TRICS

REPORT 94/1

LONG TERM CHANGES IN SUPERSTORE TRAFFIC GENERATION

JMP Consultants Ltd

TRICS Research Report

Long Term Changes in Superstore Traffic Generation

JMP Consultants Limited
Consulting Civil, Structural and Transportation Engineers
172 Tottenham Court Road
LONDON W1P 9LG

Contents

1 Introduction

1.1 It has long been a basic assumption in the preparation of Traffic Impact Assessments (TIA's) that the aggregate level of traffic generated by a new retail development will be finite and static from the first year of opening until the store eventually closes or changes its trading position in some way. Growth factors are applied only to traffic on the base network in order to evaluate any future capacity, environmental or operational problems arising from the development.

1.2 Future competitive openings, trading performance and modal split changes arising from changing transport provisions may affect traffic generation over time but these things cannot be anticipated or accounted for in the large proportion of cases. Competitive openings may only be anticipated if other retail options already exist on sites within the new store's catchment area. In these circumstances different scenarios can be tested separately, given an appropriate retail impact model.

1.3 Long term (year-on-year) variation in traffic generation has not been investigated up until now. The main reason for this is a lack of suitable data. Consistent fluctuation in traffic has been observed and documented for short term periods and time profiles are typically predicted for hour in the day and day of the week. In addition, seasonal and week-on-week variation has been looked into by Eastman (1991) and some weeks are shown to exhibit variations from mean daily flows of up to 50%, particularly close to the main public holidays.

1.4 When considering the possibility of year-on-year changes to traffic generation it is important to remember that the trip rate for a land use is wholly different to base vehicle kilometrage. The latter is projected in the NRTF to determine the 'High' and 'Low' traffic growth factors which are ostensibly applied in highway scheme appraisal. The trip rate is a measure of trip ends at a very specific site location. It will not, therefore, be affected by increased travel distances.

1.5 On the other hand, it is not unrealistic to anticipate recent growth in trips specifically to retail sites given the per capita increases in shopping trips documented by the National Travel Survey 1989/91. Between 1985/86 and 1989/91 shopping journeys per person per year rose from 125 to 145 and 70% of these trips were made by car.

1.6 Furthermore, it can be argued that use of the car for shopping is increasingly favoured for the following reasons:

- Large superstores remain in the ascendant phase of their 'product life cycle' at the expense of smaller local supermarkets and convenience stores whose custom is steadily being eroded. Larger stores are increasingly being geared to car borne trade.

- Shopping by car is being encouraged as further superstores are developed on out of town sites beside major road links.

- The geographical proliferation of superstores is making them convenient to an increasingly large number of households. This is making them more attractive for convenience customers as well as big basket shoppers. In the case of out-of-town superstores this convenience factor applies mainly to the

more mobile households who can visit by car.

1.7 On a store by store basis the picture is less clear. The long term trend for an individual store is very much a factor of the local competitive environment. Stores for which data are available differ markedly from one another and this makes the analysis of a common overall trend difficult. Some stores maybe overtrading, others maybe either newly opened stores or older stores threatened by a new opening nearby. The bulk of analysis in this report presents average trip rate changes across all available data although this is backed up by significance testing which shows these trends to be inconclusive statistically.

1.8 This may mean that long term superstore traffic generation variations can only be intimated if we compare similar sites together. This argument can be extended to the whole concept of GFA based trip rates if one considers the evidence presented by Henley (1992) showing the poor R^2 for relationships between GFA and car trips when taken across the whole population of food stores.

1.9 Hazel (1988) raised the possibility of establishing more sophisticated regression models which acknowledge the dependency of trip making on local factors. Clearly, the process of identifying and comparing like with like requires an understanding of what influences the magnitude of the trip rate and, for our purposes, the performance of the trip rate over the lifecycle of the store. The imponderables such as competition changes make any attempt at long term forecasting, at best, unreliable. Grimm (1992) cites two planning appeals where the inspector criticised attempts to predict highway impacts over a 15 year period for superstore proposals. The unpredictability of future development was given as the principal reason for this in both cases.

1.10 The question we must ask ourselves though, regarding the trip rte to a particular development, is whether the 'no change' assumption is entirely valid. This report attempts to discern whether there are any longer term trends that the planning profession should be aware of.

2 Data

2.1 The data for this study was taken from the TRICS 3 database. There was not much data available and only 17 sites in the system had compatible survey days for more than one year. No longer term aggregations of trip numbers, which would have facilitated time series type comparison, are included on the database.

2.2 The trip rates for the day and peak hour were extracted with the objective of comparing these values over consecutive years for compatible Thursdays, Fridays and Saturdays. Where there were gaps of an intervening year or more between surveys then linear incremental change over time was assumed. The data covered six years in all giving five yearly intervals to examine. Clearly most of the sites spanned fewer intervals than this. Calculation of mean and variance was calculated for each year interval and for all interval data over the whole period. The raw data is included as Appendix 1 to this report and the changes for each interval are tabulated in Appendix 2. The raw data is presented graphically in Appendix 4.

2.3 A questionnaire was sent out to the relevant County Councils for each site included in this analysis. The form was designed to record local characteristics and extraneous factors which might have affected the trip rate over time. These events along with a record of the years of survey and GFA for each site are presented in Table 1.

2.4 ATC data for a small number of stores, averaged by month, was also made available. This ran to more than a year of data for most sites. The data offers only limited scope for comparison of average daily trips across select months but the figures are included in Appendix 3 for reference. There is insufficient data for further analysis of the ATC output in this report.

Table 1 TRICS Sites - Relevant Local Changes in Survey Period

TRICS NUMBER	RETAILER/ ADDRESS	COMPATIBLE SURVEY YEARS	EVENTS
CH A 04	J S Sainsbury Howley Warrington	1989-1990	• Store entrance relocated in highway improvement
DC A 02	Asda Lansdowne Bournemouth	1989-1992	• New Tesco (6503m^2) 1991 • Free bus stopped 1991 • Office development nearby
DV A 08	Plymco (Coop) Newton Abbot	1989-1991	• New Sainsburys Barton Torquay • New Tesco Kingsteignton
ES A 01	J S Sainsbury Vogue Gyratory, Brighton	1986-1992	• J S Sainsbury Hove 1992 • Coop Hove 1985 • Asda Hollingbury 1987 • Asda (formerly Gateway) Marina 1987 • New non-food retail development nearby • Brighton Bypass- reduction in traffic 1992
ES A 02	Asda Brighton Marina	1988-1992	• Changed from Asda to Gateway 1990 • See ES A 01 for other openings
ES A 03	Asda Hollingbury Brighton	1988-1992	• See ES A 01 for other openings • Brighton bypass 1992 Improved access
ES A 06	Coop Hove	1987-1992	• See ES A 01 for other openings
ES A 07	Tesco Churchwood Hastings	1986-1987	
HB A 02	Tesco Bridlington	1990-1991	
SC A 01	J S Sainsbury Burpham Surrey	1987-1989 1991-1992	• Enlargement (end 1989) from 5825-6355m^2 plus new coffee shop • Tesco Park Barn Guildford (6040m^2) 1991 • J S Sainsbury Cobham (5486m^2) 1989 • J S Sainsbury Godalming (4275m^2) 1992
SC A 02	Tesco Hookwood Reigate	1987-1992	• New superstores in Crawley West Sussex

TRICS NUMBER	RETAILER/ ADDRESS	COMPATIBLE SURVEY YEARS	EVENTS
WS A 01	J S Sainsbury Westhamprett Chichester	1987-1988	• Tesco Bognor Regis 1988 • A27 (Chichester-Havant) dualled 1988
WS A 03	Tesco Durrington Worthing	1987-1992	• J S Sainsbury Rustington 1991
WS A 04	Tesco Bognor Regis	1988-1990	• Two nearby non-food retail parks 1988-1989
ES A 04	Safeway Old Town Eastbourne	1987-1992	• Tesco Eastbourne 1991
TA A 01	W M Low Forfar Tayside	1986-1988	• Forfar bypass - traffic diversion 1987
TA A 08	Presto Perth Tayside	1987-1988	

Comments on Table 1

2.5 The above table shows many local changes which are likely to have had an effect on the trip rate of an individual store over time. Local socio-economic characteristics combined with the effectiveness or otherwise of marketing strategies and the internal store layout will also have an important impact on the trip rate at a particular location at a particular time.

2.6 In essence, the above table shows that there were 29 significant local changes over a sample of only 46 year intervals. If we assume that such changes have a significant impact on trips then we must accept that local dynamics have an important influence on traffic generation levels over time. (Chapter 4 includes evidence which shows the importance of local competitive changes to overall customer numbers).

3 Trip Rate Analysis

3.1 Trip rate changes were calculated for six yearly intervals, where appropriate, for the 17 individual superstore sites. The six periods were 1986 -1987, 1987 - 1988, 1988 - 1989, 1989 - 1990, 1990 - 1991 and 1991 - 1992. The 1986 - 1987 period was discarded due to lack of observations when it came to averaging across the available data. This left five periods for which there were six or more observations to average across.

3.2 The sum of all trip rate changes was divided by the sum of all the base year trip rates in order to obtain an average incremental change for each yearly period. Clearly these averages will be biased by which stores recorded data for that particular period. The resultant averages were plotted as percentage changes for Thursday, Friday and Saturday for both the daily and peak hour trip rates. These are reproduced as Figure 1 and summarised in Table 2 below.

Table 2 Average Yearly Percentage Change

Trip Rate Veh/100m	Thursday	Friday	Saturday
Peak	3.4%	4.0%	3.5%
Daily	6.2%	2.6%	5.4%

3.3 Clearly, the average trip rate changes (shown in Figure 1 and Table 2) conceal sizeable variations between stores. For example, on Fridays the peak hour average trip rate across the sample (1986 - 1992 inclusive) is 13.966 Trips per 100m^2 Gross Floor Area. The Standard Deviation is 4.315. This level of variation reflects the influence of local factors on trip rate. The standard deviation of the yearly changes are invariably greater than the magnitude of the average incremental changes themselves. This suggests high variability in the long term traffic generation performance of the sample stores.

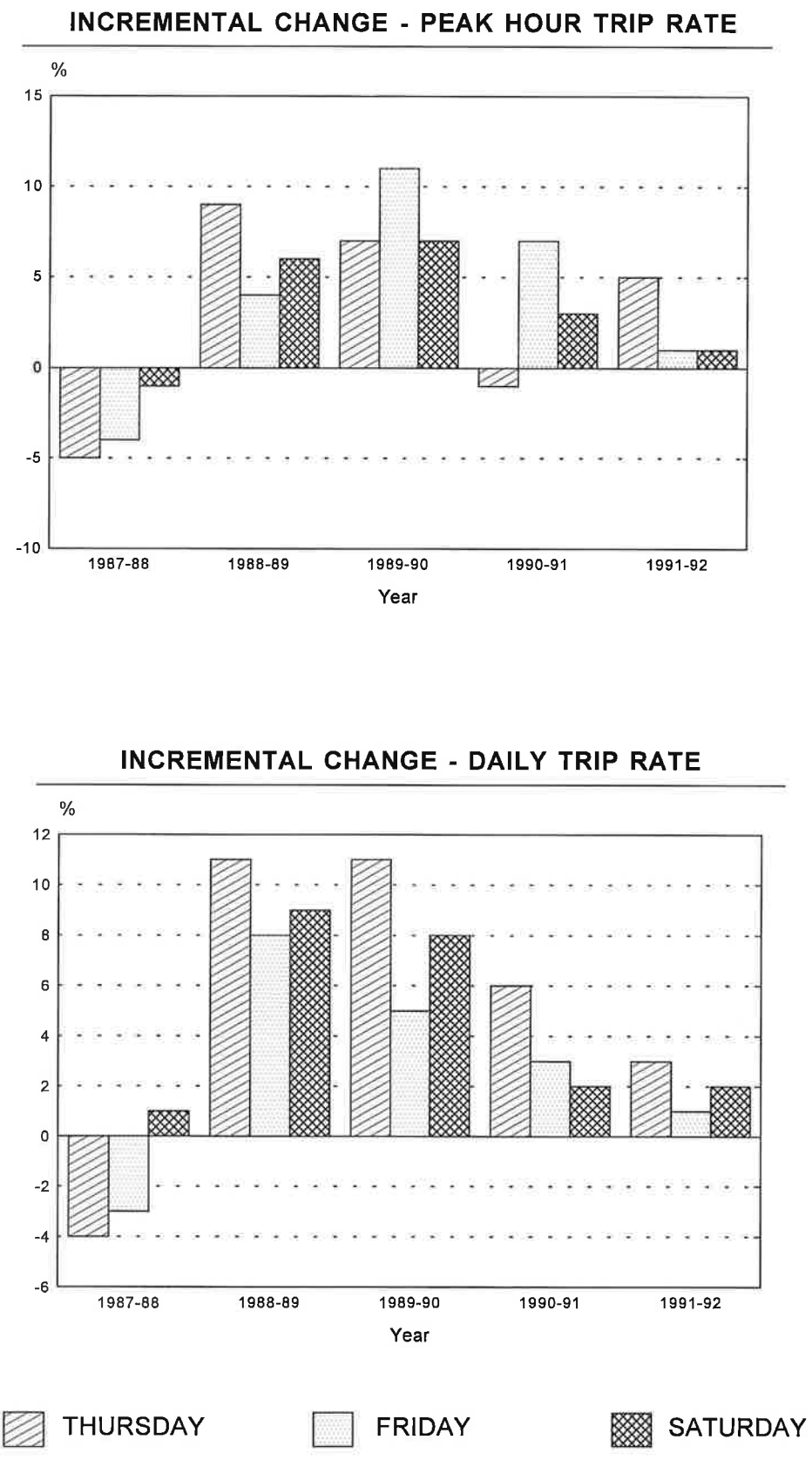
3.4 The mean values obtained in Table 2 suggest that the peak trip rate is growing overall, but at a lower rate than the daily rate. This indicates an apparent degree of peak spreading.

3.5 Other factors which may affect traffic generation performance over time include economic and trading conditions which vary according to developments in the local and national economy. This, as well as the changing sample of stores for each year, accounts for the fluctuating profile of change over time.

3.6 Notable amongst the survey sites, are two stores which display a consistent downward trend in traffic generation throughout the period for which data is available. This can be traced in the individual store profiles which are plotted in Appendix 4. The stores are Tesco, Hookwood (Surrey), and Safeway, Eastbourne. The

AVERAGE YEARLY PERCENTAGE CHANGE BY DAY

Figure 1



latter is an older style store facing competition in the town from a new Tesco since it opened in 1991. The performance of Tesco at Hookwood is more surprising although competitive openings in nearby Crawley might account for the downward trend in car customers. For these stores, the trend is consistent for all the survey days, lessening the likelihood of freak conditions misrepresenting the situation.

3.7 It should be noted that the values in Table 2 will already include a number of sites that experienced negative growth arising from increased competition from new store openings on adjacent sites. It is therefore plausible that the underlying growth values may be higher than those quoted in the table.

Testing for Significance

3.8 With large variation in the data shown by the descriptive statistics (see Appendix 2), it was considered necessary to apply some sort of significance test to the difference in mean trip rates at the start and the end of each yearly interval, across the whole data set. A lot of the variation is, of course, attributable to local factors. However, this makes detection of year on year variation difficult to any degree of statistical certainty. This is borne out in the results of the t-test.

3.9 There was insufficient data to meaningfully test each yearly interval separately so the test was conducted for all the available years of data. For each interval, the start and end of the period are considered as the base year and the base year+1. It was the difference between the mean values for each of these data sets that were tested for significance by day of the week. The two mean and variance values and the resultant t-values are presented in Table 3 for each day (for both daily trip rates and peak hour trip rates).

3.10 The t-values obtained were not significant at $\alpha = 0.05$ for any of the days. The difference between the means is not, therefore, statistically significant for the whole data set. This is either because there is no underlying, long term growth in trip generation rates to superstores or because the sample was too small, distorted or general to demonstrate the variation to the required degree of significance.

3.11 Time series data might be better explained by multiple regression models, although the data requirements of such models make their development difficult at the present time. It is worth reiterating the reservations of Henley (1992) over the GFA based trip rate, although pragmatism requires that we continue to use it as the principal variable for prediction, at least for the present.

Table 3 t-Test Results for the Significance of Mean Year-on-Year Interval Growth

	No Observations	Base Year		Base Year + 1		t - Value	Significant at $\alpha=0.05$?
		Mean	Variance	Mean	Variance		
Daily Trip Rate							
Thursday	39	101.541	1177.890	107.238	1236.121	-0.724143	No
Friday	43	124.318	1239.665	127.381	1212.387	-0.405626	No
Saturday	39	123.896	1164.954	129.823	995.658	-0.796325	No
Peak Hour Trip Rate							
Thursday	41	11.670	11.175	12.150	9.832	-0.671402	No
Friday	47	13.633	14.607	14.137	17.414	-0.610428	No
Saturday	43	14.375	13.914	14.853	12.469	-0.610355	No

4 The Life Cycle Profile

4.1 Additional data on long term customer flows to two stores were obtained from J S Sainsbury. This data, which is plotted as time profiles, suggests another interesting chronological pattern which can be referred to as the store 'Life Cycle'. The profiles also neatly illustrate the effects of local competitive changes and, for one of the stores, the effect of a major refit and extension.

4.2 The two stores for which this information was made available are the Lewes Road, Brighton store and the Burpham store in Surrey. The historical time series profiles are based on a fitted trend of actual customer numbers based on financial turnover and average visitor transaction size. These profiles are used by Sainsburys to investigate long term trends in store performance. The profiles for the Brighton and Burpham stores are illustrated in Figures 2 and 3 respectively.

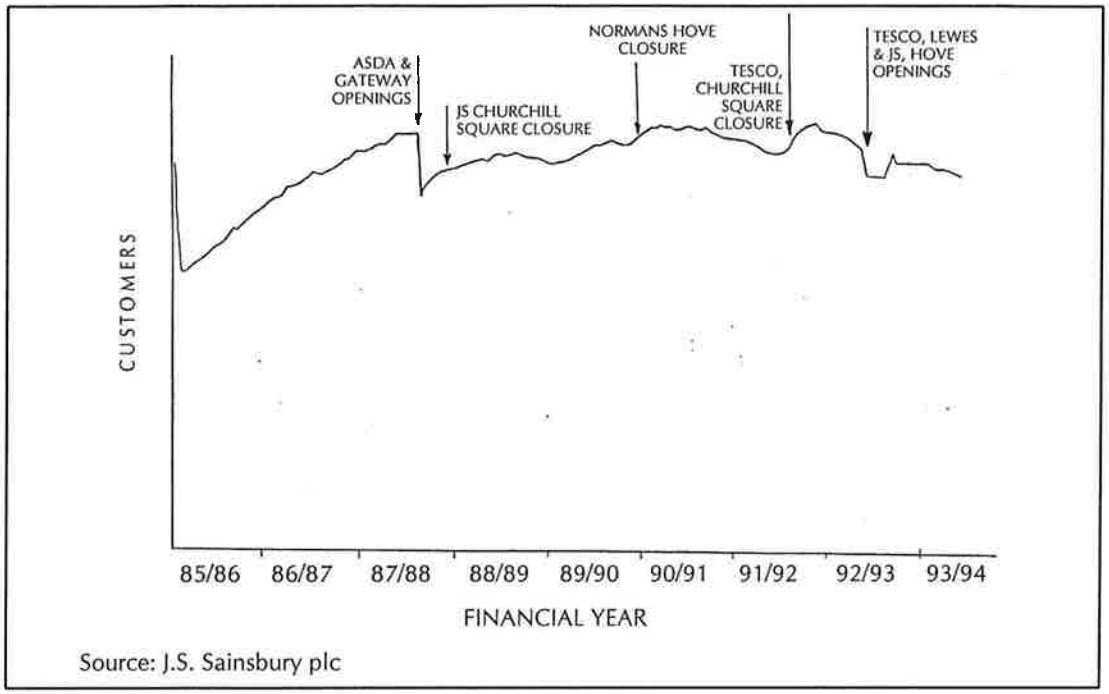
4.3 Although the profile does not show car customers in isolation, modal split data supplied with the profiles would suggest that the modal split of the two stores has been more or less constant over time (see Table 4 below). From this one might make the assumption that the profile will proportionally match the generation of car customers fairly well. The modal share data was obtained from store door interview surveys carried out over a defined two week duration in each case.

Table 4 Modal Shares

Brighton, Lewes Road		Burpham	
Survey Date	Modal Share by Car %	Survey Date	Modal Share by Car %
October, 1987	72	February, 1986	93
September, 1988	69	September, 1988	96
		October, 1990	97
		June, 1991	95

4.4 Figures 2 and 3 are annotated to show the effect of openings and closures in each store's catchment area. Competition changes are shown to have a significant impact on customer numbers, a large proportion of which is sustained change. New openings appear in the profiles as 'shocks', meaning that the initial amount of diverted trade is generally higher than the proportion diverted as time elapses and shopping behaviour settles down again. The novelty value of a newly opened store may account for this. The period immediately after opening was shown to be a particularly busy time in both of these profiles before customer numbers settled down.

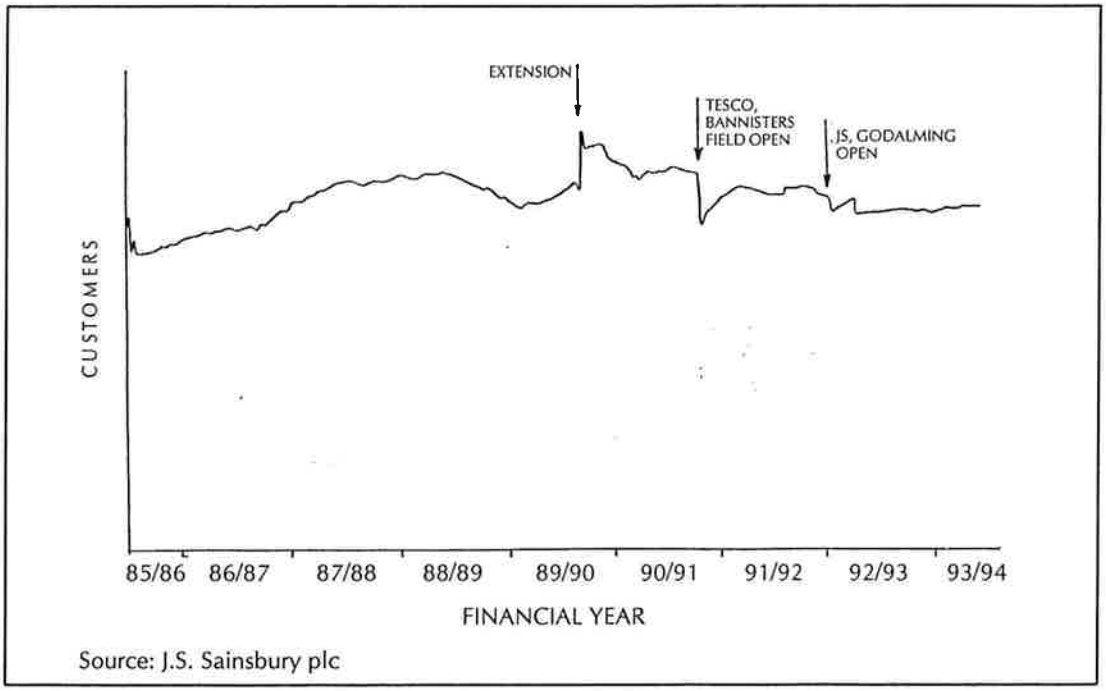
4.5 The effect of a store refit at Burpham is neatly illustrated in its profile. The store experienced a large number of visitors just after it reopened before settling down at a new, level of patronage higher than that experienced before the refit. However, the



Source: J.S. Sainsbury plc

CUSTOMER FLOW PROFILE FOR THE J.S. SAINSBURY STORE, LEWES ROAD, BRIGHTON

Figure 2



Source: J.S. Sainsbury plc

CUSTOMER FLOW PROFILE FOR THE J.S. SAINSBURY STORE, BURPHAM

Figure 3

trips to floorspace ratio actually goes down because the rise in the number of trips is insufficient to sustain the previous trip rate. One reason for this may be that a lot of the extended area was given over to basic enhancements rather than 'selling area' as such. For example, the refit included a new coffee shop and a widening of the aisles, to improve in-store circulation, as well as an increase in shelf space.

4.6 A further trend exhibited by the profiles is a period of steady growth in the base level of customer numbers from the months just after opening for a period of some 3-5 years. In this period both stores displayed a palpable growth in customer flow before levelling off. In the Brighton case, a fairly consistent early growth pattern is shown to be interrupted by two major competitive openings nearby. A relatively steady trading level was assumed by the store soon after this.

4.7 The phenomenon described in 4.6 can be referred to as youth to maturity growth. The following factors are posited as possible explanations:

- There is a time lag between a new shopping opportunity becoming available to local people and it being taken up on a regular basis.
- There is a breaking in period where a store must get it's marketing and product mix right for the local market.
- It takes time for a store to establish itself in the local consciousness through word of mouth and promotional initiatives of one sort or another.

4.8 If this growth trend is a universal phenomena, and we have some reason to believe it is, then it will be reflected in traffic impacts over time. Most retailers project customer numbers into the future in order to calculate rates of return. Obviously, such information is kept as confidential as possible. However, the youth to maturity growth trend should be borne in mind in the undertaking of traffic impact studies. When choosing data to estimate a trip rate one should ideally consider the age and competitive position of the sample stores in relation to the proposal.

4.9 The importance of competitive openings cannot be understated. The Brighton example illustrates clearly how competitive openings can affect the early growth curve. The resulting complex pattern leaves no smooth trend over the life of the store. If different competitive scenarios are anticipated, quite different low and high estimates of customer flow might be expected for a store at the proposal stage.

4.10 To put the TRICS data used for statistical analysis in context, the opening dates of each store is included on Table 5 below. As can be seen there is a bias towards newer stores.

Table 5 Opening Dates of the Selected TRICS Superstores

Store	Opening Date
Sainsburys, Howley, Warrington	*
Asda, Lansdowne, Bournemouth	1988
Plymco (Co op), Newton Abbot	1989
Sainsburys, Vogue Gyratory, Brighton	1985
Asda, Brighton Marina	1987
Asda, Hollingbury, Brighton	1987
Co op, Hove	1985
Tesco, Churchwood, Hastings	*
Tesco, Bridlington	1990
Sainsburys, Burpham	1985
Tesco, Hookwood	*
Sainsburys, Westhampnett, Chichester	1985
Tesco, Worthing	1981
Tesco, Bognor Regis	1988
Safeway, Eastbourne	*
W M Low, Forfar	*
Presto, Perth	*

* No data available

4.11 The experience of older, less attractive stores, such as Safeway, Eastbourne, is one of a decline in trade. Such stores can be considered as reaching the end of their life cycle as they are succeeded by the next generation of superstores. The larger retailers are tending to run down these units. They might end up being closed down, sold on or remarketed (as convenience or budget stores, for example). Again, the life cycle analogy seems particularly appropriate for this.

5 Conclusions

5.1 There is a lot of variability in the long term performance of the trip rate for superstores in our sample. Whilst the aggregate change in trip rate across all the available data is somewhere in the region of 3% per annum, this trend is not significant when subjected to statistical testing.

5.2 A lot of the apparent randomness in the data must be attributed to the inherent local trading conditions for the different stores over time.

5.3 Furthermore, there is anecdotal evidence to suggest that the long term change in trip rate varies over the lifetime of the store. In particular, it is suggested that high growth rates are achieved in the first three to five years following opening, afterwhich a store will reach an equilibrium trading level where customer numbers level off, all other things being equal. Of course, trading levels are very sensitive to competitive openings and closures and these sort of events have dramatic effects on visitation rates. Most of this evidence suggests that it is unsafe to assume constant linear change.

5.4 Variation in the trip rate for different stores is also attributable to local socio-economic characteristics and store layout/density factors.

5.5 Predicting traffic generation trends in the long term for a new store is difficult. If, for example, any sort of increment for youth to maturity growth was to be applied, the researcher would have to be certain at the outset that the base generation level, derived from survey data, equated to a newly opened store as opposed to a mature store. Ideally, the future competitive situation would also need to be analysed and future possible scenarios tested.

5.6 Date of opening or store categorisation may prove to be useful variables to indicate traffic performance in the longer term but more data is required before the relationships can be rigorously examined.

5.7 It maybe more appropriate and practical to estimate a gross high and low incremental change in the mean trip rate for the design period rather than attempt to produce a time series profile by year.

6 Acknowledgements

The contribution of J S Sainsburys in providing the customer flow charts for their Brighton and Burpham stores is gratefully acknowledged.

7 References

Department of Transport (1993) *National Travel Survey 1989/91* Transport Statistics Report, HMSO, London.

Eastman C (1991) Seasonal and daily variation in travel to retail stores *Traffic Engineering and Control* February 1991

Grimm P (1992) Developers contribution to highway works - a local authority's view. Paper presented to the 4th annual TRICS conference, Imperial College London, September 1992.

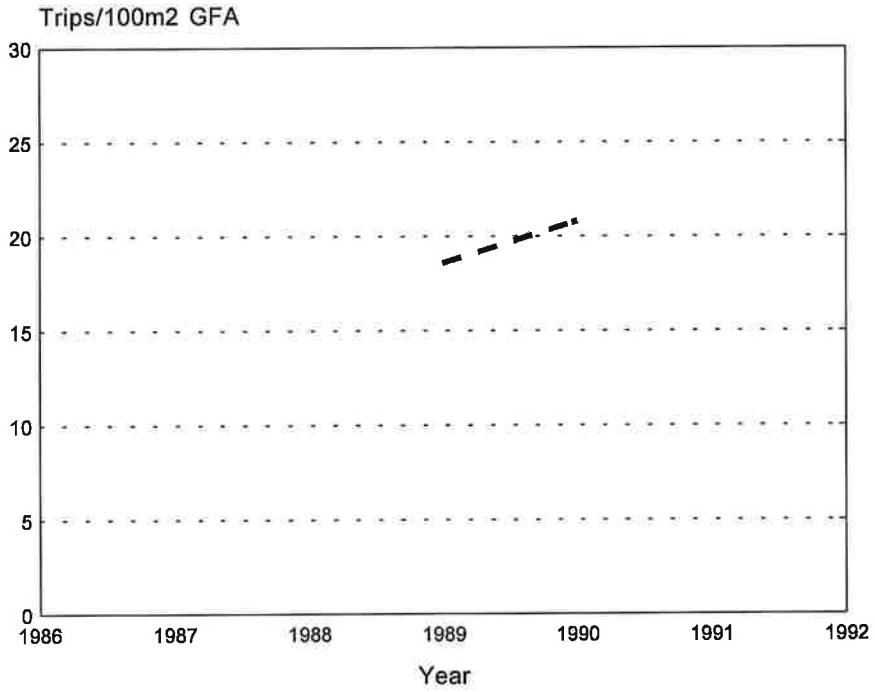
Hazel G M (1988) The development of a disaggregate trip generation model for the strategic planning control of large superstores (1-3). *Traffic Engineering and Control* January - March 1988.

Henley (1992) Superstore parking - a new look at an old approach. Paper presented to the 4th annual TRICS conference, Imperial College London, September 1992.

JS SAINSBURY HOWLEY,WARRINGTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



THURSDAY ——————

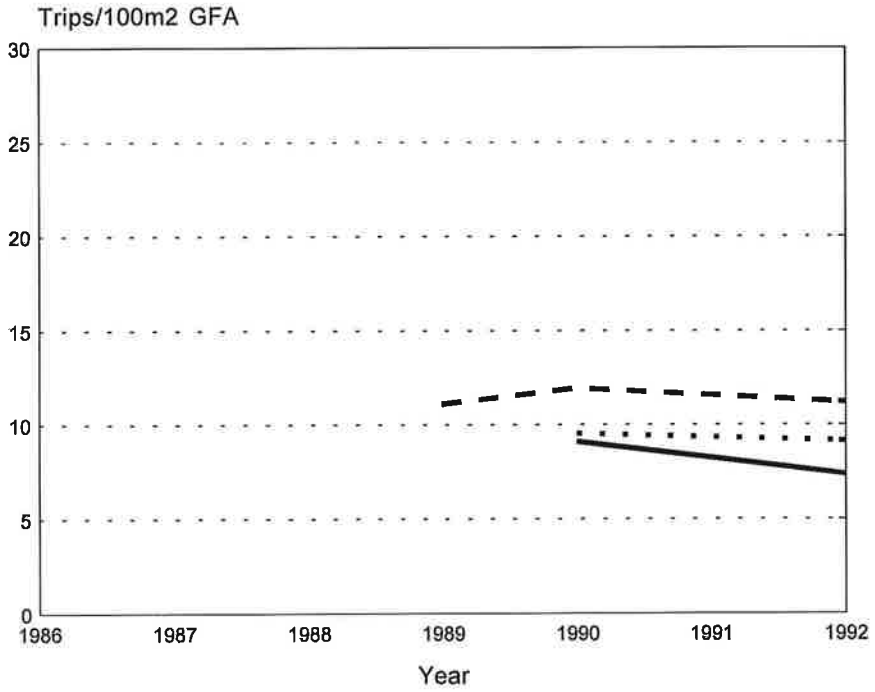
FRIDAY . . . . . .

SATURDAY – – – – –

ASDA LANSDOWNE,BOURNEMOUTH

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

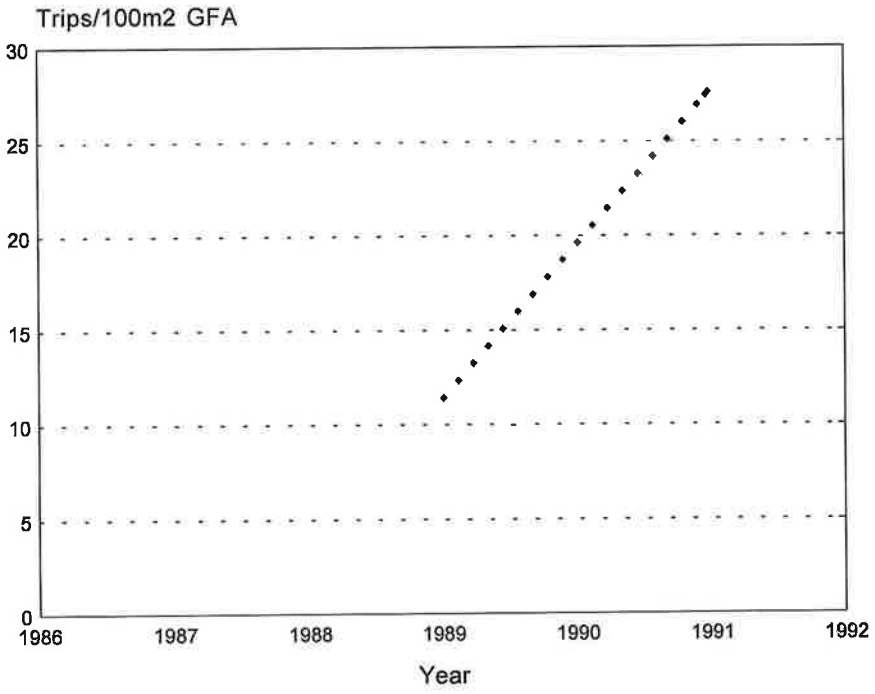


THURSDAY FRIDAY SATURDAY

PLYMCO (CO-OP) NEWTON ABBOT

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



THURSDAY ——————

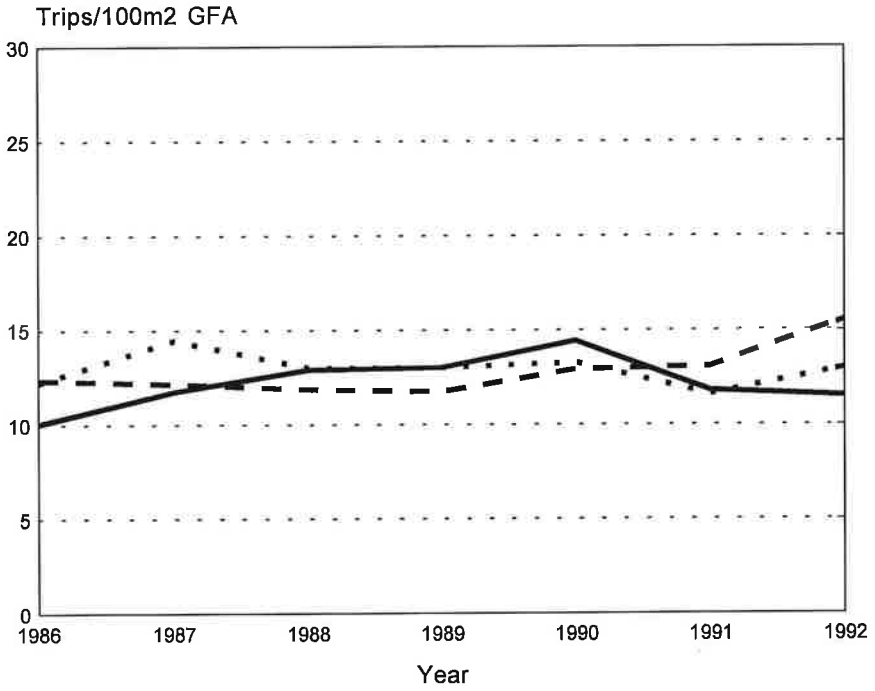
FRIDAY . . . . . .

SATURDAY - - - - - -

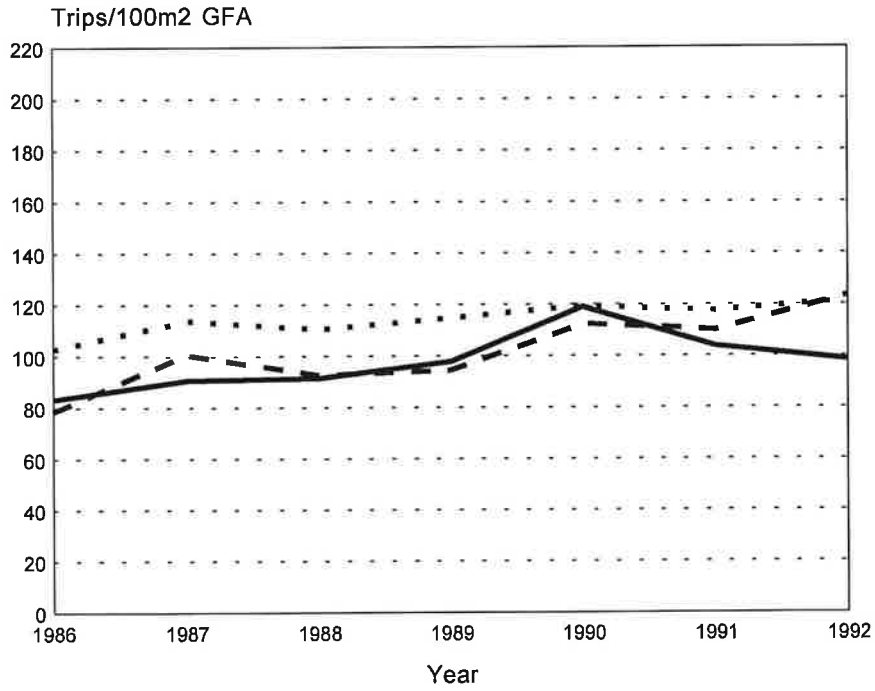
JS SAINSBURY VOGUE GYRATORY,BRIGHTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

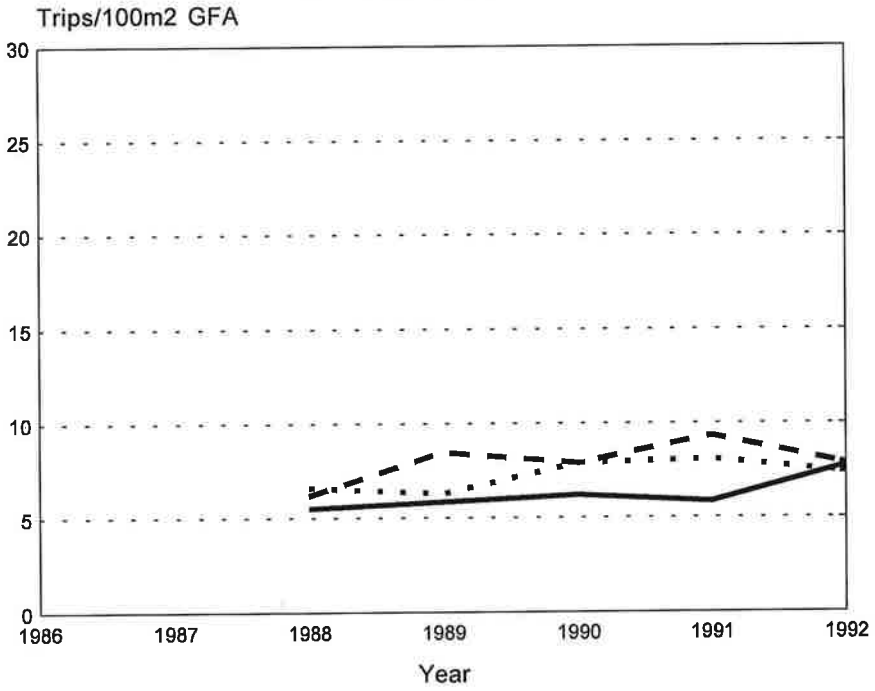


THURSDAY ——— FRIDAY . . . . . SATURDAY - - - - -

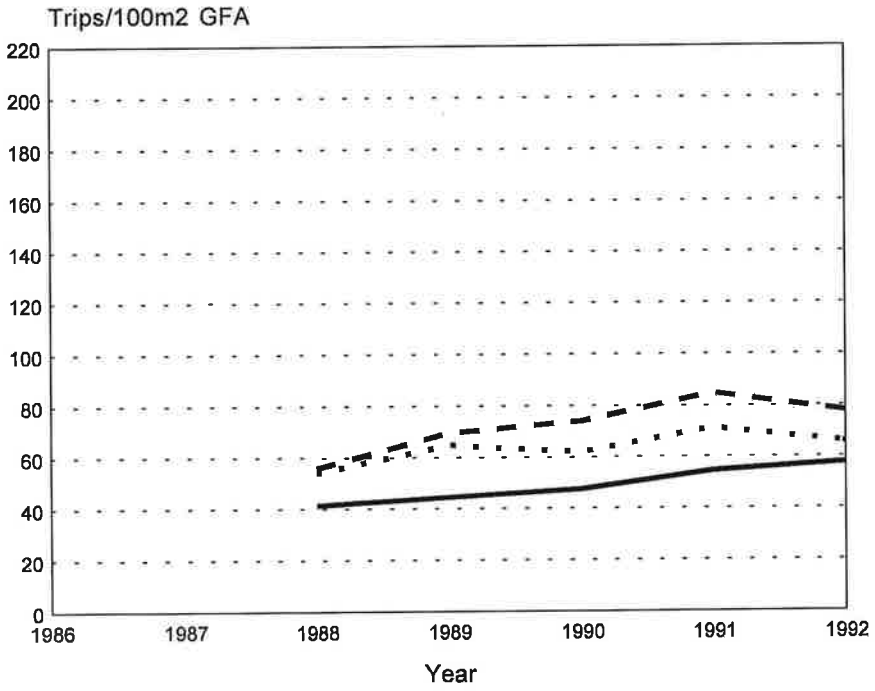
ASDA BRIGHTON MARINA

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

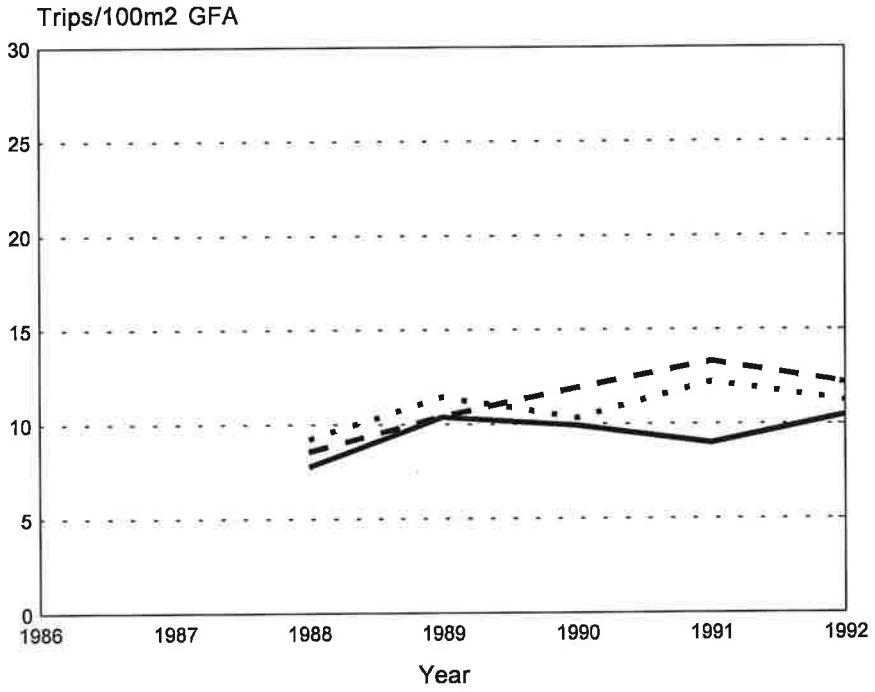


THURSDAY FRIDAY SATURDAY

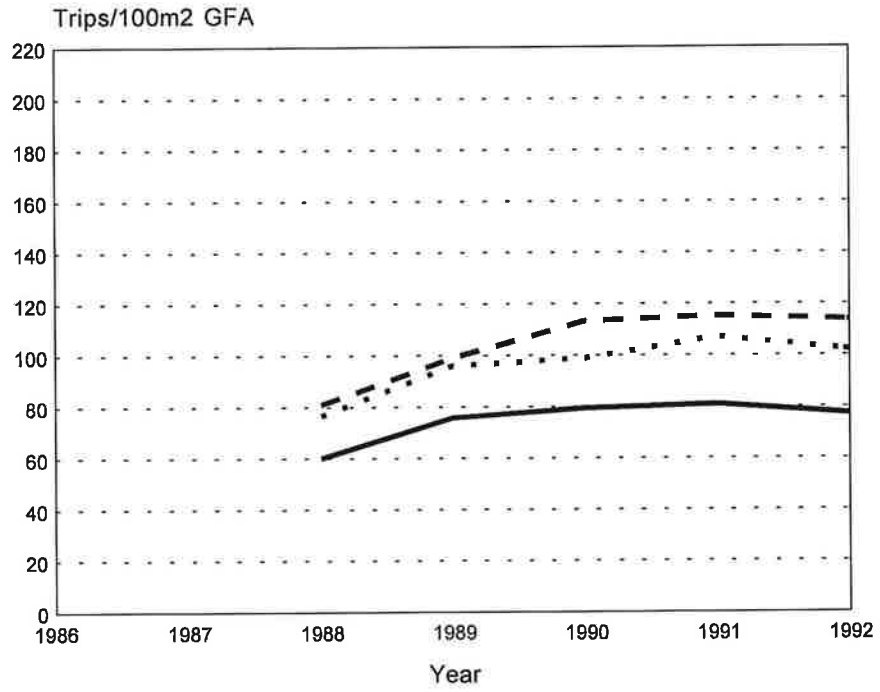
ASDA HOLLINGBURY BRIGHTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

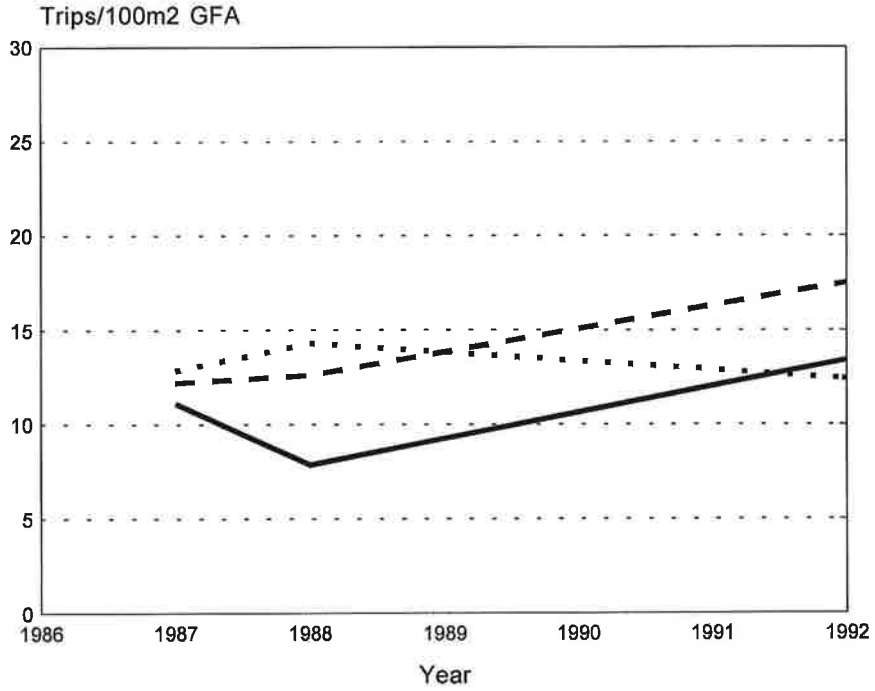


THURSDAY FRIDAY SATURDAY

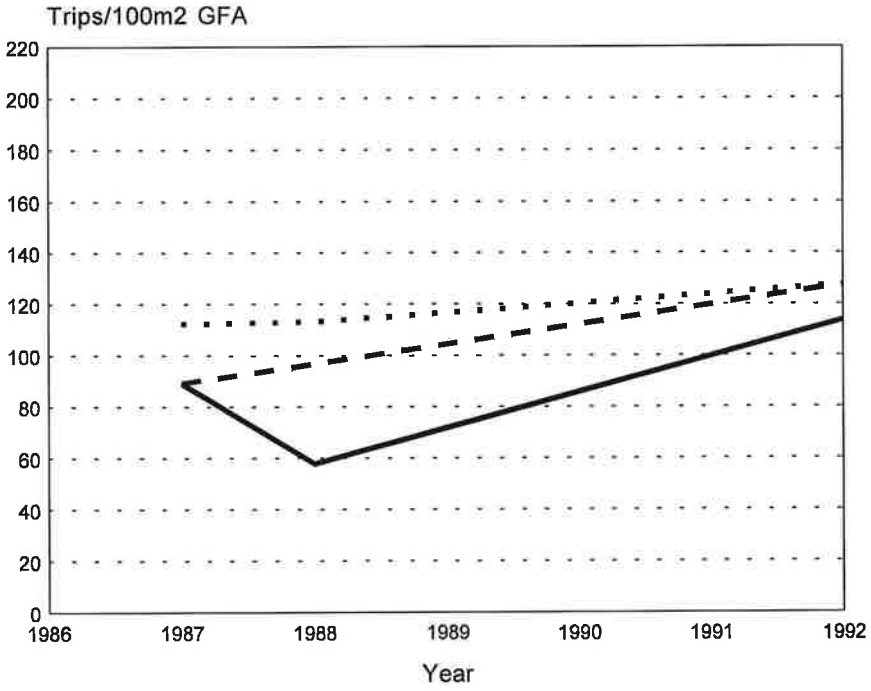
CO-OP HOVE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

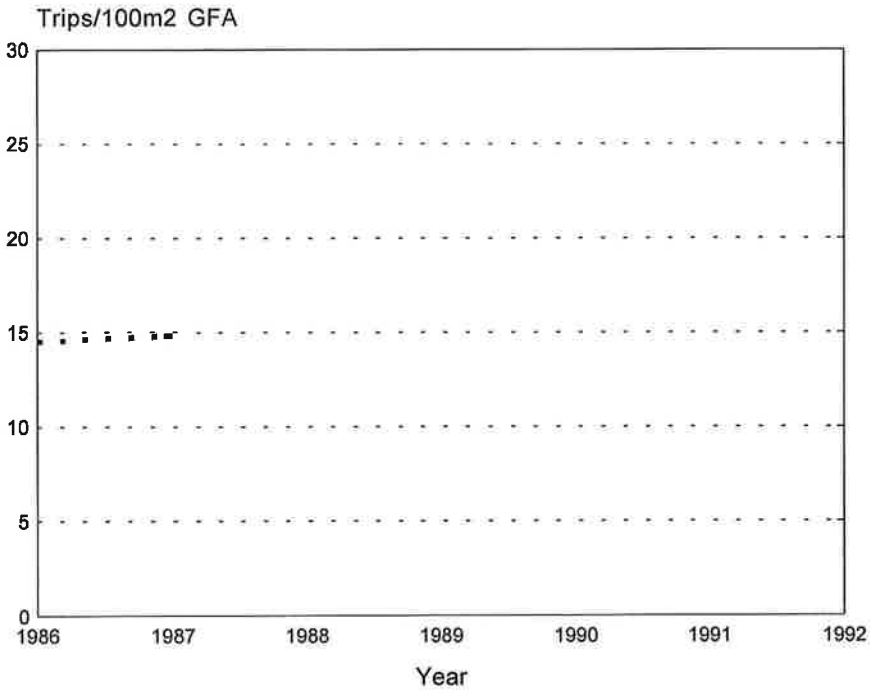


THURSDAY ——— **FRIDAY** . . . . . **SATURDAY** – – – –

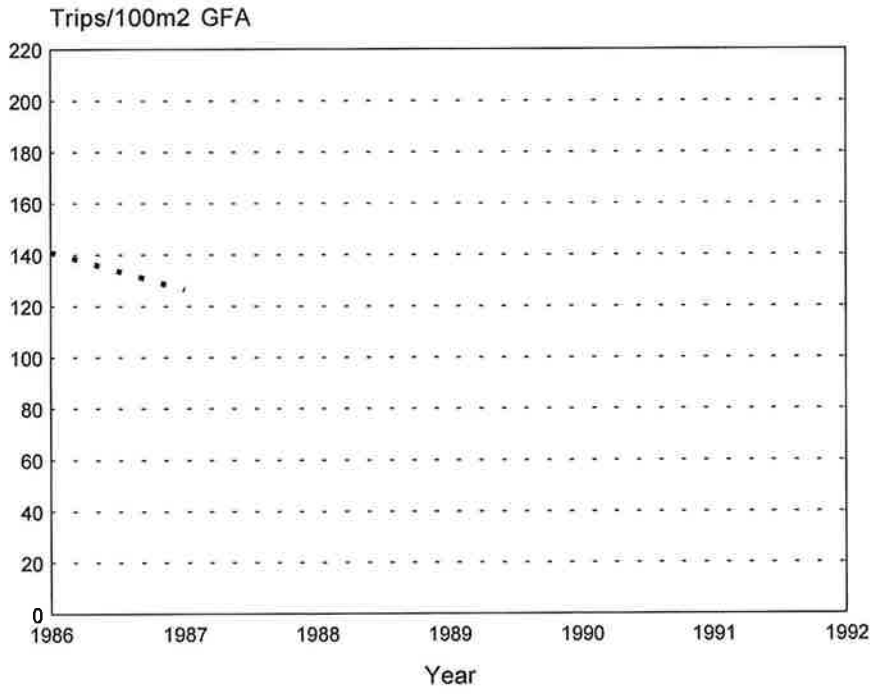
TESCO CHURCHWOOD HASTINGS

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

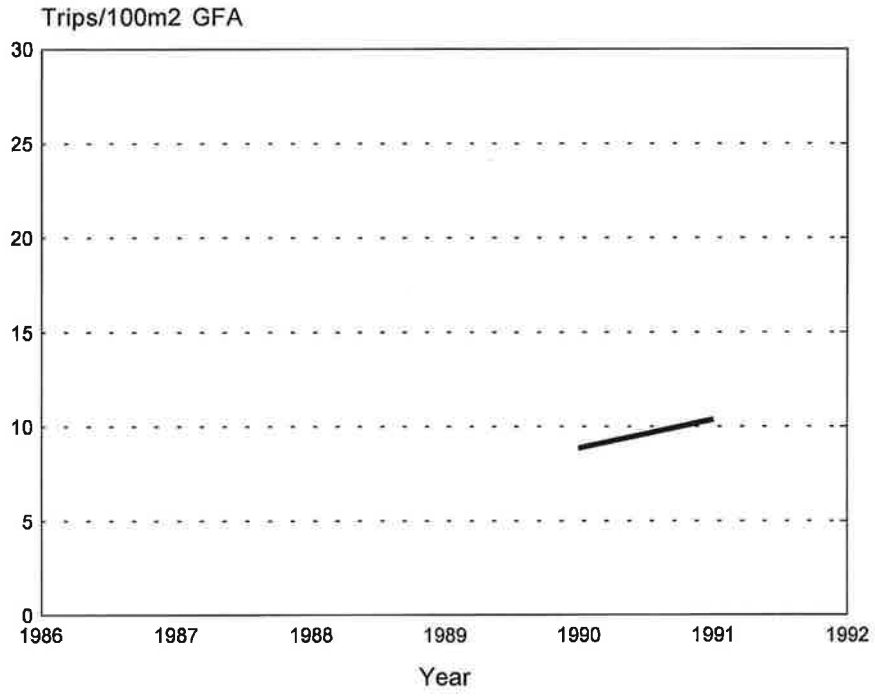


THURSDAY ——— FRIDAY . . . . . SATURDAY – – – – –

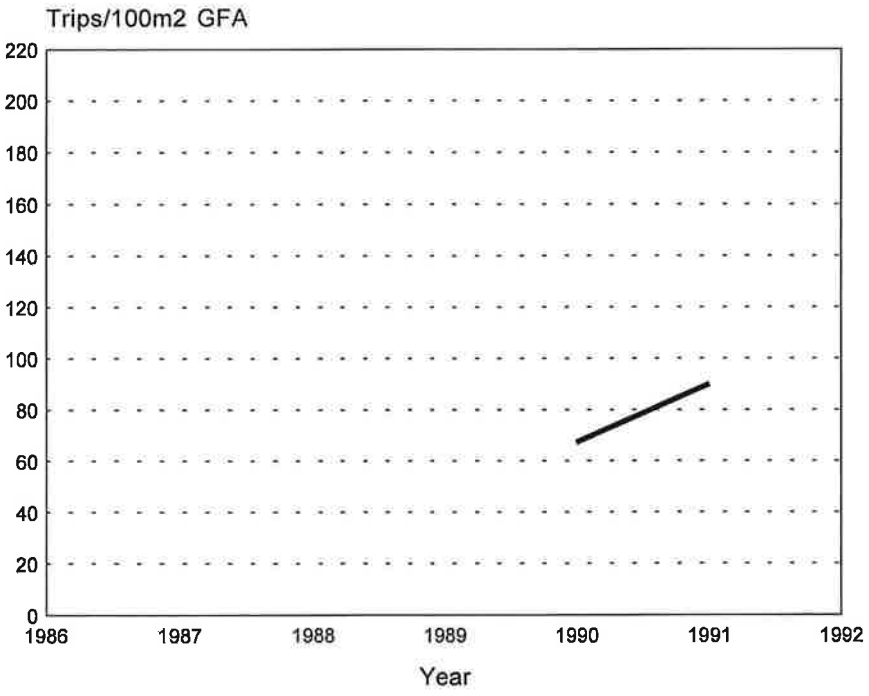
TESCO BRIDLINGTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

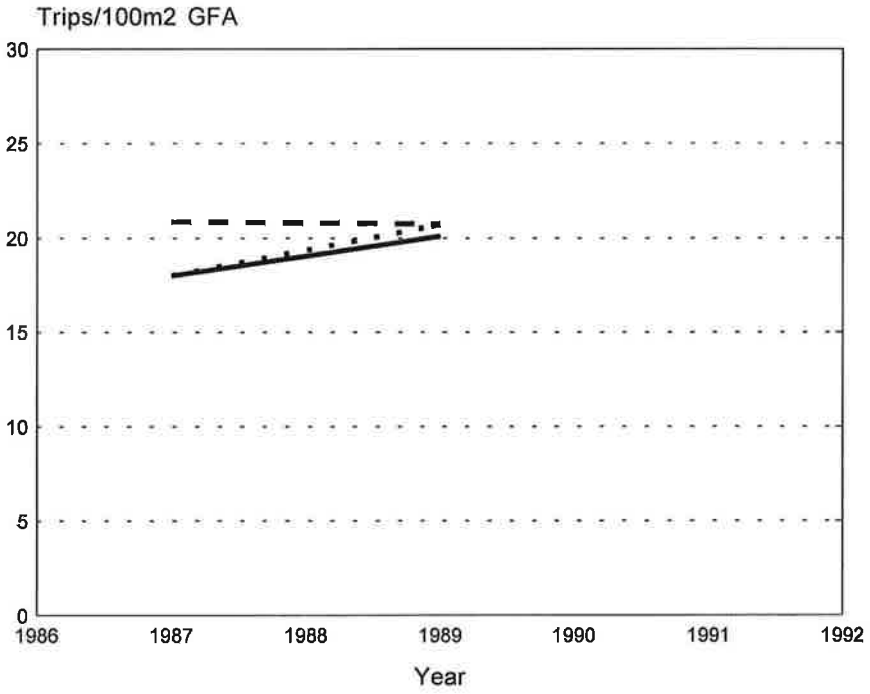


THURSDAY FRIDAY SATURDAY

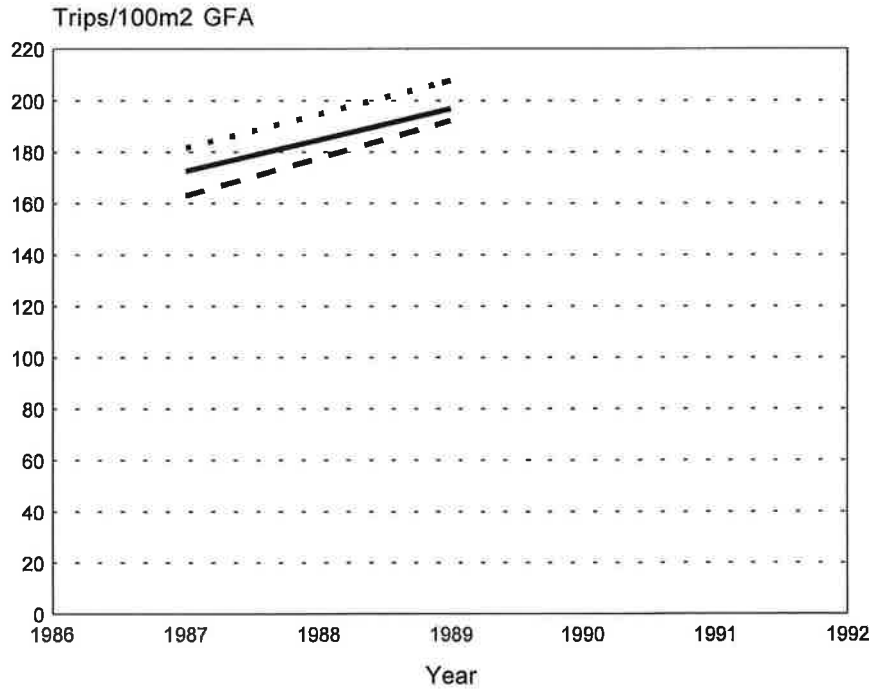
JS SAINSBURY BURPHAM SURREY

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

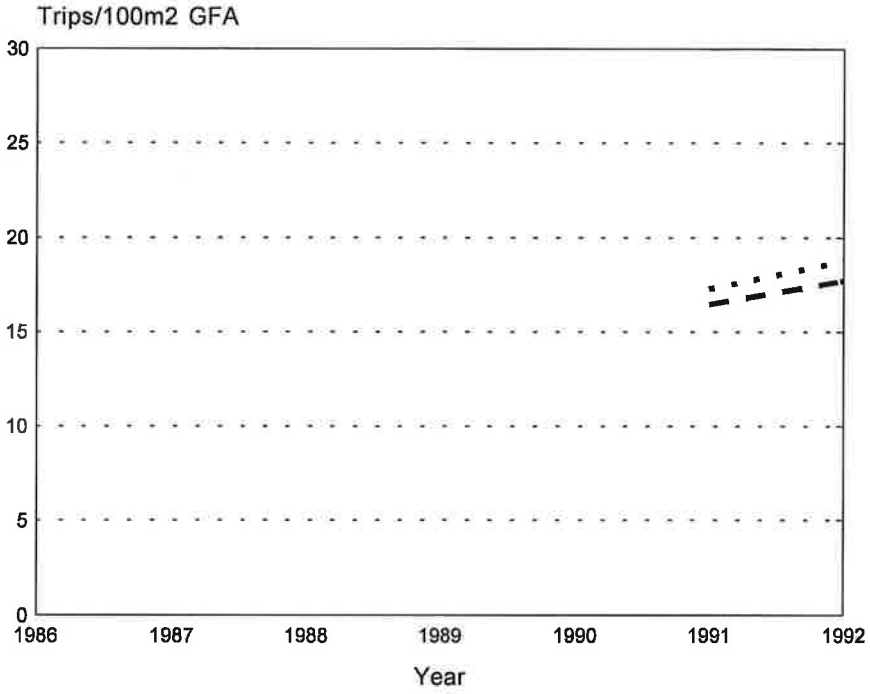


THURSDAY FRIDAY SATURDAY

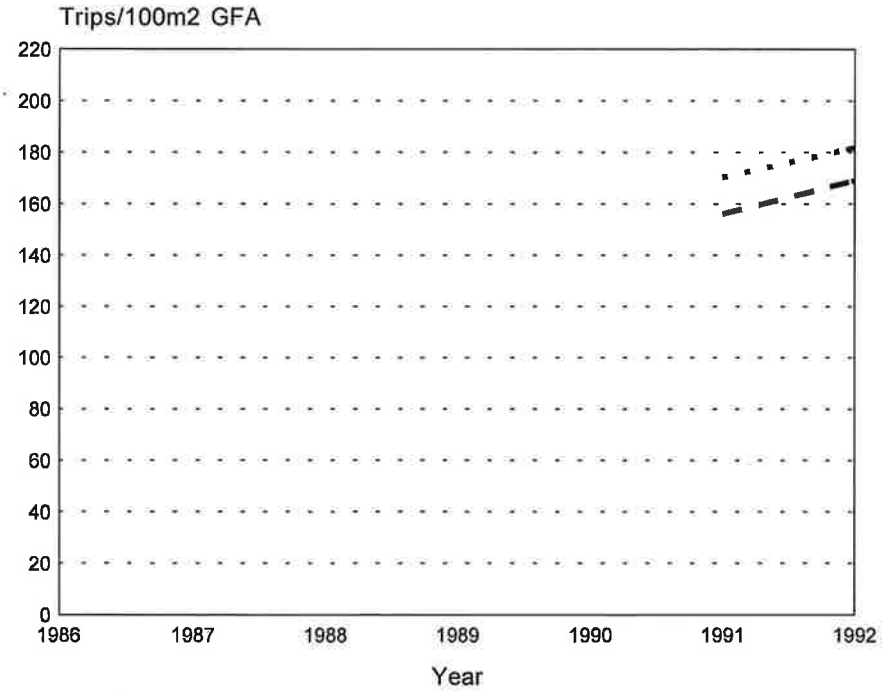
JS SAINSBURY BURPHAM SURREY (AFTER REFURBISHMENT)

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY



THURSDAY ——————

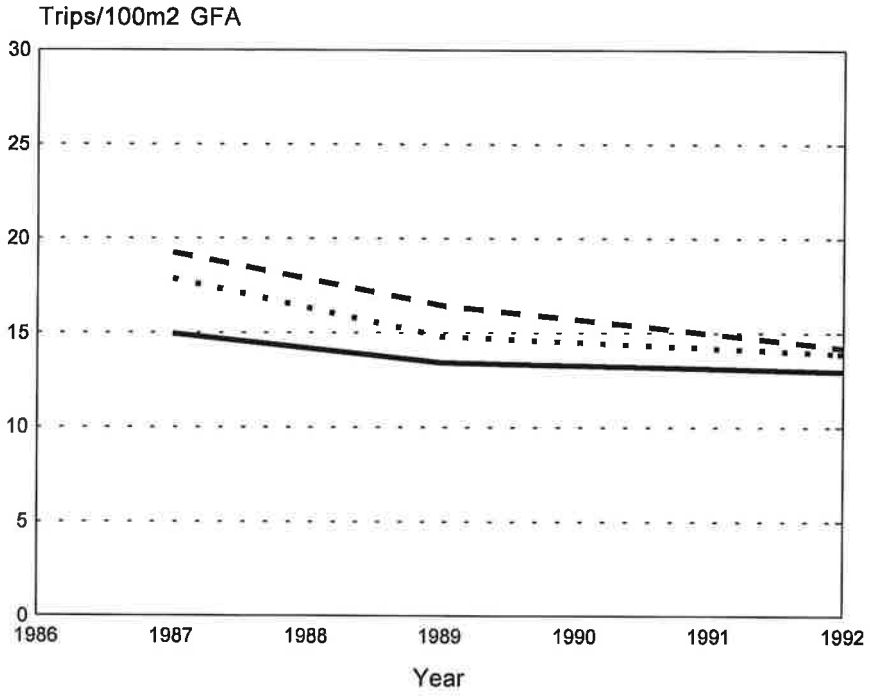
FRIDAY . . . . . .

SATURDAY – – – – –

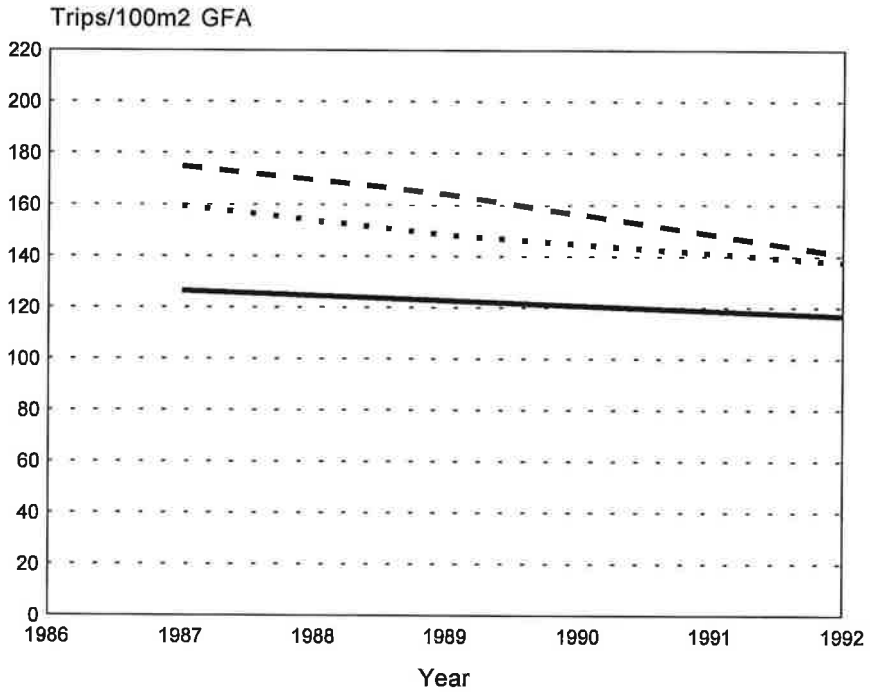
TESCO HOOKWOOD REIGATE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY



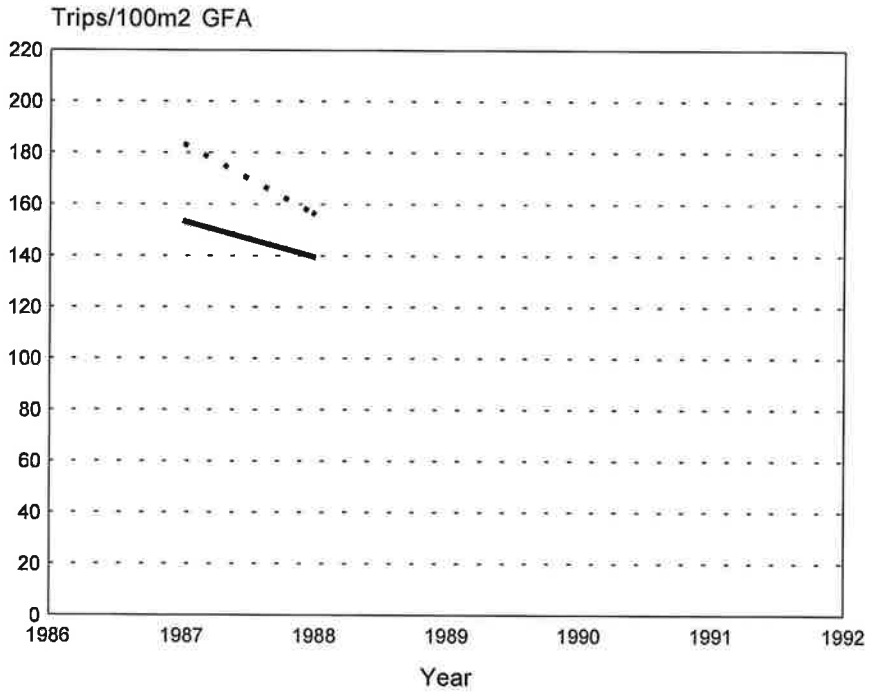
THURSDAY ——— FRIDAY . . . . . SATURDAY - - - - -

JS SAINSBURY WESTHAMPRETT CHICHESTER

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

WHOLE DAY

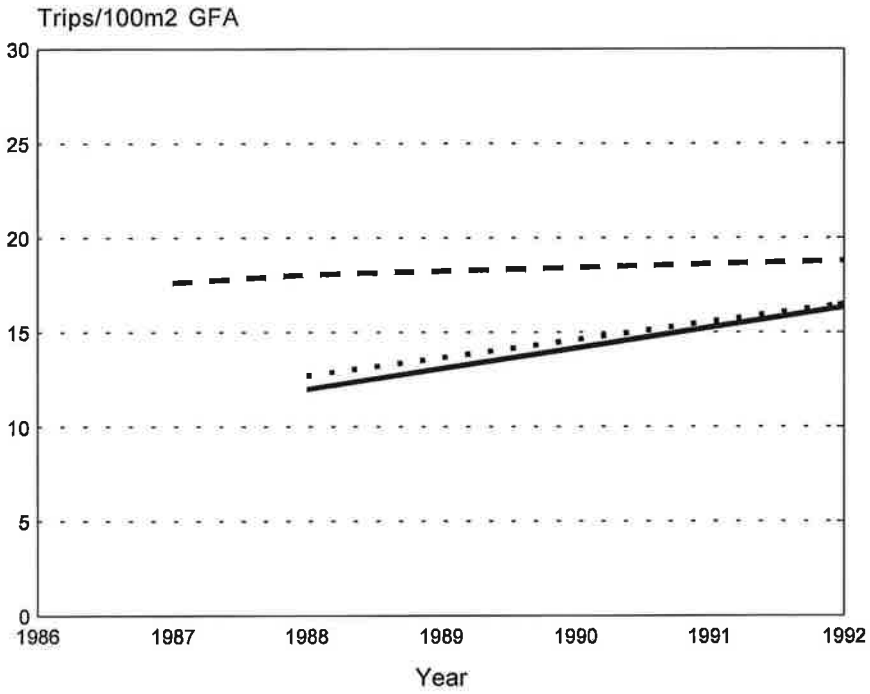


THURSDAY ——— FRIDAY . . . . . SATURDAY - - - - -

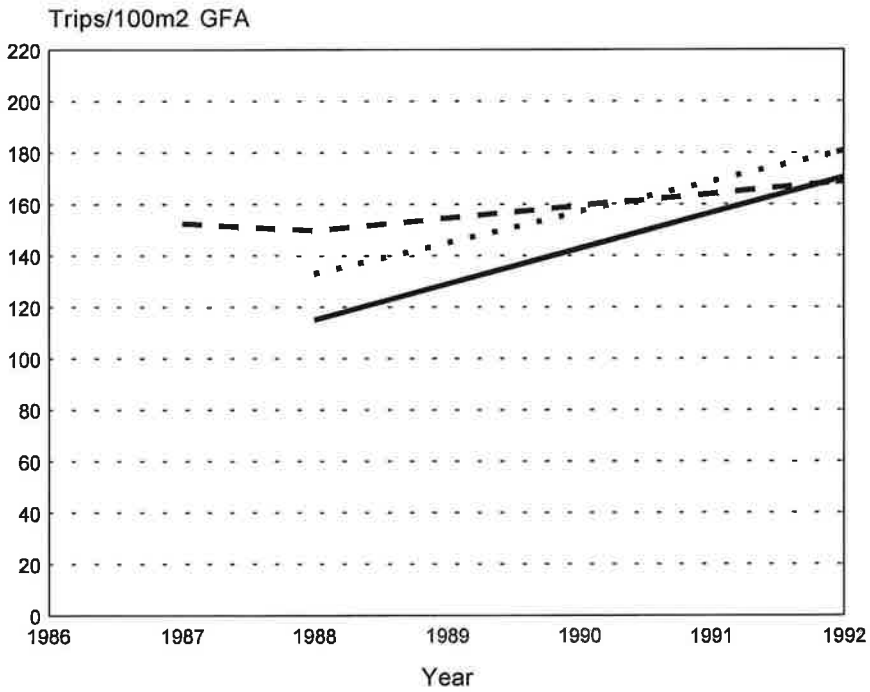
TESCO DURRINGTON WORTHING

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

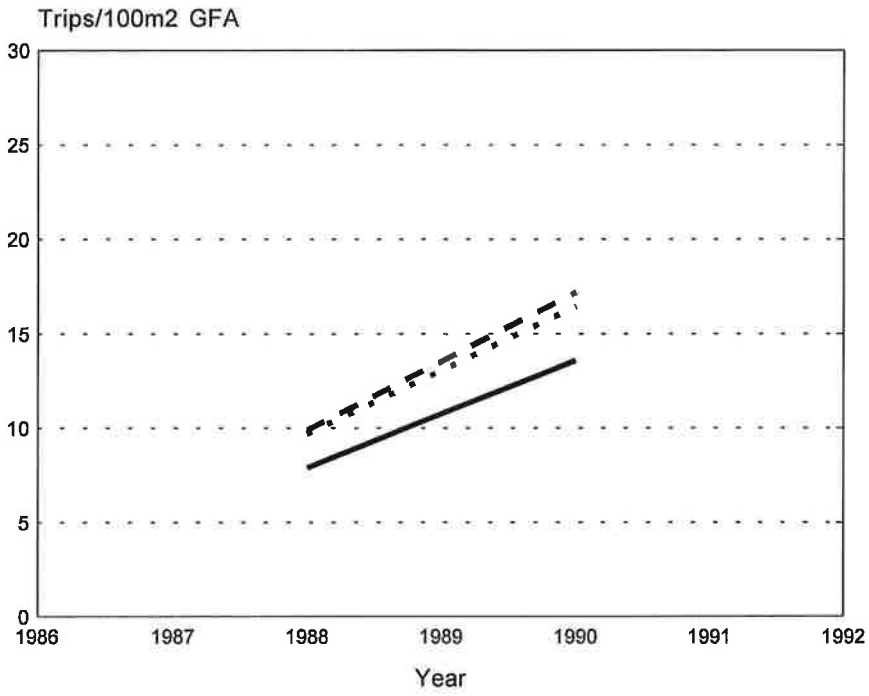


THURSDAY FRIDAY SATURDAY

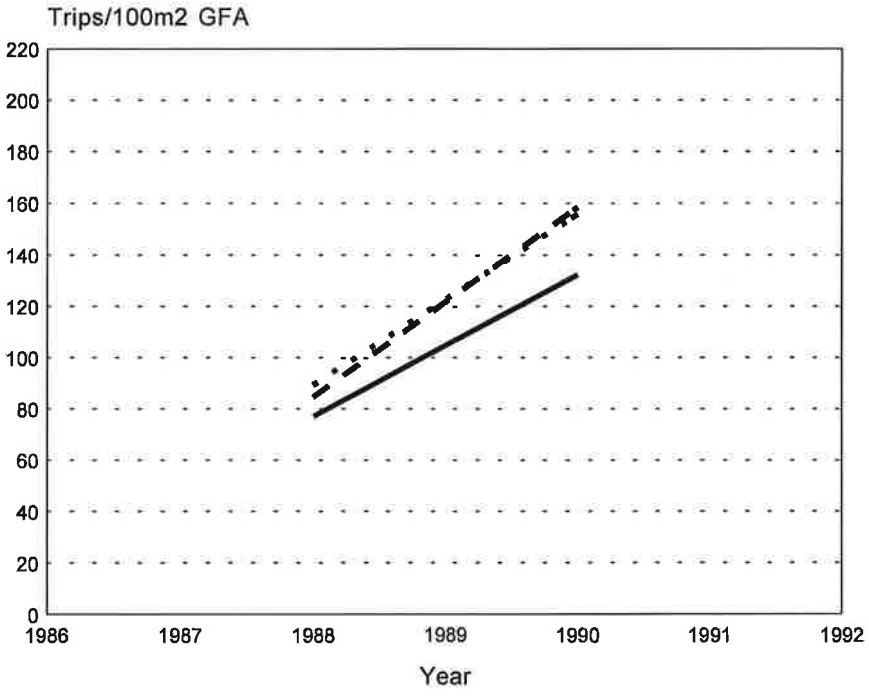
TESCO BOGNOR REGIS

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

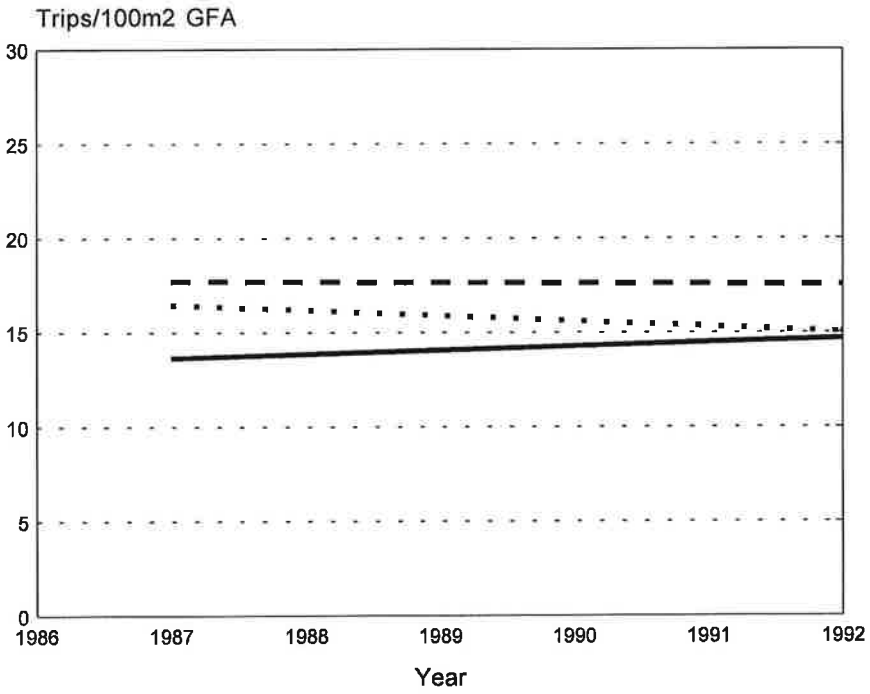


THURSDAY **FRIDAY** **SATURDAY**

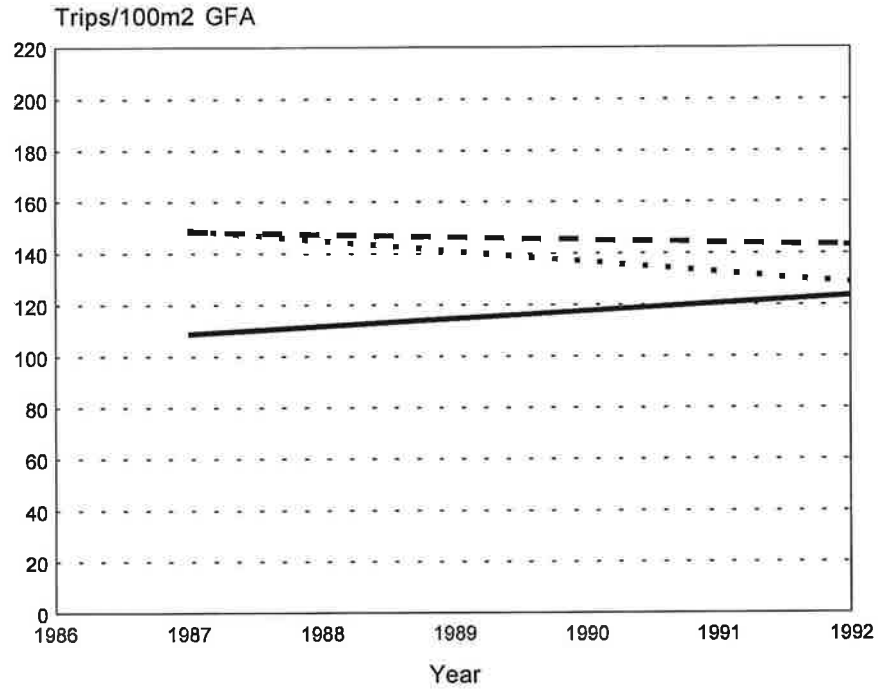
SAFEWAY OLD TOWN EASTBOURNE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

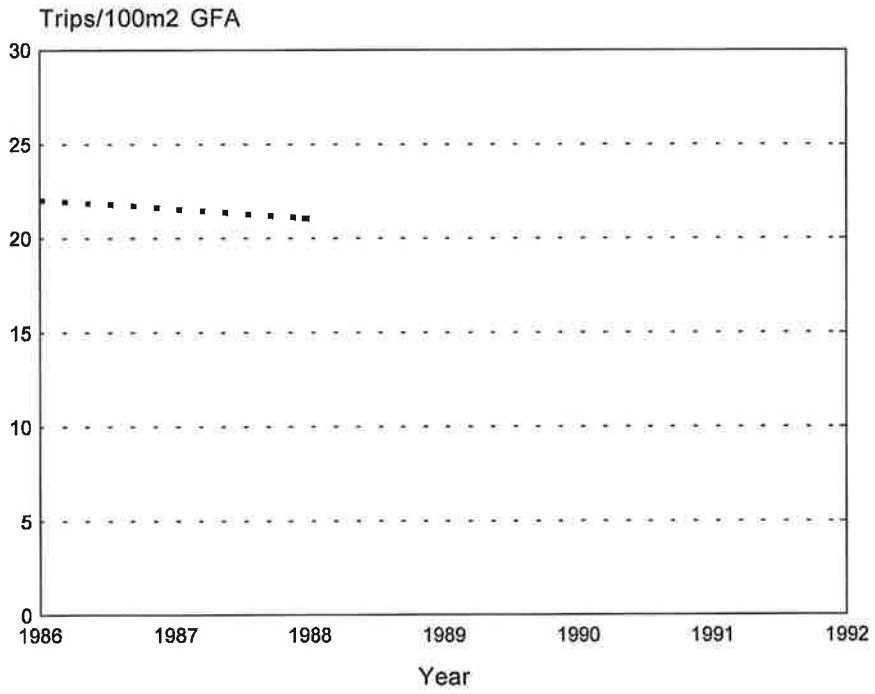


THURSDAY FRIDAY SATURDAY

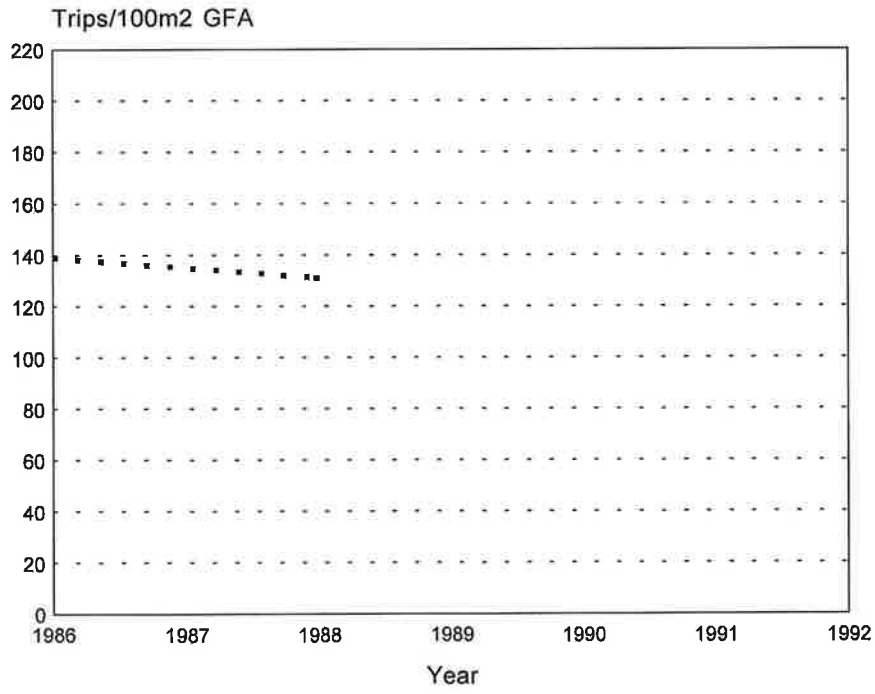
W M LOW FORFAR TAYSIDE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

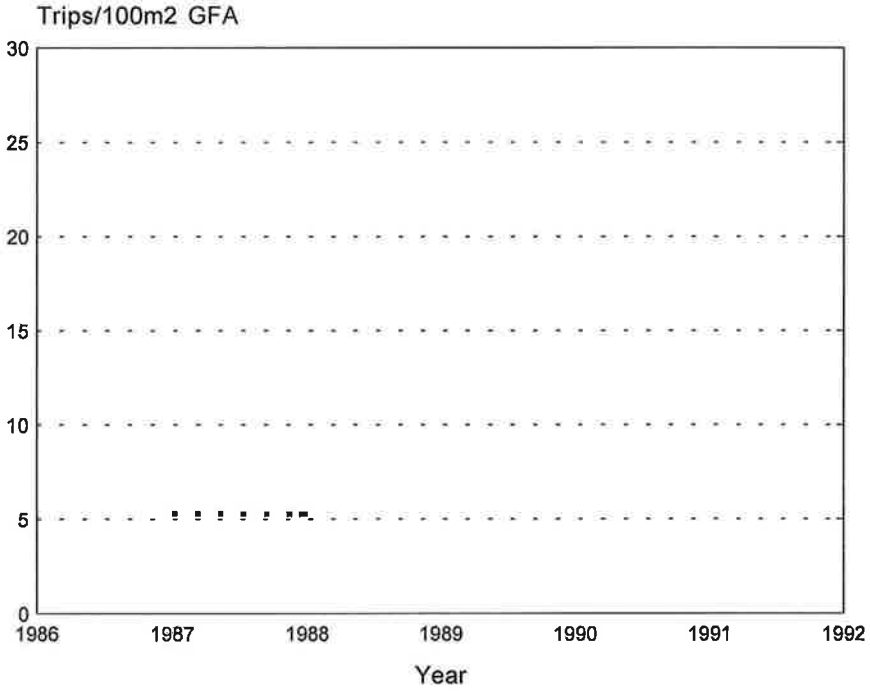


THURSDAY FRIDAY SATURDAY

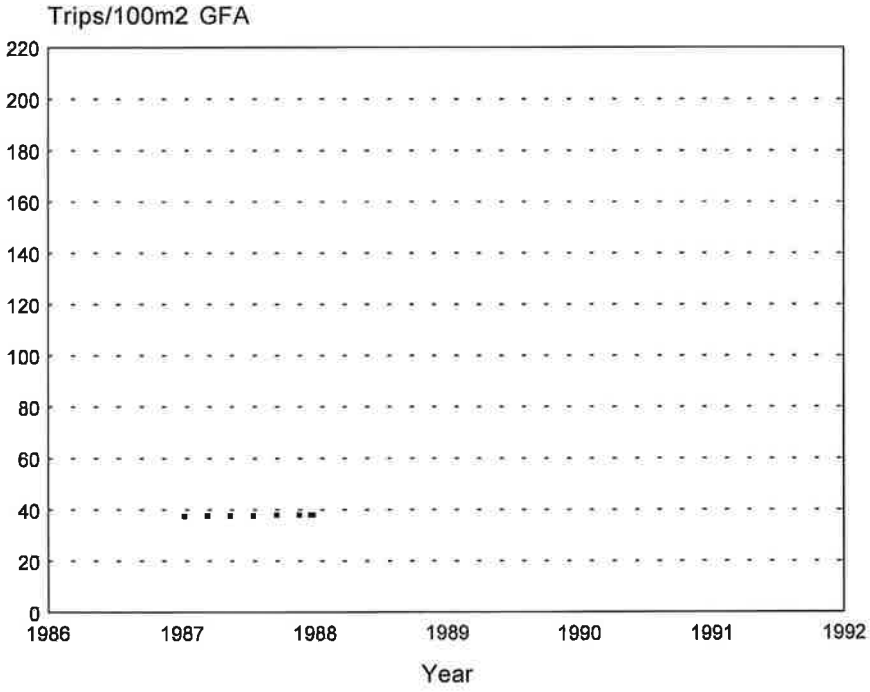
PRESTO PERTH TAYSIDE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

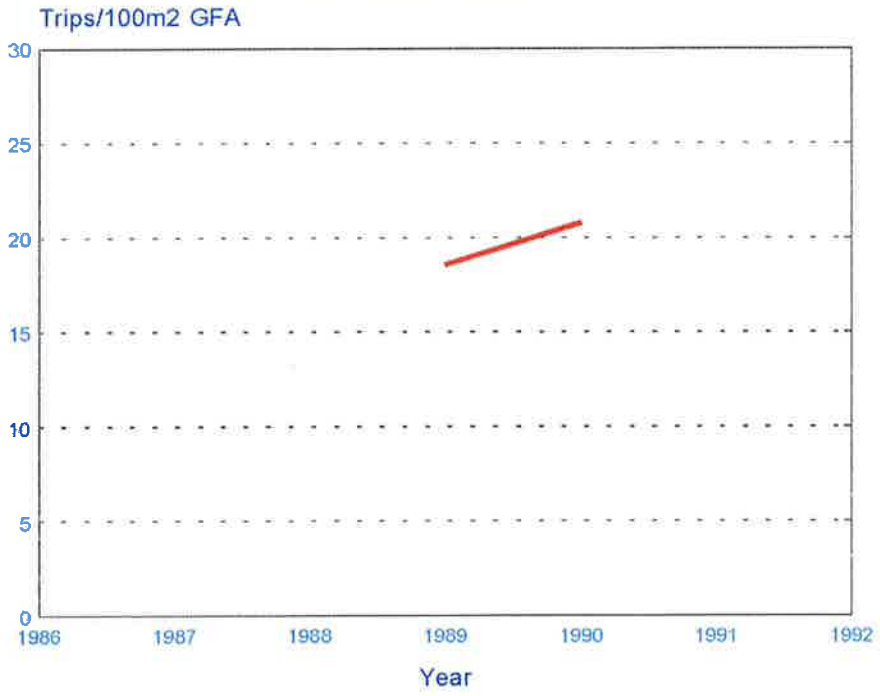


WHOLE DAY



THURSDAY FRIDAY SATURDAY

IN PEAK HOUR

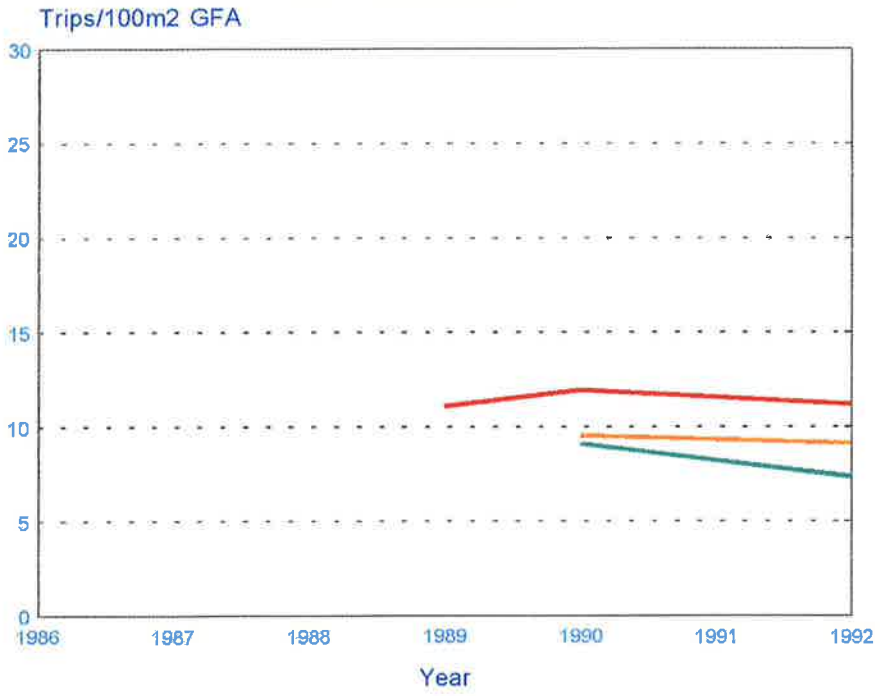


THURSDAY FRIDAY SATURDAY

ASDA LANSDOWNE BOURNEMOUTH

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

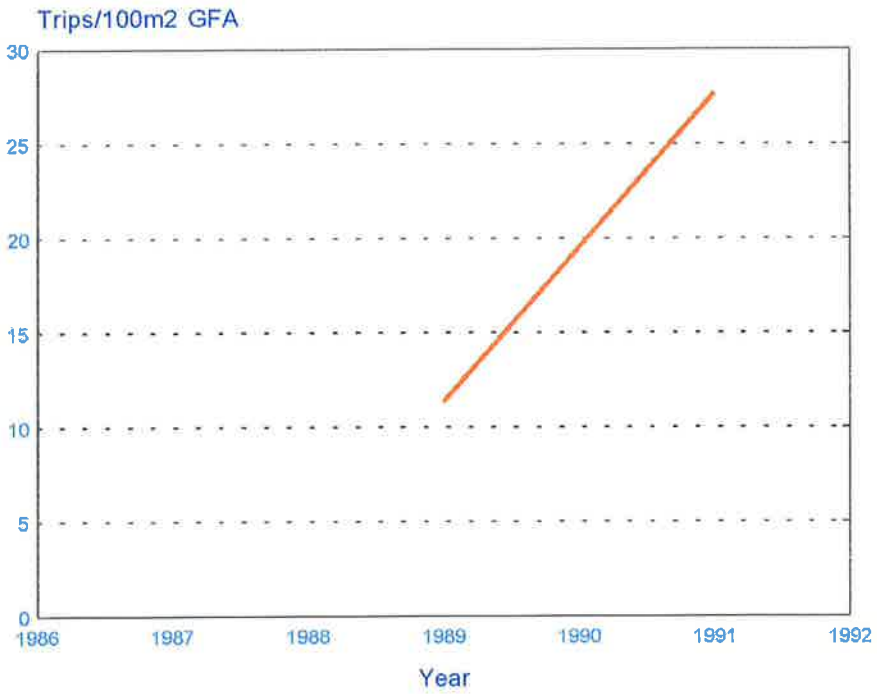


THURSDAY FRIDAY SATURDAY

PLYMCO (CO-OP) NEWTON ABBOT

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

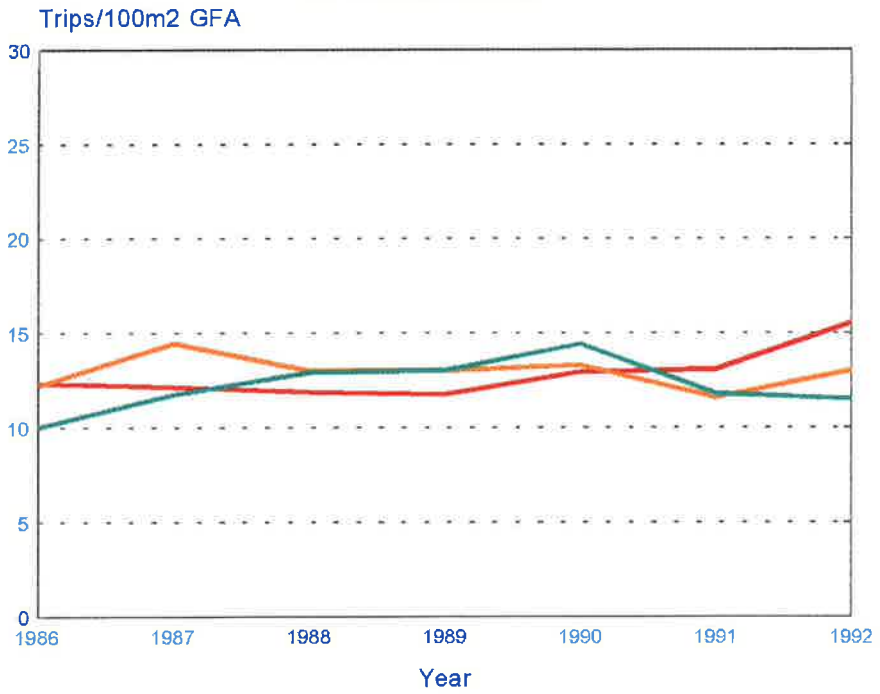


THURSDAY FRIDAY SATURDAY

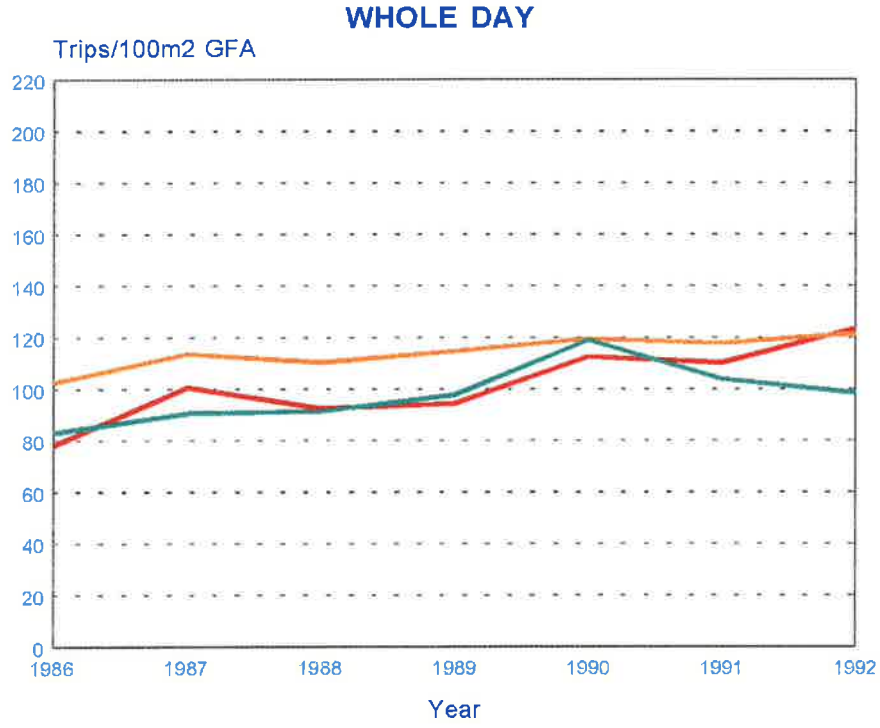
JS SAINSBURY VOGUE GYRATORY BRIGHTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

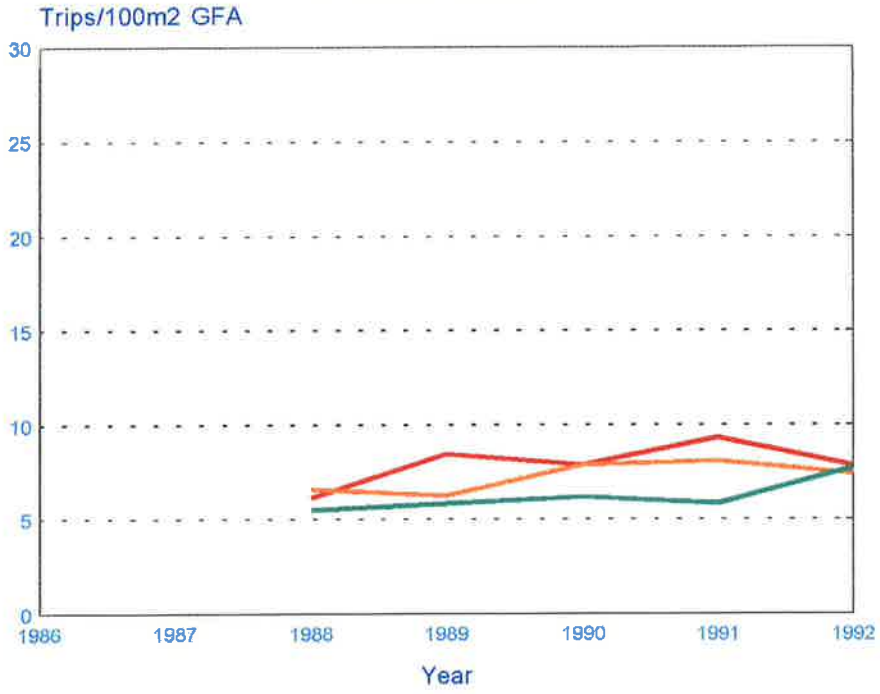


THURSDAY FRIDAY SATURDAY

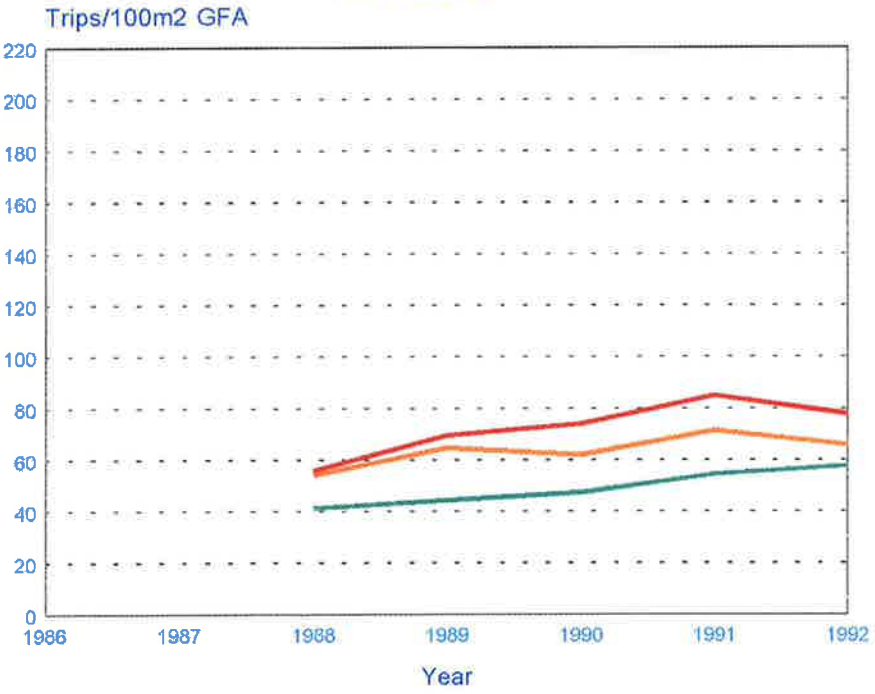
ASDA BRIGHTON MARINA

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

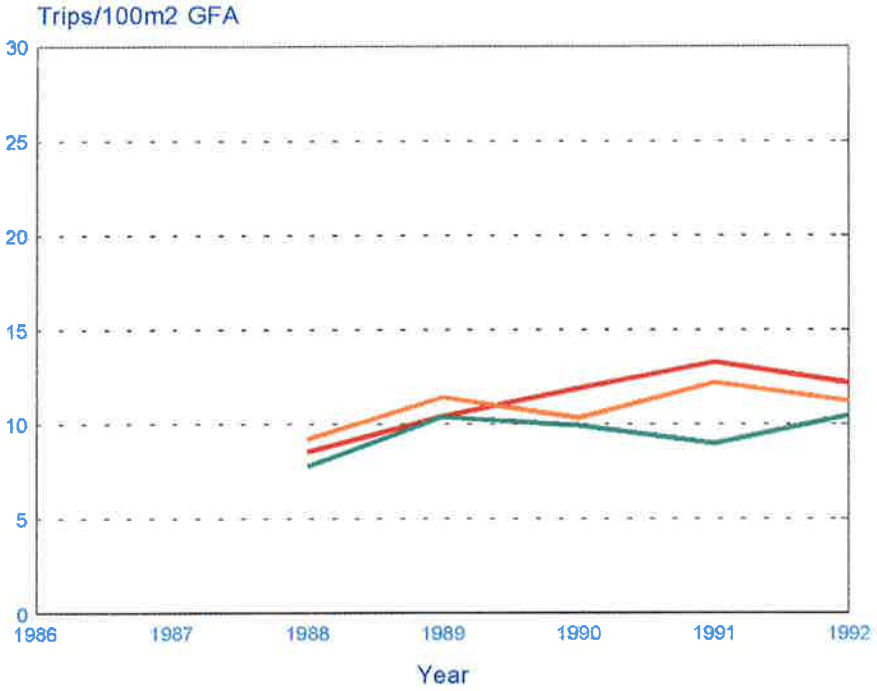


THURSDAY FRIDAY SATURDAY

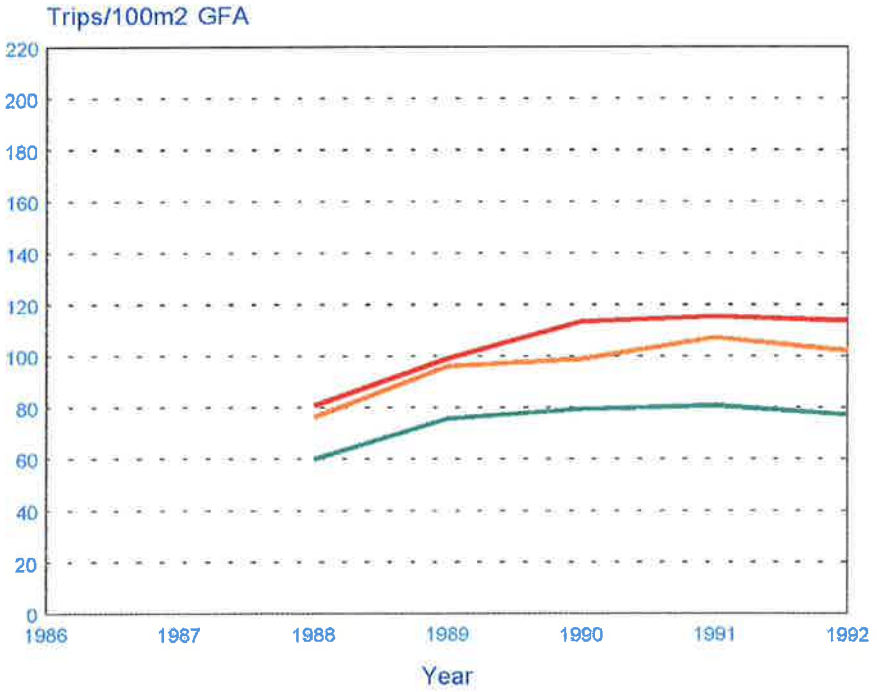
ASDA HOLLINGBURY BRIGHTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY



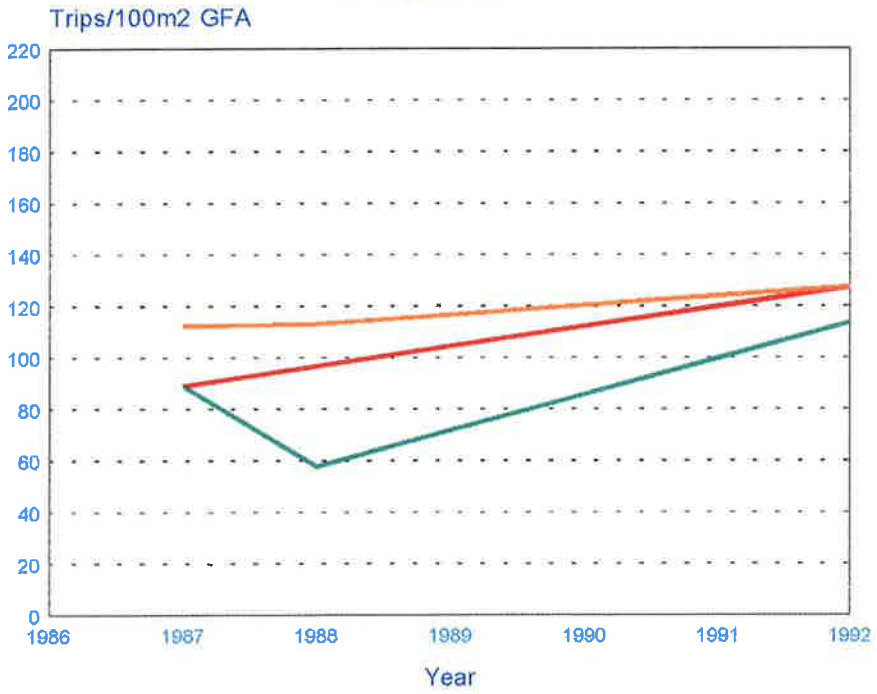
THURSDAY FRIDAY SATURDAY

CO-OP HOVE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

WHOLE DAY

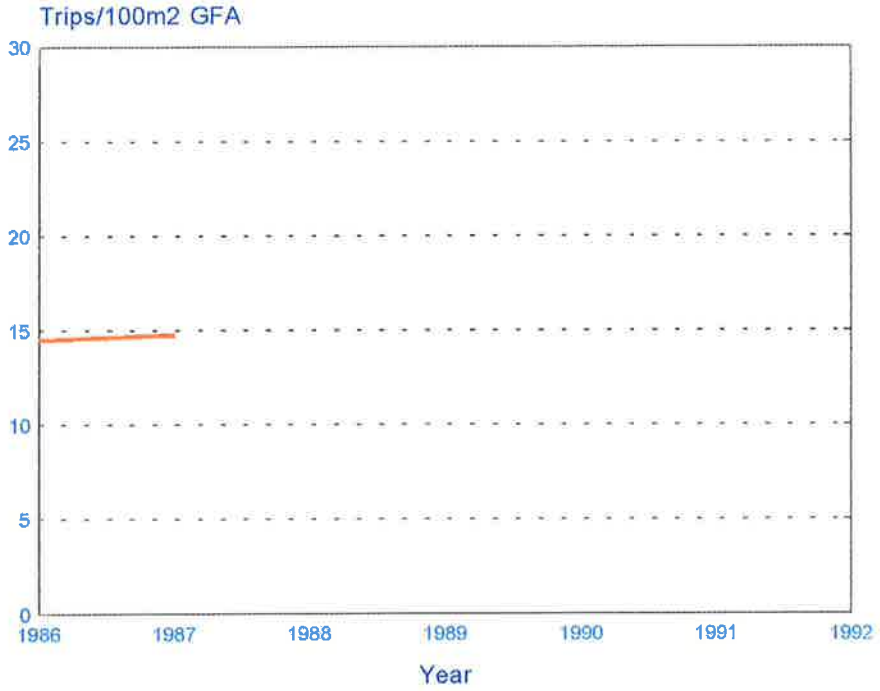


THURSDAY FRIDAY SATURDAY

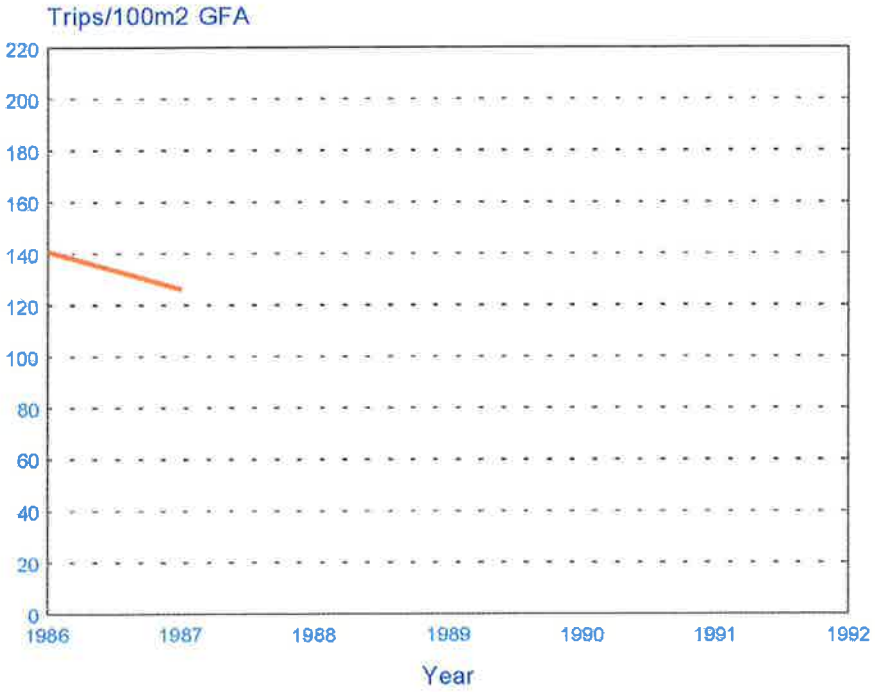
TESCO CHURCHWOOD HASTINGS

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

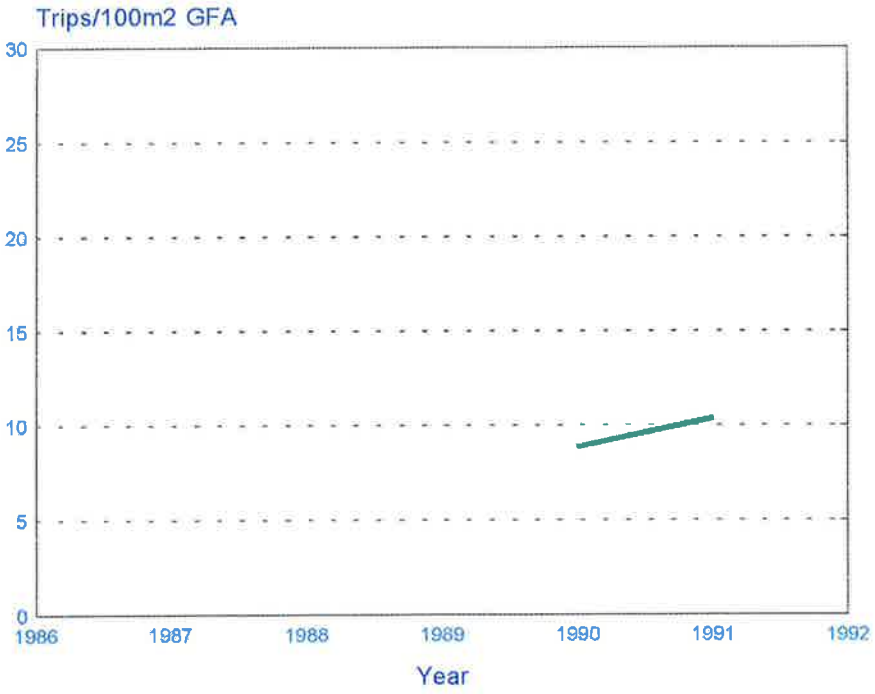


THURSDAY FRIDAY SATURDAY

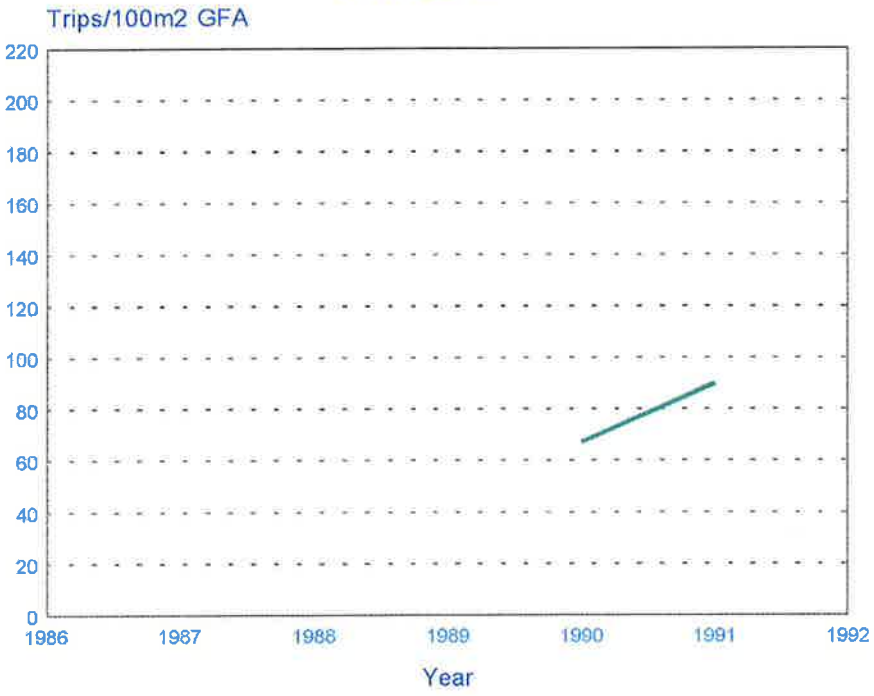
TESCO BRIDLINGTON

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

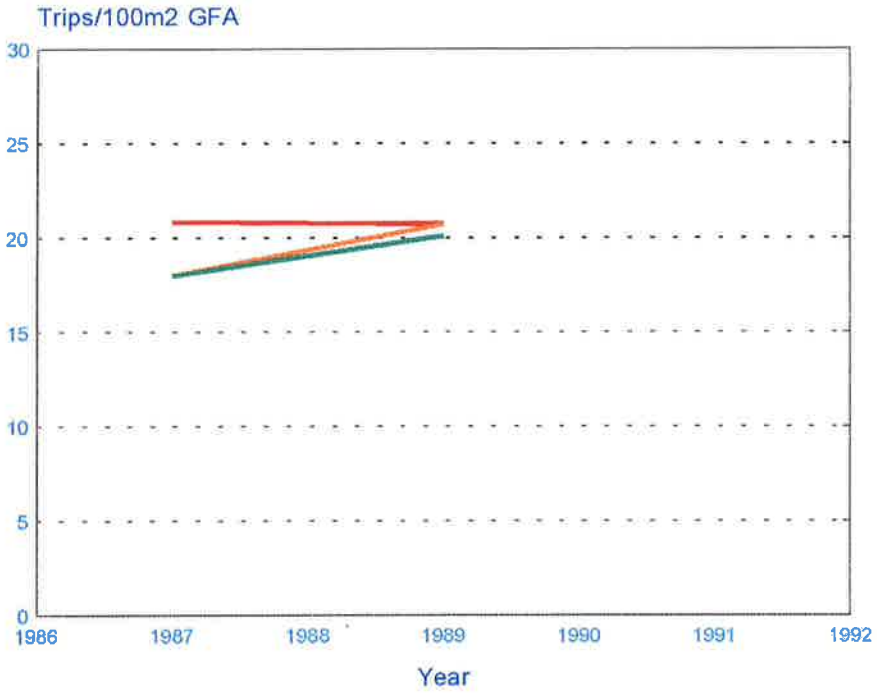


THURSDAY FRIDAY SATURDAY

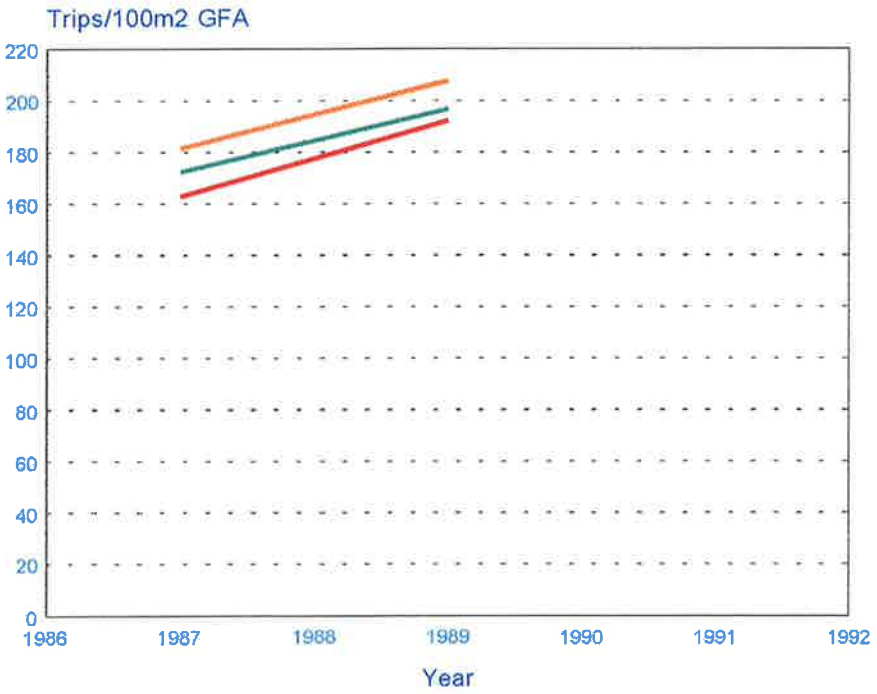
JS SAINSBURY BURPHAM SURREY

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

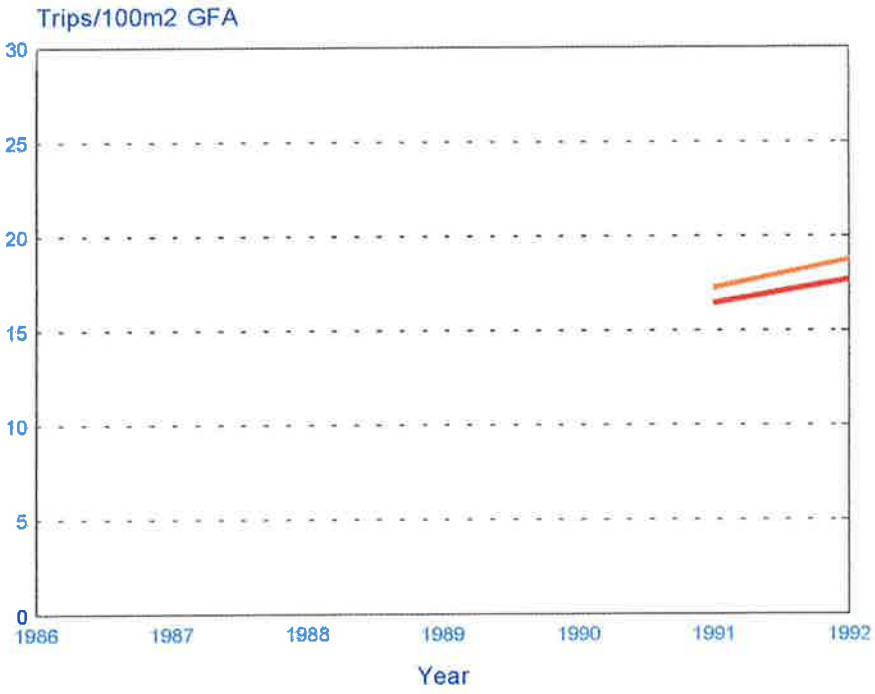


THURSDAY FRIDAY SATURDAY

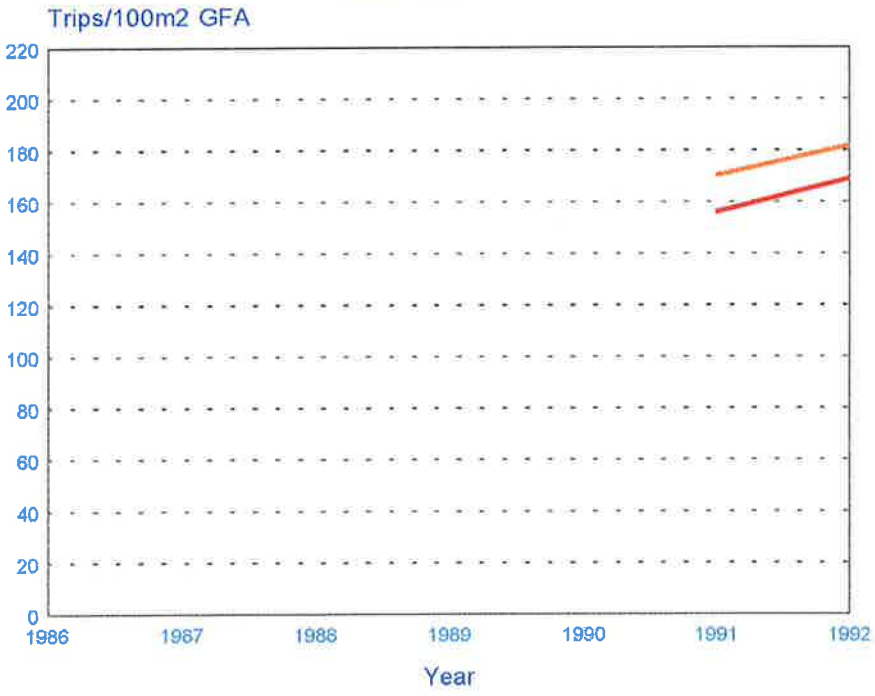
JS SAINSBURY BURPHAM SURREY (AFTER REFURBISHMENT)

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY



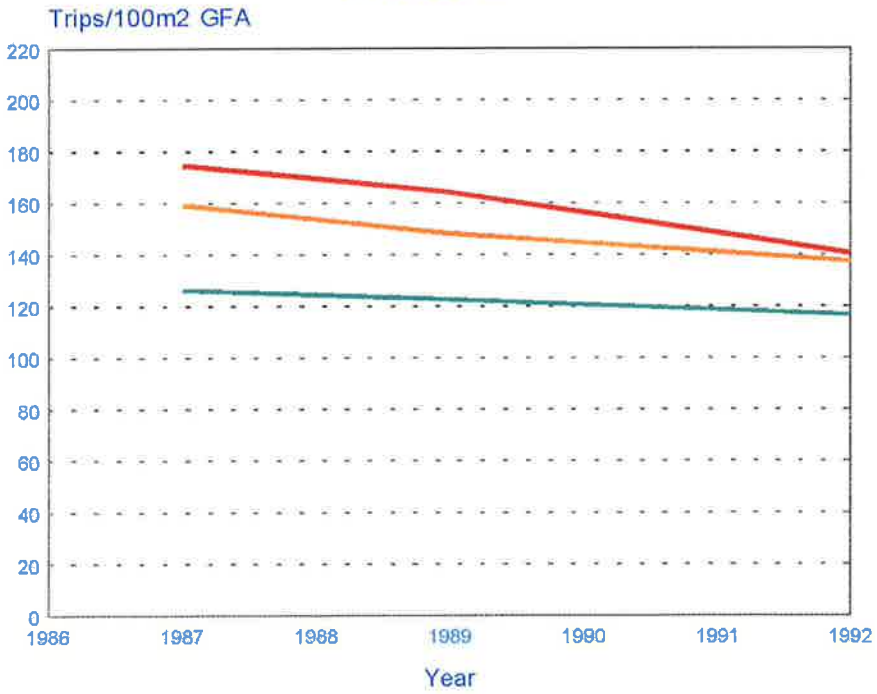
THURSDAY FRIDAY SATURDAY

TESCO HOOKWOOD REIGATE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

WHOLE DAY

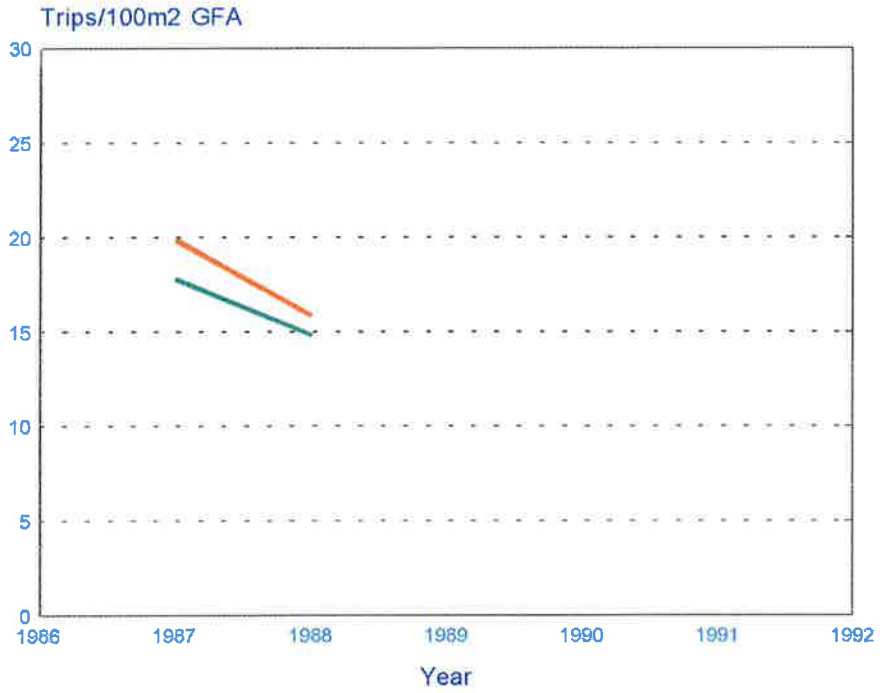


THURSDAY FRIDAY SATURDAY

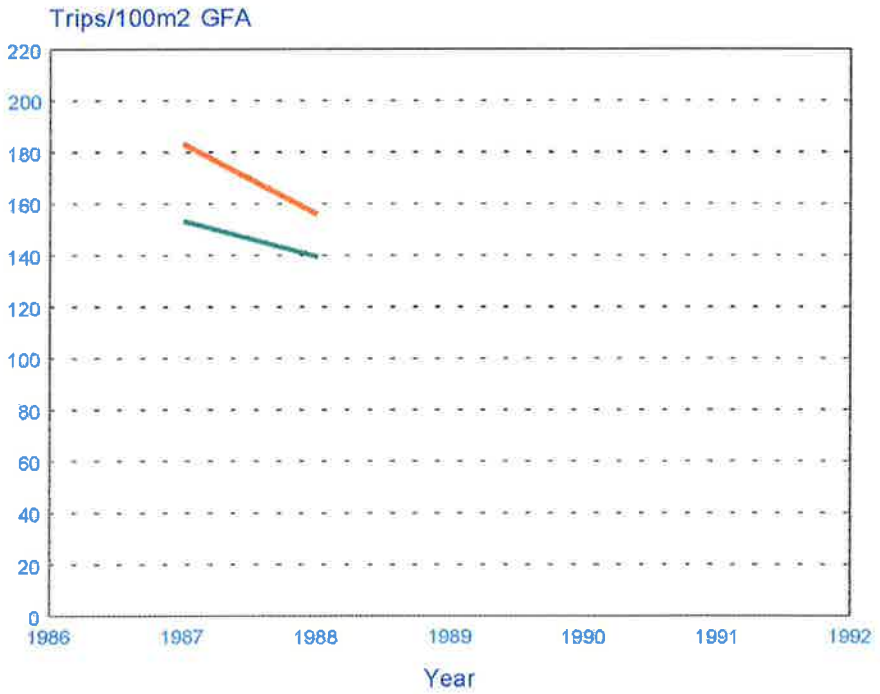
JS SAINSBURY WESTHAMPRETT CHICHESTER

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

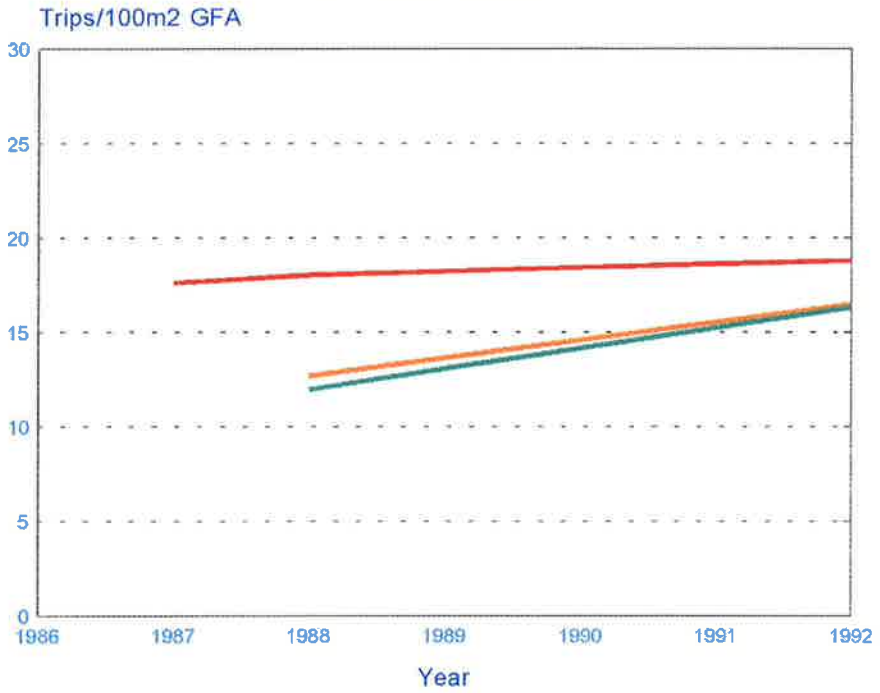


THURSDAY FRIDAY SATURDAY

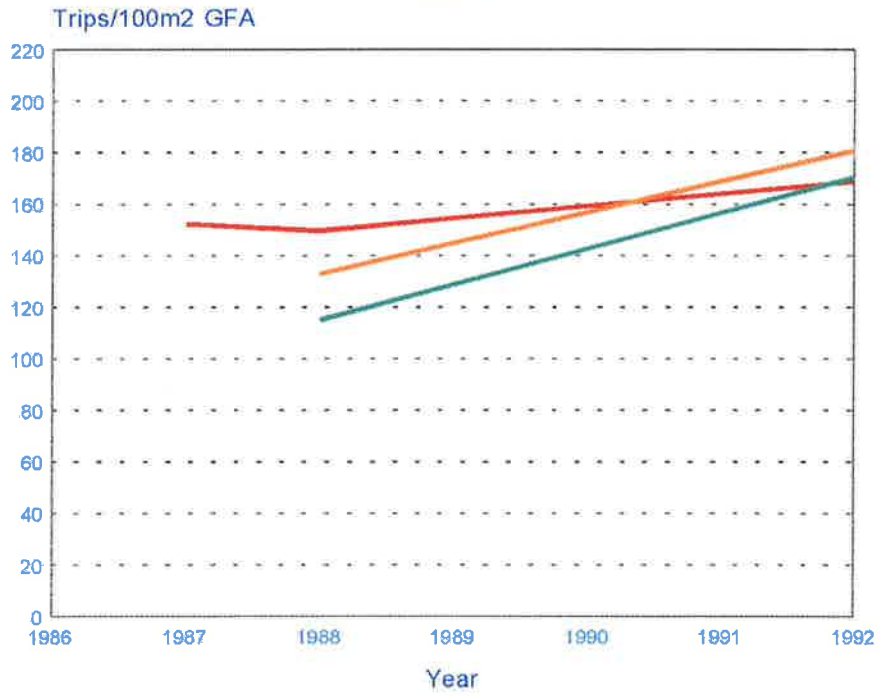
TESCO DURRINGTON WORTHING

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

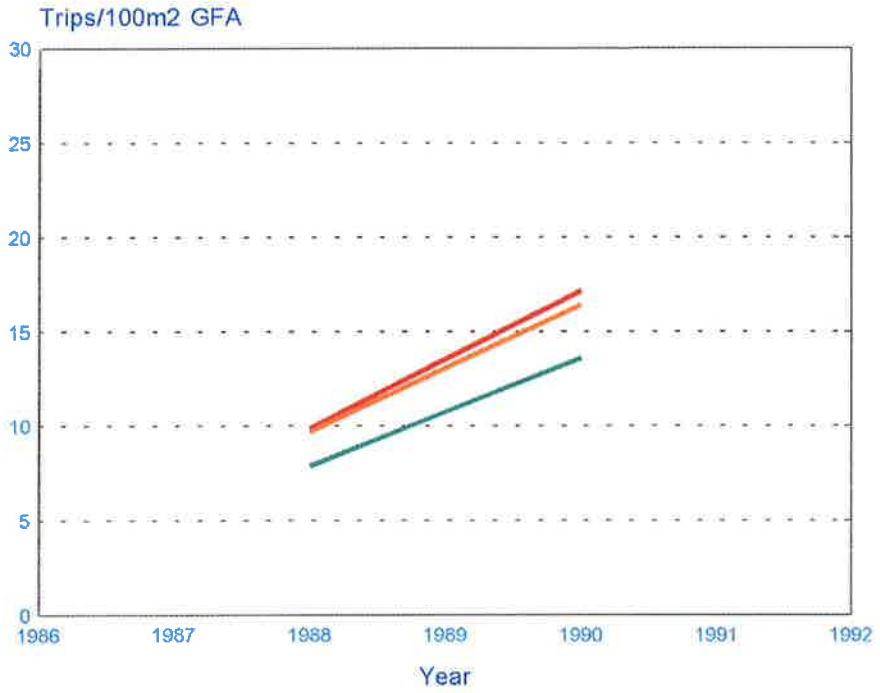


THURSDAY FRIDAY SATURDAY

TESCO BOGNOR REGIS

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

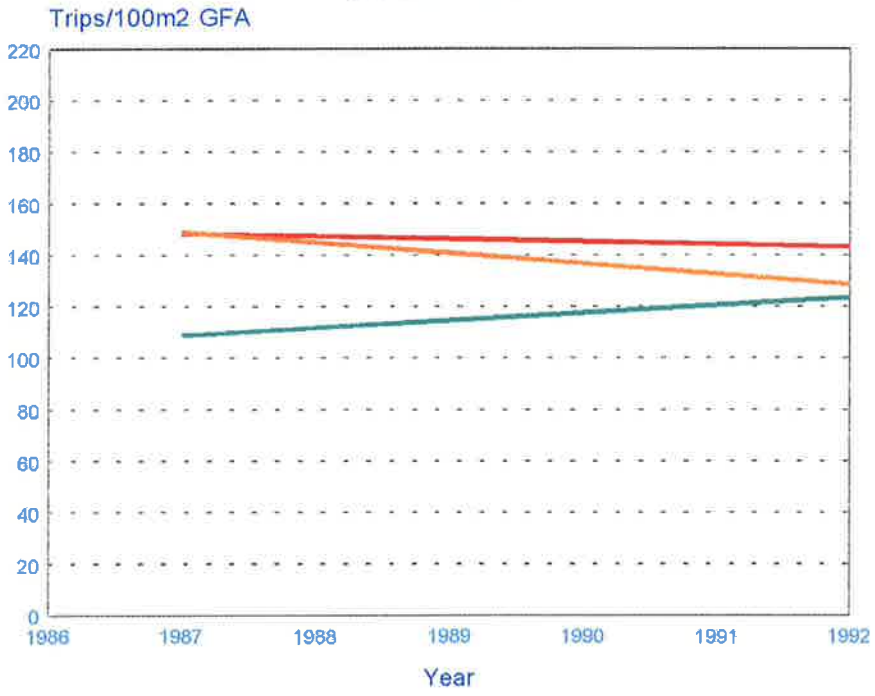
THURSDAY FRIDAY SATURDAY

SAFEWAY OLD TOWN EASTBOURNE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR

WHOLE DAY

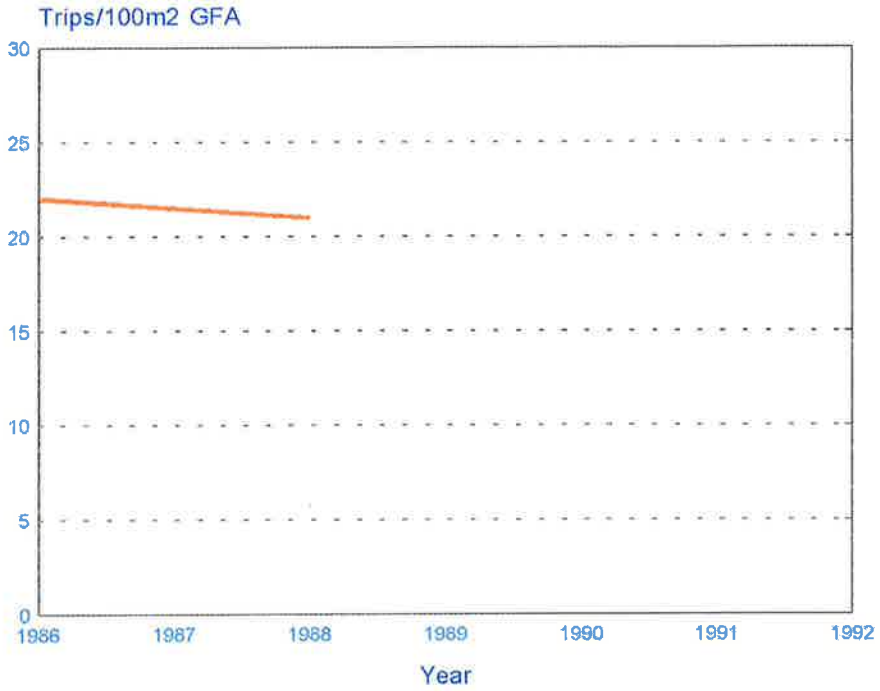


THURSDAY FRIDAY SATURDAY

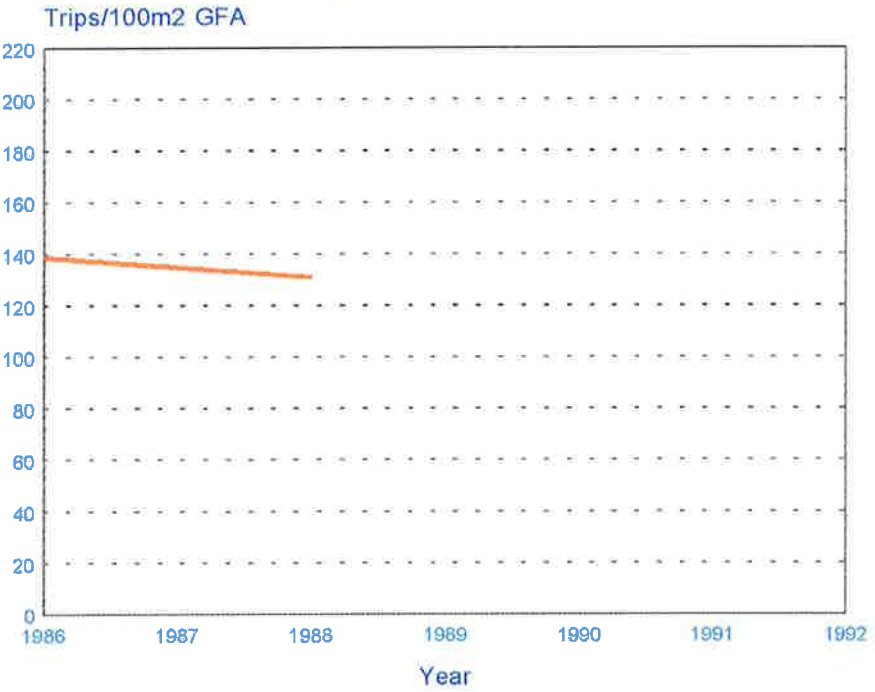
W M LOW FORFAR TAYSIDE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

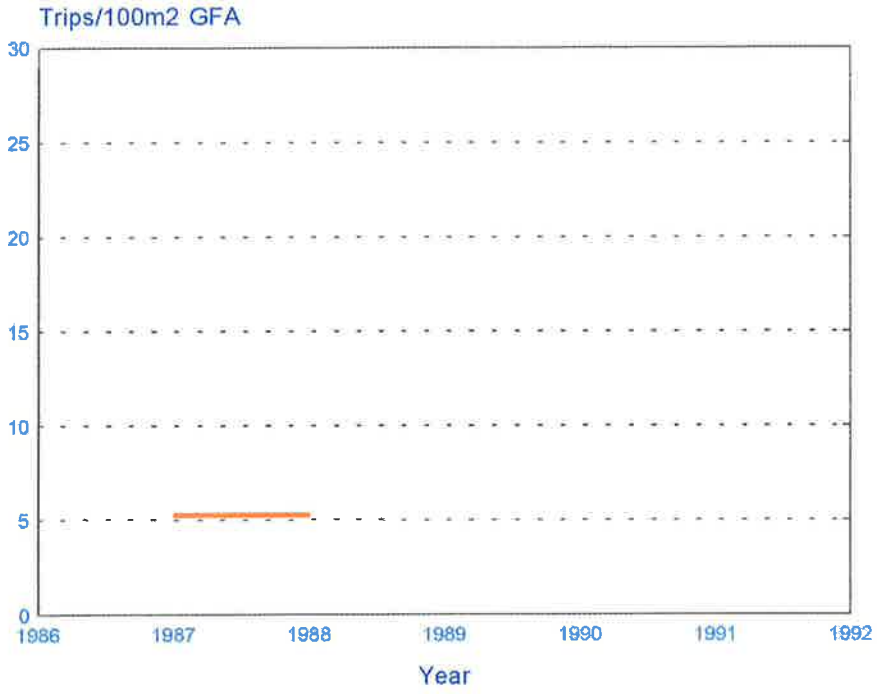


THURSDAY FRIDAY SATURDAY

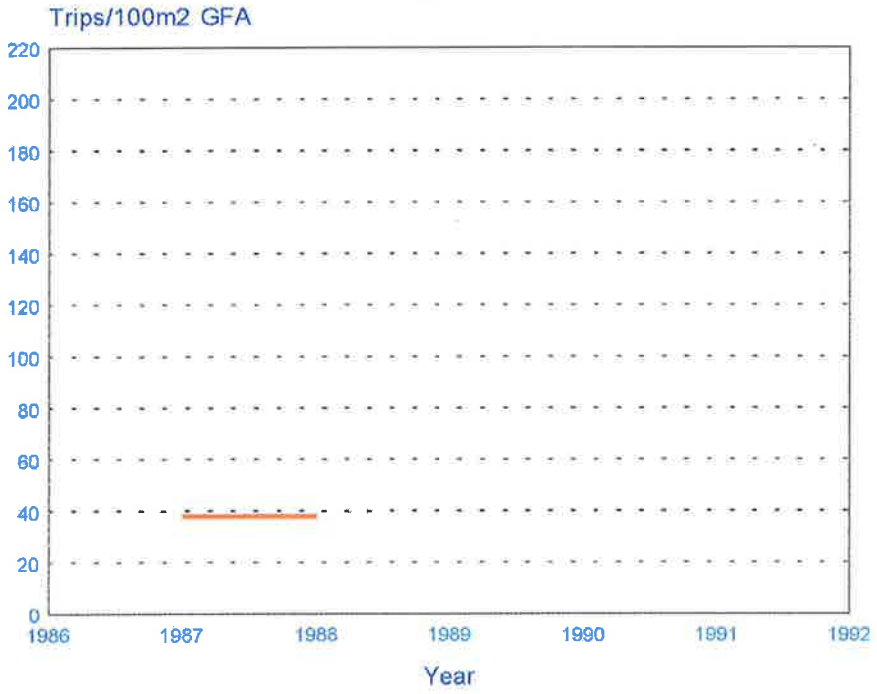
PRESTO PERTH TAYSIDE

TRIPS PER 100m2 GROSS FLOOR AREA

IN PEAK HOUR



WHOLE DAY

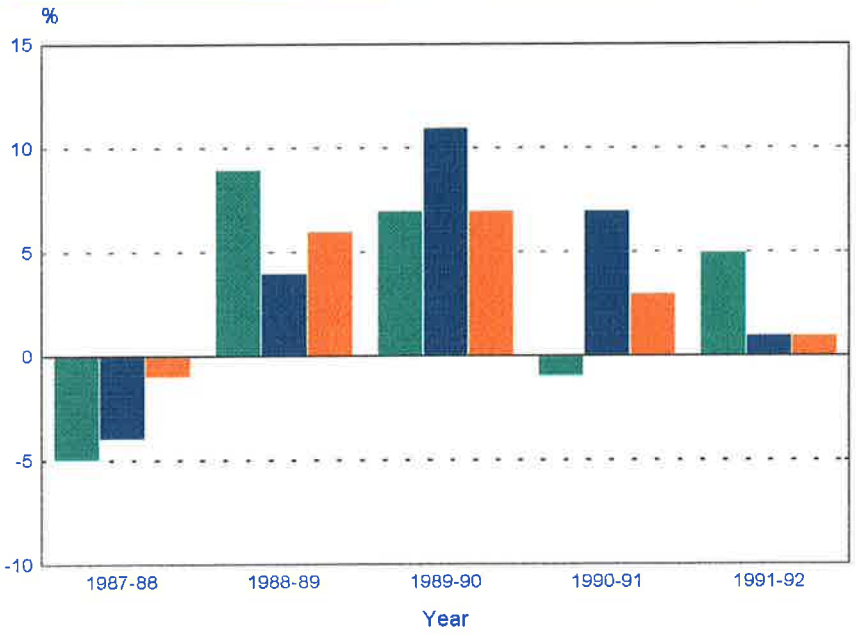


THURSDAY FRIDAY SATURDAY

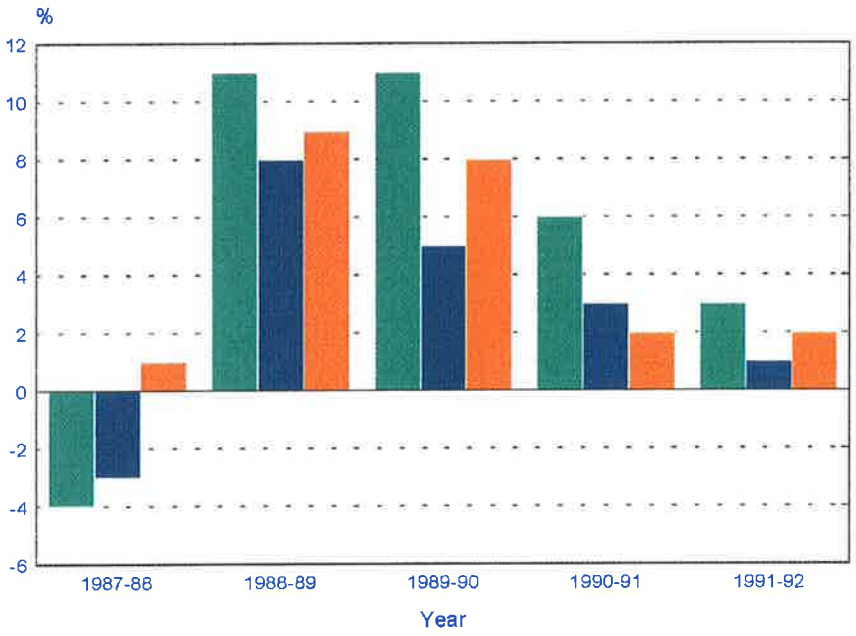
AVERAGE YEARLY PERCENTAGE CHANGE BY DAY

Figure 1

INCREMENTAL CHANGE - PEAK HOUR TRIP RATE



INCREMENTAL CHANGE - DAILY TRIP RATE



THURSDAY FRIDAY SATURDAY

Appendices

Appendix 1 TRICS Data

(1) Trips per 100m^2 Gross Floor Area in the Peak Hour for comparable surveys in different years for:

- Thursday
- Friday
- Saturday

(2) Trips per 100m^2 Gross Floor Area per Day for comparable surveys in different years for:

- Thursday
- Friday
- Saturday

Trips per 100m² Gross Floor Area in the Peak Hour for Comparable Thursdays

Site Ref.	1986	1987	1988	1989	1990	1991	1992
CH A 04							
DC A 02					9.096	*8.228*	7.360
DV A 08							
ES A 01	10.034	11.748	12.908	13.016	14.426	11.801	11.516
ES A 02			5.496	*5.841*	6.186	5.835	*7.736*
ES A 03			7.768	10.373	9.920	8.979	10.459
ES A 06		11.097	*7.871*	*9.253*	*10.635*	*12.017*	13.398
ES A 07							
HB A 02					8.847	10.361	
SC A 01		17.999	*19.049*	20.099			
SC A 02		14.939	*14.177*	13.415	*13.261*	*13.107*	12.952
WS A 01		17.808	14.830				
WS A 03			11.983	*13.068*	*14.153*	*15.238*	16.322
WS A 04			*7.889*	*10.738*	13.587		
ES A 04		13.635	*13.843*	*14.051*	*14.259*	*14.467*	14.675
SC A 03							
TA A 01							
TA A 08							

Italics denote assumed values.

Trips per 100m² Gross Floor Area in the Peak Hour for Comparable Fridays

Site Ref.	1986	1987	1988	1989	1990	1991	1992
CH A 04							
DC A 02					9.540	*9.338*	9.136
DV A 08				11.332	*19.506*	27.680	
ES A 01	12.212	14.462	13.016	13.016	13.301	11.605	13.016
ES A 02			6.598	6.271	7.881	8.087	7.405
ES A 03			9.223	11.425	10.324	12.208	11.229
ES A 06		12.817	14.280	*13.812*	*13.344*	*12.876*	12.409
ES A 07	14.505	14.786					
HB A 02							
SC A 01		18.017	*19.367*	20.716			
SC A 02		17.850	*16.327*	14.803	*14.499*	*14.195*	13.891
WS A 01		19.893	15.882				
WS A 03			12.697	*13.646*	*14.595*	*15.544*	16.491
WS A 04			9.698	*13.056*	16.413		
ES A 04		16.469	*16.182*	*15.895*	*15.608*	*15.321*	15.034
SC A 03						17.270	18.768
TA A 01	22.030	*21.520*	21.010				
TA A 08		5.297	5.263				

Italics denote assumed figures.

Trips Rate per 100m² Gross Floor Area in the Peak Hour for Comparable Saturdays

Site Ref.	1986	1987	1988	1989	1990	1991	1992
CH A 04				18.548	20.795		
DC A 02				11.101	11.948	*11.572*	11.195
DV A 08							
ES A 01	12.355	12.159	11.873	11.748	12.926	13.087	15.533
ES A 02			6.174	8.462	7.881	9.322	7.857
ES A 03			8.563	10.422	11.902	13.284	12.183
ES A 06		12.172	12.581	*13.812*	*15.043*	*16.274*	17.505
ES A 07							
HB A 02							
SC A 01		20.858	*20.805*	20.752			
SC A 02		19.224	*17.837*	16.449	*15.701*	*14.953*	14.204
WS A 01							
WS A 03		17.618	18.050	*18.238*	*18.426*	*18.614*	18.802
WS A 04			9.889	*13.524*	17.159		
ES A 04		17.725	*17.689*	*17.653*	*17.617*	*17.581*	17.546
SC A 03						16.458	17.712
TA A 01							
TA A 08							

Italics denote assumed values

Trips per 100m^2 Gross Floor Area per Day for Comparable Thursdays

Site Ref.	1986	1987	1988	1989	1990	1991	1992
CH A 04							
DC A 02							
DV A 08							
ES A 01	83.110	90.502	91.394	97.733	118.961	103.714	98.429
ES A 02			41.211	*44.274*	47.337	54.431	57.663
ES A 03			60.024	75.670	79.339	80.783	77.211
ES A 06		88.968	57.656	*71.645*	*85.634*	*99.623*	113.613
ES A 07							
HB A 02					67.083	89.904	
SC A 01		172.472	*184.622*	196.771			
SC A 02		126.313	*124.470*	122.626	*120.617*	*118.608*	116.599
WS A 01		153.405	139.408				
WS A 03			115.045	*128.874*	*142.703*	*156.532*	170.361
WS A 04			77.095	*104.635*	132.175		
ES A 04		108.683	*111.640*	*114.597*	*117.554*	*120.511*	123.466
SC A 03							
TA A 01							
TA A 08							

Italics denote assumed values

Trips per 100m^2 Gross Floor Area per Day for Comparable Fridays

Site Ref.	1986	1987	1988	1989	1990	1991	1992
CH A 04							
DC A 02							
DV A 08							
ES A 01	102.607	113.694	110.355	114.765	119.425	117.675	121.585
ES A 02			54.128	64.709	61.985	71.356	65.847
ES A 03			76.502	96.012	98.924	107.217	102.116
ES A 06		112.344	113.097	*116.710*	*120.323*	*123.936*	127.548
ES A 07	140.916	126.440					
HB A 02							
SC A 01		181.613	*194.671*	207.729			
SC A 02		159.456	*153.830*	148.204	*144.648*	*141.092*	137.537
WS A 01		183.323	156.045				
WS A 03			133.020	*144.961*	*156.902*	*168.843*	180.785
WS A 04			89.460	*122.699*	155.937		
ES A 04		149.085	*144.995*	*140.905*	*136.815*	*132.725*	128.633
SC A 03						170.222	181.817
TA A 01	138.858	*134.906*	130.954				
TA A 08		37.765	38.038				

Italics denote assumed values

Trips per 100m^2 Gross Floor Area per Day for Comparable Saturdays

Site Ref.	1986	1987	1988	1989	1990	1991	1992
CH A 04							
DC A 02							
DV A 08							
ES A 01	78.325	100.661	92.519	94.412	112.444	110.123	123.460
ES A 02			55.884	69.516	74.044	84.867	77.809
ES A 03			80.832	99.058	113.419	115.352	113.823
ES A 06		89.075	96.774	*104.441*	*112.108*	*119.775*	127.441
ES A 07							
HB A 02							
SC A 01		162.908	*177.537*	192.165			
SC A 02		174.816	*169.544*	164.272	*156.385*	*148.498*	140.612
WS A 01							
WS A 03		152.348	149.812	*154.55*	*159.288*	*164.026*	168.764
WS A 04			84.841	*121.651*	158.460		
ES A 04		148.475	*147.413*	*146.351*	*145.289*	*144.227*	143.165
SC A 03						156.075	169.039
TA A 01							
TA A 08							

Italics denote assumed values

Appendix 2 Interval Analysis

(1) Changes in the number of Trips per 100m² GFA in the Peak Hour Year-on-Year for Comparable surveys on:

- Thursday
- Friday
- Saturday

(2) Changes in the number of Trips per 100m² GFA per Day Year-on-Year for Comparable surveys on:

- Thursday
- Friday
- Saturday

Changes in the number of Trips per 100m^2 GFA in the Peak Hour Year-on-Year for Comparable Thursdays

Site Ref.	1986-7	1987-8	1988-9	1989-90	1990-1	1991-2
CH A 04						
DC A 02					-0.868	-0.868
DV A 08						
ES A 01	1.714	1.16	0.108	1.41	-2.625	-0.285
ES A 02			0.345	0.345	-0.351	1.901
ES A 03			2.605	-0.453	-0.941	1.48
ES A 06		-3.226	1.382	1.382	1.382	1.381
ES A 07						
HB A 02					1.514	
SC A 01		1.05	1.05			
SC A 02		-0.762	-0.762	-0.154	-0.154	-0.155
WS A 01		-.2.978				
WS A 03			1.085	1.085	1.085	1.084
WS A 04			2.849	2.849		
ES A 04		0.208	0.208	0.208	0.208	0.208
SC A 03						
TA A 01						
TA A 08						
No Obs.	1	6	9	8	9	8
Mean	1.714	-0.758	0.986	0.834	-0.083	0.593
St. Dev.	-	1.944	1.178	1.070	1.328	1.224
Change / Base Trip Rates (Totals)	0.1708	-0.0521	0.0878	0.0743	-0.0074	0.0529
% Change	NA	-5	+9	+7	-1	+5

Changes in the number of Trips per 100m^2 GFA in the Peak Hour Year-on-Year for Comparable Fridays

Site Ref.	1986-7	1987-8	1988-9	1989-90	1990-1	1991-2
CH A 04						
DC A 02					-0.202	-0.202
DV A 08				8.174	8.174	
ES A 01	2.25	-1.446	0	0.285	-1.696	1.411
ES A 02			-0.327	1.61	0.206	-0.682
ES A 03			2.202	-1.101	1.884	-0.979
ES A 06		1.463	-0.468	-0.468	-0.468	-0.467
ES A 07	0.281					
HB A 02						
SC A 01		1.35	1.349			
SC A 02		-1.523	-1.524	-0.304	-0.304	-0.304
WS A 01		-4.011				
WS A 03			0.949	0.949	0.949	0.949
WS A 04			3.358	3.357		
ES A 04		-0.287	-0.287	-0.287	-0.287	-0.287
SC A 03						1.498
TA A 01	-0.51	-0.51				
TA A 08		-0.034				
No Obs.	3	8	9	9	9	9
Mean	0.674	-0.625	0.584	1.357	0.917	0.104
St. Dev.	1.421	1.760	1.521	2.887	2.895	0.928
Change / Base Trip Rates (Totals)	0.0415	-0.0396	0.0447	0.1079	0.0696	0.0080
% Change	+4	-4	+4	+11	+7	+1

Changes in the number of Trips per 100m^{2}GFA in the Peak Hour Year-on-Year for Comparable Saturdays

Site Ref.	1986-7	1987-8	1988-9	1989-90	1990-1	1991-2
CH A 04				2.247		
DC A 02				0.847	-0.376	-0.377
DV A 08						
ES A 01	-0.196	-0.286	-0.125	1.178	0.161	2.446
ES A 02			2.288	-0.581	1.441	-1.465
ES A 03			1.859	1.48	1.382	-1.101
ES A 06		0.409	1.231	1.231	1.231	1.231
ES A 07						
HB A 02						
SC A 01		-0.053	-0.053			
SC A 02		-1.387	-1.388	-0.748	-0.748	-0.749
WS A 01						
WS A 03		0.432	0.188	0.188	0.188	0.188
WS A 04			3.635	3.635		
ES A 04		-0.036	-0.036	-0.036	-0.036	-0.035
SC A 03						1.254
TA A 01						
TA A 08						
No Obs.	1	6	9	10	8	9
Mean	-0.196	-0.1535	0.844	0.944	0.405	0.155
St. Dev.	*	0.667	1.540	1.337	0.841	1.272
Change / Base Trip Rates	-0.0159	-0.0092	0.0615	0.0675	0.0292	0.0106
% Change	-2	-1	+6	+7	+3	+1

Changes in the number of Trips per 100m² GFA per Day for Comparable Thursdays

Site Ref.	1986-7	1987-8	1988-9	1989-90	1990-1	1991-2
CH A 04						
DC A 02						
DV A 08						
ES A 01	7.392	0.892	6.339	21.228	-15.247	-5.285
ES A 02			3.063	3.063	7.094	3.232
ES A 03			15.646	3.669	1.444	-3.572
ES A 06		-31.312	13.989	13.989	13.989	13.99
ES A 07						
HB A 02					22.821	
SC A 01		12.15	12.149			
SC A 02		-1.843	-1.844	-2.009	-2.009	-2.009
WS A 01		-13.997				
WS A 03			13.829	13.829	13.829	13.829
WS A 04			27.54	27.54		
ES A 04		2.957	2.957	2.957	2.957	2.957
SC A 03						
TA A 01						
TA A 08						
No Obs.	1	6	9	8	8	7
Mean	7.392	-5.192	10.408	10.533	5.610	3.306
St. Dev.	*	15.331	8.836	10.310	11.863	8.014
Change / Base Trip Rates	0.0889	-0.0421	0.1085	0.1109	0.0576	0.0315
% Change	+9	-4	+11	+11	+6	+3

Changes in the number of Trips per 100m² GFA per Day Year-on-Year for Comparable Fridays

Site Ref.	1986-7	1987-8	1988-9	1989-90	1990-1	1991-2
CH A 04						
DC A 02						
DV A 08						
ES A 01	11.087	-3.339	4.41	4.66	-1.75	3.91
ES A 02			10.581	-2.724	9.371	-5.509
ES A 03			19.51	2.912	8.293	-5.101
ES A 06		0.753	3.613	3.613	3.613	3.612
ES A 07	-14.476					
HB A 02						
SC A 01		13.058	13.058			
SC A 02		-5.626	-5.626	-3.556	-3.556	-3.555
WS A 01		-27.278				
WS A 03			11.941	11.941	11.941	11.942
WS A 04			33.239	33.238		
ES A 04		-4.09	-4.09	-4.09	-4.09	-4.092
SC A 03						11.595
TA A 01	-3.952	-3.952				
TA A 08		0.273				
No Obs.	3	8	9	8	7	8
Mean	-2.447	-3.775	9.626	5.749	3.403	1.600
St. Dev.	12.848	11.189	12.028	12.323	6.628	7.277
Change / Base Trip Rates	-0.0192	-0.0282	0.0810	0.0485	0.0284	0.0124
% Change	-2	-3	+8	+5	+3	+1

Changes in the number of Trips per 100m² GFA per Day Year-on-Year for Comparable Saturdays

Site Ref.	1986-7	1987-8	1988-9	1989-90	1990-1	1991-2
CH A 04						
DC A 02						
DV A 08						
ES A 01	22.336	-8.142	1.893	18.032	-2.321	13.337
ES A 02			13.632	4.528	10.823	-7.058
ES A 03			18.226	14.361	1.933	-1.529
ES A 06		7.699	7.667	7.667	7.667	7.666
ES A 07						
HB A 02						
SC A 01		14.629	14.628			
SC A 02		-5.272	-5.272	-7.887	-7.887	-7.886
WS A 01						
WS A 03		-2.536	4.738	4.738	4.738	4.738
WS A 04			36.81	36.809		
ES A 04		-1.062	-1.062	-1.062	-1.062	-1.062
SC A 03						12.964
TA A 01						
TA A 08						
No Obs.	1	6	9	8	7	8
Mean	*	0.886	10.14	9.648	1.984	2.646
St. Dev.	*	8.605	12.626	13.663	6.367	8.338
Change / Base Trip Rates	0.2852	0.0064	0.0865	0.0809	0.0159	0.0203
% Change	*	+1	+9	+8	+2	+2

Appendix 3 ATC Data

- Tesco, Hastings
- Safeway, Eastbourne
- Asda, Fareham
- Co op, Havant
- Asda, Burgh Heath
- J S Sainsbury, Chichester
- Tesco, Hookwood
- J S Sainsbury, Burpham
- Tesco, Bognor Regis

ATC TRAFFIC FLOWS
Mean Daily Traffic Flow by Month: 24 Hour Inbound Direction

SITE	Tesco, Hastings		Safeway, East-bourne	Asda, Fareham		Co op, Havant	
YEAR	1989	1990	1990	1989	1990	1989	1990
Jan.	-	3549	1466	2880	2957	-	3674
Feb.	3320	3538	1497	3014	3113	-	3672
March	3768	3457	1516	3097	3325	-	3952
April	3970	3860	1500	3072	3250	-	4243
May	3890	3872	1475	3011	3236	-	4267
June	3849	3802	-	-	3252	-	3869
July	4076	3486	-	3060	-	-	4000
Aug.	3867	3592	-	3010	-	-	3872
Sept.	3803	3315	-	3087	-	-	4032
Oct.	3962	3650	-	3035	-	-	4354
Nov.	3762	3241	-	3087	-	4475	-
Dec.	3717	-	-	3704	-	5072	4886

SITE	Asda, Burgh Heath				J S Sainsbury, Chichester		
YEAR	1989	1990	1991	1992	1988	1989	1990
Jan.	-	2732	-	3572	-	-	3470
Feb.	-	3026	-	3644	-	-	3659
March	-	3033	-	3771	-	-	3786
April	-	3240	-	3947	-	-	4030
May	-	3134	-	-	-	-	3958
June	2502	3333	-	-	-	-	4000
July	2679	-	-	-	-	-	-
Aug.	2623	-	-	-	3644	-	-
Sept.	2687	-	-	-	3479	-	-
Oct.	2730	-	-	-	3444	3663	-
Nov.	2824	-	-	-	3371	3674	-
Dec.	3076	-	-	-	3584	3919	-

ATC TRAFFIC FLOWS
Mean Daily Traffic Flow by Month: 24 Hour Inbound Direction

SITE	Asda, Burgh Heath				J S Sainsbury, Chichester		
YEAR	1989	1990	1991	1992	1988	1989	1990
Jan.	-	2732	-	3572	-	-	3470
Feb.	-	3026	-	3644	-	-	3659
March	-	3033	-	3771	-	-	3786
April	-	3240	-	3947	-	-	4030
May	-	3134	-	-	-	-	3958
June	2502	3333	-	-	-	-	4000
July	2679	-	-	-	-	-	-
Aug.	2623	-	-	-	3644	-	-
Sept.	2687	-	-	-	3479	-	-
Oct.	2730	-	-	-	3444	3663	-
Nov.	2824	-	-	-	3371	3674	-
Dec.	3076	-	-	-	3584	3919	-

ATC TRAFFIC FLOWS
Mean Daily Traffic Flow by Month: 24 Hour Inbound Direction

SITE	Tesco, Hookwood				
YEAR	1988	1989	1990	1991	1992
Jan.	-	4344	4490	-	4365
Feb.	-	4771	4764	-	4347
March	-	4991	5009	-	4380
April	-	5489	5012	-	4510
May	-	4971	4876	-	4186
June	-	4940	4959	-	-
July	-	4768	4908	-	-
Aug.	4476	4519	-	-	-
Sept.	4669	4589	-	-	-
Oct.	4746	4685	-	-	-
Nov.	4764	4863	-	-	-
Dec.	4774	4932	-	-	-

SITE	Sainsburys, Burpham				
YEAR	1988	1989	1990	1991	1992
Jan.	-	4629	4763	-	5035
Feb.	-	4880	5049	-	5137
March	-	4921	5250	-	5189
April	-	5038	5263	-	-
May	-	4777	5337	-	-
June	-	5055	5391	-	-
July	-	5043	5369	-	-
Aug.	-	5081	-	-	-
Sept.	4989	5114	-	-	-
Oct.	4940	5008	-	-	-
Nov.	4913	5153	-	-	-
Dec.	4840	4658	-	-	-

ATC TRAFFIC FLOWS
Mean Daily Traffic Flow by Month: 24 Hour Inbound Direction

SITE	Sainsburys, Burpham				
YEAR	1988	1989	1990	1991	1992
Jan.	-	4629	4763	-	5035
Feb.	-	4880	5049	-	5137
March	-	4921	5250	-	5189
April	-	5038	5263	-	-
May	-	4777	5337	-	-
June	-	5055	5391	-	-
July	-	5043	5369	-	-
Aug.	-	5081	-	-	-
Sept.	4989	5114	-	-	-
Oct.	4940	5008	-	-	-
Nov.	4913	5153	-	-	-
Dec.	4840	4658	-	-	-

ATC TRAFFIC FLOWS
Mean Daily Traffic Flow by Month: 24 Hour Inbound Direction

SITE	Tesco, Bognor Regis			
YEAR	1989	1990	1991	1992
Jan.	-	3545	-	4292
Feb.	-	3969	-	4322
March	-	4189	-	4232
April	-	4536	-	-
May	4139	4464	-	4635
June	4238	4377	-	4418
July	4298	-	-	4616
Aug.	4197	-	-	4618
Sept.	3964	-	-	-
Oct.	4138	-	-	-
Nov.	3918	-	-	-
Dec.	4250	-	-	-

Appendix 4 Graphs of the Data

- JS Sainsburys, Howley, Warrington
- Asda, Lansdowne, Bournemouth
- Plymco (Co-op), Newton Abbot
- JS Sainsbury, Vogue Gyratory, Brighton
- Asda, Brighton Marina
- Asda, Hollingbury, Brighton
- Co-op, Hove
- Tesco, Churchwood, Hastings
- Tesco, Bridlington
- JS Sainsbury, Burpham, Surrey
- JS Sainsbury, Burpham, Surrey (after refurbishment)
- Tesco, Hookwood, Reigate
- JS Sainsbury, Westhamprett, Chichester
- Tesco, Durrington, Worthing
- Tesco, Bognor Regis
- Safeway, Old Town, Eastbourne
- WM Low, Forfar, Tayside
- Presto, Perth, Tayside