7	N/A

*Figures supplied by Department of Transport - Transport Statistics Great Britain 1979-1989. In certain years these may differ from figures published in previous reports following the revision of traffic figures for Great Britain by the Department of Transport.

= Based on provisional estimates supplied by the Department of Transport.

Tables 6 and 7 show that both morning and evening peak hour traffic decreased during 1991 by 2.4% and 0.5% respectively. Morning peak traffic on all road types excluding motorways decreased. The largest decrease in evening peak traffic was on trunk and principal roads whilst unclassified roads showed an increase of 2.1%.

Table 6. Total travel in 000's vehicle-kilometres 1980-1991;- 7 a.m. to 9 a.m. Monday to Friday average day.

	Trunk &	Class. Non-	Un-	Total Ex.
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Year	Motorway	Principal	Principal	Classified	Motorway
1980	39,217	90,336	48,788	80,953	220,077
1981	37,835	90,051	47,321	78,726	216,096
1982	41,622	92,387	49,199	80,113	221,699
1983	43,303	92,274	50,052	78,028	220,354
1984	45,471	92,928	51,396	76,713	221,037
1985	45,737	96,050	50,874	79,596	226,520
1986	48,857	92,475	52,585	84,889	229,949
1987	N/A	99,792	54,473	86,831	241,096
1988	N/A	103,293	59,269	92,624	255,186
1989	N/A	107,683	62,374	97,310	267,368
1990	N/A	108,320	63,808	103,122	275,251
1991	N/A	105,412	61,706	101,629	268,749

Table 7. Total Travel in 000's vehicle-kilometres 1980-1991:
4 p.m to 6 p.m Monday to Friday average day.

Year	Motorway	Trunk & Principal	Class. Non-Principal	Un-Classified	Total Ex. Motorway
1980	44,103	102,818	59,254	100,573	262,645
1981	42,473	102,527	58,423	96,227	257,177
1982	46,886	103,585	59,840	94,800	258,225
1983	47,398	105,692	61,242	96,607	263,541
1984	50,570	105,618	61,119	97,808	264,545
1985	50,102	109,483	61,198	98,445	269,126
1986	54,447	108,444	64,001	107,924	280,369
1987	N/A	114,274	65,921	106,997	287,192
1988	N/A	116,171	68,979	112,241	297,391
1989	N/A	119,497	72,073	117,332	308,856
1990	N/A	122,140	73,847	124,910	320,898
1991	N/A	118,207	73,315	127,591	319,113

4.2 Seasonal Variations

Figures 2 and 3 illustrate the percentage of yearly traffic in each week to show seasonal variations in traffic. The figures represent motorways and all purpose roads throughout the West Midlands. However, percentage yearly flows in each week for each road type are available from the J.D.T. on request.

4.3 Weekly Variations.

Table 8 provides factors by which flows on a particular day should be divided to give the flow on an average weekday. Similarly, flows on an average day can be multiplied by these factors to give flows on a particular day. Factors are also available to convert flows to a seven day average.

Table 8. Weekday Conversion Factors Calculated From 1991 Hundred Point Analysis.

Day of Week	Motorway*	Trunk & Principal	Class Non-Principal	Un-Classified
Monday	0.959	0.972	0.963	0.975
Tuesday	0.959	0.992	0.992	0.979
Wednesday	0.989	1.008	1.005	0.988
Thursday	1.002	1.001	1.011	1.009
Friday	1.074	1.028	1.029	1.050

4.4 Daily Variations.

Total hourly travel in terms of vehicle kilometres is shown in Figure 4 for 1986 and 1991. Percentage increases since 1986 are also given. These show that the largest growth in traffic has occurred between the hours of 7-8 a.m. and 9-10 a.m. and after 6 p.m. This illustrates the trend for the peak to spread both in the morning and evening. However, considerable growth has occurred during all 12 hourly periods with the smallest increase being 6.1% between 8 am and 9 am.

Table 9. Percentage of 24 Hour 1991 Traffic Flows in Selected Periods of an Average Weekday.

Hour of Day	Motorway*	Trunk & Principal	Class Non-Principal	Un-Classified
8 - 9 a.m.	8.4	7.6	8.8	8.3
5 - 6 p.m.	8.3	8.0	8.9	8.8
7 - 19 (12 hr)	82.1	76.7	78.7	76.4
6 - 22 (16 hr)	93.6	92.5	93.6	93.1
6 - 24 (18 hr)	96.3	97.2	98.1	98.2

Figures shown in Table 9 are the percentage of 24 hour flows which occurs at selected times of an average weekday on the four types of road. For example, on motorways the 12 hour (7-19) flow is 82.1% of the 24 hour total flow. The percentages in table 9 can also serve as factors to convert short term counts into flows covering a longer time period. For instance to convert a 12 hour flow on a motorway into a 24 hour flow, divide the 12 hour count by 0.821. Alternatively, to convert an a.m. peak (8-9) flow on a motorway to a 24 hour flow divide the peak flow by 0.084 to produce a 24 hour flow and then multiply this figure by 0.821 to convert back to a 12 hour flow.

*Figures for motorway are 1986

4.5 Proportions of Non-Motorway Travel - 1991

In view of the absence of flow data for motorways in 1991, the calculation of proportions of total travel has had to be restricted to non-motorway roads. The figures presented in table 10 show how large a proportion of travel (62.7% on classified roads) continues to be carried on a small proportion of the road network (21.2% is classified).

Traffic carried on unclassified roads has grown at a faster rate than other road types (ex. motorways). Traffic on classified roads has grown at a slower rate and declined during 1990 and 1991.

Table 10. Proportions of non-motorway travel 1991.

	Trunk & Principal	Class Non-Principal	Unclassified
% of travel	39.9	22.8	37.3
% of non-mway road length	9.6	11.6	78.8

4.6 Other Information.

Flow reduction factors for holiday weeks, average weekly/daily/peak hour/Sunday flows for each site, and grossing factors for converting weekly flows to yearly flows for each four week period are also available from the J.D.T. upon request.

4.7 Traffic Compositions.

Traffic compositions are obtained from manual counts, the most recent of which were carried out in 1990. Figure 5 shows traffic compositions on the M6 motorway between junctions 2 and 3 for 1984 and 1989 (The Department of Transport did not appear to survey this site in 1990). Figure 6 shows average traffic compositions excluding motorways for 1984 and 1990 throughout the county.

During these six years there has not been an enormous change in the composition of traffic. Cars and taxis have gained 3%, at the expense of L.G.V.'s, motor cycles and pedal cycles. H.G.V.'s have maintained their 7% share of traffic, but as fig. 7 indicates, the type of goods vehicle has changed. There has been a small shift towards larger vehicles. The largest class, articulated vehicles with at least 5-axles has gone from 2% of all HGVs >1.5T in 1984 to 6% in 1990. The shift to more and heavier vehicles is reflected nationally. Overall, the number of H.G.V's has grown in the six years by nearly 17%.

The next set of manual counts is due to be carried out by the districts during 1992.