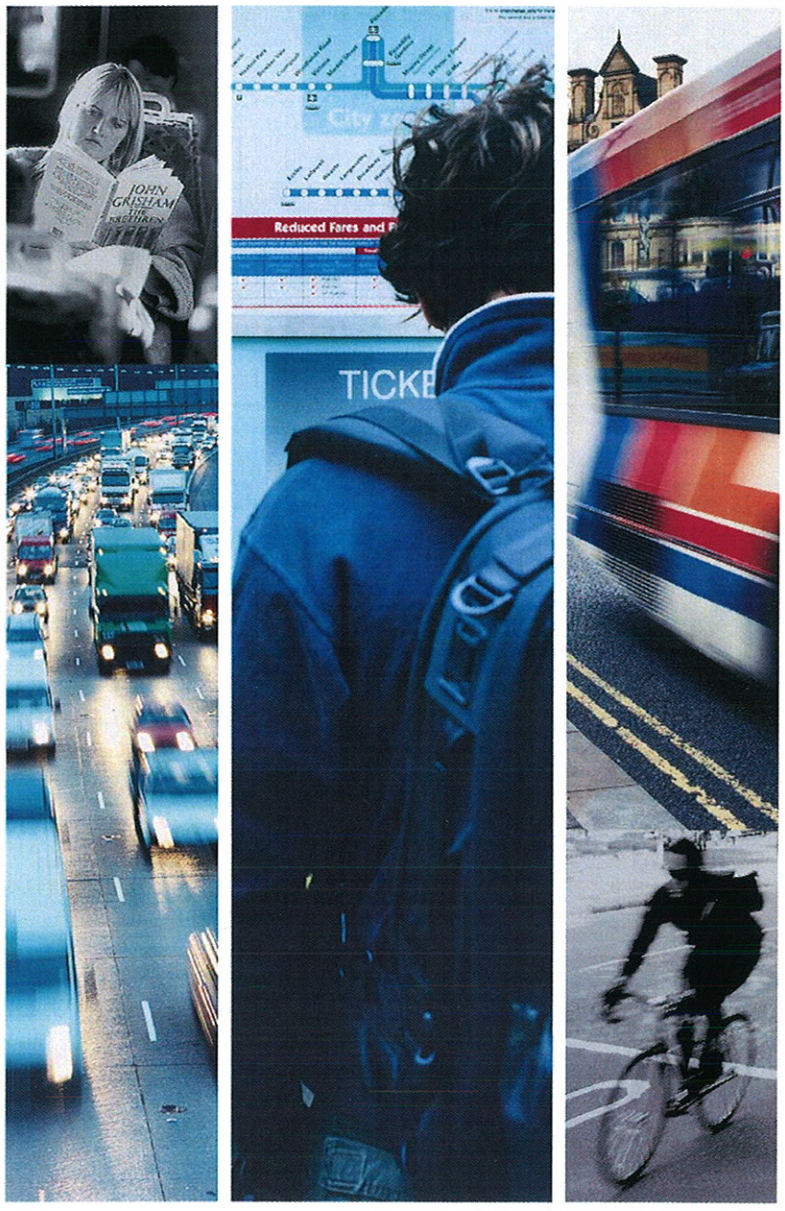
RELATIONSHIPS BETWEEN ACCESSIBILITY AND PARKING FOR NEW DEVELOPMENTS

TRICS RESEARCH BRIEF NO.1

RESEARCH REPORT

JULY 2002



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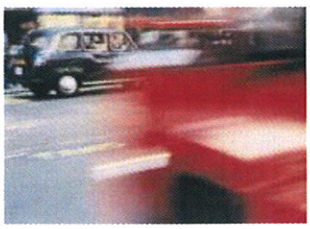


Executive Summary

BACKGROUND

Faber Maunsell were commissioned to undertake TRICS Research Brief 1, which is to explore the relationship between accessibility and parking for new developments. TRICS commissions and undertakes research in areas directly related to the use and understanding of the database.

RESEARCH OBJECTIVES

Specifically the research topic is as follows:

> *'Examination of the variation in levels of parking provision within new developments, for example by public transport accessibility or location, and relevance to travel characteristics by mode'.*

The broad objectives of the Research Brief were as follows:

- To explore the relationship between parking provision, accessibility and mode choice for new developments;
- To examine how the level of parking influences and relates to the mode choice;
- To provide advice on parking standards for new developments; and
- To determine appropriate definitions of modal accessibility, appropriate for use in TRICS.

SCOPE OF WORK

The scope of work undertaken included the following:

- Review of national, regional and local policies with regard to accessibility and parking and a literature search to identify relevant research and to determine the availability of models and data appropriate for use in this project;
- Review of information contained in the TRICS database of relevance to this study including TRICS multi-modal sites;
- Selection of main parameters / key criteria;
- Investigation of key relationships and trends and statistical analysis to establish empirical relationships and correlations between different data sets and criteria;
- Review of alternative approaches at selected local authorities to setting parking standards at new developments.

POLICY BACKGROUND

The need for parking restraint is well recognised in Central Government Guidance:

- The 1997 Transport White Paper identified the need for restraint and required local authorities to set targets for future traffic levels;
- PPG13 established the framework for the adoption of maximum standards by Regional Planning Bodies and local authorities;

- The latest guidance seeks to minimise the level of parking associated with new developments through the adoption of maximum standards and through lower provision in locations more accessible by sustainable modes;

- Various local authorities are developing their own methods for determining parking standards based upon location, accessibility and other criteria.

One of the key concepts of the National Planning Policy Guidance is accessibility. Guidance on accessibility is given with the aim of encouraging development in areas that have high accessibility by non-car modes and improving public transport, walking and cycling facilities where accessibility is lower. The intention of targeting development according to accessibility is also designed to achieve changes in travel patterns, particularly a reduction in car use.

ACCESSIBILITY

A number of local authorities are using accessibility models to identify where parking restraint will be applied. Some such as Hertfordshire are based on complex matrix based approaches with a range of weighted criteria. Others rely on locally developed public transport accessibility models and local knowledge to assist in the process of identifying core areas where reduced parking would be sought.

This study considers local accessibility, assessing both user accessibility *to* the available transport networks, and user accessibility *through* the available transport networks.

A review of the main alternative approaches to measuring accessibility was undertaken, identifying the accessibility techniques and the accessibility software that are currently available and most widely used. Of the wide range of accessibility models and measures available, the TRICS Catchment Population Method and the Public Transport Accessibility Level (PTAL) were concluded to be most appropriate in the context of this research brief:

- The TRICS catchment population method defines accessibility in terms of the relevant catchment populations that can be reached within a set travel time by different modes of transport;

- PTAL was developed by the London Borough of Hammersmith and Fulham to measure accessibility to the local public transport network.

SELECTION OF MAIN PARAMETERS / KEY CRITERIA

Modal choice is arguably the single most important element in transport planning and policy making. A whole range of diverse factors influence modal split. Key overriding parameters are likely to include:

- Site location;

- Key site characteristics;

- Accessibility; and

- Parking provision and restraint.

Key criteria were identified within each of these parameters for the purposes of exploring the relationships between location, accessibility and modal split.

DATA LIMITATIONS

In interpreting the results of the study it is important to recognise the limitations of the dataset that has been analysed. These include the following:

- The site selection process focussed upon the multi-modal sites in the TRICS database, with only 18 sites selected covering business land uses (B1, B2 and B8);
- The selected sites covered a wide variety of geographical locations. Accordingly a wide variety of individual site characteristics and local policies are likely to influence the results;
- The TRICS modal split surveys are based on 'observed' movements into and out of each site, which may lead to discrepancies where the last leg of a journey is made by foot, but the car or public transport has been the main mode of travel.

ANALYSIS OF RESULTS

A detailed spreadsheet analysis model was developed which included the main parameters and key criteria for each selected site. Key findings included the following:

- Site location was found to be the key overriding parameter, showing statistically significant relationships with almost all key parameters and selected criteria;
- A strong relationship was identified between public transport accessibility (as derived by PTAL) and modal split;
- Relationships between population catchment measures of accessibility and modal split were less conclusive but there was a relationship identified between the walk catchment populations and the proportion of employees walking to work;
- No strong relationship was identified between car ownership / car availability and modal split;
- Average mode split for all 18 sites indicated 78 percent of employees travelling by private car and 22 percent travelling by sustainable modes (pedestrians, cyclists, public transport users).

CONCLUSIONS

The results of the study have identified a high level of correlation between public transport accessibility level, as identified through the PTAL approach and modal split. The results for the catchment population method were less conclusive but indicated a relationship between the numbers of employees walking to work, and the walk population catchment.

The results of the study have confirmed that a whole range of key criteria influence modal split, aside from parking and public transport accessibility. The vast majority of these key criteria relate to the accessibility of the site, by whatever mode, with the location of the site being the key overriding parameter.

The common factor in all approaches to determining parking policy is the application of local knowledge, which has the effect of ensuring that the parking standards are suitable for the particular area for which they were designed.

However, this frequently makes the strategies inappropriate for use in other locations. The need to be able to regulate parking standards to take account of any special / localised factors means that it is difficult to find an approach that is universally acceptable. There are however a number of key issues that should be taken into account when determining parking standards and policy. These may be defined as follows:

- Location – The definition of 'zones' in which different parking standards are employed is, perhaps, the issue that is most reliant on local knowledge. Consequently, the methodology for defining zone boundaries, and the parking standard(s) that will apply within each zone, will vary from area to area. Nevertheless, there are a number of common indicators that are likely to influence where the most stringent parking standards are applied, including proximity to shopping / town centres, community facilities, and major transport termini and interchanges;

- Accessibility – The current approaches to setting parking standards that use accessibility tend to concentrate on public transport accessibility, since travel by public transport is seen as the closest surrogate for travel by private car. However, examination of accessibility by all modes is recommended, since it may indicate significant potential to transfer trips from private car to cycling and walking as well as public transport – particularly in urban areas;

- Economic and Social Issues – In some circumstances the characteristics of an particular area may support the use of stringent parking standards, but local authorities have chosen to relax standards to attract new development in to areas that need an economic and/or social boost. Parking policy should be framed with these economic and social aims in mind;

- Mode Split – Examination of mode split data from similar sites in the same area is likely to give a good indication of the mode split that can be achieved at a new development. Parking standards should be set such that the required mode split is both realistic and attainable;

- Catchment Populations – Assessment of the density and distribution of the population around a new development will give an indication of where employees are most likely to travel from and, depending on distance and availability, what their main mode of transport is likely to be;

- Local Parking Restraint – The application of rigorous parking standards at new developments is unlikely to be effective in reducing travel by private car if they are not coupled with similarly strict parking controls in the surrounding area. Thus, the parking standards applied must be appropriate to the level of parking restraint and availability of parking in the locality of the development.

RECOMMENDATIONS

Specific recommendations with regard to the enhancement of the TRICS database include:

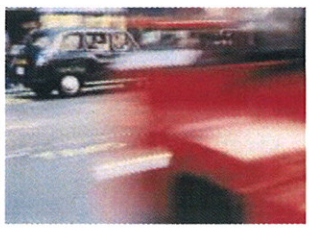
- Inclusion of an additional site location classification in the TRICS database, based on a small number of general site location categories;

- Development of a new section of TRICS specifically concerned with parking provision and restraint;

- Improvements to the current process for collecting data with regard to on and off-site parking, including a more rigorous and structured appraisal of off-site parking and restraint;

- Development of the existing accessibility section of the TRICS database to include additional information about public transport services, a PTAL measure of accessibility and catchment populations for walking, cycling and private car use.

1 INTRODUCTION



1 Introduction

1.1 BACKGROUND

TRICS commissions and undertakes research in areas directly related to the use and understanding of its trip rate database. The objective of such research is to support and complement the application of TRICS in development-related projects. In 2001 a TRICS Research Forum was established to look into future TRICS Research projects. A number of key areas were identified with a view to commissioning future research work. From 1999 onwards TRICS has been adding multi-modal travel data to the database and research projects were identified that either utilise this information or complement its application.

PPG13 (Transport) notes that the availability of car parking has a major influence on the means of transport people choose for their journeys. The levels of parking may be more significant than levels of public transport provision in determining mode choice. Reducing the amount of parking in new developments is essential to promote sustainable travel choices.

FaberMaunsell have been commissioned to undertake TRICS Research Brief No 1, which is to explore the relationship between accessibility and parking for new developments.

1.2 RESEARCH OBJECTIVES

The broad objectives of TRICS Research Brief 1 are as follows:

- To explore the relationship between parking provision, accessibility and mode choice for new developments;
- To examine how the level of parking influences and relates to the mode choice;
- To provide advice on parking standards for new developments; and
- To determine appropriate definitions of modal accessibility, appropriate for use in TRICS.

Specifically the research topic is as follows:

> 'Examination of the variation in levels of parking provision within new developments, for example by public transport accessibility or location, and relevance to travel characteristics by mode'.

1.3 SCOPE OF WORK

The scope of work undertaken included the following:

- Project Inception – to confirm study methodology, study programme and timetable;
- Review of national, regional and local policies with regard to accessibility and parking, and a literature search to establish relevant recent research and to determine the availability of models and data for use in the project;
- Review of alternative models currently available to measure accessibility;
- Review of existing alternative approaches to setting parking standards at new developments was also undertaken, utilising the excellent contacts that would be possible though the TRICS Consortium;

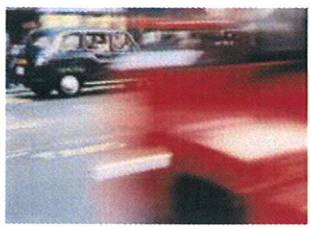
- A thorough review of the information contained in the current TRICS database of relevance to this study was undertaken, including the new multi-modal sites;
- Selection of main parameters / key criteria for the analysis stage;
- Development of an appropriate accessibility model;
- The development of a detailed spreadsheet model to explore the relationship between site location details, parking and accessibility, and the other identified main parameters and key criteria;
- The identification of significant trends and detailed statistical analysis to establish empirical relationships and correlations between different data sets and criteria;
- A brief review of alternative approaches used by selected local authorities to set parking standards at new developments in light of the key findings of our analysis.

1.4 CONTENTS OF THIS REPORT

Following this introduction, section 2 reviews existing parking policy and parking standards, and section 3 examines the various methods available for measuring accessibility. Section 4 considers the selection of main parameters and key criteria influencing accessibility, parking and modal split.

Section 5 summarises the data collected from the TRICS database, and any data obtained from alternative sources, as well as describing the sites selected for use in the study. Section 6 summarises the data analysis process, with the relationships between parking, accessibility and modal split investigated, and the key trends identified. The conclusions are presented in section 7 together with a review of emerging approaches to setting parking standards at new developments. The recommendations of this study are set out in section 8, and a research bibliography is included in section 9.

2 PARKING



2 Parking Standards

2.1 NATIONAL POLICY & GUIDANCE

The majority of national policy guidance on parking standards can be found in the series of Planning Policy Guidance (PPG) documents issued by the DETR / DTLR. Of these, 'PPG3: Housing' and 'PPG13: Transport' are of most relevance to the determination of parking standards.

PPG3 is specifically concerned with planning issues relating to residential developments, promoting parking policies that are 'framed with good design in mind, recognising that car ownership varies with income, age, household type, and the type of housing and its location' (Paragraph 60, PPG3). The rigid enforcement of car parking standards as a minimum requirement at residential developments is criticised, noting that 'developers should not be required to provide more car parking than they or potential occupiers might want, nor to provide off-street parking when there is no need' (Paragraph 60, PPG3). Local Authorities are advised to alter standards in order to reduce parking provision at highly accessible locations such as town centres, where residents are likely to have a lower parking demand, or when sufficient off-street parking cannot be easily designed into building schemes that involve conversion to residential land-uses. The provision of more than 1.5 off-street parking spaces is considered contrary to the Government's aim of providing 'sustainable residential environments' (Paragraph 62, PPG3), and consequently the acceptance of such policies is not recommended.

PPG13 gives more comprehensive guidance on parking policy, with the aim of using it in conjunction with other policy measures, 'to promote sustainable transport choices and reduce reliance on the car for work and other journeys' (Paragraph 6, PPG13, 2001). Parking provision is one of the major determinants of modal choice for journeys, and has significant costs, both in terms of money and of space, associated with it. With this in mind it is suggested that local authorities should, as part of their Local Transport Plans, aim to adopt parking policies that:

- are co-ordinated with, and complementary to, other transport and planning policies;
- do not require developers to provide more spaces than they deem necessary, except where there may be an unacceptable increase in on-street parking in the locality;
- encourage shared parking between land-uses with complementary parking accumulation profiles;
- do not encourage development in non-town-centre locations where parking policies are less stringent;
- introduce on-street parking controls to reduce parking displacement around areas where on-site parking is being limited;
- provide appropriate levels of cycle and motor cycle parking.

The suggested method for achieving these aims is the implementation of maximum parking standards, and the removal of minimum standards except for disabled parking. A set of maximum standards is suggested for developments exceeding certain size or employment thresholds. However, this does not preclude local authorities from adopting policies that yield lower parking provision, or allowing higher parking provision where there is a demonstrable need.

2.2 REGIONAL POLICY & GUIDANCE

In addition to the parking policy advice given in PPG3 and PPG13, there are a series of Regional Planning Guidance documents for various parts of the UK, which give supplementary guidance on parking standards where appropriate. The majority of these documents advocate adherence to the maximum standards set out in PPG13, although many suggest further action in order to refine parking policy for use in the specific regions they cover. Two notable exceptions are RPG3 and RPG9, guidance for London and the South East respectively, which suggest the implementation of more rigorous parking controls.

RPG9 encourages the setting of maximum parking policies that follow the strategy set out in PPG13, but notes that 'the South East Region exhibits a wide range of social and economic circumstances which necessitates a flexible approach to standard setting at local level' (Paragraph 9.11, RPG9). The proximity of the ROSE (Rest of South East) area to London means that the adoption of more severe parking standards is appropriate in order to ensure an approach that is consistent with the policies of the Outer London boroughs. The key policy guidance points are:

- the adoption of a maximum parking standard in the range 1 space per 30-100 m^2 of gross floor area for B1 (Office) land uses;
- the relaxation of maximum parking standards for employment generating land uses in Outer London from 1 space per 300-600 m^2 to 1 space per 100-600 m^2 to achieve greater consistency with the ROSE area
- the implementation of standards in accordance with the guidelines in PPG13 for all other land uses;
- the potential for the adoption of more rigorous standards where traffic congestion is a key concern;
- the setting of parking standards that complement both the desired level of economic growth and regeneration, and the public transport accessibility levels.

RPG3 focuses on the determination of parking standards that are appropriate for London Boroughs as part of an 'overall strategy to discourage traffic growth and promote modal shift' (Paragraph 6.46, RPG3). The London Boroughs are directed to adopt the maximum standards set out in RPG3 for employment land uses, and derive standards for other specific land uses based upon these figures. The key policy guidance points are:

- the derivation of parking standards based on judgements about current and future public transport accessibility to the area, and existing and future traffic levels;
- the adoption of maximum parking standards for employment land uses of 1 space per 300-600 m^2 GFA for Outer London, 1 space per 600-1000 m^2 GFA for Inner London, and 1 space per 1000-1500 m^2 GFA for Central London;
- the development of strategies that incorporate on-street and off-street parking policies and take account of the policies of neighbouring authorities;
- the giving of priority to short-term parking for shoppers over long term parking for commuters;
- the establishment of parking provision necessary for essential operation purposes in conjunction with other Boroughs and LPAC (London Planning Advisory Committee);

- the reduction of parking provision as public transport accessibility to the area improves.

The Government Office for the South East (GOSE) conducted research into parking standards in the South East in 1998, developing a land use location matrix for use in determining appropriate parking standards. A set of criteria, considering location, accessibility, zone activities, and land uses, were established for classifying zones into one of four categories. Based upon this categorisation, guidance for determining parking standards is given for mixed-use developments, residential developments and other land uses that are potential trip attractors.

2.3 LOCAL AUTHORITY POLICY & GUIDANCE

Using the framework set out in PPG3, PPG13 and the RPG documents local authorities have produced their own parking standards, as part of their Local Transport Plans (LTPs), Unitary Development Plans (UDPs) or as stand-alone documents. In general, these explicitly state the maximum parking standards to be adopted at new (or extended) developments, or the method by which the parking provision can be derived. The policies adopted closely follow those set out in the national and regional guidance, although they are frequently modified for urban centres and other strategic locations to achieve more rigorous parking standards.

Alternative approaches have been developed by a number of local authorities, notably Hertfordshire County Council in their Supplementary Planning Guidance 25 (SPG25); and by Surrey County Council and Hampshire County Council through the development of accessibility models.

The Hertfordshire SPG25 suggests a zonal approach to the setting of parking standards, based upon a weighted scoring system that takes account of zone characteristics such as location, economic health, and accessibility by sustainable transport modes. Using the scoring system it is possible to classify each zone into one of four zone types, which have associated guidance on the percentage of non-operational parking to be provided. Zones falling in the highest category (Zone 1) require developers to provide 0-25% of full parking demand on-site, while zones in the lowest category (Zone 4) require 75-100% of full parking demand to be supplied on-site. Wycombe District Council and Worcester City Council have also used similar zonal approaches to the determination of appropriate parking provision at new developments.

Some local authorities, including Surrey and Hampshire have adopted maximum parking standards that are based upon accessibility. They have developed their own methods of measuring accessibility, which has given them a greater flexibility in setting, and assisting their District Councils in setting, appropriate parking standards. LB Hammersmith and Fulham have also generated standards based upon accessibility. Their approach, more fully discussed later in this section, sets maximum parking standards relative to plot ratios that are determined by measuring public transport accessibility.

2.4 ADDITIONAL GUIDANCE

A number of alternative methods are available for the determination of parking standards, in addition to those already suggested in national, regional and local parking policy guidance.

Mark Valleley et al discuss several methods of standard setting, including capacity based restraint and modal split approaches, in their paper entitled 'The Role of Parking Standards in Sustainable Development'. The capacity assessment approach considers restricting the level of on-site parking in order to ensure that traffic generated by new developments does not cause the local road network capacity to be exceeded. In order to achieve this objective, the level of parking permitted at new developments is constrained below the spare capacity available on the network. This approach is only really appropriate to, and has only been

used for, setting parking standards along key corridors. The London Borough of Hounslow successfully applied this approach on a 5-mile section the A4, but no authority has been able to utilise this approach on an area wide basis. The modal split approach involves the assessment of the ability of development users to travel by non-car modes. The level of parking provision is based upon the proportions of users who do not need to use cars to access the site, and consequently requires the collection of modal split data for different land use classes and the monitoring of site accessibility in order to determine standards that are appropriate.

The London Planning Advisory Committee (LPAC) suggest a matrix approach to the setting of parking standards in London. Accessibility to developments by modes other than private cars is identified as a key factor in determining how much parking should be provided. In addition, the importance of social and economic factors means that varying levels of restraint are appropriate for Central, Inner and Outer London. A series of matrices are derived for different land uses, which express the maximum parking standard relative to the Gross Floor Area, depending on accessibility and the level of restraint required. Accessibility by non-car modes is measured by the LB Hammersmith and Fulham PTAL method, expressed in 6 tiers from low to high accessibility. The parking restraint level varies from demand standard (A) where all parking requirements are met on site, to rigorous restraint (F) where a minimum level parking is provided on-site. This approach is currently only suggested for employment land-uses although research is being conducted into the potential for extending the method to encompass residential, leisure and retail land uses. The LPAC matrix method has several potential weaknesses, not least the likely preference of developers to locate in areas of lower accessibility in order to secure higher on-site parking provision. This is contrary to national guidance, which seeks to implement restraint-based policies without disadvantaging town centre areas where accessibility is highest.

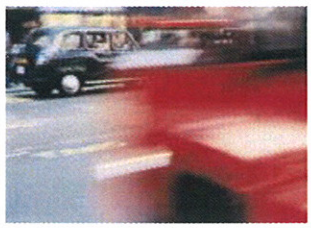
These problems are overcome to some extent by the refined PTAL method set out by LB Hammersmith and Fulham. This uses plot ratios, associated with the six levels of public transport accessibility, to define the developable floor space relative to the level of on-site parking provision and vice-versa. The level of parking is set at 1 space per 600 m^2 of net site area for B1 business use. The application of the plot ratios based upon this standard allow a much higher density of development per parking space in highly accessible areas than in areas that are relatively inaccessible. This method is further improved with the introduction of variable parking standards that are applied relative to the severity of parking restraint required.

2.5 RESEARCH INTO PARKING STANDARDS

TRICS published research into parking demand and parking standards in 1992, based on parking demand surveys for several different land uses, including offices, business parks and general industrial sites. The research compared the 85th percentile parking demand standards, derived from the survey data for each of the land uses, with the standards adopted by Surrey County Council. The comparison showed good correlation between demand and provision for retail and office land uses, but there appeared to be an over-provision of parking spaces at business parks and industrial sites. Further TRICS research, into trip rate variation, in 1999 also noted the over-provision of parking at many land uses, including office and business park sites.

A research study into accessibility standards for the South West Regional Planning Conference advocates a reduction in the use of maximum parking standards, in favour of policies that only provide parking spaces for those trips that cannot be made using non-car modes. Developers would be asked to provide measures to ensure that accessibility to their sites using non-car modes rose above certain minimum threshold levels, before the site would be deemed suitable for development. A set of maximum parking standards would still be adopted, particularly for use at locations where accessibility cannot easily be determined or where other factors, in addition to accessibility, are key.

3 ACCESSIBILITY



3 Accessibility

3.1 DEFINING ACCESSIBILITY

Accessibility can be defined in many ways, split into many different types and measured using many different methods. It is necessary, therefore, to define what is meant by accessibility in the context of this research brief.

The aspect of accessibility considered in this brief is best described as local accessibility. Local accessibility considers transport services and networks that exist within a defined catchment area around a particular location. The catchment area can be defined in many ways, for example by travel time or travel distance, and its size will depend on the mode or modes of transport considered in the accessibility assessment. The assessment of local accessibility requires the measurement of both user accessibility *to* the transport networks and user accessibility *through* the networks.

There is a wealth of research into accessibility, but the methods and models identified in this section are particularly appropriate to the concept of local accessibility.

3.2 MEASURING ACCESSIBILITY

Accessibility measures the ability to access 'opportunities' using the available transport services. The exact nature of the 'opportunities' depends on the type of accessibility that is being measured. Most transport accessibility measures can be defined as one of three basic types (pp 9-11, Halden et al):

- Simple methods;
- Opportunity methods;
- Value methods.

3.2.1 Simple Methods

Simple methods consider the number of 'opportunities' that can be reached within a fixed threshold. Some typical examples of this type of accessibility measure are:

- Catchment indices;
- Network access measures;
- Peripherality indices;
- Geographic measures.

Catchment indices count the number of people, jobs, shops or any other type of 'opportunity' that lie within a fixed catchment around a particular location. The catchment is usually, although not exclusively, defined by travel time, travel distance or travel cost. The accessibility index is derived by comparing the catchment 'opportunity' populations that can be reached from alternative locations, or using alternative modes of transport. The simplicity of the approach and its wide range of uses mean that this type of accessibility measure is frequently used in development and transport planning.

Network access measures are similar to catchment indices, but consider accessibility to, rather than through, transport networks. The 'opportunities' are no longer defined as people or jobs, but as access points to the transport network such as roads, footpaths, bus stops and rail stations. Accessibility is measured in terms of the number of access points that can be reached within a fixed walk

catchment, and generally includes some notion of service frequency and reliability. Again, the popularity of this approach is mainly due to its simplicity.

Peripherality indices measure the cost, in terms of money, time or distance, to reach particular types of 'opportunity' such as hospitals, schools or urban centres. This gives some indication of the proximity of a particular location to key trip attractors and generators.

Geographic measures consider the number of opportunities that exist within a limited travel time catchment. This approach has useful applications in logistics, but can also be used for other accessibility applications.

3.2.2 Opportunity Measures

Accessibility measurements based upon this approach will consider all available 'opportunities', weighting them according to the ease with which the 'opportunity' can be reached. The weighting given to each 'opportunity' will be determined by a deterrence function based upon some measure of ease of access. Deterrence functions are often based upon cost, distance or time, with the exact form of the function dependent on the transport network and transport mode being considered. Three main types of opportunity measure exist:

- Hansen indices;
- Shimbel measures;
- "Economic Potential" measures.

Hansen methods are essentially the same as the simple measures, except they do not include thresholds that limit the number of opportunities that are considered in the accessibility calculation.

Shimbel measures are a specific type of Hansen indices, where all opportunities are given equal weighting and the accessibility measure is merely the sum of the cost of reaching each of the opportunities, expressed in terms of money, time or distance.

Hansen indices that consider accessibility in terms of regional incomes and travel distance are sometimes referred to as "Economic Potential" measures.

3.2.3 Value measures

Value measures may be generally quantified as utility-based measures of accessibility. They consider the additional value of new opportunities to individual or groups of users. The addition of a new opportunity will have significant value when relatively few similar opportunities exist, but will be value-less if there are a significant number of similar opportunities.

3.3 NATIONAL POLICY & GUIDANCE

One of the key concepts of the Government Planning Policy Guidance (PPG) documents is accessibility, outlining the Government's objective of ensuring that housing, jobs, and community services and facilities are accessible by sustainable transport modes as well as by private car. Guidance on accessibility is given with the aim of encouraging development in areas that have high accessibility by non-car modes, and improving public transport and walking and cycling facilities where accessibility is lower. The intention of targeting development according to accessibility is also designed to achieve changes in travel patterns, particularly a reduction in car use.

PPG13 identifies accessibility measurement as 'a valuable tool in planning for new developments and encouraging transport choices' (Paragraph 3.09, PPG13, 1994). The TRICS catchment area approach and the LB Hammersmith and Fulham are

both identified as case studies for the use of accessibility measurement tools in policy making, emphasising the importance of accessibility in determining development characteristics such as scale and density, catchment area, and transport service provision and integration.

3.4 REGIONAL POLICY & GUIDANCE

The guidance given in the RPG documents further develops the Government aims set out in PPG13. Many of the guidance documents highlight the need to promote public transport and develop walking and cycling facilities in order to improve accessibility by non-car modes. The guidance issued for London outlines the importance of public transport accessibility, aiming to improve both the attractiveness and viability of all public transport. The integration of transport services is also encouraged, along with the provision of on-site facilities to promote sustainable travel at new developments.

3.5 LOCAL POLICY & GUIDANCE

A number of local authorities have adopted policies based upon accessibility measurement. The setting of parking standards related to accessibility is not uncommon, and some local authorities have extended accessibility modelling and assessment to aid with setting other transport and planning policies – particularly for sustainable travel and development planning and control.

3.6 REVIEW OF ALTERNATIVE APPROACHES TO MEASURING ACCESIBILITY

A review of the major approaches to measuring accessibility was conducted, identifying the accessibility modelling techniques and the accessibility software that are currently available and most widely used. Some of the approaches considered are not suited to the requirements of this research brief, because they have been designed for a specific purpose (Surrey and Hants PTAMs), or are region specific (LT CAPITAL Model), or have incompatible data needs (Dutch ABC Approach).

A brief overview of the most suitable accessibility modelling approaches and software packages in the context of this research brief is given in the following sections.

3.6.1 Alternative Approaches / Models

Of the accessibility measuring techniques previously considered, the following approaches are thought to be most useful starting point for the development of a new accessibility model:

- TRICS Catchment Population Method;
- Public Transport Accessibility Level (PTAL);
- TRANSAM;
- Potential Accessibility Index (PAI).

3.6.1.1 TRICS Catchment Population Method

The TRICS catchment population method defines accessibility in terms of relative catchment populations that can be reached within a set travel time by different modes of transport. The 45-minute catchment populations are compared for travel by private transport and travel by public transport, with the ratio giving an indication of modal choice. Previous TRICS/SERPLAN research into parking and public transport and the effect upon mode choice at B1 developments in 1993 and 1995, found that public transport usage was broadly of the same order as relative public transport accessibility measured using this method.

This approach is relatively simple, with limited data requirements beyond the definition of the catchment populations. It can be easily be extended to included additional modes of transport through the calculation of additional mode specific catchment populations. The method is likely to be time-consuming if catchment population calculations are conducted manually, but the calculation process lends itself to some form of automation.

3.6.1.2 Public Transport Accessibility Level (PTAL)

The London Borough of Hammersmith and Fulham have developed the Public Transport Accessibility Level (PTAL) approach to measure accessibility to the local public transport network. An 'Accessibility Index' (AI) can be derived for a particular location based upon the number of public transport services available within designated walk-time catchments, and service frequency and reliability characteristics. The AI scores fall within one of six PTALs, defining accessibility from low (1) to high (6). The method can be used to assess accessibility at a single location, but is more commonly used to generate contour maps showing area wide variation in accessibility to public transport. The PTAL method has some merits, but also a number of shortcomings – not least that it is best suited to urban areas with dense public transport networks.

Despite these problems of application, the theory behind PTAL is well developed and documented, and it is still a useful measure of public transport accessibility. It may be possible to extend this type of approach to cover other modes of transport and thus formulate a more universal measure of site accessibility. It should also be relatively easy to match the data requirements of such a model with the data collection process for TRICS multi-modal sites.

3.6.1.3 TRANSAM

TRANSAM (Transport Accessibility Modelling) was developed as a customised geographic information system (GIS), capable of modelling not only public transport accessibility, but accessibility by a wider range of transport modes. The model utilises datasets such as OSCAR and Meridian from Ordnance Survey in association with other accessibility measures to produce travel time contours for individual modes of transport, or journeys using a combination of modes. The ability to model journeys from origin to destination by a variety of modes of transport, allows the TRANSAM method to take account of service suitability as well as service proximity in calculating accessibility.

While the TRANSAM approach gives a 'complete' picture of accessibility, it does not cover the whole of the UK. The models are built on a client-by-client basis, reflecting individual needs and demands. Consequently, the cost of developing a TRANSAM model to cover TRICS sites (present and future) and the large data requirements are unlikely to fit the scope of this research.

3.6.1.4 Potential Accessibility Index (PAI)

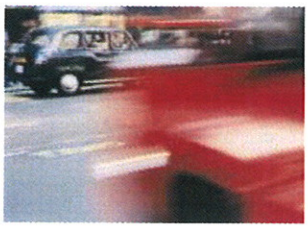
The PAI approach, suggested in the Accessibility Standards Study Report for the South West Regional Planning Conference, includes separate indices for residential and non-residential land-uses. The PAI for residential developments measures the 'facilities catchment' based upon a hierarchy of services and facilities that are deemed important. The PAI for non-residential developments is based upon catchment population methods, calculating the ratio of populations for those that can access a site using sustainable modes with those who can only gain access using a car. The suitability of a site for development will be determined by its PAI score, with local authorities developing policy in relation to PAI benchmarks, and developers seeking or being required to improve access by sustainable modes so that development can proceed at a particular location or the permitted development density can be improved.

This approach is similar to the TRICS Catchment Population method, although it has the advantage of being extended to cover a range of land use classes, including residential.

3.7 SOFTWARE MODELS

A number of software packages were also reviewed. It is not envisaged that any of these packages would be of benefit to this research project.

4 SELECTION OF MAIN PARAMETERS/KEY CRITERIA



4 Selection of Main Parameters / Key Criteria

4.1 PARAMETERS INFLUENCING MODAL CHOICE

A whole range of diverse factors will have an influence upon the modal choice of trips made to and from a particular site. These parameters may be split into several distinct categories:

- Characteristics of the trip maker;
- Characteristics of the journey;
- Site locations details;
- Accessibility by private car, public transport and other modes; and
- Parking provision and level of restraint in the surrounding area.

There are clearly many factors within each of these categories that will have some degree of influence on modal split, but the key overriding parameters are likely to include the following:

- Location of the site;
- Land Use / Site Characteristics;
- Accessibility;
- Parking Provision.

In exploring the relationship between accessibility, modal split and parking, it is essential to consider these main parameters, and as such the overriding parameters identified above are considered in more detail in the following sections. However, it is also important to remember that there may be unique and localised factors which may also have an important influence on mode choice.

Location of the Site

It is important to draw a distinction between sites in 'core' urban areas and those in other built up or rural areas.

In the core areas there is considerable experience of policies that can reduce or limit the levels of private car users such as parking controls, including controlled parking zones and restricted on-site parking, and public transport improvements.

However, very little restraint is currently being imposed on most private car users, outside the 'core' urban areas. In these areas, the use of the private car is not usually deterred by congestion and parking control as it is in the core urban areas. In a number of non-core areas, it must be recognised that, for many people, no alternative to the car will ever be attractive unless there is major public transport investment and draconian parking restraint.

The TRICS database currently categorises sites by eight classifications, namely; town centre, edge of town centre, neighbourhood centre, suburban area, edge of town, free standing, industrial zone and commercial zone.

These classifications were considered too specific for the purposes of this study. Accordingly selected sites have been re-categorised according to the following broader classifications for site location:

- Town Centre Core;
- Town Centre;
- Edge of Town / Out of Town.

The TRICS database includes estimates of the resident population within 1 and 5 miles of each site.

Land Use / Site Characteristics

In exploring relationships affecting parking, accessibility and mode choice, all multi modal-modal sites for commercial developments have been grouped together. The vast majority of the new multi-modal sites are B1 use, with 3 B2 sites and 1 B8 site out of the 18 sites.

For all of these sites information is provided on the database with regard to site area, gross floor area and number of employees. Accordingly it is possible to derive key parameters such as the following:

- Employment density;
- Plot ratio.

Accessibility

Accessibility is a key concept of PPG13. To help in determining parking standards and the need for improved public transport infrastructure at new developments, a standard method of measuring accessibility would be of great help to local authorities, consultants and developers.

Recent alternative methods of measuring accessibility include the following:

- Public Transport Accessibility Level (PTAL) system developed by the LB Hammersmith and Fulham;
- TRICS catchment population ratio;
- Potential Accessibility Index method.

All of these methods are principally concerned with the accessibility of a particular location or area by public transport, although it is possible to make some inference about accessibility by non-sustainable modes of transport using the latter two methodologies. However, when assessing the accessibility of a site, it is also important to consider the characteristics that influence the accessibility of a site by other modes of transport, such as walking, cycling and private car.

In addition to the site information available from the TRICS database, further data has been collected from various different sources. Catchment population data has been estimated using ward level data from the 1991 Census, obtained from the Office of National Statistics for England, Wales and Scotland. The census data obtained includes the following datasets:

- Resident population (by ward);
- Number of residents in permanent households (by ward);
- Number of permanent households (by ward);
- Number of economically active residents aged 16 or over (by ward);
- Number of registered cars (by ward).

Data relating to bus and rail services around each site was obtained from a variety of sources, including local timetables, regional travel websites and telephone information services. Limited car ownership information in the surrounding area was available from the TRICS database for each site.

Parking Provision

Current national guidance seeks Local Authorities to adopt restrictive standards for off-street parking at new developments in order to reduce the demand and requirement for parking where access to public transport is good. By linking parking provision to sustainable transport policy objectives, the guidance seeks to stabilise or even reduce future traffic growth, rather than following a demand led approach. A common problem with this approach to setting parking standards is that Local Authorities may be willing to relax their standards in order to attract inward investment.

In the context of this study, the following parking related issues are important:

- The level of parking provision relative to gross floor area and the number of employees at each site;
- The extent to which off-site parking is restrained, if at all.

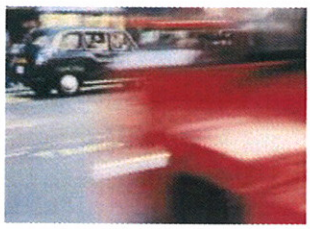
4.2 KEY CRITERIA

Considering the four main parameters identified above, key criteria have been identified within each of these categories for the purpose of exploring the relationship between accessibility, modal split and parking. Table 4.1 below summarises the key criteria within each of these categories, together with the modal split parameter.

Table 4.1 – Main Parameters / Key Criteria

Main Parameters	Key Criteria	Already in TRICS?	Units / Classifications
Site Location	Site Details	Yes	Site Name, Town, County/ Region, Grid Reference
	Location Category	No	Town Centre Core, Town Centre, Edge of Town / Out of Town
	Population Density	Yes	Within 1 mile of site Within 5 miles of site
Key Site Characteristics	Land Use Class	Yes	Standard Use Classes
	Gross Floor Area	Yes	sqm
	Site Area	Yes	hectares and sqm
	Number of Employees	Yes	full and part time
	Employee Density	No	GFA per Employee (sqm)
	Plot Ratio	No	GFA / Site Area
Accessibility	Car Ownership	Yes	Cars per household
	Car Availability	No	Percent of population
	Public Transport Accessibility (PTAL)	No	PTAL Index Score PTAL (Level)
	TRICS Population Catchments	No	Walk Catchment (15 minutes) Cycle Catchment (30 minutes) PT Catchment (45 minutes) Car Catchment (45 minutes) Private:Public Ratio
	Potential Accessibility Index	No	PT Catchment (45 minutes) Car Only Catchment (45 minutes) PT / Car Only
Parking Provision & Restraint	Number of Parking Spaces	Yes	No
	On-site parking provision per Employee	No	Parking Spaces per employee
	On-site parking provision per GFA sqm	No	GFA per parking space, sqm
	Off-site parking restraint	Some	Yes, Some, None
Modal Split	All Modes	Yes	Percent
	Car / Non-Car	Yes	Percent

5 DATA REVIEW & SITE SELECTION



5 Data Review & Site Selection

5.1 TRICS DATA

In assessing the importance of the various main parameters and key criteria, data has been extracted from the TRICS database. The database contains survey data relating to both multi-modal (MM) and non-MM sites. In order to explore in detail the relationship between parking, accessibility and modal split, the site selection process has focussed upon the multi-modal sites contained in the TRICS database.

5.2 SITE SELECTION

The selected sites cover B1 (Office / Light Industrial), B2 (Industrial) and B8 (Warehousing) commercial land use classes. Of these sites, 14 relate to B1 use classes and the remaining 4 sites cover B2 and B8 uses.

Table 5.1 – TRICS Research Brief No 1 – Selected Sites

Site Reference	Site Name	TRICS Reference
B-01	Demeter House, Cambridge	CA-02-A-01
B-02	Fountain Court, Middlesbrough	CL-02-A-01
B-03	Premier House, Kilburn	GL-02-A-17
B-04	District Council Offices, Melton Mowbray	LE-02-A-01
B-05	G.O.S.E., Guildford	SC-02-A-10
B-06	Cambridge Science Park, Cambridge	CA-02-B-01
B-07	Greyfriars Business Park, Stafford	ST-02-B-03
B-08	Fleet House (Dorset Echo), Weymouth	DC-02-C-02
B-09	Durable Business Systems, Wimborne	DC-02-C-03
B-10	Thomas Hardy Brewery, Dorchester	DC-02-C-04
B-11	Friskies Petcare, Barrhead	ER-02-C-01
B-12	Keniston Press Limited, Kilburn	GL-02-C-01
B-13	Laurence Scoot & Electromotors, Norwich	NF-02-C-01
B-14	Muriel Street Industrial Estate, Barrhead	ER-02-D-01
B-15	Spiersbridge Industrial estate, Giffnock	ER-02-D-02
B-16	Boulevard Unit Factory Estate, Hull	KH-02-D-02
B-17	Rashes Green Industrial Estate, East Dereham	NF-02-D-02
B-18	Baillieston Distribution Centre, Glasgow	GC-02-F-01

The location of each of these sites is shown in a national context in Figure 5.1.

5.2.1 SITE DESCRIPTIONS

A brief description of each of the sites listed in Table 5.1 is given below, based upon the information provided in the TRICS database.

B-01 – Demeter House, Cambridge

The site is located on Station Road, to the southeast of the centre of Cambridge, and is currently occupied by the Mott Macdonald Group. The site falls under use class B1, consisting of 4344 sq m (GFA) of office space. Cambridge rail station is around 100 metres to the east of the site, and there is good access to the A1307. There are a mixture of office and residential developments nearby.

B-02 – Fountain Court, Middlesbrough

The site is located just south of the A66 in the centre of Middlesbrough, and is situated around 200 metres to the north of the city centre. The site falls under use class B1, consisting of 4100 sq m (GFA) of office space. There are a mixture of office and residential developments nearby.

B-03 – Premier House, Kilburn

The site is located at Premier Corner, with good access to the local road network and both rail and underground stations close by. The site consists of 19 occupied office suites (B1 land use class) totalling 408 sq m (GFA), which are used by a variety of companies. The surrounding area is largely residential.

B-04 – Council Offices, Melton Mowbray

The site is located on Nottingham Road, to the north of Melton Mowbray town centre, with good access to the A6006. The site is occupied by Melton Mowbray District Council and consists of 4710 sq m (GFA) of office space. The surrounding area consists of a mixture of office, industrial and residential developments.

B-05 – G.O.S.E., Guildford

The site is located on Walnut Tree Close in the heart of Guildford town centre, with good access to the A31, A3100 and A281 as well as being a short walk from Guildford rail station. The site is occupied by the Government Office for the South East, and consists of 4312 sq m (GFA) of office space (B1 land use class). The surrounding area is a mixture of retail and leisure developments.

B-06 – Cambridge Science Park, Cambridge

The site is located on Milton Road towards the northern edge of Cambridge, with good road access to the A1309, A45 and A10. The site consists of 55 individual units that are occupied by a variety of organisations, and is a mixture of light industrial and office uses falling under the B1 land use class. The total GFA of all 5 units is 118448 sq m. The surrounding land is used for a variety of commercial, industrial and agricultural activities.

B-07 – Greyfriars Business Park, Stafford

The site is part of a much larger industrial development on Frank Foley Way, situated close to the town centre, and central ring road giving good access to the local strategic road network. The park consists of a single building comprising 10 separate office units, which total 4064 sq m (GFA) and fall under the B1 land use class.

B-08 – Fleet House (Dorset Echo), Weymouth

The site is situated on Hampshire Road on the western edge of Weymouth, with relatively poor access to the local strategic road network. The site is occupied by the Dorset Echo and used as both a news and print centre, with 3035 sq m (GFA) of office / light industrial space covered by the B1 land use class. The local area is a mixture of office and industrial developments.

B-09 – Durable Business Systems, Wimborne

The site is part of the Ferndown Industrial Estate located on Nimrod Way between Ferndown and Wimborne. The site has easy access to Wimborne Road West, which links Ferndown and Wimborne. The site consists of 1626 sq m (GFA) used for light industrial activities covered by the B1 land use class. The surrounding area is largely undeveloped.

B-10 – Thomas Hardy Brewery, Dorchester

The site is located on Weymouth Avenue in the centre of Dorchester, with good access to Dorchester West and Dorchester South rail stations as well as the A35, which bypasses Dorchester to the south. The site consists of 19857 sq m (GFA) of space used for a mixture of office and light industry (B1 land use class). The surrounding area consists of a mixture of retail, leisure and residential developments.

B-11 – Friskies Petcare, Barrhead

The site is located on Glasgow Road on the north-eastern edge of Barrhead, and has good access to the local strategic road network. The site is mainly used for light industry but also contains a small amount of office development, consisting of 22926 sq m (GFA) under the B1 land use class. The surrounding area is partially developed, with residential and industrial/retail land uses.

B-12 – Keniston Press, Kilburn

The site is located on Claremont Road, with good access to the local road network and both rail and underground stations close by. The site is used for light industry (B1 land use class) totalling 620 sq m (GFA. The surrounding area is largely residential.

B-13 – Laurence Scott & Electromotors, Norwich

The site is located on Kerrison Road on the southeastern edge of Norwich, with good access to the local strategic road network and in close proximity to Norwich rail station. The site consists of 32000 sq m (GFA) of general industry (B2 land use class). The surrounding area is partially used, with residential and industrial developments.

B-14 – Muriel Street Industrial Estate

The site is located on Muriel Street close to the centre of Barrhead, and has good access to the M77 and other strategic routes, and is close proximity to Barrhead rail station. The site consists of 11 individual units used for a mixture of light industry and offices (B1 land use class), which comprise 7211 sq m (GFA). The surrounding area is used for a mixture of industrial and residential developments.

B-15 – Spiersbridge Business Park, Giffnock

The site is located on Spiersbridge Avenue, and has good access to the local strategic road network. The site comprises 9 individual units with provide 4233 sq m (GFA) of space, used for a mixture of office and industrial land uses (B1 land use class). The site is surrounded by residential development to the north and east, and other industrial sites to the southwest.

B-16 – Boulevard Unit Factory Estate, Hull

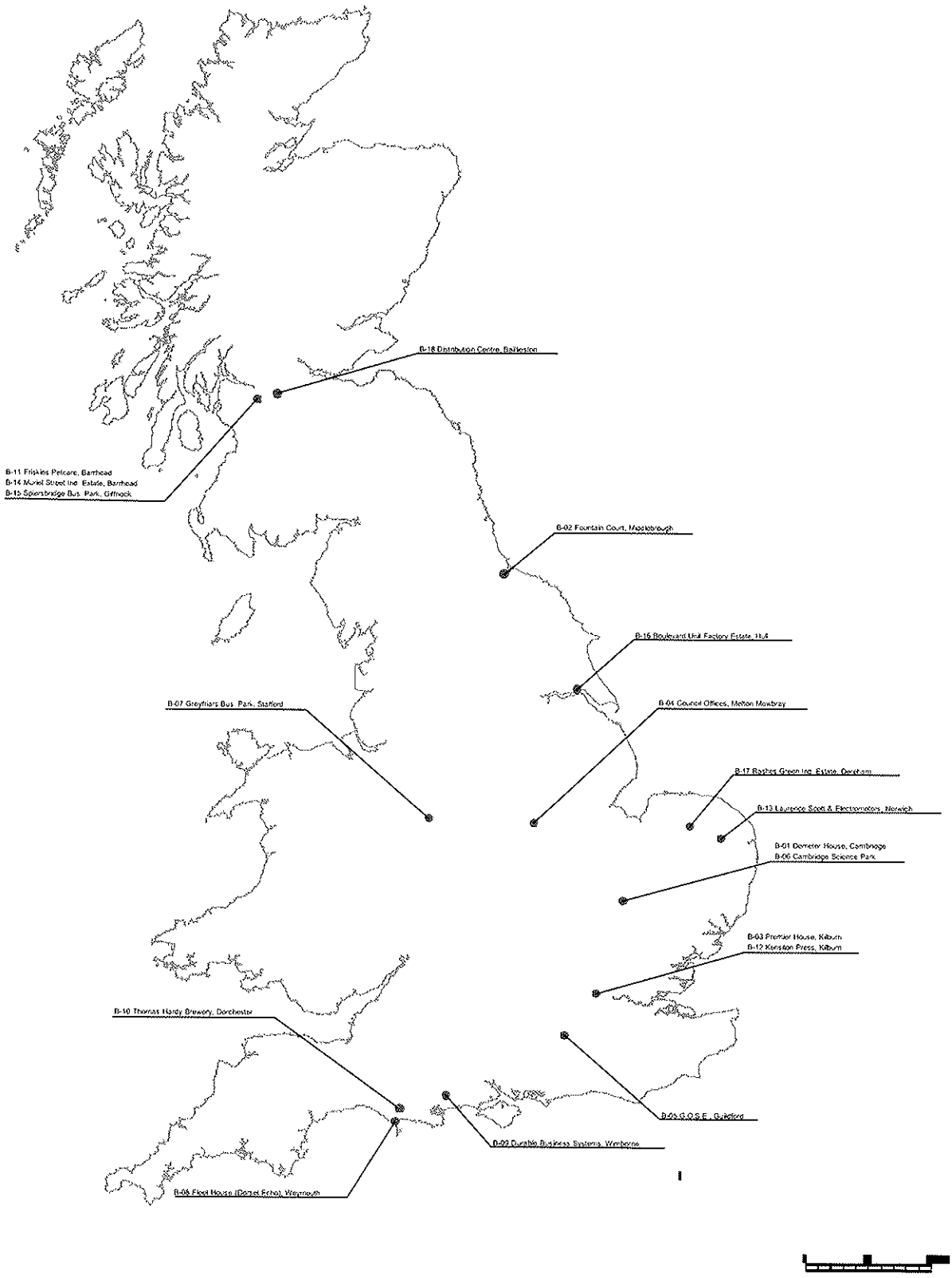
The site is located on Boulevard in an industrial zone to the southwest of central Hull, and a short distance from the A63, which provides good access to the centre of Hull and to the wider strategic road network. The site consists of 27 individual units that are a mixture of light industrial units and offices (B1 land use class). The surrounding area comprises mainly industrial developments.

B-17 – Rashes Green Industrial Estate, East Dereham

The site is located on Rashes Green in the south of East Dereham, and has good connections to the local strategic road network. The site consists of 71 individual units comprising 51000 sq m (GFA), which are used for a mixture of general industrial (B2) land uses. The surrounding area is a mixture of industrial and residential developments.

B-18 – Baillieston Distribution Centre, Glasgow

The site is located on Barrachnie Road on the eastern edge of Glasgow, and has good road links to the A8 and A89 and a rail station a short walk away. The site comprises 17 individual units used for a mixture of office, light industry and warehousing. The units total 11504 sq m (GFA) and fall under B1 and B8 land use classes. The site is largely surrounded by residential development.



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Design: JDW | Date: APR 2002 | Chk'd:	Marlborough House, Upper Marlborough Road St Albans, Herts, AL1 3UT	AutoCAD Location: F:\PROJECTS\T28047\MapInfo-CAD\ | Rev:
Drawn: JDW | Scale: NTS | App'd:	Tel: +44 (0) 20 8784 5784 Fax: +44 (0) 20 8784 5700 www.fabermaunsell.com	No. Figure 5.1
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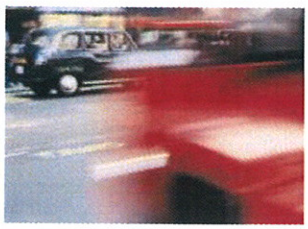
6 ANALYSIS OF RESULTS



6 Analysis of Results

6.1 INTRODUCTION

A detailed spreadsheet model was developed which included the key parameters and criteria for each selected site. The model allowed an exploration of the relationship between site location details, parking and accessibility and the other main parameters and key criteria identified previously.

Key areas of analysis included the impact of the following on mode choice:

- Site location details, including location category and population density;
- Key site characteristics, including land use class, employment (GFA per employee) and plot ratio (volume of development on a site compared to the site area);
- Accessibility, including car ownership and availability, accessibility by mode and relative accessibility;
- Parking provision and restraint, including on-site parking provision per employee and by GFA and level of parking.

Key parameters and details for each site are provided for each of the above in Appendix A. The following section provides a summary of the analysis of these parameters and criteria.

6.2 MODAL SPLIT

The modal split to each site is summarised in Table 6.1. The average for all sites can be summarised as follows:

- Total Private Car – 78 percent
    - Car Driver – 67 percent
    - Car Passenger – 11 percent
- Total Non Car – 22 percent
    - Public Transport – 4 percent
    - Walk – 16 percent
    - Cycle – 2 percent

Table 6.1 – Modal Split by Site Location

Site Name	Percentage Modal Split						
	Private Car			Non Car			
	Driver	Pass	Total	Peds	Cycle	PT	Total
Demeter House, Cambridge	68.1%	10.7%	**78.8%**	11.2%	9.2%	0.8%	**21.2%**
Fountain Court, Middlesbrough	51.7%	0.3%	**52.0%**	39.4%	0.4%	8.2%	**48.0%**
Premier House, Kilburn	43.6%	7.1%	**50.7%**	37.9%	0.0%	11.4%	**49.3%**
District Council Offices, Melton Mowbray	65.2%	8.7%	**73.9%**	22.1%	3.6%	0.4%	**26.1%**
G.O.S.E., Guildford	14.2%	2.4%	**16.6%**	62.7%	1.5%	19.3%	**83.4%**
Cambridge Science Park, Cambridge	82.1%	11.9%	**94.0%**	2.4%	2.5%	1.1%	**6.0%**
Greyfriars Business Park, Stafford	42.8%	44.3%	**87.1%**	11.0%	0.9%	1.1%	**12.9%**
Fleet House (Dorset Echo), Weymouth	77.4%	17.4%	**94.8%**	3.3%	1.2%	0.7%	**5.2%**
Durable Business Systems, Wimborne	92.7%	7.3%	**100.0%**	0.0%	0.0%	0.0%	**0.0%**
Thomas Hardy Brewery, Dorchester	74.4%	0.0%	**74.4%**	23.6%	1.2%	0.8%	**25.6%**
Friskies Petcare, Barrhead	79.6%	13.9%	**93.5%**	5.1%	0.4%	1.0%	**6.5%**
Keniston Press Limited, Kilburn	46.9%	9.5%	**56.4%**	35.2%	0.0%	8.4%	**43.6%**
Laurence Scoot & Electromotors, Norwich	71.7%	13.4%	**85.1%**	7.8%	5.5%	1.6%	**14.9%**
Muriel Street Industrial Estate, Barrhead	83.3%	8.6%	**91.9%**	6.2%	0.2%	1.7%	**8.1%**
Spiersbridge Industrial Estate, Giffnock	77.3%	11.0%	**88.3%**	8.1%	0.4%	3.1%	**11.7%**
Boulevard Unit Factory Estate, Hull	86.7%	9.8%	**96.5%**	2.9%	0.6%	0.0%	**3.5%**
Rashes Green Industrial Estate, East Dereham	74.1%	13.3%	**87.4%**	3.5%	4.5%	4.6%	**12.6%**
Baillieston Distribution Centre, Glasgow	74.9%	15.2%	**90.1%**	7.5%	0.4%	2.0%	**9.9%**

6.2.1 National Statistics Data: Journey to Work

The DTLR regularly issue regional statistics bulletins, which provides data on a variety of aspects of transport and travel, including statistics about journey to work. The most recent bulletin, issued in November 2001, contains information about the main mode of travel to work for various regions of the UK. The modal split statistics given in the bulletin are summarised in Table 6.2 below. The average mode split for Great Britain can be summarised as follows:

- Total Private Car – 71 percent;
- Total Non Car – 29 percent.

This indicates that a slightly higher proportion of trips are made by non-car modes than the data from the 18 TRICS sites indicates. The major difference is that public transport accounts for a far greater number of journey to work trips – 14% compared to 4% - while walking only accounts for 11% of trips compared to an estimated 16% share at the TRICS sites.

Table 6.2 – Journey to Work: Modal Split

Region	Main Mode of Transport			
	Walk	Cycle	Private Transport	Public Transport
ENGLAND	11%	4%	71%	14%
North East	12%	2%	71%	14%
North West	10%	3%	77%	10%
Yorks. & The Humber	12%	4%	71%	13%
East Midlands	12%	5%	75%	7%
West Midlands	10%	3%	77%	9%
East of England	11%	5%	77%	6%
London	9%	2%	44%	43%
South East	11%	4%	77%	7%
South West	13%	4%	77%	5%
SCOTLAND	11%	2%	68%	17%
WALES	10%	2%	79%	6%
GREAT BRITAIN	11%	3%	71%	14%

Source: Table 1.9, Regional Transport Statistics, DTLR Statistics Bulletin (01) 21, November 2001

This discrepancy may be a result of the limited dataset considered, but may also be indicative of problems with the survey methods used to collect modal split data for the TRICS multi-modal sites. It is understood that the surveys are based on 'observed' movements into and out of the site, rather than being questionnaire based, which leads to problems accounting for people who park in the surrounding area, away from the immediate vicinity of the site, and walk into the site, and people whose main mode is public transport, but make the last stage of their journey on foot.

6.3 SITE LOCATION

Sites were categorised according to the following broad locational categories:

- Town centre core;
- Town centre; and
- Edge of town / Out of town.

A summary of average modal split by location category is provided in Table 6.3. The average modal split in terms of car / non car modes is as follows:

- Town centre core – 44 percent car, 56 percent non car;
- Town Centre – 87 percent car, 13 percent non car; and
- Edge of Town / Out of Town – 90 percent car, 10 percent non car.

As expected, car use is greatest outside the core town centre areas, decreasing in the town centre core areas. Conversely, sustainable modes such as walking and public transport are highest in the town centre core areas. The level of cycling appears to be largely independent of site location. In terms of average modal split there is little difference between those site classified as town centre, but outside the core area, and edge of town / out of town sites.

The range in modal split for each locational category is provided in Table 6.4.

Table 6.3 – Average Modal Split by Location Category

Location Type	No. of Sites	Percentage Modal Split by Car			Percentage Modal Split by Non-Car Modes			
		Driver	Pass	Total	PT	Walk	Cycle	Total
Town Centre Core	4	39	5	44	12	44	1	56
Town Centre	8	77	10	87	2	9	2	13
Edge/Out of Town	6	72	17	90	1	7	2	10
All Sites	18	67	11	78	4	16	2	22

Table 6.4 – Variation in Modal Split by Location Category

Location Type	Modal Split by Private Car			Modal Split by Non Car Modes		
	Min	Max	Average	Min	Max	Average
Town Centre Core	17	56	44	48	84	56
Town Centre	74	97	87	3	26	13
Edge/Out of Town	74	100	90	0	26	10
All Sites	17	100	78	0	84	22

A summary of the extent to which population density varies by site location category is provided in Table 6.5. The majority of sites have a population density within 1 mile of between 15,000 and 25,000, although three quarters of the town centre core sites and a quarter of the town centre sites have a higher population density and a third of the non-town centre sites have a lower population density. Population densities within 5 miles of the sites vary between 25,000 and more than 500,000.

The average modal split by population density within a mile of the site is summarised in Table 6.6.

Table 6.5 – Population Density with 1 and 5 miles, by Location Category

Location Type	No. of Sites	Number of Sites with a Population Density within 1 mile			Number of Sites with a Population Density within 5 miles			
		Less than 15k	15 to 25k	More than 25k	Less than 50k	50 to 100k	100 to 250k	More than 250k
Town Centre Core	4	0	1	3	0	0	1	3
Town Centre	8	0	6	2	1	1	2	5
Edge/Out of Town	6	2	4	0	2	2	2	0
All Sites	18	2	11	5	3	3	5	8

Table 6.6 – Average Modal Split by Population Density with 1 mile

Population Density	No. of Sites	Percentage Modal Split by Car			Percentage Modal Split by Non-Car Modes			
		Driver	Pass.	Total	PT	Walk	Cycle	Total
1,001 – 5,000	1	92.7	7.3	100.0	0.0	0.0	0.0	0.0
5,001 – 10,000	0	-	-	-	-	-	-	-
10,001 – 15,000	1	74.1	13.3	87.4	4.6	3.5	4.5	12.6
15,001 – 20,000	9	67.3	13.0	80.3	2.9	15.5	1.3	19.7
20,001 – 25,000	2	74.5	12.2	86.7	2.4	7.9	3.0	13.3
25,001 – 50,000	3	64.9	8.7	73.6	3.7	19.4	3.3	26.4
50,001 – 100,000	2	45.3	8.3	53.6	9.9	36.6	0.0	46.4
All Sites	18	67.0	11.4	78.4	3.7	16.1	1.8	21.6

6.4 KEY SITE CHARACTERISTICS AND MODAL SPLIT

The following key site characteristics are provided for each site, by location category, in Appendix A2:

- Land Use Class
- Gross Floor Area (sqm);
- Site Area (hectares);
- Number of employees (full and part time);
- Employment density (GFA per employee, sqm);
- Plot ratio (GFA / site area).

The average employment density and plot ratio are summarised in Table 6.7, by location category with an indication of the range of values between individual sites also provided. There is a considerable variation in both employment density and plot ratio between sites. Key points to note are as follows:

- Employment density varies between 8.2 and 102.4 sqm per employee, with an average of 21.4 sqm per employee in core areas, increasing to 54.6 and 37.7 sqm per employee in the other location categories;
- Plot ratio varies between 2.70 and 0.16 with an average of 1.24 in core areas, 0.56 in town centre areas and 0.27 in edge/out of town locations.

Table 6.7 – Site Characteristics by Location Category

Location Type	Employment Density (GFA per Employee, sqm)			Plot Ratio (GFA / Site Area)		
	Min	Max	Average	Min	Max	Average
Town Centre Core	8.2	41.3	21.4	0.52	2.70	1.24
Town Centre	12.0	102.4	54.6	0.17	2.17	0.56
Edge/Out of Town	17.1	58.1	37.4	0.16	0.53	0.27
All Sites	8.2	102.4	41.4	0.16	2.70	0.61

6.5 ACCESSIBILITY

The following alternative measures of accessibility are provided in Appendix A3:

- Public Transport Accessibility Level (PTAL);
- TRICS Catchment Population Ratio and individual population catchments by mode;
- Potential Accessibility Index;
- Car Ownership Rate in surrounding area (Cars per household);
- Car Availability (percentage of population with car available for use, derived using 1991 census data).

A strong relationship is identified between public transport accessibility, as derived through the PTAL method and modal split, with the following average PTAL index scores by location category:

- Town Centre Core: 18.6;
- Town Centre: 9.4; and
- Edge/Out of Town: 3.0.

The relationships between the population catchment measures of accessibility (TRICS and PAI) are less conclusive. No strong relationships were identified between car ownership and car availability, although as one would expect car ownership and availability increased for non town centre sites.

6.6 PARKING PROVISION AND RESTRAINT

In the context of this study, key issues with regard to parking provision to be considered include the following:

- The extent to which off-site parking is restrained;
- The relationship between parking provision, site locational characteristics, accessibility and modal split.

The following details are provided in Appendix A4, for each site, with regard to parking provision:

- On-site parking provision;
- Number of parking spaces per employee;
- Gross floor area per parking space, sqm;
- Level of off-site parking restraint.

Parking provision by location category is summarised in Table 6.8 for both parking spaces per employee and gross floor area per parking space. The average number of parking spaces per employee varies, by location, with lower provision in town centre areas:

- Town centre core sites: 0.47 spaces per employee;
- Town centre sites: 0.54 spaces per employee; and
- Edge / out of town sites: 1.32 spaces per employee.

The level of parking provision in terms of gross floor area per parking spaces varies considerably between sites from 20 sqm per space in out of town locations to 239 sqm per space in town centre locations. The average for all sites is 68 sqm per space, falling to 1 space per 104 sqm in town centres and increasing to 1 space per 28 sqm in edge of town / out of town locations. Conversely where there is parking restraint, non car use increases.

Table 6.8 – Parking Provision by Location Category

Location Type	Number of Parking Spaces per Employee			Gross Floor Area per Parking Space (sqm)		
	Min	Max	Average	Min	Max	Average
Town Centre Core	0.14	1.07	0.47	31	113	59
Town Centre	0.13	0.82	0.54	55	239	104
Edge/Out of Town	0.84	2.21	1.32	20	37	28
All Sites	0.13	2.21	0.78	20	239	68

It is possible to examine the level of usage of on-site parking facilities by comparing the peak occupancy of the car park with the stated capacity. Table 6.9 shows the

variation in mode split with different levels of car park occupancy. The proportion of trips made by non-car modes greatly increases at sites where the car parking space provision was fully utilised, compared to sites that have spare parking capacity.

Table 6.9 – Level of Car Park Occupancy, by Average Modal Split

Peak Car Park Occupancy	No. of Sites	Percentage Modal Split by Car			Percentage Modal Split by Non-Car Modes			
		Driver	Pass.	Total	PT	Walk	Cycle	Total
> 100%	4	62.5	7.0	69.5	5.1	22.9	2.5	30.5
85% – 100%	2	75.7	13.7	89.4	1.3	6.4	2.9	10.6
50% – 85%	8	66.3	9.5	75.8	4.6	18.6	1.0	24.2
< 50%	4	68.7	18.4	87.1	1.5	9.2	2.2	12.9
All Sites	18	67.0	11.4	78.4	3.7	16.1	1.8	21.6

For a third of the selected sites, there was identified to be at least some level of restraint applied to on street parking in the surrounding area. Table 6.10 summarises the average modal split by level of on-street parking restraint in the surrounding area. Although the classifications for parking restraint are fairly crude, it can be seen that car use increases where there is no on-street parking restraint.

Table 6.10 – Level of On-Street Parking Restraint in Surrounding Area, by Average Modal Split

On Street Parking Restraint in Surrounding Area?	No. of Sites	Percentage Modal Split by Car			Percentage Modal Split by Non-Car Modes			
		Driver	Pass.	Total	PT	Walk	Cycle	Total
Yes	4	57.6	10.2	67.8	5.5	23.0	3.7	32.2
Some	2	48.7	5.5	54.2	10.5	34.5	0.8	45.8
None	12	73.2	12.8	86.0	1.9	10.7	1.3	14.0
All Sites	18	67.0	11.4	78.4	3.7	16.1	1.8	21.6

The links between car park occupancy, site location and parking restraint in the surrounding area are examined in Table 6.11, below. The table shows that the car parks at six of the eighteen sites are at or very near capacity. These six sites are all located in Town Centre Core or Town Centre Areas, and half have some form of parking restraint operated in the local area. This indicates that the level of off-site parking restraint will be an important factor in determining modal split, particularly in town centre areas, where on-site car park usage is highest.

Table 6.11 – Level of Car Park Occupancy, by Site Location and Level of On-Street Parking Restraint in Surrounding Area

On Street Parking Restraint in Surrounding Area?	No. of Sites	Site Location			On Street Parking Restraint in Surrounding Area?		
		Town Centre Core	Town Centre	Edge / Out of Town	Yes	Some	None
> 100%	4	2	2	-	2	-	2
85% – 100%	2	-	2	-	1	-	1
50% – 85%	8	2	4	2	1	2	5
< 50%	4	-	-	4	-	-	4
All Sites	18	4	8	6	4	2	12

6.7 KEY RELATIONSHIPS AND TRENDS

6.7.1 Trendline Analysis

The key criteria were plotted against modal split for each site in order to identify significant trends and variation by modal split. The aim was to explore relationships and identify significant trends (see Figures 6.1 to 6.18). The key points can be summarised as follows:

Site Location

- A strong relationship between modal split and site location category was identified with car use and increasing away from the core areas and walking and PT use decreasing. However there was a significant level of variation in modal split within each locational category. Cycling appeared to be largely independent of site location (see Figure 6.1);
- The task of classifying sites by locational categories was difficult, even for the broad categories used, due to the variety of urban locations included with the selected sites;
- The relationship between modal split and population has been investigated at two levels – the first considering the variation in modal split with the population living within 1 mile of the site, and the second considering the variation in modal split with the population living within 5 miles of the site. The trendlines indicate a decrease in the proportion of employees making journeys by car as the population within 1 mile increases, while the proportion of pedestrians and (to a lesser extent) public transport users increases. The proportion of employees travelling as vehicle passengers or cycling appears to be largely independent of the population within 1 mile. Modal split is largely unaffected by the population living within 5 miles of the site (see Figures 6.2 and 6.3).

Site Characteristics

- The trendlines indicate a strong inverse relationship between both plot ratio and employment density and the number of employees travelling by car, and a weaker inverse relationship between plot ratio and the proportion of vehicle passengers. A strong direct trend is identified between the number of pedestrians and the plot ratio, and the proportion of cyclists and public transport users also appears to increase with plot ratio. However there is a clear bias towards sites with low plot ratios. The limited number of sites in the higher ranges may mean that trendlines are not truly representative (see Figures 6.4 and 6.5).

Accessibility

- A strong relationship is identified between public transport accessibility, as derived through the PTAL method and modal split (see Figures 6.6 and 6.7);
- The relationships between the population catchment measures of accessibility (TRICS and PAI) and modal split are less conclusive, although the population catchments by mode reflect the link between modal split and the population density of the surrounding area (see Figures 6.8 and 6.13);
- No strong relationships were identified between car ownership and car availability (see Figure 6.14 and 6.15).

Parking

- In terms of parking provision, based on the selected sites, there appears to be a stronger direct relationship between modal split and employees per parking space than GFA (sqm) per parking space. The selected sites cover a wide geographical area and no doubt reflect significant variations in approaches to setting parking standards and the development control process. Furthermore, simply considering the level of on-site parking provision, takes no account of the level of parking restraint in the surrounding area (see Figures 6.16 and 6.17);

- As one would expect there appears to be a relationship between parking restraint in the surrounding area and modal split, with lower car use where there is evidence of parking restraint (see Figure 6.18).

6.7.2 Statistical Analysis

The limited number of sites means that some of the trends identified between mode split and the various key parameters may not be truly representative of the wider population of sites in the UK. Accordingly, detailed statistical analysis to establish empirical relationships and correlations between different data sets and criteria was undertaken.

The chosen methodology involves the examination of the level of correlation between each parameter and the modal split data, by means of the calculation of the Pearson Product Moment Correlation Coefficient (r). This gives an indication of the strength of the linear relationship between two datasets, with a score of ±1 indicating perfect correlation and a score of 0 indicating no correlation. Given the number of sites analysed it is unlikely that this study will identify any trends with strong correlation. However, it is useful to predict whether the trends identified are significant or a spurious result created by the limited site sample. This is achieved through the application of hypothesis testing of the Pearson Product Moment Correlation Coefficient (r). For the purposes of this study, at a 90 percent confidence level, 'r' values of +/- 0.4 indicate a significant relationship. Values of 'r' less than +/- 0.4 indicate no relationship.

The relationships between the key parameters / selected criteria and modal split are identified in Table 6.12. Clear statistical relationships are identified between modal split by car / non car modes and the following key parameters / selected criteria:

- PTAL Accessibility Index;
- Location Category;
- Plot Ratio;
- Private Car Catchment Population;
- Parking Spaces per Employee;
- Population Density within 1 mile; and
- Off-Site Parking Restraint.

Table 6.12 – Relationships Between Key Parameters / Selected Criteria and Modal Split (Car / Non Car Modes)

Rank	Statistical Relationship		No Statistical Relationship	
	Parameter	'r' Score	Parameter	'r' Score
1	PTAL Accessibility Index	0.905	Walking Catchment Population	0.397
2	Location Category	0.734	PT Catchment Population	0.367
3	Plot Ratio	0.727	Cycling Catchment Population	0.322
4	Private Car Catchment Population	0.636	Employment Density	0.299
5	Parking Spaces per Employee	0.534	Potential Accessibility Index	0.194
6	Population Density within 1 mile	0.436	Car Ownership	0.157
7	Off-Site Parking Restraint	0.425	Car Availability	0.141
8			Population Density within 5 miles	0.121
9			TRICS Catchment Population Method	0.121
10			GFA per parking Space	0.033

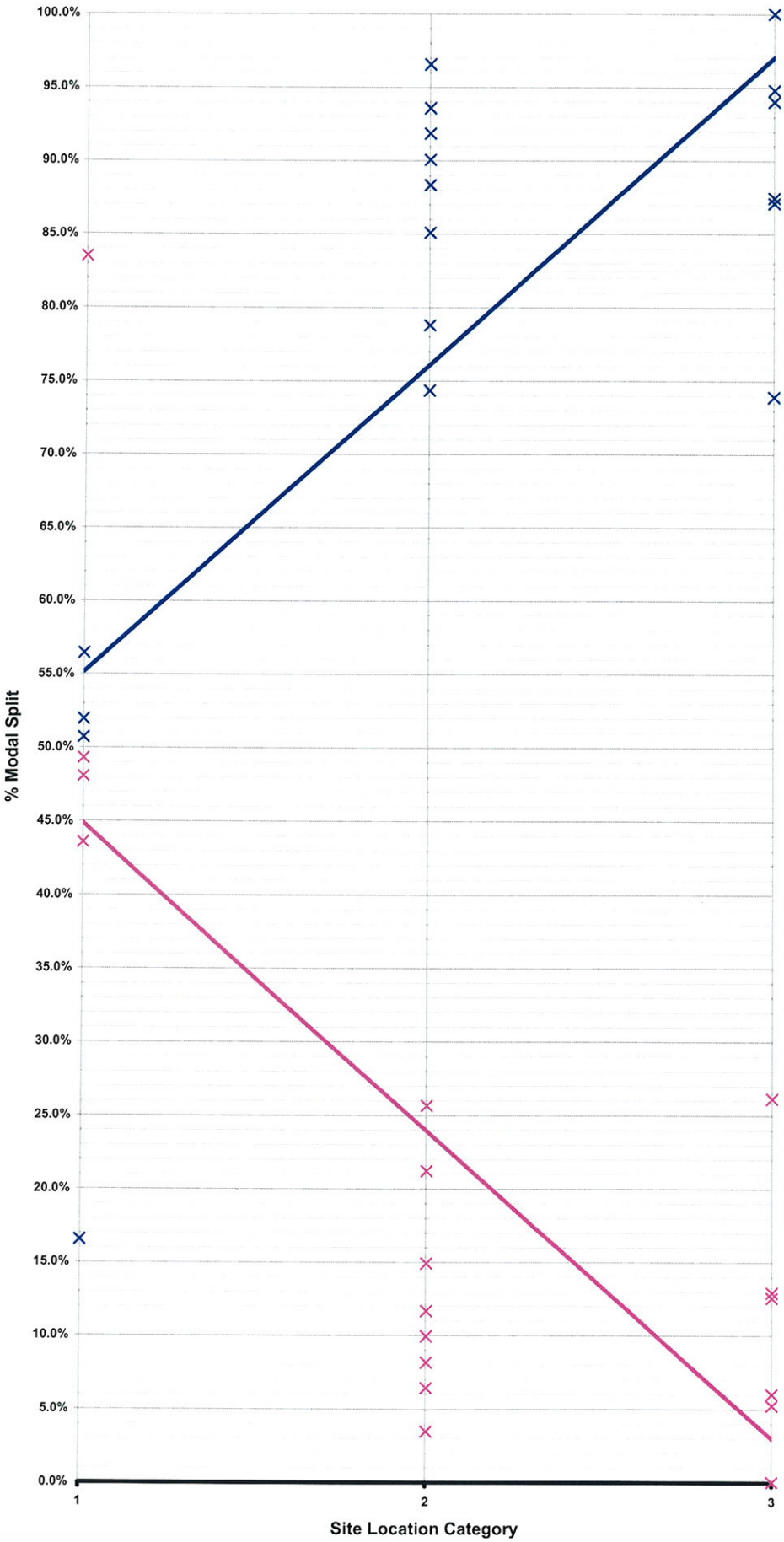
The relationships between the key parameters / selected criteria and location category are identified in Table 6.13. Clear statistical relationships are identified between site location and the following key parameters / selected criteria:

- PT Catchment Population;
- PTAL Accessibility Index;
- Population Density within 1 mile;
- Cycling Catchment Population;
- Population Density within 5 miles;
- Off-Site Parking Restraint;
- Car Availability;
- Plot Ratio;
- Parking Spaces per Employee;
- Walking Catchment Population;
- TRICS Catchment Population Method;
- Employment Density; and
- Private Car Catchment Population.

Table 6.13 – Relationships Between Key Parameters and Location Category

Rank	Statistical Relationship		No Statistical Relationship	
	Parameter	'r' Score	Parameter	'r' Score
1	PT Catchment Population	0.744	Potential Accessibility Index	0.381
2	PTAL Accessibility Index	0.718	GFA per parking Space	0.295
3	Population Density within 1 mile	0.695	Car Ownership	0.167
4	Cycling Catchment Population	0.658		
5	Population Density within 5 miles	0.654		
6	Off-Site Parking Restraint	0.554		
7	Car Availability	0.550		
8	Plot Ratio	0.519		
9	Parking Spaces per Employee	0.508		
10	Walking Catchment Population	0.492		
11	TRICS Catchment Population Method	0.467		
12	Employment Density	0.461		
13	Private Car Catchment Population	0.441		

The statistical analysis confirms that the location of a site is the key overriding parameter and is directly related to practically all of the previously identified key criteria relating to the location of the site, the site characteristics, accessibility and parking. Parking provision and accessibility by mode are just part of a whole range of criteria and factors that determine the overall 'accessibility' of a site.



Site Location Categories:

1 = Town Centre Core
2 = Town Centre
3 = Edge / Out of Town

Comments:
Pearsons Product Moment Correlation Coefficient (at 90% Confidence Interval):

r = 0.734

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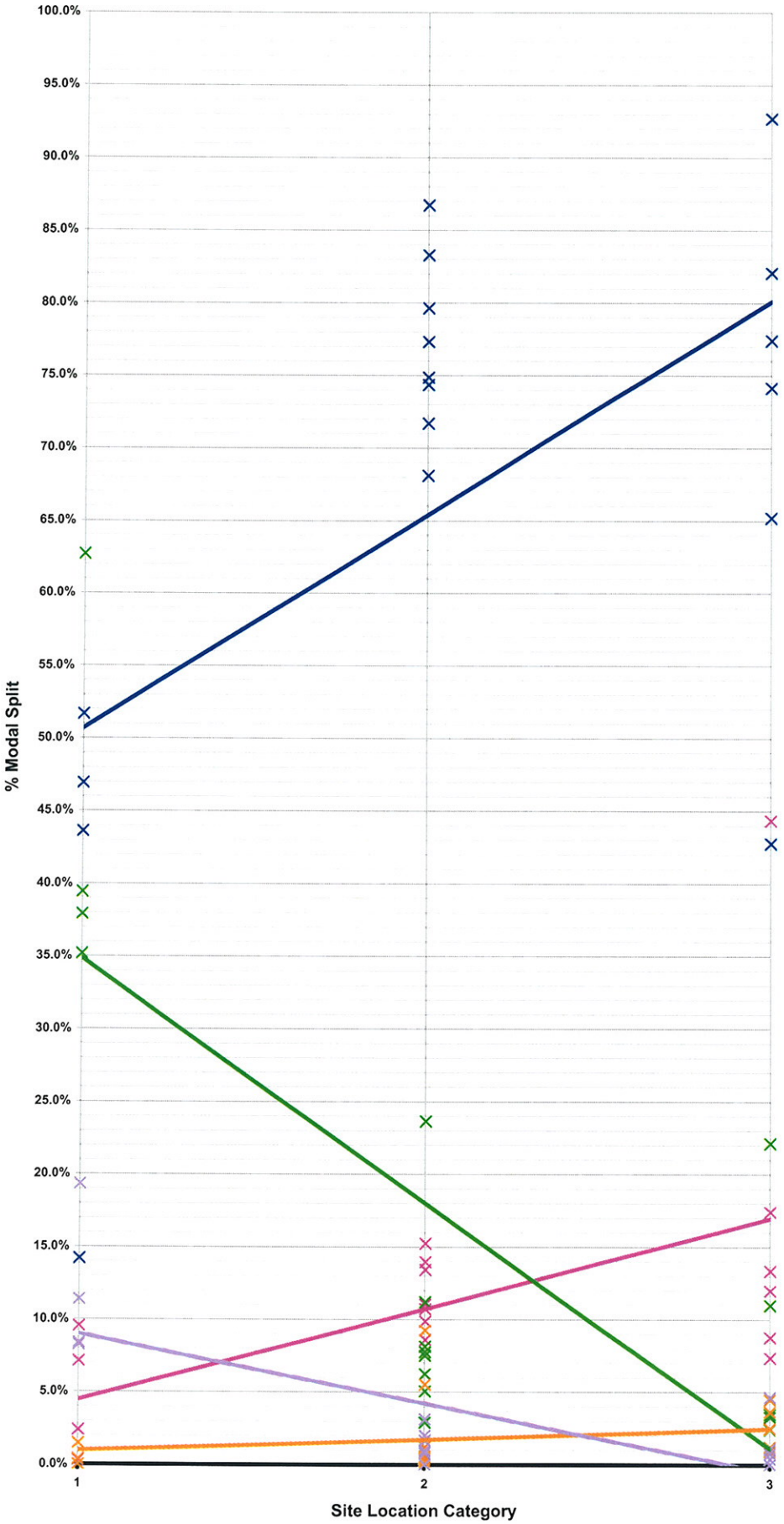
Variation in Modal Split by Site Location Category

Key
Car
Non-Car

Figure 6.1a



Site Location Categories:

1 = Town Centre Core
2 = Town Centre
3 = Edge / Out of Town

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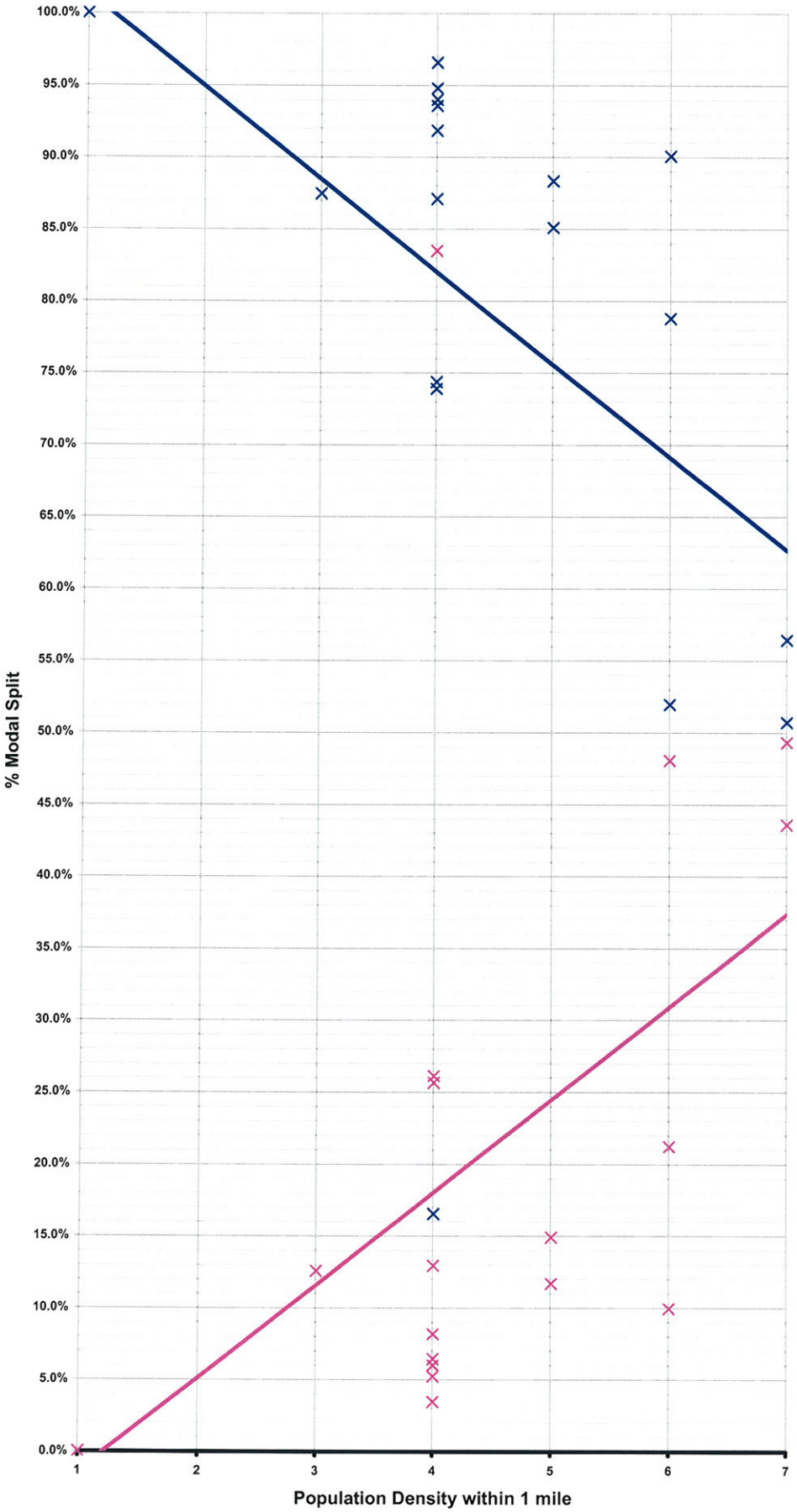
Variation in Modal Split with Site Location

Key

- All Vehicle Drivers
- Vehicle Passengers
- Pedestrians
- Cyclists
- Public Transport Users

Figure 6.1b



Population Categories:

1 = 1,001 - 5,000
2 = 5,001 - 10,000
3 = 10,001 - 15,000
4 = 15,001 - 20,000
5 = 20,001 - 25,000
6 = 25,000 - 50,000
7 = 50,001 - 100,000

Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.436

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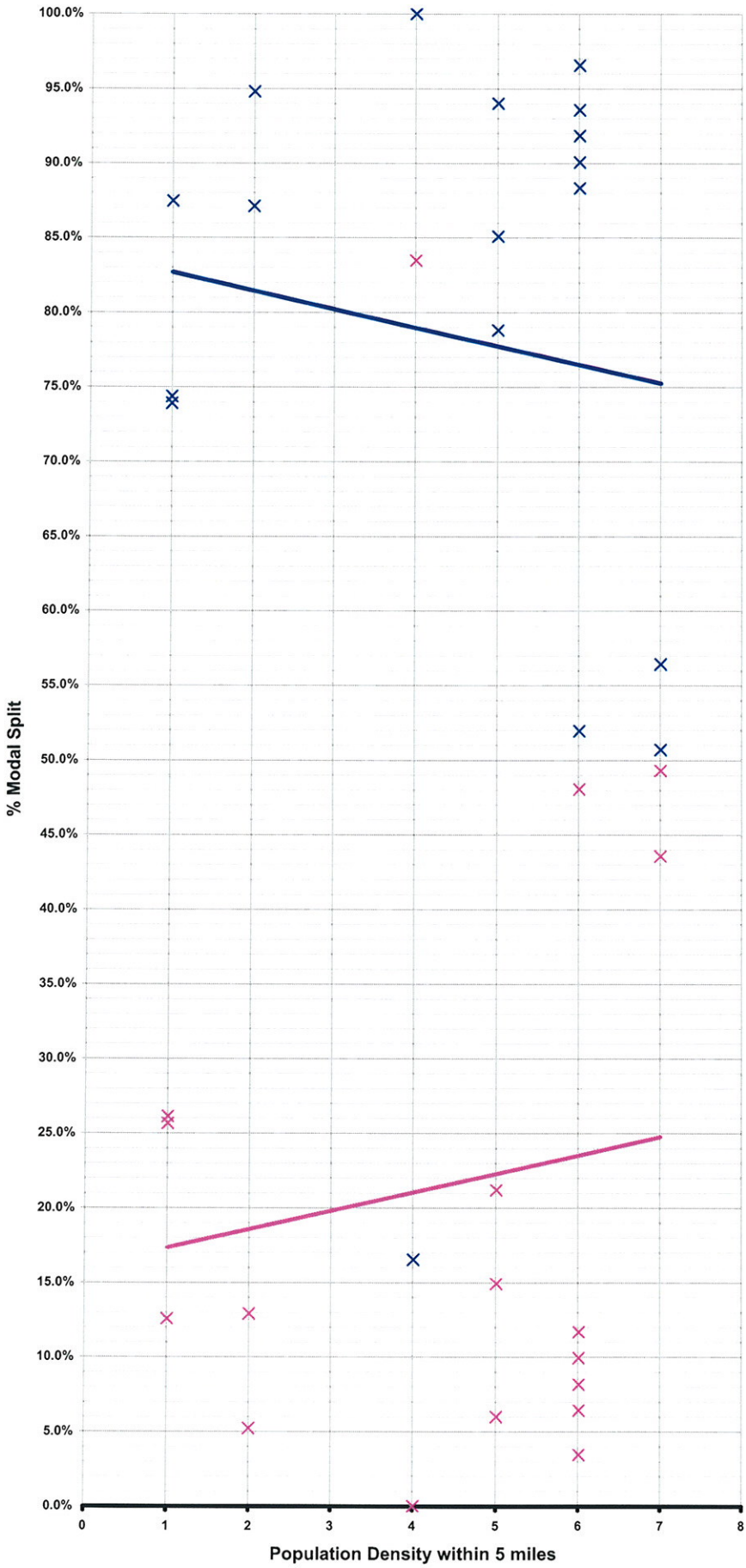
Variation in Modal Split by Population Density within 1 mile from Site

Key: ×Car ×Non-Car

Figure 6.2



Population Categories:

1 = 25,001 - 50,000
2 = 50,001 - 75,000
3 = 75,001 - 100,000
4 = 100,001 - 125,000
5 = 125,001 - 250,000
6 = 250,001 - 500,000
7 = 500.00 +

Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):
r = 0.121

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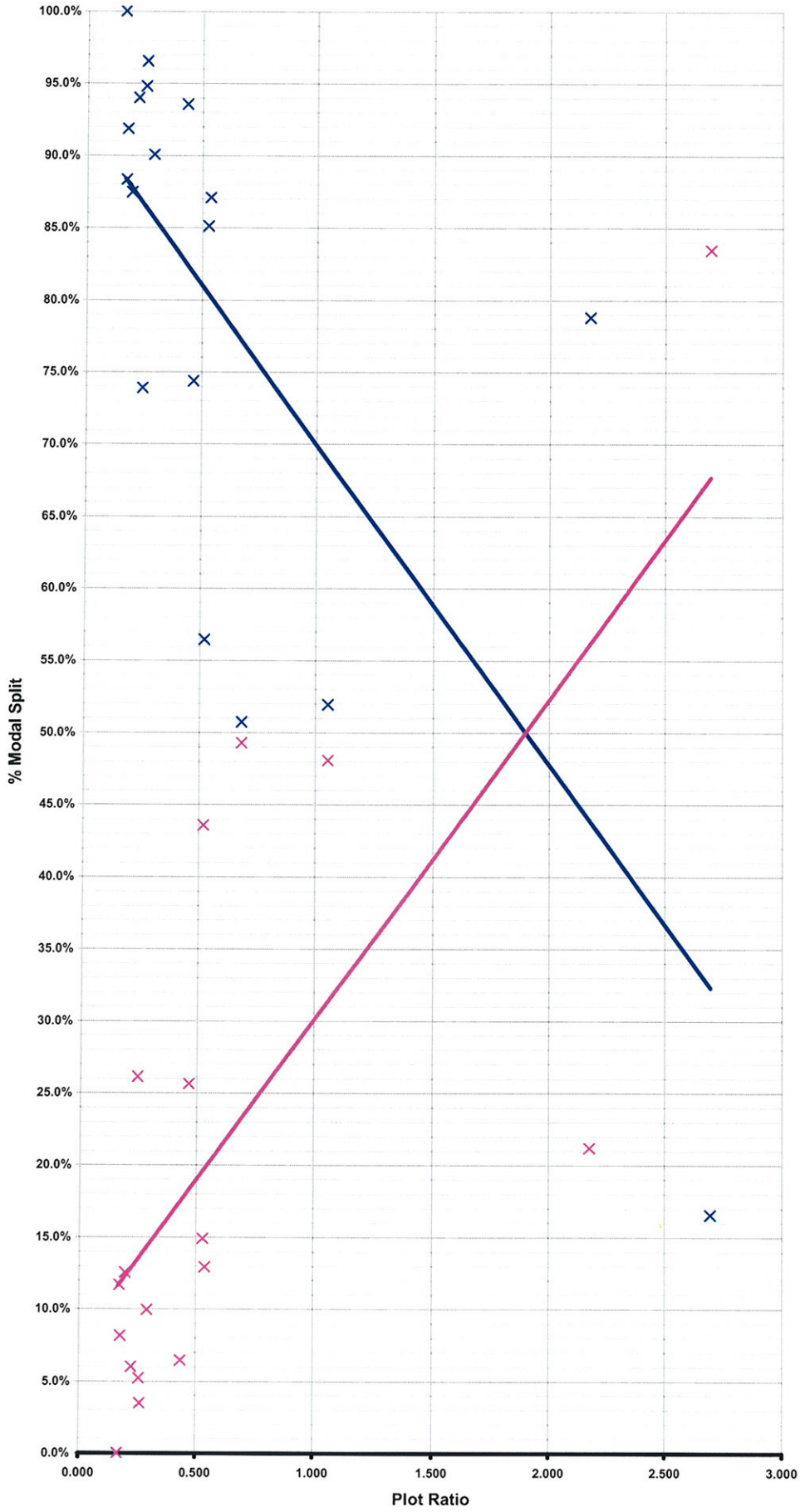
Variation in Modal Split by Population Density within 5 miles of Site

Key
× Car × Non-Car

Figure 6.3



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Conifdence Level):

r = 0.727

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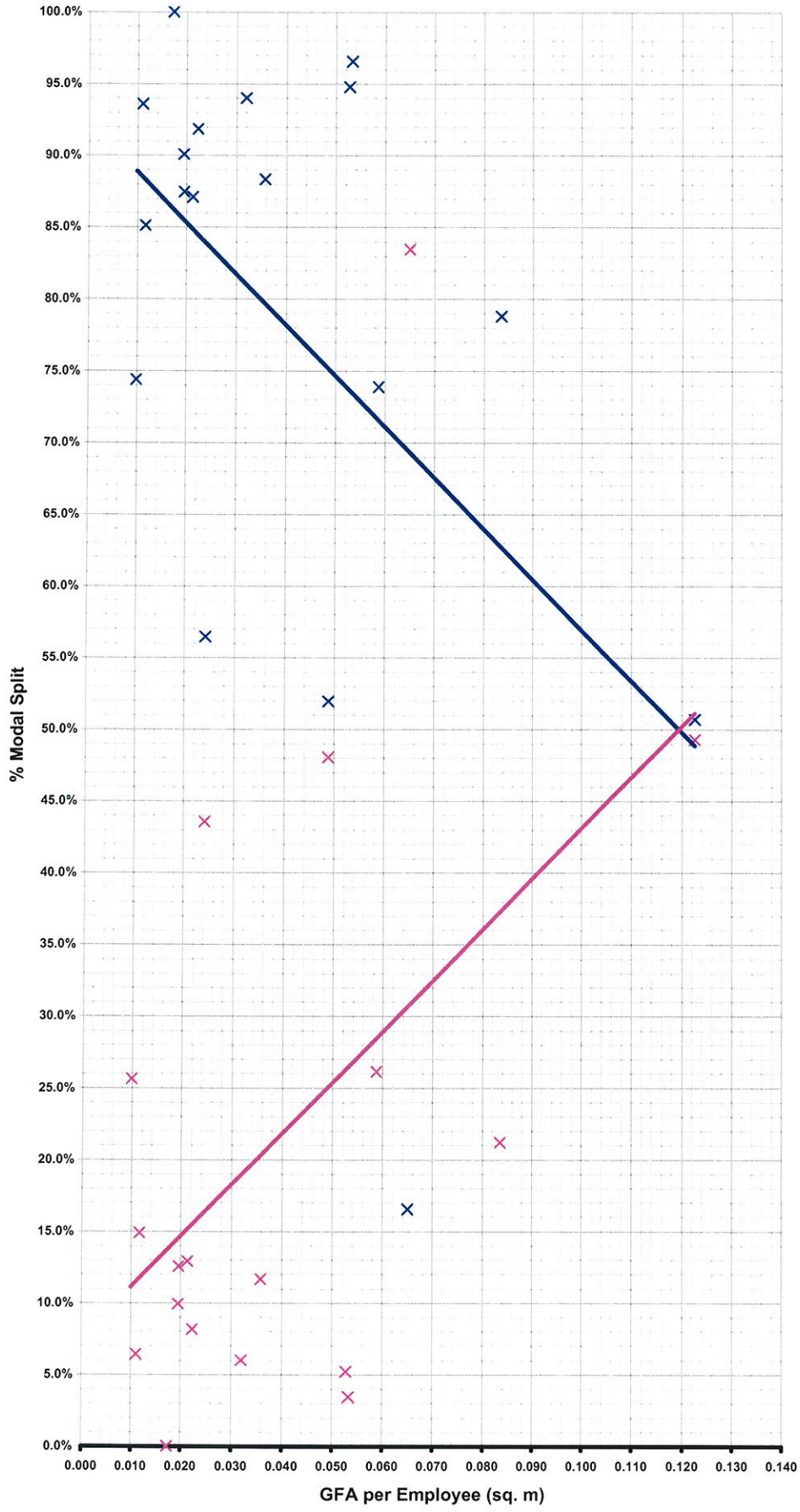
Variation in Modal Split by Plot Ratio

Key

× Car × Non-Car

Figure 6.4



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.299

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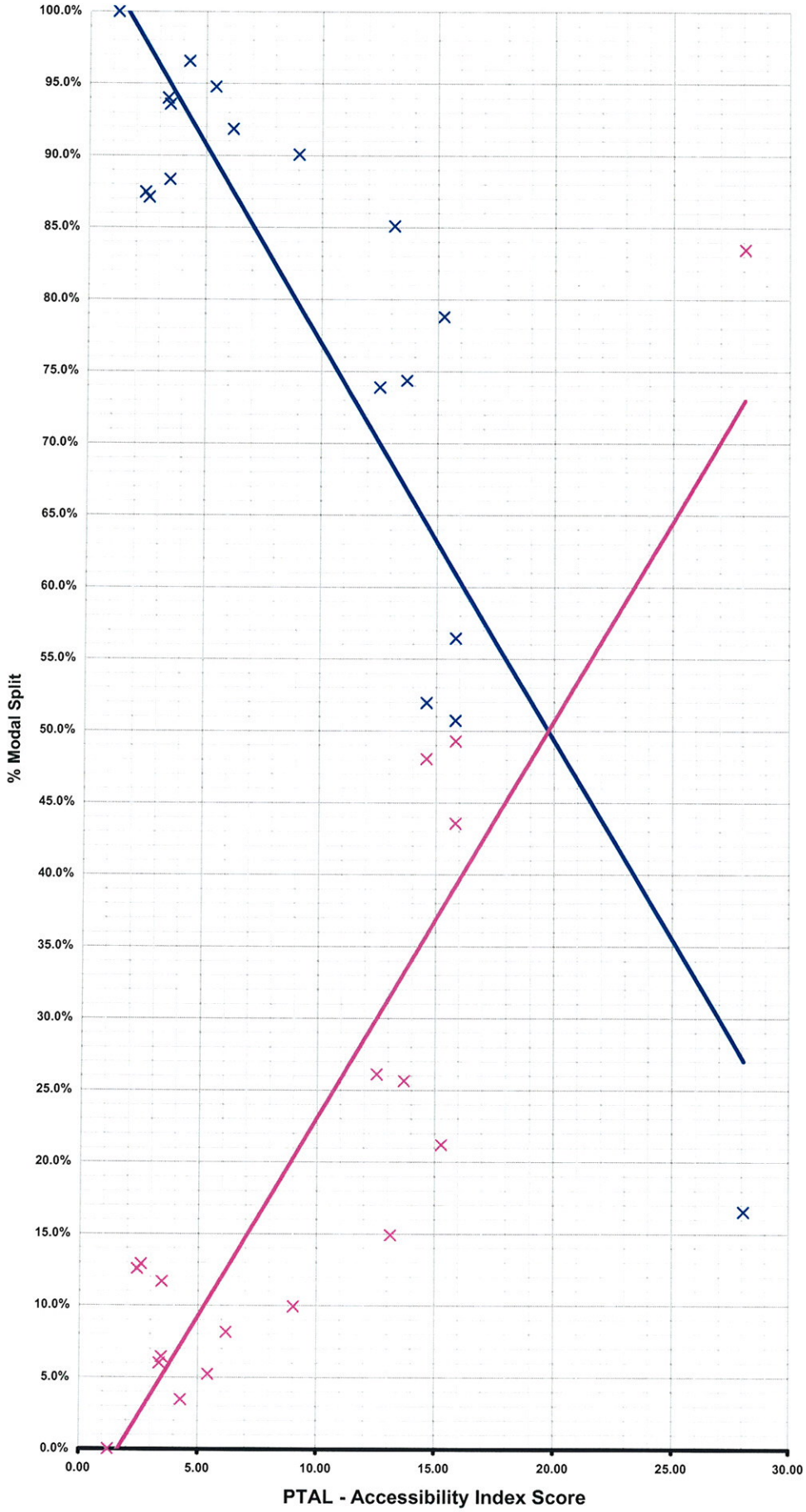
Variation in Modal Split by Employment Density

Key

× Car × Non-Car

Figure 6.5



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.905

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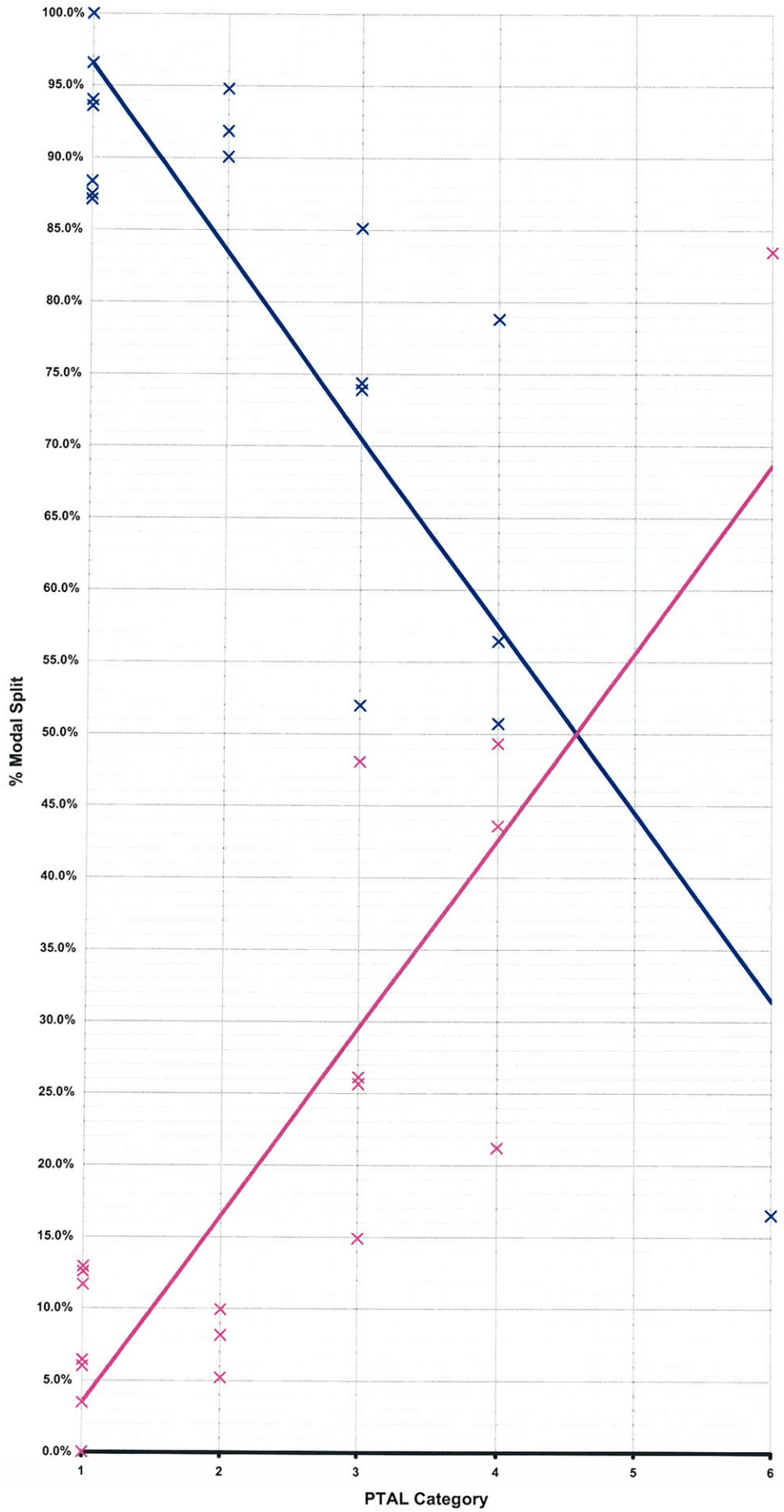
Variation in Modal Split by PTAL Accessibility Index Score

Key: × Car × Non-Car

Figure 6.6



PTAL Categories:

1 - Very Low
2 - Low
3 - Medium Low
4 - Medium High
5 - High
6 - Very High

Comments:

Pearson Product Moment Correlation Coefficent (at 90% Confidence Level):

r = 0.579

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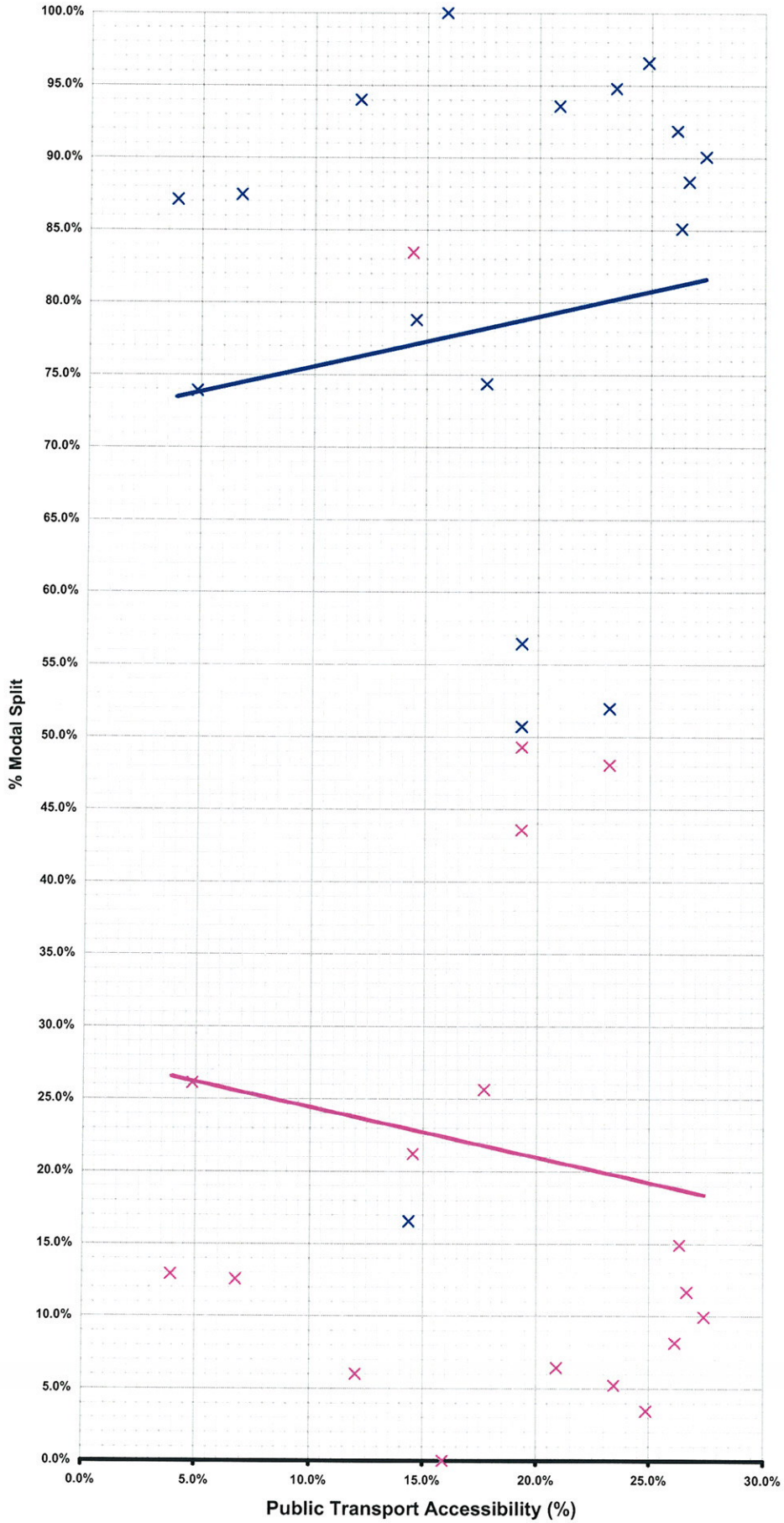
Variation in Modal Split by Public Transport Accessibility Level (PTAL)

Key: ×Car ×Non-Car

Figure 6.7



Comments:

Pearson Product Moment Correlation Coefficent (at 90% Confidence Level):

r = 0.121

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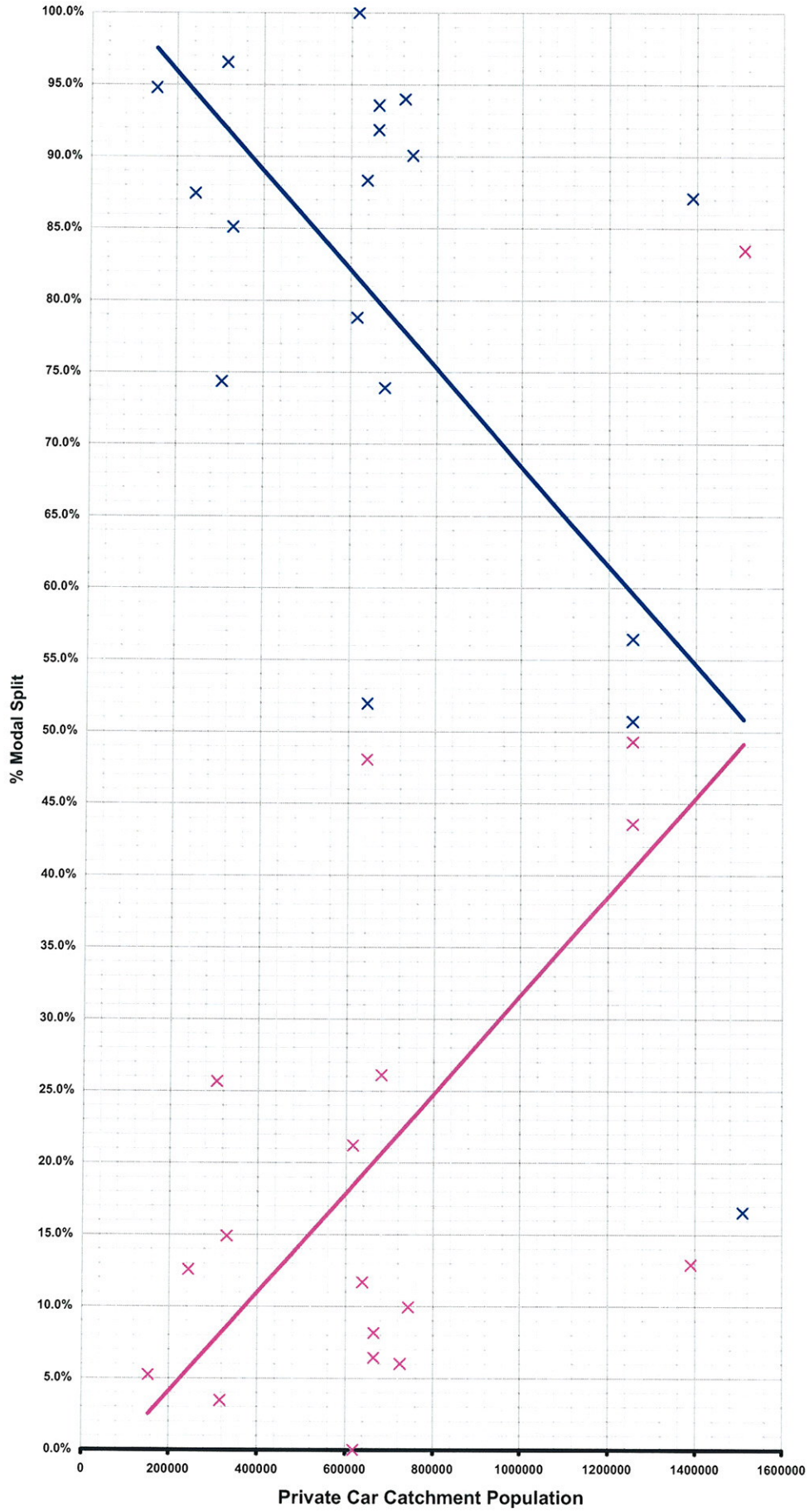
Variation in Modal Split by Public Transport Accessibility (TRICS Catchment Population Method)

Key: ×Car ×Non-Car

Figure 6.8



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.636

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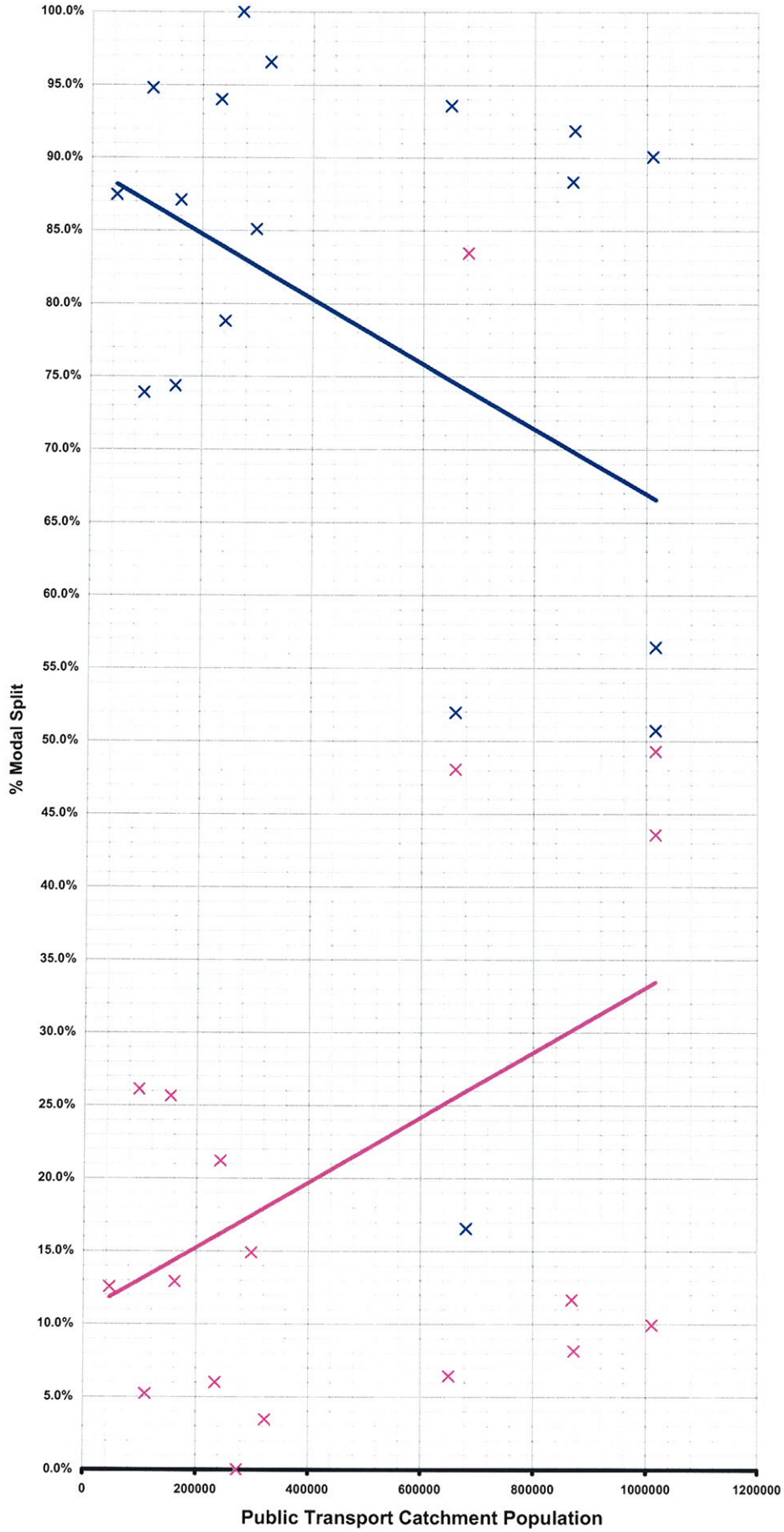
Variation in Modal Split by Private Car Catchment Population

Key: × Car × Non-Car

Figure 6.9



Comments:

Pearson Product Moment Correlation coefficient (at 90% Confidence Level):

r = 0.367

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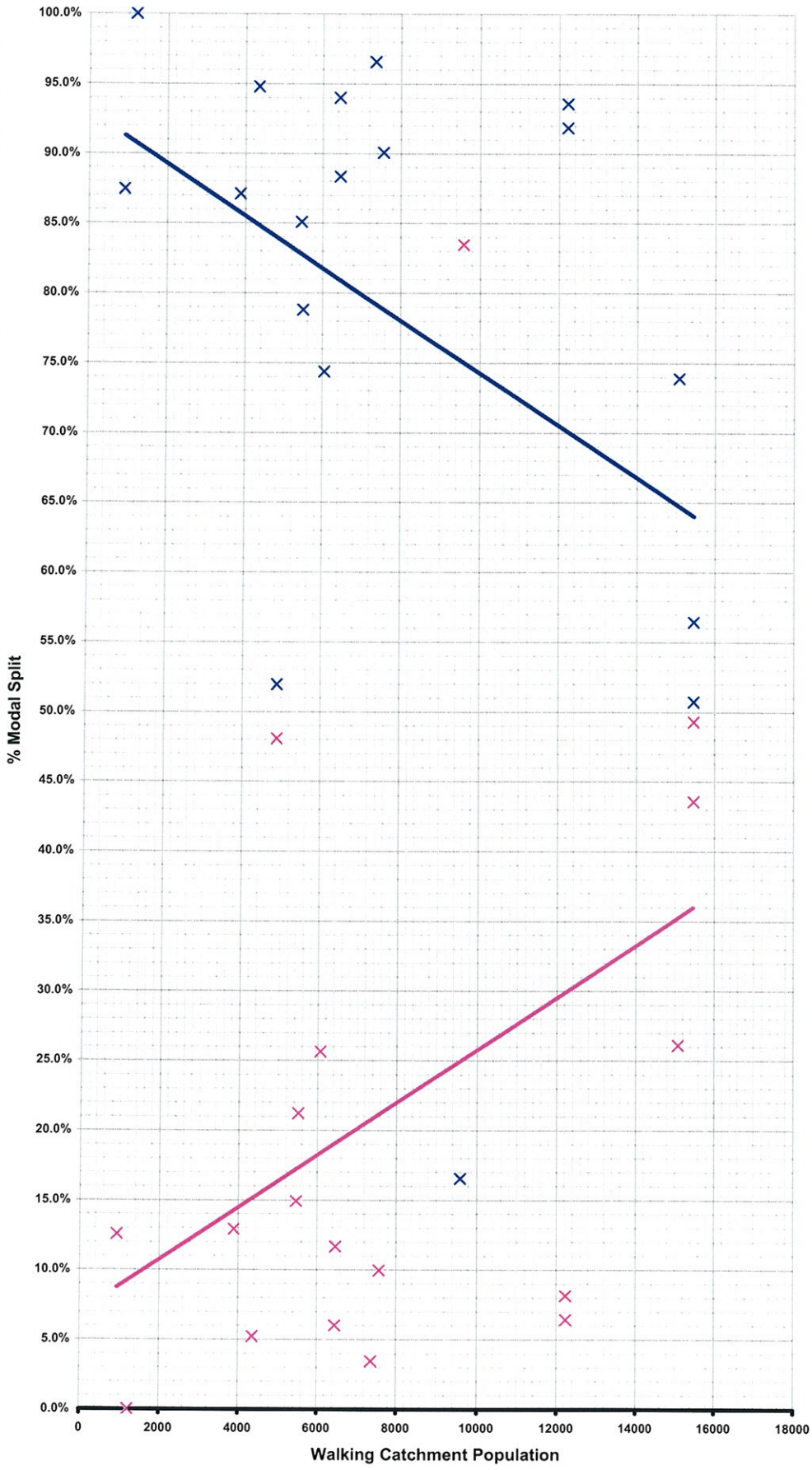
Variation in Modal Split by Public Transport Catchment Population

Key: ×Car ×Non-Car

Figure 6.10



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.397

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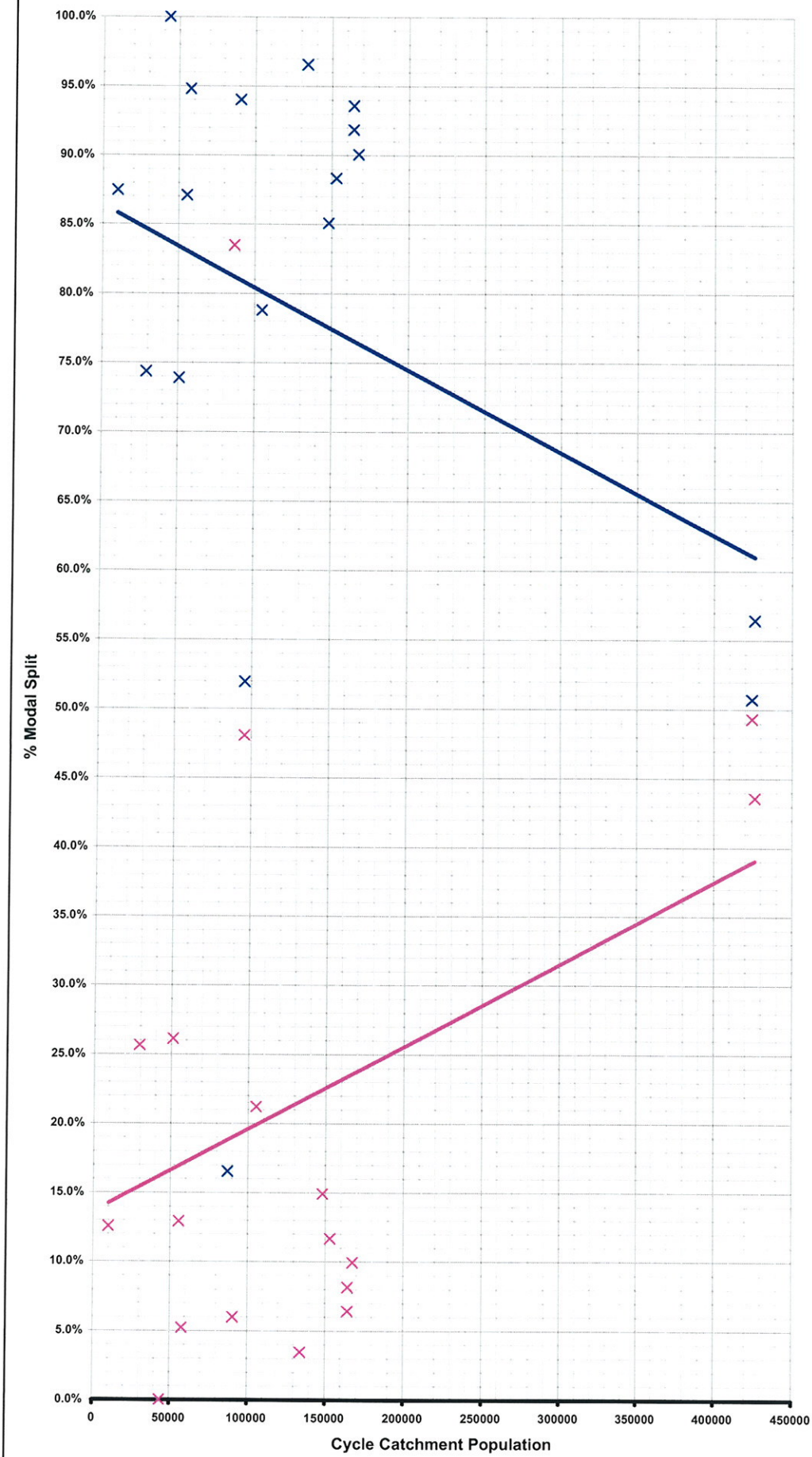
Variation in Modal Split by Walking Catchment Population

Key: ×Car ×Non-Car

Figure 6.11



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.322

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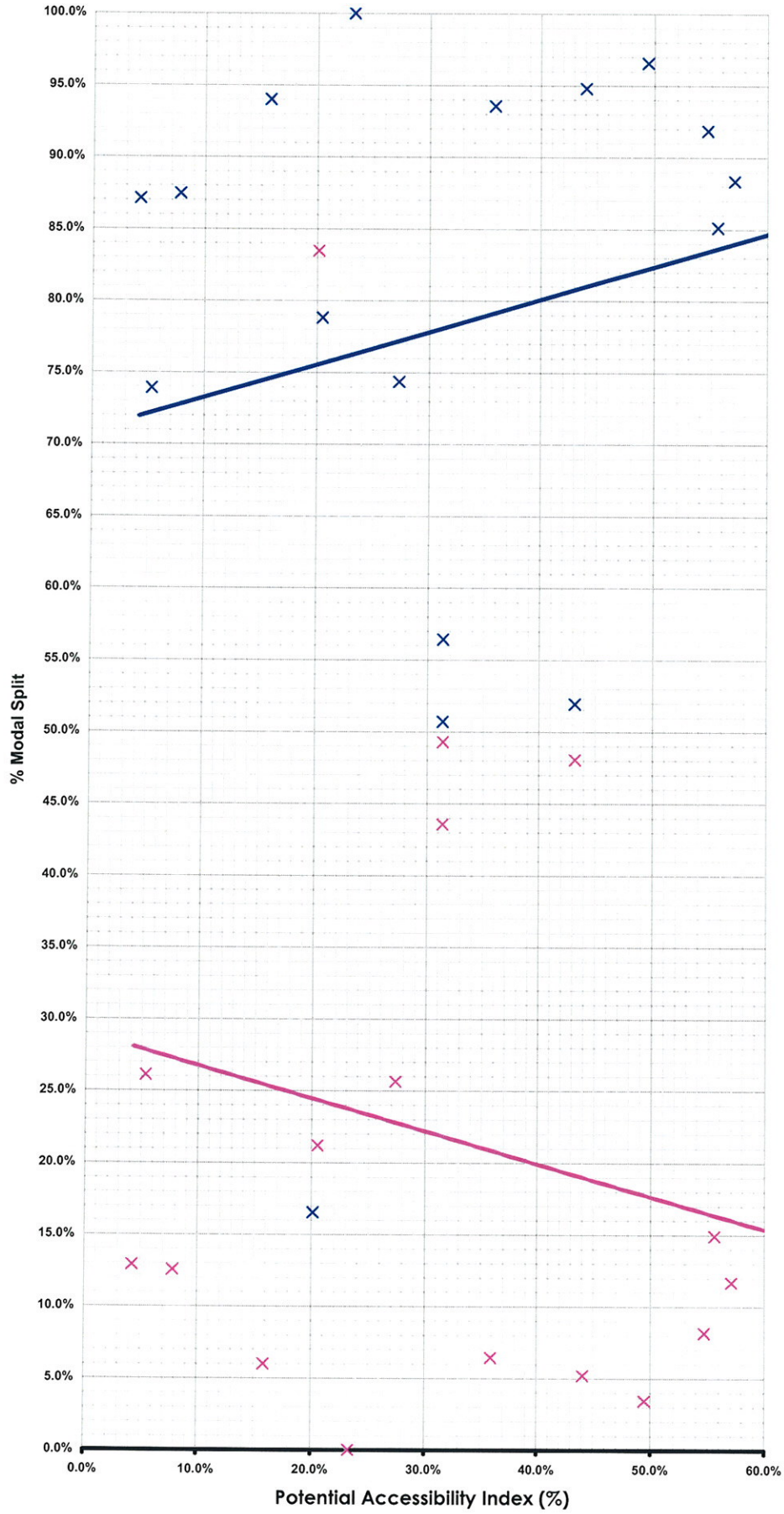
Variation in Modal Split by Cycling Catchment Population

Key: ×Car ×Non-Car

Figure 6.12



Comments:

Pearson Product Moment Correlatiopn Coefficient (at 90% Confidence Level):

r = 0.194

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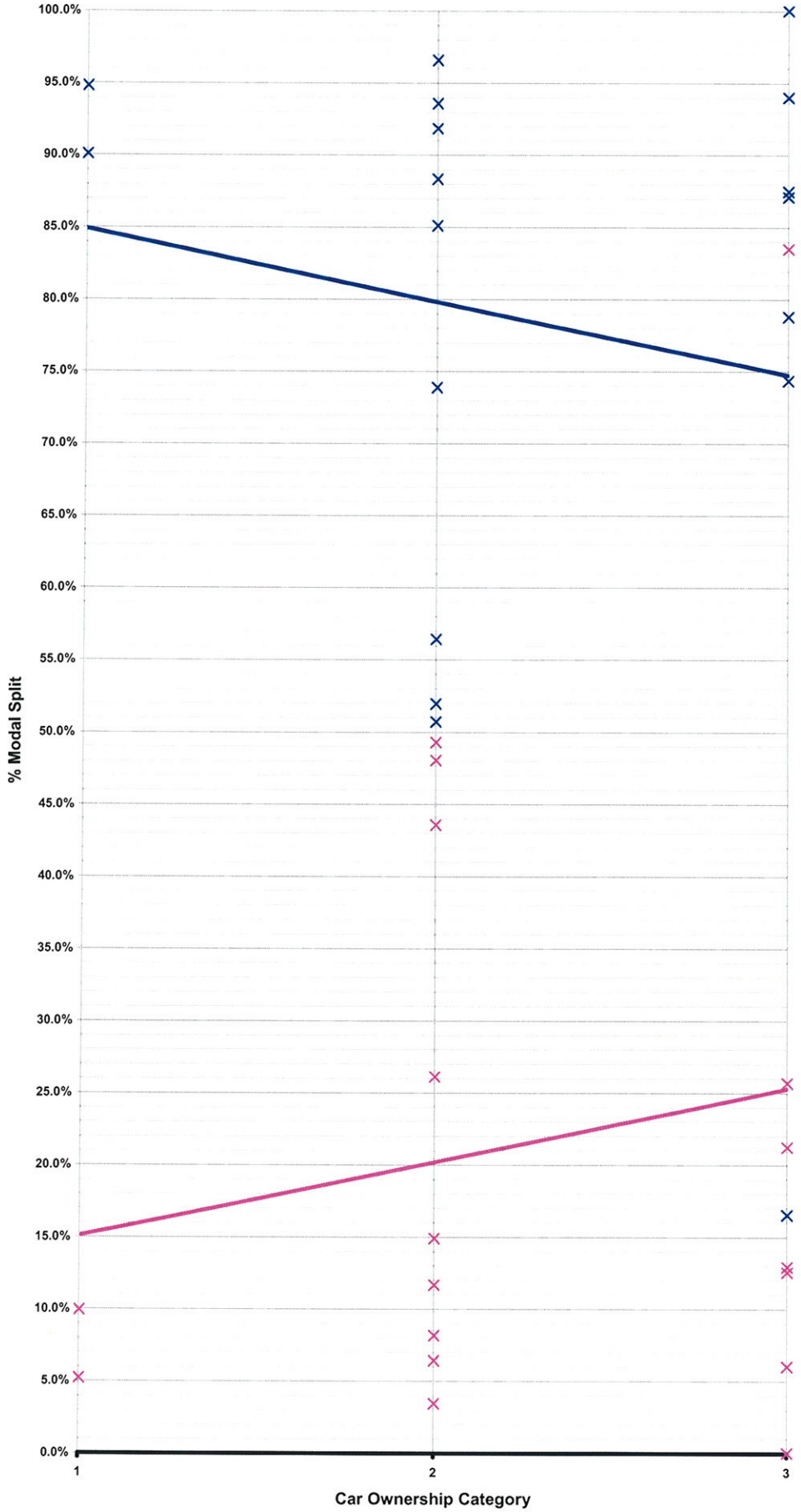
Variation in Modal Split by Potential Accessibility Index

Key: × Car × Non-Car

Figure 6.13



Car Ownership Categories:

1 = 0.0 - 0.5
2 = 0.6 - 1.0
3 = 1.1 - 1.5

Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.157

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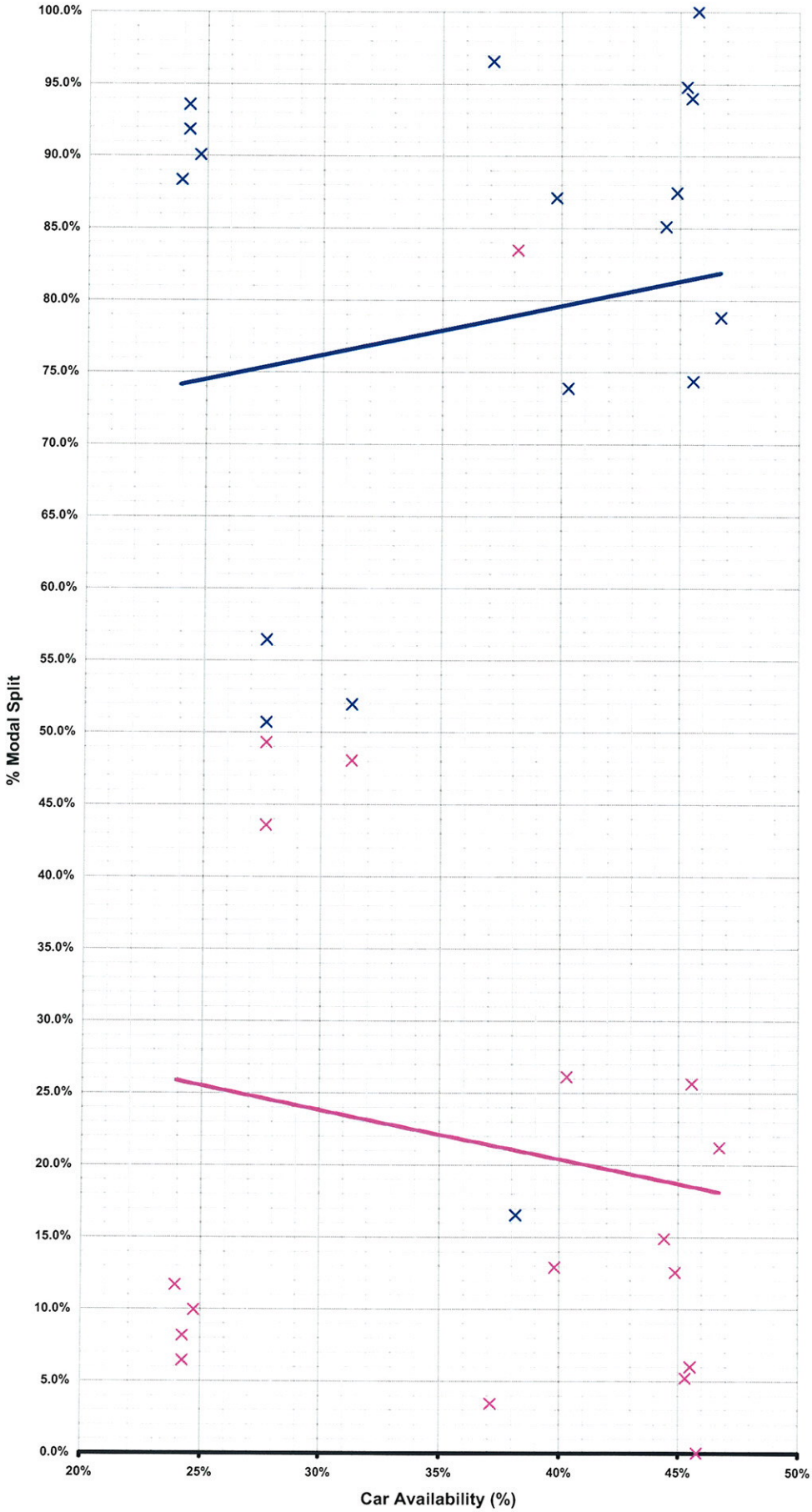
Variation in Modal Split by Car Ownership

Key: ×Car ×Non-Car

Figure 6.14



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

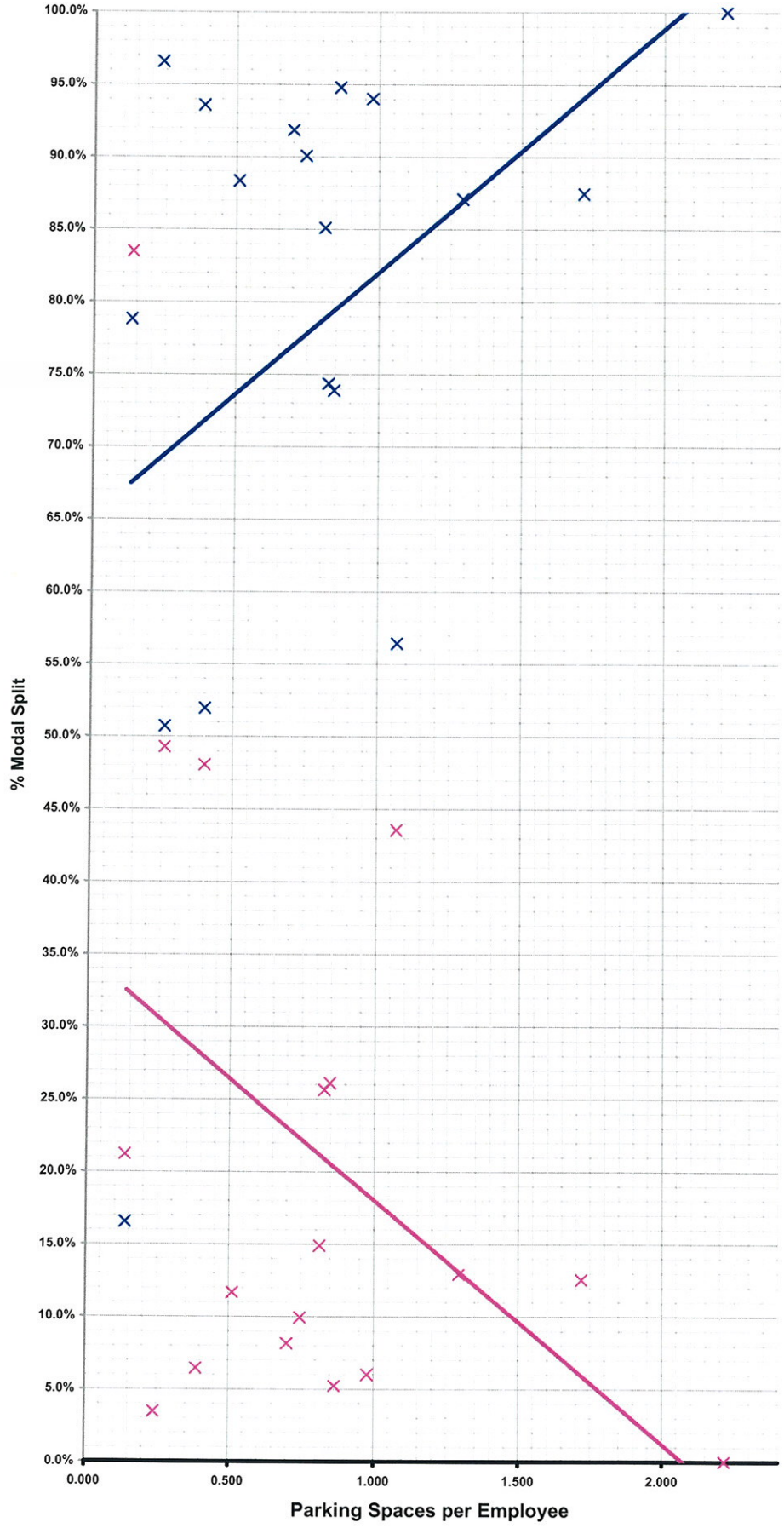
r = 0.141

FABER MAUNSELL

Variation in Modal Split by Car Availability

Key: ×Car ×Non-Car

Figure 6.15



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

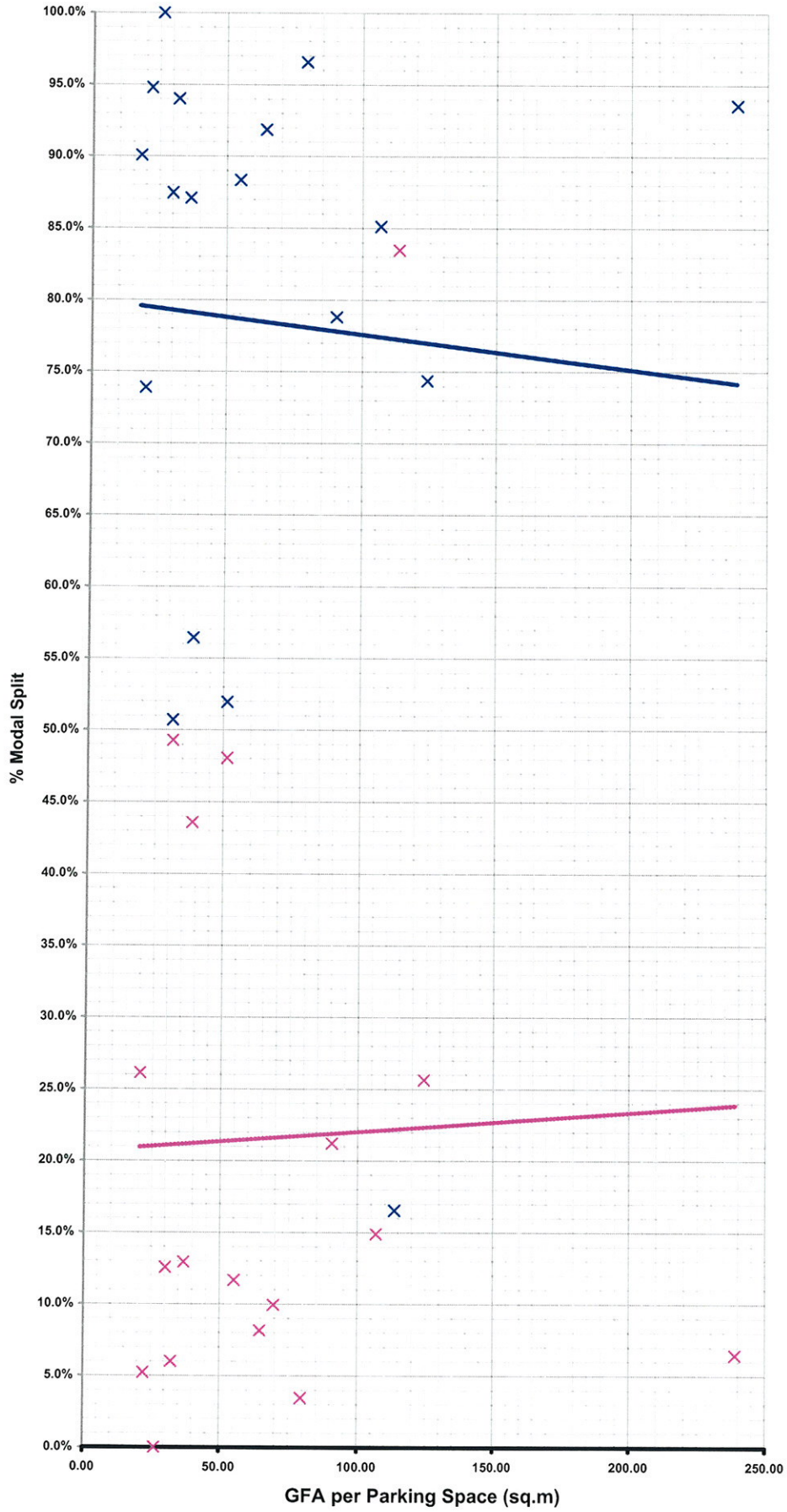
r = 0.425

FABER MAUNSELL

Variation in Modal Split by Parking Spaces per Employee

Key: X Car X Non-Car

Figure 6.16



Comments:

Pearson Product Moment Correlation Coefficient (at 90% Confidence Level):

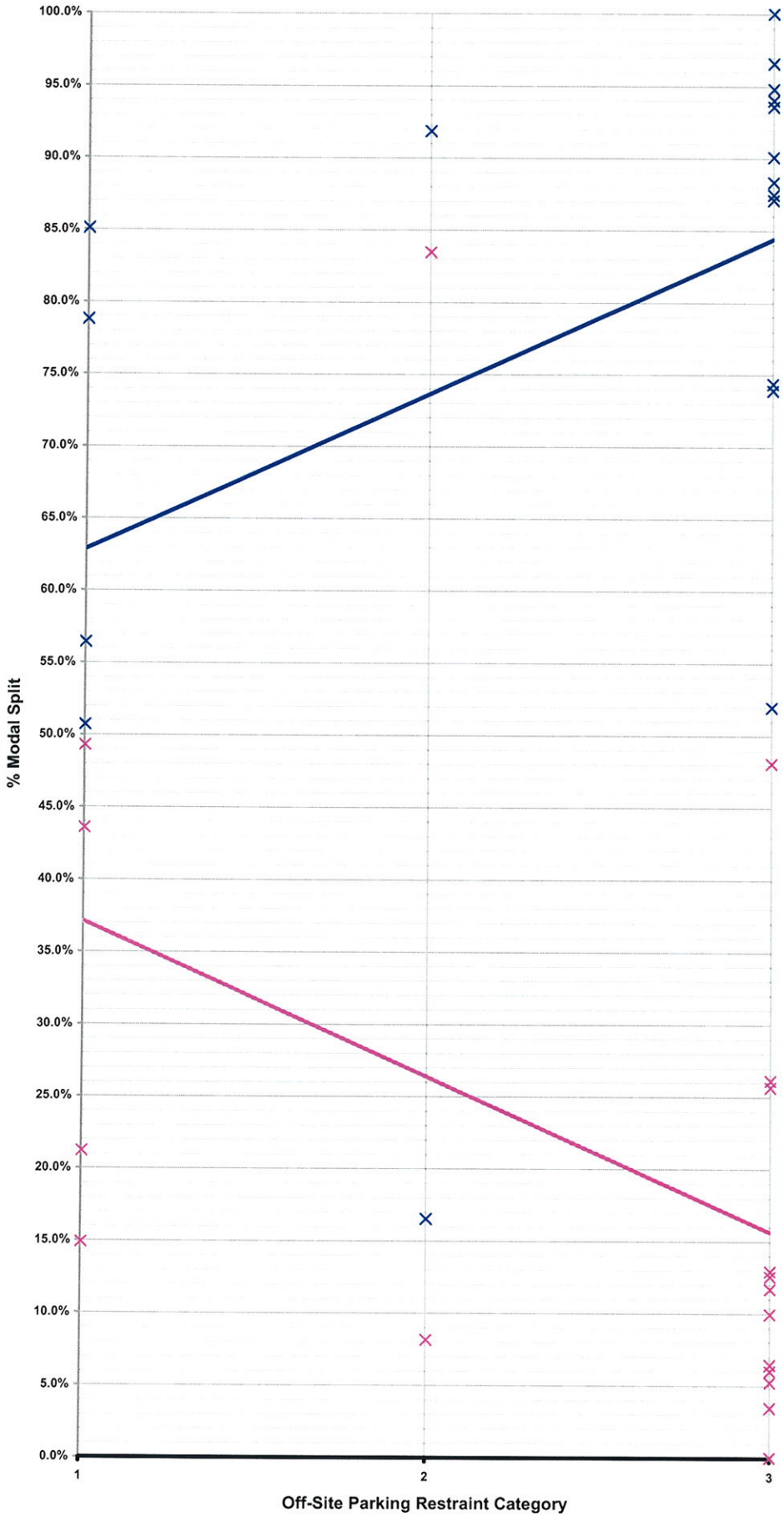
r = 0.033

FABER MAUNSELL

Variation in Modal Split by GFA per Parking Space

Key: X Car X Non-Car

Figure 6.17



Off-Site Parking Restraint Categories:

1 = Yes
2 = Some
3 = None

Comments:

Pearsons Product Moment Correlation Coefficient (at 90% Confidence Level):

r = 0.425

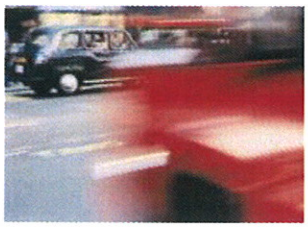
FABER MAUNSELL

Variation in Modal Split by Off-Site Parking Restraint

Key: ×Car ×Non-Car

Figure 6.18

7 CONCLUSIONS



7 Conclusions

7.1 DATA LIMITATIONS

In interpreting the results of this study it is important to recognise the limitations of the dataset that has been analysed. The 18 available multi-modal sites encompass a wide variety of geographic locations and have not been carefully selected to reflect a range of different locational characteristics. Accordingly a wide variety of individual site characteristics and local policies are likely to influence the results. Nevertheless there is a fairly good range for the majority of key parameters, influencing accessibility, modal split and parking.

It is understood that the modal split for a number of the TRICS multi-modal sites is based on 'observed' movements into and out of the site, rather than questionnaire based surveys. Accordingly the identified modal split may not fully take account of the following:

- Those who park in the surrounding area, away from the immediate vicinity of the site, and walk into the site;
- Those whose main mode is public transport, but make the last stage of their journey on foot.

7.2 MEASURING ACCESSIBILITY

One of the requirements of the study was to define an easily understood measure of accessibility that could be easily applied to the range of sites contained in the TRICS database.

For the purposes of this study, two alternatives methods of measuring accessibility have been considered in parallel. These were the following:

- 'Catchment Population' Method;
- PTAL-type 'Opportunity' Method.

Table 7.1 sets out the relative advantages and disadvantages associated with the two preferred alternative approaches to modelling site accessibility.

Table 7.1 – Alternative Accessibility Models – Relative Advantages and Disadvantages

'Catchment Population' Method	
Advantages	Disadvantages
• Systematic approach that is easy to understand. • Ease of application to a variety of sites. • Makes use of data that is freely available and likely to be regularly updated. • Can be adjusted for use with residential sites using 'All Employee Jobs' in each ward as a surrogate for trip attraction potential. • Process could be simplified by the use of drive-time software or other GIS software (modify existing GIS software tools / develop in-house GIS tool).	• Difficult to estimate the public transport catchment population. • The manual computation of catchment populations is time-consuming.

PTAL-type 'Opportunity' Method	
Advantages	Disadvantages
• Approach is similar to the PTAL method, so is likely to be easy to understand and apply. • Ease of application to a variety of sites. • Makes use of data that is freely available and relatively easy to collect. • Applicable to both residential and non-residential land use sites. • May be possible to incorporate/ adapt the existing PTAL method of measuring public transport accessibility as a component within the overall accessibility measure.	• Lack of theoretical basis may lead to inconsistencies in application and results. • Accessibility relationships, particularly those derived for walking / cycling, are likely to be largely empirical. • Model may require a significant amount of additional data collection.

The results in the previous section have identified a high level of correlation between public transport accessibility level, as identified through the PTAL approach and modal split. The results for the catchment population method were less conclusive but indicated a relationship between the numbers of employees walking to work, and the walk population catchment.

The results of the study have confirmed that a whole range of key criteria influence modal split, aside from parking and public transport accessibility. The vast majority of these key criteria relate to the accessibility of the site, by whatever mode, with the location of the site being the key overriding parameter.

7.3 ACCESSIBILITY AND PARKING STRATEGY

The publication of PPG13 in March 2001 established the formal framework for the adoption of maximum parking standards by Regional Planning bodies and local authorities. Recommended maximum standards for a range of specified uses were given, and a number of highway authorities have now revised their guidelines based on maximum rather than minimum standards.

A recent study investigating the effects of maximum standards found that although a number of county highway authorities have now revised their guidelines based on maximum standards, the District Planning Authorities rarely applied them as strict maxima, instead opting to employ a degree of flexibility. Within South East England, the implementation of maximum parking standards by the relevant planning authority was found to be more stringent.

Table 7.2 – PPG13 Parking Standards, March 2001

Land Use	PPG13 Maximum Standards
Retail (food)	1:14 sqm
Retail (non food)	1:20 sqm
Business	1:30 sqm
Cinema / conference	1:5 sqm
Stadia	1:15 sqm
Leisure	1:22 sqm
Higher Education / Further Education	1:2 sqm plus 1:15 students

The first LTPs were published in July 2000 and cover a five-year period from April 2001 to March 2006. LTPs represent one of the cornerstones of the Government White Paper, which emphasises a new direction for transport. Central Government guidance on producing an LTP stated *"...planning policies on parking need to minimise the level of parking associated with development and through the adoption of maximum standards in development plans, and through lower provision*

(and in certain circumstances no parking) in locations more accessible by other modes or which can be made more accessible..." The publication of Planning Policy Guidance 13 – Transport (March 2001) strengthened Central Government guidance on the management of parking provision in relation to public transport accessibility.

A number of local authorities are now using accessibility models to identify areas where parking restraint will be applied. Some are based on complex matrix based approaches based on a whole range of criteria whilst others are simply GIS tools used to assist in the process of identifying core areas where reduced parking would be sought, based on local knowledge and known public transport accessibility levels.

7.4 CURRENT APPROACHES TO SETTING PARKING STANDARDS

Faber Maunsell contacted members of the TRICS Consortium in order to undertake a brief review of current and emerging approaches to setting parking standards and defining accessibility at new developments. In particular, they were asked to provide details with regard to the following:

- Current and emerging countywide policies and approaches to setting parking standards at new developments;
- Different approaches to setting parking standards and variations in parking standards among the District and Borough Councils within the County;
- The use of accessibility modelling in setting reduced parking standards.

A summary of the current approaches of Surrey, West Sussex and Hampshire are provided below.

7.4.1 Surrey

Current parking standards were adopted in November 1999 on an interim basis pending final PPG13 and RPG9. Maximum standards were introduced for all forms of development except residential, where minimum standards continued to apply outside town centres and corridors with good public transport. They are currently in the process of revising the standards now that final guidance has been published. The intention is to adopt standards that include an average maximum of 1.5 spaces per dwelling for residential developments above a certain size, so as to accord with the principles of PPG3. Consultation on the revised standards is due in the summer. For business use, they will probably move from 1:35 to 1:30 in line with PPG13.

The majority of the eleven district planning authorities have revised their standards in line with the County's recommended levels. Some are still in the process of doing so through the Local Plan process. There are a few local variations for some land uses and the degree of restraint applied. There has not been universal agreement with the county approach or the numerical standards recommended, and at times this has led to difficulties in interpretation by developers and in inquiry decisions. There has been a general reluctance toward moving to the tighter standards that have applied hitherto.

The highway authorities approach to reduced parking standards at sub PPG13 standards is based on an accessibility model called PTAM, originally developed by consultants. District planning authorities have been supplied with contour maps of accessibility and requested to determine where such reductions should apply based on these maps together with Local Plan policies covering accessible locations like town centres. They are required to submit Local Parking Management Plans (LPMP) that should include mapped areas of parking reduction together with other details on the supply of on and off street public car parking. This information

is fed into Local Plans as far as the standards are concerned and into the Local Transport Plan process as far as the LPMP and overall strategy are concerned.

7.4.2 West Sussex

The County are currently working with the 7 District Councils to update parking standards - the intention being to base standards on Total Access Demand and accessibility. Part of this process involves clarifying the current approaches that Districts are adopting - this varies between urban and rural districts. The intention is to identify bands of accessibility that can then be used to allow reduced parking standards where appropriate. It is intended that the bands will be established using 'local knowledge' as opposed to a model.

They are also looking at the possibility of developing a formula approach to contributions based around similar principles of Total Access Demand.

7.4.3 Hampshire

Hampshire County Council has recently adopted the following parking strategy, which proposes (undefined) links between accessibility and parking limits. The actual reduction is delegated to local planning officers in each of Hampshire's 11 districts.

The Hampshire Parking Strategy and Standards aims to provide a robust but flexible approach to setting standards for the county and the two unitary cities with more stringent parking standards proposed for developments that have better access by public transport and other non-car modes. In the medium to long term this approach is expected to influence travel behaviour significantly, particularly in the Major Development Areas.

The approach seeks to apply a different set of standards for new developments, depending on the availability of alternative means of transport to the car and on local characteristics. However, in areas where there are few realistic alternatives, the car will inevitably remain the dominant means of transport. In settlements where public transport, cycling or walking are available as a choice, more restrictive parking provision will be applied. For example, the Major Development Areas will be planned with high public transport accessibility and more stringent parking limits.

A detailed and extensive public transport accessibility model has been developed for the County Council, districts and unitary authorities. Where the model is not used, other means of measuring accessibility are considered appropriate. This will assist in determining the maximum level of parking provision. Other factors that will influence the parking limit include the availability of existing public car parking spaces nearby, environmental effects, the local economy and pedestrian and cycle access.

The maximum standards assume the lowest level of accessibility as a standard. However, parking spaces will be reduced where better levels of accessibility are provided, or can be delivered as a result of the development. Parking limits at the various land uses are to be reduced by different degrees to take account of their accessibility to non-car modes and to contribute to traffic reduction. For example, parking limits at workplaces can go down to 30% of the maximum, since this can generally improve peak-hour travel conditions and conforms with the recommended range specified in Regional Planning Guidance (RPG 9) for the South East Region (March 2001), Policy T3. In the very highest range of accessible locations (for example, close to public transport interchanges), zero parking may be appropriate.

Table 7.3 - Reduction in car parking for levels of accessibility by land use

Land Use	Parking standard for least accessible location	Reduced parking standard for highly accessible location
Retail	100%	75%
Residential, education, health, leisure	100%	50%
Employment	100%	30%

7.5 THE DEVELOPERS PERSPECTIVE

A study was undertaken in 1998 on behalf the British Property Foundation to investigate the linkage between growth in business use, employment accessibility and car parking standards in order to illustrate the impact of reduced standards on locational decisions of developers and occupiers. It was found that whilst the level of car parking was a concern to developers, it was only one of many concerns that are considered through the decision making process, and is unlikely to come into the decision making process until a specific area or range of locations have been identified. Accordingly it is important to set out the context that transport and car parking plays in the locational decision making process. Factors such as public sector incentives, workforce availability, sector track record, transport and communications, quality of life, research and education are usually far more important in the decision making process, therefore, unless the correct conditions exist within these areas, car parking provision will not even feature in the decision making process. One of the key findings was that whilst car parking is initially perceived to be a key component in the transport equation, on closer scrutiny, it is actually good accessibility, by whatever mode, that is the key issue in terms of the site selection process. Accordingly in locations where a suitable level of accessibility is available by non-car modes, the presence of limited parking is easier to bear.

7.6 PARKING STANDARDS AT NEW DEVELOPMENTS

The common factor in all approaches to determining parking policy is the application of local knowledge, which has the effect of ensuring that the parking standards are suitable for the particular area for which they were designed. However, this frequently makes the strategies inappropriate for use in other locations. The need to be able to regulate parking standards to take account of any special / localised factors means that it is difficult to find an approach that is universally acceptable. There are however a number of key issues that should be taken into account when determining parking standards and policy. These may be defined as follows:

- Location – The definition of 'zones' in which different parking standards are employed is, perhaps, the issue that is most reliant on local knowledge. Consequently, the methodology for defining zone boundaries, and the parking standard(s) that will apply within each zone, will vary from area to area. Nevertheless, there are a number of common indicators that are likely to influence where the most stringent parking standards are applied, including proximity to shopping / town centres, community facilities, and major transport termini and interchanges;

- Accessibility – The current approaches to setting parking standards that use accessibility tend to concentrate on public transport accessibility, since travel by public transport is seen as the closest surrogate for travel by private car. However, examination of accessibility by all modes is recommended, since it may indicate significant potential to transfer trips from private car to cycling and walking as well as public transport – particularly in urban areas;

- Economic and Social Issues – In some circumstances the characteristics of an particular area may support the use of stringent parking standards, but local authorities have chosen to relax standards to attract new development in to areas that need an economic and/or social boost. Parking policy should be framed with these economic and social aims in mind;

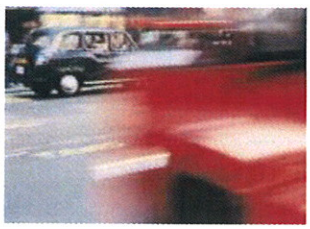
- Mode Split – Examination of mode split data from similar sites in the same area is likely to give a good indication of the mode split that can be achieved at a new development. Parking standards should be set such that the required mode split is both realistic and attainable;

- Catchment Populations – Assessment of the density and distribution of the population around a new development will give an indication of where employees are most likely to travel from and, depending on distance and availability, what their main mode of transport is likely to be;

- Local Parking Restraint – The application of rigorous parking standards at new developments is unlikely to be effective in reducing travel by private car if they are not coupled with similarly strict parking controls in the surrounding area. Thus, the parking standards applied must be appropriate to the level of parking restraint and availability of parking in the locality of the development.

The standards set out in PPG13 are not yet being consistently applied across the country. This is partly because national policy comes into force more immediately than local policies that predate it, but is also because perfectly legitimate different approaches are taken by local authorities to suit local geographic, economic and political conditions. Until a more universal approach is to parking and accessibility is developed, it will be difficult to link develop any meaningful link between accessibility, parking standards and the determination of appropriate developer contributions. More localised considerations will always be paramount.

8 RECOMMENDATIONS



8 Recommendations

8.1 INTRODUCTION

This Research Study has identified a number of areas in the TRICS Database where the information provided could be expanded or improved. Specifically, these are site location, parking provision (both on-site and off-site) and accessibility. The following sections provide detailed recommendations for the way forward.

8.2 SITE LOCATION

This study has shown that site location is the key overriding parameter, with clear relationships identified between location and the other key criteria that relate to site location, site characteristics, accessibility and parking.

The TRICS database currently contains a location field as part of the details listed for each site. This field is split into nine categories, which are defined as follows:

- Town Centre – *in the central area of the town/city;*
- Edge of Town Centre – *edge of the central area of the town/city;*
- Neighbourhood Centre – *self-contained "village" style area within a town/city;*
- Suburban Area – *outer area of town/city, normally mainly residential in nature;*
- Edge of Town – *outskirts of town or city, not predominantly residential;*
- Free Standing – *out of town and in an area of its own;*
- Commercial Zone – *specifically retail-based area;*
- Industrial Zone – *specifically industrial-based area;*
- Development Zone – *area in which significant development has been undertaken.*

While these categories provide useful information about the location of a particular site, and give an indication of the characteristics of the are surrounding the site, it is considered that they may be too specific to be of use in the appraisal of accessibility or the determination of parking standards.

It is recommended that an additional site location classification is included in the TRICS database, based on a small number of more general site location categories. An example of such a simplified approach has been adopted in this study, based upon the following three location categories:

- Town Centre Core;
- Town Centre;
- Edge of Town / Out of Town.

The determination of sites in to these categories is somewhat subjective, having been derived from limited local knowledge and key indicators of location type and characteristics (e.g. shopping centres, major public transport termini). In developing such a classification for inclusion in the TRICS database, it would be necessary to define more rigorous / robust definitions for each category to aid in the accurate and consistent determination of site location.

The limitations of the dataset in this study resulted in the amalgamation of the 'Edge of Town' and 'Out of Town' categories. However, if this approach to classifying site location were to be included in future releases of the TRICS database it may be beneficial to split the final category back into two categories.

Surrey have adopted a similar, four tier approach to defining site location characteristics, which may satisfy the need for more robust definitions for each category. The Surrey classifications are set out in Table 8.1, below, along with a comparison to the site location categories used in this study.

Table 8.1 – Surrey County Council Site Location Definitions

Area	Surrey Classification	FaberMaunsell Classification
1	Regional / Major Town Centre	Town Centre Core
2	Larger Town Centres, Periphery of Area 1 Centre	Town Centre
3	Smaller Town Centres, Urban Fringes, Inner Suburbs	Edge of Town
4	Outer Residential Areas, Isolated Built-Up Areas	Out of Town

The inclusion of a more generalised definition of site location may also allow the existing site location field in the TRICS database to be expanded to include further categories that may be of use in defining site characteristics.

8.3 PARKING PROVISION

Parking provision is another of the key criteria that has been identified as being important to the determination of overall site accessibility. The TRICS database currently gives a range of information about the parking characteristics of each site. There is a particular focus upon on-site parking provision, with information provided about whether there is parking available, whether it is a multi-storey or surface parking facility, and an indication of the number of spaces provided by type (employee, visitor, disabled etc.). In addition, some qualitative information is given about the nature of off-site parking, but it is in this area where the parking information contained in the database is considered particularly weak.

It is recommended that TRICS develop a separate report card for each site that gives more comprehensive information with regard to on-site and off-site parking, with particular emphasis on enhancing the information provided in the latter category. More detailed recommendations are provided below.

8.3.1 On-Site Parking Provision

The data that is currently collected with regard to on-site parking is considered sufficient for the likely requirements of users of the TRICS database. However, it is noted that the quality of information collected varies dramatically from site to site, with fields frequently left blank/unrecorded. It is recommended that the data collection and review process be more rigorous in order to ensure that the data collected is both complete and consistent for all sites.

8.3.2 Off-Site Parking Provision

The TRICS database currently records data about any off-site parking, as well as details of any parking restraint that is operated on or around the site. The data in this latter category varies greatly in both quantity and quality.

In order to improve the collection of data for off-site parking provision and restraint, it is recommended that TRICS develop a more rigorous and structured survey programme for off-site parking. It is considered that the data collection should focus upon the following areas:

ON-STREET PARKING

- Existence of a Controlled Parking Zone or other parking restraints in the surrounding area;
- Distance / walk time from site to reach areas where no parking controls are operated (up to 20 minutes).

OFF-STREET PARKING

- Existence of short-stay parking within 20 minutes of the site;
- Existence of long-stay parking within 20 minutes of the site.

8.4 ACCESSIBILITY

The TRICS database already contains some data about the sustainable features at and around sites and accessibility by public transport at multi-modal sites, however it is not considered sufficient to be able to draw any significant conclusions about the accessibility characteristics of individual sites.

It is recommended that TRICS further develop this section of the database to include a number of key parameters / criteria that would aid in assessing site accessibility.

8.4.1 Public Transport Accessibility Level

This study has shown that the Public Transport Accessibility Level (PTAL) developed by LB Hammersmith and Fulham exhibits an extremely strong correlation to modal split, and would therefore be a useful indicator of site accessibility. The data collected for bus and rail services for inclusion in the TRICS database does not fit the requirements of the PTAL model exactly, but it is anticipated that the collection process could be relatively easily modified to yield suitable data.

The following data is currently collected for all bus services within 400m of each site and rail services within 1000m of each site (both bus and rail services must have a frequency of at least 2 buses/trains per hour during the period 0800-1800):

- Service destination (Town or Area);
- Service frequency;
- Approximate journey time to destination.

It is recommended that the catchments be extended to 800m (10 minutes walk) for bus services and 1200m (15 minutes walk) for rail services, and that the following additional information is collected:

- Service route number / name;
- Service operator (optional);
- Walk time to bus-stop/station (0–5 minutes, 5–10 minutes, 10–15 minutes).

Using this additional information it should prove relatively easy to calculate a PTAL score, using the slightly modified methodology outlined in Appendix B. In addition, the provision of a service identifier (route number or name) and/or service operator will allow TRICS users to obtain further information about public transport services if they require.

8.4.2 Catchment Populations

The data analysis showed no conclusive relationships between the catchment population methods of measuring accessibility (TRICS and PAI) and modal split, but did show an observable correlation between the walk catchment populations and the proportion of employees walking to work. Previous studies have indicated a relationship between catchment population methods of measuring accessibility and modal split.

Accordingly, it is recommended that estimates of the following catchment populations are included in the accessibility section of the TRICS database, as supplementary information:

- 15-minute walk time catchment population;
- 30-minute cycle time catchment population;
- 45-minute private car travel time catchment population.

The inclusion of a public transport catchment population is not currently recommended due to the onerous nature of calculating a reasonable estimate.

8.5 SUMMARY OF RECOMMENDATIONS

The summary, the following enhancements and additions to the TRICS database are recommended:

SITE LOCATION

(a) Inclusion of an additional site location classification based on a small number of general site location categories. The existing site categorisation could be developed into a more specific (secondary) classification of site location;

PARKING

(b) Development of a separate section specifically concerned with parking provision and restraint, both on and off-site;

(c) Increased rigour in the data collection and review process in order to ensure that the data collected about on-site parking is both complete and consistent;

(d) Development of a more rigorous and structured survey for off-site parking, to gain more detailed and consistent data for inclusion in the database;

ACCESSIBILITY

(e) Development of the existing section on accessibility;

(f) Additions and modifications to the data collected for bus and rail service characteristics;

(g) Inclusion of a PTAL (or similar) measure of public transport accessibility;

(h) Inclusion of catchment populations for walk, cycle and private car.

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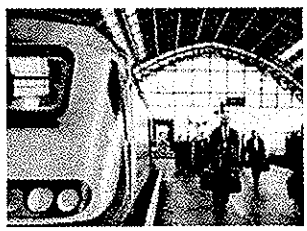

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Appendix A – Site Details

APPENDIX A1 - SITE LOCATION PARAMETERS

Location Category	Land Use Class	Site Ref.	Site Name	Town	County / Region	OS Grid Reference		Local Population	
						Easting	Northing	Within 1 mile	Within 5 miles
Town Centre Core	B1	B-02	Fountain Court	Middlesbrough	North Cleveland	449810	520130	25,001 - 50,000	250,001 - 500,000
	B1	B-03	Premier House	Kilburn	Greater London	524570	183100	50,001 - 100,000	500,001 +
	B1	B-05	G.O.S.E.	Guildford	Surrey	499290	149560	15,001 - 20,000	100,001 - 125,000
	B1	B-12	Keniston Press Limited	Kilburn	Greater London	524530	183130	50,001 - 100,000	500,001 +
	AVERAGE								
Town Centre	B1	B-01	Demeter House	Cambridge	Cambridgeshire	545970	257290	25,001 - 50,000	125,001 - 250,000
	B1	B-10	Thomas Hardy Brewery	Dorchester	Dorset	369140	090210	15,001 - 20,000	25,001 - 50,000
	B1	B-11	Friskies Petcare	Barrhead	Renfrewshire	251150	659850	15,001 - 20,000	250,001 - 500,000
	B1	B-15	Spiersbridge Business Park	Giffnock	Renfrewshire	254600	659350	20,001 - 25,000	250,001 - 500,000
	B1	B-16	Boulevard Unit Factory Estate	Hull	Yorks and North Lincs	508110	427560	15,001 - 20,000	250,001 - 500,000
	B2	B-13	Laurence Scott & Electromotors Ltd	Norwich	East Anglia	624320	307840	20,001 - 25,000	125,001 - 250,000
	B2	B-14	Muriel Street Industrial Estate	Barrhead	Renfrewshire	250190	659470	15,001 - 20,000	250,001 - 500,000
	B8	B-18	Baillieston Distribution Centre	Glasgow	Glasgow	267010	664510	25,001 - 50,000	250,001 - 500,000
	AVERAGE								
Edge / Out of Town	B1	B-04	Melton Mowbray Council Offices	Melton Mowbray	Leicestershire	474780	319650	15,001 - 20,000	25,001 - 50,000
	B1	B-06	Cambridge Science Park	Cambridge	Cambridgeshire	546840	261330	15,001 - 20,000	125,001 - 250,000
	B1	B-07	Greyfriars Business Park	Stafford	Staffordshire	391610	323960	15,001 - 20,000	50,001 - 75,000
	B1	B-08	Fleet House (Dorset Echo)	Weymouth	Dorset	365610	079840	15,001 - 20,000	50,001 - 75,000
	B1	B-09	Durable Business Systems	Wimborne	Dorset	405640	100920	1,001 - 5,000	100,001 - 125,000
	B2	B-17	Rashes Green Industrial Estate	Dereham	East Anglia	599480	317780	10,001 - 15,000	25,001 - 50,000
	AVERAGE								
ALL SITES	**AVERAGE**								

APPENDIX A2 - SITE CHARACTERISTICS

Location Category	Land Use Class	Site Ref.	Site Name	Gross Floor Area	Site Area	Number of Employees		Employment Density	Plot Ratio
				(sq m)	(Ha)	Full Time	Part Time	See Note 1	See Note 2
Town Centre Core	B1	B-02	Fountain Court	4100	0.39	160	40	20.50	1.05
	B1	B-03	Premier House	408	0.06	50	0	8.16	0.68
	B1	B-05	G.O.S.E.	4312	0.16	260	20	15.40	2.70
	B1	B-12	Keniston Press Limited	620	0.12	15	0	41.33	0.52
	AVERAGE			2360	0.18	121	15	21.35	1.24
Town Centre	B1	B-01	Demeter House	4344	0.20	351	12	11.97	2.17
	B1	B-10	Thomas Hardy Brewery	19857	4.29	184	10	102.36	0.46
	B1	B-11	Friskies Petcare	22926	5.30	239	10	92.07	0.43
	B1	B-15	Spiersbridge Business Park	4233	2.48	121	30	28.03	0.17
	B1	B-16	Boulevard Unit Factory Estate	2220	0.86	118	0	18.81	0.26
	B2	B-13	Laurence Scott & Electromotors Ltd	32000	6.10	360	10	86.49	0.52
	B2	B-14	Muriel Street Industrial Estate	7211	4.15	157	3	45.07	0.17
	B8	B-18	Baillieston Distribution Centre	11504	3.98	217	6	51.59	0.29
	AVERAGE			13037	3.42	218	10	54.55	0.56
Edge / Out of Town	B1	B-04	Melton Mowbray Council Offices	4710	1.94	183	93	17.07	0.24
	B1	B-06	Cambridge Science Park	118448	53.20	3780	0	31.34	0.22
	B1	B-07	Greyfriars Business Park	4064	0.76	84	2	47.26	0.53
	B1	B-08	Fleet House (Dorset Echo)	3035	1.19	150	10	18.97	0.26
	B1	B-09	Durable Business Systems	1626	1.00	28	0	58.07	0.16
	B2	B-17	Rashes Green Industrial Estate	51000	26.20	870	120	51.52	0.19
	AVERAGE			30481	14.05	849	38	37.37	0.27
ALL SITES	**AVERAGE**			**16479**	**6.24**	**407**	**20**	**41.44**	**0.61**

NOTES

1. Employment Density = Gross Floor Area / Number of Employees (Full-Time and Part-Time)
2. Plot Ratio = Gross Floor Area / (Site Area x 10 000)

APPENDIX A3 - ACCESSIBILITY

Location Category	Land Use Class	Site Ref.	Site Name	Walking Catchment Population	Cycling Catchment Population	Private Car Catchment Population	Public Transport Catchment Population	Population with Accessibility by Car Only
				See Note 1	See Note 2	See Note 3	See Note 4	See Note 5
Town Centre Core	B1	B-02	Fountain Court	4874	95611	2189660	660660	1529000
	B1	B-03	Premier House	15458	424165	4260343	1016652	3243691
	B1	B-05	G.O.S.E.	9581	86763	4069024	681441	3387583
	B1	B-12	Keniston Press Limited	15458	425831	4260343	1016652	3243691
	AVERAGE			11343	258092	3694843	843851	2850991
Town Centre	B1	B-01	Demeter House	5484	104899	1419427	241158	1178269
	B1	B-10	Thomas Hardy Brewery	6041	29142	708709	152039	556670
	B1	B-11	Friskies Petcare	12226	164181	2465440	650436	1815004
	B1	B-15	Spiersbridge Business Park	6446	152893	2390038	868374	1521664
	B1	B-16	Boulevard Unit Factory Estate	7351	134084	973766	322170	651596
	B2	B-13	Laurence Scott & Electromotors Ltd	5443	148079	831739	297181	534558
	B2	B-14	Muriel Street Industrial Estate	12226	164181	2465440	871786	1593654
	B8	B-18	Baillieston Distribution Centre	7553	167386	2677761	1011098	1666663
	AVERAGE			7846	133106	1741540	551780	1189760
Edge / Out of Town	B1	B-04	Melton Mowbray Council Offices	15073	50772	1898334	96041	1802293
	B1	B-06	Cambridge Science Park	6434	90561	1707478	233107	1474371
	B1	B-07	Greyfriars Business Park	3861	55413	3957661	160536	3797125
	B1	B-08	Fleet House (Dorset Echo)	4339	57524	354601	108441	246160
	B1	B-09	Durable Business Systems	1192	43314	1442851	271956	1170895
	B2	B-17	Rashes Green Industrial Estate	911	9616	619902	44898	575004
	AVERAGE			5302	51200	1663471	152496	1510975
ALL SITES	**AVERAGE**			**7775**	**133579**	**2149584**	**483590**	**1665994**

NOTES

1. Walking Catchment Population is derived from 1991 Census data for a 15 minute walk at an average speed of 5kph (=1250m Catchment)
2. Cycling Catchment Population is derived from 1991 Census data for a 30 minute cycle at an average speed of 13kph (= 6500m Catchment)
3. Private Car Cactchment Population is derived from 1991 Census data for a 45 minute drive time during peak periods (based on drive time software)
4. Public Transport Catchment Population is derived from 1991 Census data for a 45 minute travel time
5. Population with access by Car Only = Private Car Catchment Population - Public Transport Catchment Population

APPENDIX A3 - ACCESSIBILITY

Location Category	Land Use Class	Site Ref.	Site Name	Public Transport Accessibility Level		TRICS Catchment Population Ratio (Private:Public)	Potential Accessibility Index (PAI)	Car Ownership	Car Availability
				Index Score	PTAL	See Note 6	See Note 7	See Note 8	See Note 9
Town Centre Core	B1	B-02	Fountain Court	14.56	3	77 : 23	0.43	0.6 - 1.0	31%
	B1	B-03	Premier House	15.80	4	81 : 19	0.31	0.6 - 1.0	28%
	B1	B-05	G.O.S.E.	28.06	6	86 : 14	0.20	1.1 - 1.5	38%
	B1	B-12	Keniston Press Limited	15.80	4	81 : 19	0.31	0.6 - 1.0	28%
	AVERAGE			18.56	-	81 : 19	0.32	-	31%
Town Centre	B1	B-01	Demeter House	15.25	4	85 : 15	0.20	1.1 - 1.5	47%
	B1	B-10	Thomas Hardy Brewery	13.65	3	82 : 18	0.27	1.1 - 1.5	46%
	B1	B-11	Friskies Petcare	3.45	1	79 : 21	0.36	0.6 - 1.0	24%
	B1	B-15	Spiersbridge Business Park	3.45	1	73 : 27	0.57	0.6 - 1.0	24%
	B1	B-16	Boulevard Unit Factory Estate	4.25	1	75 : 25	0.49	0.6 - 1.0	37%
	B2	B-13	Laurence Scott & Electromotors Ltd	13.10	3	74 : 26	0.56	0.6 - 1.0	44%
	B2	B-14	Muriel Street Industrial Estate	6.15	2	74 : 26	0.55	0.6 - 1.0	24%
	B8	B-18	Baillieston Distribution Centre	9.00	2	73 : 27	0.61	0.0 - 0.5	25%
	AVERAGE			9.42	-	73 : 27	0.57	-	31%
Edge / Out of Town	B1	B-04	Melton Mowbray Council Offices	-	3	95 : 5	0.05	0.6 - 1.0	40%
	B1	B-06	Cambridge Science Park	3.35	1	88 : 12	0.16	1.1 - 1.5	46%
	B1	B-07	Greyfriars Business Park	2.56	1	96 : 4	0.04	1.1 - 1.5	40%
	B1	B-08	Fleet House (Dorset Echo)	5.40	2	77 : 23	0.44	0.0 - 0.5	45%
	B1	B-09	Durable Business Systems	1.20	1	84 : 16	0.23	1.1 - 1.5	46%
	B2	B-17	Rashes Green Industrial Estate	2.40	1	93 : 7	0.08	1.1 - 1.5	45%
	AVERAGE			3.00	-	85 : 15	0.25	-	45%
ALL SITES	**AVERAGE**			**9.26**	**-**	**82 : 18**	**0.33**	**-**	**37%**

NOTES

6. TRICS Catchment Population Method

Private = Private Car Catchment Population / (Private Car Catchment Population + Public Transport Catchment Population)

Public = Public Transport Catchment Population / (Private Car Catchment Population + Public Transport Catchment Population)

7. Potential Accessibility Index (PAI)

PAI = Public Transport Catchment Population / Population with accessibility by Car Only

8. Car Ownership = Average number of cars per household in the surrounding area

9. Car Availability = % of population with a car available for use (derived from 1991 Census data)

APPENDIX A4 - PARKING PROVISION AND RESTRAINT

Location Category	Land Use Class	Site Ref.	Site Name	On-site Parking Space Provision	Parking Spaces per Employee	Gross Floor Area per Parking Space	Peak Car Park Occupancy	Off-site Parking Restraint
				Spaces	See Note 1	See Note 2	(%)	See Note 3
Town Centre Core	B1	B-02	Fountain Court	80	0.40	51	227.5%	None
	B1	B-03	Premier House	13	0.26	31	161.5%	Yes
	B1	B-05	G.O.S.E.	38	0.14	113	60.5%	Some
	B1	B-12	Keniston Press Limited	16	1.07	39	75.0%	Yes
	AVERAGE			37	0.47	59	131.1%	-
Town Centre	B1	B-01	Demeter House	48	0.13	91	214.6%	Yes
	B1	B-10	Thomas Hardy Brewery	160	0.82	124	75.6%	None
	B1	B-11	Friskies Petcare	96	0.39	239	89.6%	None
	B1	B-15	Spiersbridge Business Park	77	0.51	55	76.6%	None
	B1	B-16	Boulevard Unit Factory Estate	28	0.24	79	217.9%	None
	B2	B-13	Laurence Scott & Electromotors Ltd	300	0.81	107	94.3%	Yes
	B2	B-14	Muriel Street Industrial Estate	112	0.70	64	72.3%	Some
	B8	B-18	Baillieston Distribution Centre	166	0.74	69	64.5%	None
	AVERAGE			123	0.54	104	113.2%	-
Edge / Out of Town	B1	B-04	Melton Mowbray Council Offices	233	0.84	20	46.8%	None
	B1	B-06	Cambridge Science Park	3685	0.97	32	80.7%	None
	B1	B-07	Greyfriars Business Park	111	1.29	37	39.6%	None
	B1	B-08	Fleet House (Dorset Echo)	138	0.86	22	57.2%	None
	B1	B-09	Durable Business Systems	62	2.21	26	33.9%	None
	B2	B-17	Rashes Green Industrial Estate	1700	1.72	30	33.5%	None
	AVERAGE			988	1.32	28	48.6%	-
ALL SITES	**AVERAGE**			**392**	**0.78**	**68**	**95.6%**	-

NOTES

1. Parking Spaces per Employee = Total Number of Parking Spaces / Total Number of Employees
2. Gross Floor Area per Parking Space = GFA / Number of Parking Spaces
3. Parking restraint is based upon qualitative assessment of the information provided about on-street parking around the site. None is entered where no information is given.

APPENDIX A5 - MODAL SPLIT

Location Category	Land Use Class	Site Ref.	Site Name	Private Car		Car	Walking	Cycling	Public Transport	Non-Car
				Driver	Passenger	See Note 1				See Note 2
Town Centre Core	B1	B-02	Fountain Court	51.7%	0.3%	51.9%	39.4%	0.4%	8.2%	48.1%
	B1	B-03	Premier House	43.6%	7.1%	50.7%	37.9%	0.0%	11.4%	49.3%
	B1	B-05	G.O.S.E.	14.2%	2.4%	16.5%	62.7%	1.5%	19.3%	83.5%
	B1	B-12	Keniston Press Limited	46.9%	9.5%	56.4%	35.2%	0.0%	8.4%	43.6%
	AVERAGE			39.1%	4.8%	43.9%	43.8%	0.5%	11.8%	56.1%
Town Centre	B1	B-01	Demeter House	68.1%	10.7%	78.8%	11.2%	9.2%	0.8%	21.2%
	B1	B-10	Thomas Hardy Brewery	74.4%	0.0%	74.4%	23.6%	1.2%	0.8%	25.6%
	B1	B-11	Friskies Petcare	79.6%	13.9%	93.6%	5.1%	0.4%	1.0%	6.4%
	B1	B-15	Spiersbridge Business Park	77.3%	11.0%	88.3%	8.1%	0.4%	3.1%	11.7%
	B1	B-16	Boulevard Unit Factory Estate	86.7%	9.8%	96.6%	2.9%	0.6%	0.0%	3.4%
	B2	B-13	Laurence Scott & Electromotors Ltd	71.7%	13.4%	85.1%	7.8%	5.5%	1.6%	14.9%
	B2	B-14	Muriel Street Industrial Estate	83.3%	8.6%	91.9%	6.2%	0.2%	1.7%	8.1%
	B8	B-18	Baillieston Distribution Centre	74.9%	15.2%	90.1%	7.5%	0.4%	2.0%	9.9%
	AVERAGE			77.0%	10.3%	87.3%	9.1%	2.2%	1.4%	12.7%
Edge / Out of Town	B1	B-04	Melton Mowbray Council Offices	65.2%	8.7%	73.9%	22.1%	3.6%	0.4%	26.1%
	B1	B-06	Cambridge Science Park	82.1%	11.9%	94.0%	2.4%	2.5%	1.1%	6.0%
	B1	B-07	Greyfriars Business Park	42.8%	44.3%	87.1%	11.0%	0.9%	1.1%	12.9%
	B1	B-08	Fleet House (Dorset Echo)	77.4%	17.4%	94.8%	3.3%	1.2%	0.7%	5.2%
	B1	B-09	Durable Business Systems	92.7%	7.3%	100.0%	0.0%	0.0%	0.0%	0.0%
	B2	B-17	Rashes Green Industrial Estate	74.1%	13.3%	87.5%	3.5%	4.5%	4.6%	12.5%
	AVERAGE			72.4%	17.2%	89.5%	7.0%	2.1%	1.3%	10.5%
ALL SITES	**AVERAGE**			**67.0%**	**11.4%**	**78.4%**	**16.1%**	**1.8%**	**3.7%**	**21.6%**

NOTES

1. Modal Split by Car includes both Private Car Drivers and Passengers
2. Modal Split by Non-Car includes Pedestrians, Cyclists and Public Transport Users

Appendix B – Definition of Accessibility Measures

PUBLIC TRANSPORT ACCESSIBILITY LEVEL

The LB Hammersmith and Fulham developed a public transport accessibility index, to identify those areas of the borough that were most (and least) accessible by public transport. The assessment is based upon the number of bus and rail services that can be accessed within a fixed walking catchment around a particular point, and measures of service frequency and reliability.

The PTAL assessment uses the following assumptions:

- Inclusion of all bus services within 10 minutes walk of the site;
- Inclusion of all rail services within 15 minutes walk of the site;
- Assumed average walk speed of 80 metres per minute (3 mph);
- Reliability Factor, K = 1 for rail services and 2 for bus services.

The Accessibility Index is defined as follows:

- **K** = Reliability Factor
- **AVERAGE WAITING TIME** = K x Average Scheduled Waiting Time
- **ACCESS TIME** = Walking Time + Average Waiting Time
- **EQUIVALENT DOORSTEP FREQUENCY** = 0.5 x (60 / Access Time)
- **ACCESSIBILITY INDEX** =
  EDF (most accessible bus service) + 0.5 x EDF (all other accessible bus services)
  + EDF (most accessible rail service) + 0.5 x EDF (all other accessible rail services)

Finally, the PTAL is defined as follows:

PUBLIC TRANSPORT ACCESSIBILITY LEVEL		RANGE OF ACCESSIBILITY INDICES
1	Very Low	0 – 5
2	Low	5 – 10
3	Medium Low	10 – 15
4	Medium High	15 – 20
5	High	20 – 25
6	Very High	25 +

A slightly revised version of the PTAL approach to measuring accessibility has been used in this study. Since no data was available about the exact walk time to the bus stops and rail stations in the environs of the 18 sites, the walk time has been split into the following three bands:

- 0 – 5 minutes (Average Walk Time = 2.5 minutes);
- 5 – 10 minutes (Average Walk Time = 7.5 minutes);
- 10 – 15 minutes (Average Walk Time = 12.5 minutes).

In addition, all bus and rail services are assumed to run according to the specified timetables, and hence the reliability factor is 1 for both types of service.

TRICS CATCHMENT POPULATION METHOD

The TRICS Catchment Population method measures accessibility by comparing the catchment area population that could be reached by within 45 minutes travel time by public transport with the catchment population that could be reached by private transport in 45 minutes travel time.

The public and private transport accessibility calculations are defined as follows:

- $P_{PUB\ 45}$ = Population within 45 minutes travel by public transport;
- $P_{PRIV\ 45}$ = Population within 45 minutes travel by private transport;
- **PUBLIC TRANSPORT ACCESSIBILITY** = $P_{PUB\ 45} / (P_{PUB\ 45} + P_{PRIV\ 45})$;
- **PRIVATE TRANSPORT ACCESSIBILITY** = $P_{PRIV\ 45} / (P_{PUB\ 45} + P_{PRIV\ 45})$.

The accessibility is usually represented as a ratio of the Public Transport Accessibility and the Private Transport Accessibility.

POTENTIAL ACCESSIBILITY INDEX

The PAI approach is similar to the TRICS Catchment Population method, giving an indication of the proportion of the population that can use sustainable modes of transport, and the proportion of the population who have no realistic alternative to using the car.

The Potential Accessibility Index is defined as follows:

- P_{SM} = Population with a choice of mode;
- $P_{CAR\ ONLY}$ = Population having to use a car;
- **POTENTIAL ACCESSIBILITY INDEX** = $P_{SM} / P_{CAR\ ONLY}$.

Like the TRICS Catchment Population method, the catchment populations are assessed within defined travel time catchments. In addition, the $P_{CAR\ ONLY}$ population is adjusted to take account of car ownership / availability.