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ABSTRACT

PATTERSON, N.S. and A.D. MAY (1982) The transport problems of inner city firms : an approach to solutions. Leeds : University of Leeds, Inst. Transp. Stud., WP 155 (unpublished).

The paper arises from a recent investigation into the extent to which transport problems affect manufacturing firms and their employees. It summarises the conclusions of that study and notes their implications for the selection and assessment of transport policies designed to assist industry.

One of the conclusions is that most problems are local or site-specific; this suggests that local and probably low cost solutions developed by local authorities or by firms themselves may well be more appropriate than programmes of major investment. However, another conclusion is that firms are generally inadequately aware of the effects of their transport problems and the costs to which they give rise; this suggests that the justification even for low cost solutions may not be being made sufficiently apparent to local authorities. These conclusions indicate the need for a more careful assessment of the effects of both high and low cost transport policies on industry.

The paper outlines the way in which an analysis of firms' transport problems may be used to develop appropriate solutions and to assess their effects. It discusses some of the problems of such an investigation, using case studies drawn from recent research in Inner London.

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1. INTRODUCTION

1.1 Background

As part of the current initiatives to regenerate the Inner City, the Department of Transport has sought advice on the role of transport policy in helping to retain and increase employment opportunities there. Past studies[1] have indicated that transport problems are of considerable concern to inner city firms, but that they are unlikely to motivate firms to leave the inner city, and that transport requirements are usually not the prime consideration in new firms' decisions to locate in the inner city. This suggests that transport policy may be more important as a means of improving conditions for firms remaining in the inner city than as a basis for retaining firms considering leaving or for attracting new firms.

In addition, however, it is important to know how much it is worth devoting to resolving firms' transport problems, whether such allocations should be specific to the Inner City, and which transport policy initiatives provide the most appropriate solutions.

1.2 Objectives

Against this background, the Institute for Transport Studies has recently completed a study for the Department of Transport designed to identify:

i) the extent to which transport problems affect the operation of inner city firms;

ii) whether these problems are more severe in the inner city than elsewhere; and

iii) transport measures which could ease these problems.

The study involved detailed surveys of small samples of firms drawn from manufacturing and servicing industries in study areas in Inner and Outer Leeds and in Inner and Outer London. Information was obtained through interviews and questionnaires from management, employees, visitors and commercial vehicle drivers on travel patterns and on the nature and severity of transport problems. Site surveys recorded operating conditions at, and adjacent to, each firm. These data have been used to draw comparisons between areas and types of firm and to suggest appropriate solutions to firms' problems which can be pursued either by local authorities or by firms themselves.[2]

1. See for example references 1, 2 and 3.
2. The surveys are described in reference 4. References 5 and 6 respectively contain descriptions of the Leeds and London study areas.

1.3 Assessment of problems

The literature provides little quantified information and little guidance as to the most appropriate methodology. Consequently a first principles approach was adopted, based on surveys at each firm, which sought to determine:

i) is there a problem for the firm?

ii) how large is it?

iii) what are its effects on the firm?

iv) what costs to the firm does it give rise to?

The study has sought to identify the range of problems experienced by firms. Respondents' perception of problems provided a starting point to indicate those problems most likely to be of concern to firms and to affect their operations. Background information and trip data collected during the interviews, questionnaires and on-site surveys enabled these perceived problems to be judged against more objective measures of severity and effect. The comparison produced a short list of serious problems, for which solutions would most likely result in cost savings or other benefits for the firm.

1.4 Results

Resources were devoted to the analysis of the surveys so as to identify and measure problems and their effects in each of the four study areas. This has enabled objectives (i) and (ii) to be met, general conclusions on firms' transport problems to be made, and provided the background for an evaluation of possible solutions. The detailed survey results for each study area are contained in references 5 and 6, and reference 7 summarises problems and their effects.

In meeting objective (iii) above, the site specific nature of many of the problems and the inability of firms to cost them has made it difficult to provide more than general advice on the types of transport measure to be pursued. While it is now clear that the types of problem and their effects are common to most areas, relative severity is likely to vary with location. Consequently this report is intended to provide guidance for local authorities, PTE's and firms in identifying possible solutions and evaluating their likely benefits.

1.5 Outline of the report

Chapter 2 summarises the main transport problems and notes differences by location and type of firm. Implications for transport policy are discussed and a checklist of possible solutions is presented. Chapter 3 outlines an approach to solution identification based on determining, for each problem measure, thresholds of severity above which action may be warranted. The approach is demonstrated in Chapters 4 and 5 using parking and public transport in the Inner London Study area as examples. Chapter 6 assesses the proposed approach, identifies areas of uncertainty, and discusses the evaluation of solutions in terms of the reduction of problem severity.

2. GENERAL IMPLICATIONS FOR SOLUTIONS[1]

2.1 The main problems

The study confirmed past conclusions that transport and transport problems were of considerable importance to firms. The main problems could be conveniently grouped into the following categories:

i) person trips (i.e. employee journey to work, business trips, and personal trips; and trips by visitors)
   - en route to the site (e.g. congestion)
   - parking
   - public transport.

ii) commercial vehicle trips (i.e. the movement of goods and services)
   - en route to the site (e.g. congestion)
   - within the site
   - loading and unloading.

The combined results of the surveys at each firm were used to determine those problems of most frequent occurrence and greatest severity. Table 2.1 provides a broad ranking in which the number of asterisks indicates the level of severity.

... ...

1. Much of this chapter is based on the conclusions of the summary report, reference 7.

Table 2.1 Relative severity of problems[1,2]

PROBLEM	LEEDS		LONDON	
	Inner	Outer	Inner	Outer
CONGESTION				
journey to work	***	**	****	****
business trips	**	*	***	**
visitor trips	*	*	***	**
employee personal trips				*
PARKING				
journey to work	*		**	*
business trips			*	
visitor trips	*		***	*
inadequate parking elsewhere on business trips	*	*	***	*
PUBLIC TRANSPORT				
journey to work	****	***	****	****
employee personal trips		*		*
COMMERCIAL VEHICLES				
congestion	**	*	***	***
indirect route	*			*
poor road conditions	*	**	*	
inadequate on-site parking			*	*
on-street loading	*	*	***	*
manoeuvring difficulties	**	*	**	**
loading delays (inadequate or unsuitable loading facilities)	**	**	**	***

1. Only the main problems have been listed.
2. Increasing number of asterisks indicates increasing severity.

2.2 Discussion of problems

There were few differences in the types of problem or in their implications between inner and outer areas, but in the case of parking, on street loading and the effects of congestion on business trips and on lost time the scale and effects of problems were more severe in inner areas. By contrast, on site loading problems and the effects of transport on recruitment tended to be worse in outer areas.

Similarly there were few differences in type of problem between Leeds and London, and indeed other studies suggest that similar problems arise in most inner city areas. However, the severity and effect of congestion, parking and loading conditions were greater in London than in Leeds. Objective measures of public transport problems suggested

that they too were greater in London, but Leeds respondents perceived their public transport problems as being as severe.

Problems were, for the most part, local or even site-specific, and were seldom concerned with the longer distance movement of goods and services. The main exceptions were area wide congestion and parking shortages in London. The location of the firm within the study area affected the severity and effect of transport problems by virtue of variations in availability of parking space, local manoeuvring problems, proximity to public transport services and availability of facilities for personal trips (e.g. shops, post-offices).

Problems, and their effects, were similar for different types of firm irrespective of their industrial classification. There was some indication that on site and loading problems were greater for small firms.

Managements tended to emphasise local transport problems more than did their employees, visitors and drivers and concentration solely on the views of management may therefore mask some serious problems. While managements were otherwise well able to identify the transport problems which they suffered, they were often unable to specify their effects or costs to the firm. This suggests that they may well under-represent the costs of transport problems to industry and the benefits of transport policy initiatives.

2.3 Implications for solutions

The importance placed on transport and transport problems by management suggests that transport improvements should make an important contribution to the easing of operating conditions and the restoration of confidence for existing inner city firms. However, the inability of management to quantify and cost its transport problems makes it difficult to evaluate potential transport solutions, and may cause some beneficial solutions to be overlooked. It will therefore be important for local authorities to adopt a problem-orientated approach to developing transport strategies for inner city firms, and to encourage managment to identify the costs which could be saved as a result.

Although specific problems may well be apparent in individual areas, a problem-orientated approach could usefully concentrate on congestion, public transport difficulties and parking for person movements, and

congestion, on-site manoeuvring and loading for freight, which are the most common problems for inner city firms. Since these are also the most common problems outside the inner city, any solutions are likely to be fairly traditional ones, and to have widespread application.

Since most problems are local or site-specific, the most appropriate solutions are likely to be those which concentrate on the individual firm or group of firms. The implication of this is that localised and usually low cost policies will be more appropriate than major infrastructure investment. Only in inner London does there seem to be a need for wider ranging policies to reduce area-wide congestion and parking shortages and it may be that investment in new infrastructure is required to achieve this.

Many of the problems experienced are amenable to solution by the firms themselves, and local authorities can play a valuable role in providing encouragement, advice and assistance to firms willing to pursue such solutions.

2.4 Checklist of possible solutions

The following checklist (Table 2.2) includes, for each of the most common problem types, those measures which local authorities and firms themselves might consider in order to relieve firms' transport problems. Although most of them are in common use an assessment of relative cost-effectiveness cannot be made in general because circumstances vary considerably from site to site.

Table 2.2

Checklist of possible solutions

i) Congestion - localised

Solutions for local authorities:
- Junction improvements
- Limited realignment/widening of access routes
- Selective provision of loading bays/off street parking
- One way streets/banned turns
- Localised on street parking restrictions
- Improved enforcement of existing restrictions
- Improved signing for through traffic
- Diversion of through traffic

Solutions for firms:
- Rescheduling of work hours to avoid congestion peaks
- Rescheduling of deliveries to avoid peaks
- Provision of advice to visitors/suppliers
- Encouragement of off street parking for employees, off street loading for suppliers.

ii) Congestion - area-wide

Solutions for local authorities:
- Centralised urban traffic control
- New roads or major reconstruction
- Area-wide peak spreading
- Traffic restraint

Solutions for firms:
- As (i) above
- Encouragement of public transport use
- Car sharing

iii) Public transport

Solutions for local authorities:
- New services to link to untapped recruitment areas
- New services to destinations for personal trips (shops, post offices, etc.)
- Bus rerouteing to penetrate industrial areas
- Bus stop relocation
- Rescheduling to match employees working hours
- Improved reliability through better garage control, staffing levels, maintenance and bus service monitoring
- Feeder buses to rail services
- Reopening inner city stations
- Traffic management and parking control to reduce effects of congestion on bus services (including works buses)
- Fares simplification (bulk ticket purchase,simplified structures)
- Improved service information

Solutions for firms:
- Assistance with public transport fares
- Works bus service provision (possibly in conjunction with other firms)
- Assistance with personal business journeys (e.g. collection of lunch orders, van service to city centre)
- Encouragement of car sharing
- Recruitment concentrated in existing catchment areas

iv) Parking

Solutions for local authorities:
- Site acquisition or use of vacant public land for surface parking
- Car park redesign to increase capacity
- Provision of on street parking and loading bays
- Reassessment of existing on street controls
- Channelisation of movement to increase on street space
- Restrictions on long stay parking through price or regulation
- Improved enforcement of existing controls
- Introduction of business permit parking schemes

Solutions for firms:
- Develop adjacent vacant space (perhaps in collaboration with neighbours)
- Improve layout of existing parking space
- Control of on-site long stay employee parking
- Encouragement of employees to use adjacent off street parking space
- Assistance with costs of employee parking

v) Commercial vehicle manoeuvring and loading

Solutions for local authorities:
- Improving substandard road geometry
- On street parking restrictions, particularly at junctions, site accesses
- Road maintenance
- Improved signing
- Reassessment of existing weight restrictions
- Provision of on street loading bays
- Provision of short and long stay lorry parks
- Improved site entrances

Solutions for firms:
- Better information and signing for drivers
- Improved site layout and entrances
- Control of on site parking
- Improved/increased loading facilities
- Better scheduling of deliveries

2.5 The case for further analysis

While the study has been of value in indicating the types and severity of problems and in giving general guidance on types of solution to be pursued, it has not fully achieved its final objective of identifying the most appropriate solutions to specific problems. This shortcoming has arisen for three main reasons. Firstly, while the types of problem are common to all areas, their size and severity have been shown to be very location-specific. As a result, although the range of possible solutions may be clear, the most appropriate solution will vary from site to site, and generally applicable recommendations cannot therefore be made on specific solutions. Secondly, while the direct effects of individual solutions on such aspects as employee travel times or delivery vehicle delays can be estimated, little is known of the reactions of employees or firms to such changes and the resulting second order benefits to firms who may, as a result, be better able to retain staff, to recruit them from a wider area, or to attract new customers and suppliers. Thirdly, there is very little information from firms on the costs which they incur, and hence it is not always possible to estimate the benefits which a particular solution can achieve. As a result, although it may be possible to demonstrate that a particular solution will be beneficial to a particular firm, it is not possible to indicate whether those benefits outweigh the costs of introducing the solution.

Instead of recommending specific solutions, therefore, the study report suggests that local authorities adopt a problem orientated approach to the identification of solutions, and monitor the effects of solutions introduced. The remainder of this paper suggests ways in which these can be done.

3. AN APPROACH TO THE IDENTIFICATION OF SOLUTIONS

3.1 A problem orientated approach

Chapter 2 suggested adopting a problem orientated approach to solution identification. This suggestion stems from the realisation that the problem categories adopted in the study (refer to Section 2.1) lead to reasonably self-contained sets of potential solutions. This is demonstrated in Section 2.4 in which only a few of the suggested solutions are appropriate to more than one problem. It is suggested therefore that solutions can best be identified by analysing in detail

each problem in turn, and it seems appropriate to concentrate on the major problems identified: congestion, public transport difficulties and possibly parking for person trips, and congestion, site access and loading for commercial vehicle trips. The one reservation on this approach is that some solutions to individual problems may exacerbate other problems; for example, additional parking provision may add to congestion. It will be important at the assessment stage to consider the possible disbenefits to others, as well as to firms themselves, of the individual solutions suggested.

The detailed analysis will require a description of the nature and severity of the problem for the study area as a whole. In addition, the data collected in the study permits the effects of the problem on different locations and users to be identified. Problems and their effects can, for example, be considered separately for individual firms, streets, parking locations, trip origins, routes and services, and for employees, visitors and commercial vehicles. Such disaggregation of the information provides useful guidance on those most at risk, and hence on the situations in which solutions can best be sought.

3.2 Thresholds for action based on measures of problem severity

Ideally, in doing this, some measure of the cost of the problem is required. In some cases such information is available directly, for example in the form of time penalties or estimated operating costs. However, in many cases only the respondents' perceptions of the severity of the problem are available and this raises the question of the value to be placed on perceived severity. The study has adopted a simple scoring system in which a very serious problem scores 100, a serious one 67 and a slight problem 33. Mean scores for a particular group have been used as the indicator of problem severity for that group.[1]

At this stage it would be possible simply to concentrate on those situations in which direct costs or, where costs are not available, mean scores exceed a specified level. This gives an indication of priorities for treatment, but not the amount of action necessary. However, in many cases it is possible to compare estimated costs or mean scores with an objective measure of the conditions which have generated them. Such a comparison (e.g. of mean score for unreliability of public transport with variation in travel time) may indicate a threshold in the objective measure above which costs or mean scores are significantly

1. Refer to Appendix I for a description of mean scores.

higher. If such a relationship exists, the need to reduce the objective measure below the threshold provides an indication of the scale of action necessary, and such indications will provide more specific guidance for identifying appropriate solutions.

For the reasons indicated above it is still not possible to evaluate the benefits of selected solutions. However, this analysis does provide an estimate of the reductions in costs or in mean scores which can be achieved.

3.3 The proposed approach

In summary, the proposed problem orientated approach to solution identification involves the following stages:-

1) a specification of the nature and severity of the problem for the study area as a whole, in terms of stated costs or mean scores;

2) disaggregation of the specification in (1) in the most appropriate way to identify those individuals, locations and transport services with the most severe problems;

3) comparison of stated costs or mean scores with appropriate objective measures of conditions;

4) the use of the comparisons in (3) to identify levels of the objective measure above which costs or mean scores are significantly higher;

5) identification of solutions which would enable these objective measures to be reduced to below the thresholds identified in (4).

The following chapters demonstrate the application of this approach to the problems of public transport and parking as experienced in the Inner London study area of South Shoreditch.

4. EXAMPLE 1: PUBLIC TRANSPORT

4.1 Background

4.1.1 Problems assessed. Public transport problems as experienced by employees on the journey to work in the Inner London study area of South Shoreditch (Figure 4.1) are used to provide an example of the problem orientated approach described in Chapter 3. Public transport is the predominant mode for the journey to work in South Shoreditch, and the associated problems were consistently more severe in this study area than elsewhere. The problems are also of interest because potential solutions are to be found both at the firm itself and, in the form of service improvements, over a wider area. By contrast although some 30% of reported business trips were by public transport, these were predominantly trips by underground to central London destinations by employees from relatively few firms. In fact public transport was only used for business trips by one-third of the firms surveyed. Similarly it was not used to any extent by visitors to the firms, or by employees on personal trips away from the firm during the day.

The surveys indicated the following problems related to public transport journey to work trips by employees:-

- congestion and traffic delays
- indirect routeing
- inadequate service frequency and coverage
- unreliability i.e. services not keeping to timetable (in part caused by cancelled or terminated services)
- cost of journey
- walk distance from stop or station, and danger whilst walking
- transfers i.e. the necessity to use more than one stage on the journey
- crowded and uncomfortable conditions.

4.1.2 Background information. A total of 19 firms were surveyed. Data on the important effects of problems is available from the management interview. The employee questionnaire provides trip details and information on perceived problems and mean scores. Around 600 completed employee questionnaires were obtained, representing a 47% response rate. Table 4.1 indicates the characteristics and work journey modes of the respondents, which adequately represent the situation in the study area as a whole.

Fig 4.1 South Shoreditch Study Area

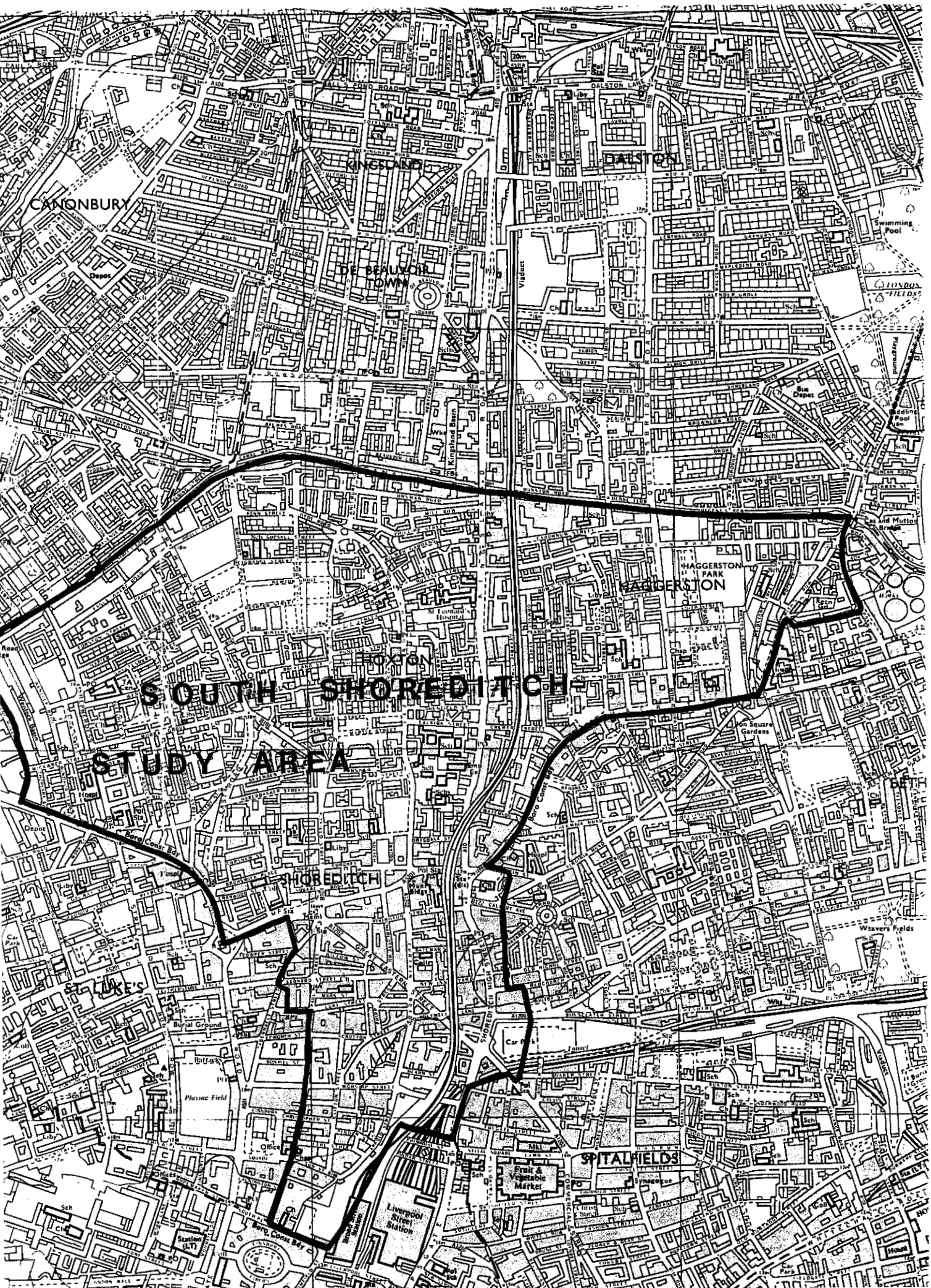

Table 4.1 Journey to work : mode split

	managerial/ professional	office (clerical/ technical)	works/ production	male	female	Total
private	43.8	20.8	38.2	39.7	15.6	32.7
public	48.2	71.7	45.2	51.8	67.1	56.0
walk	4.4	5.8	13.5	5.2	16.2	8.4
other	3.6	1.8	3.0	3.3	1.2	2.7
Total	100.0	100.0	100.0	100.0	100.0	100.0%
Public transport modes						
bus	5.1	19.0	20.0	10.6	30.1	16.2
rail	33.6	37.6	17.4	30.5	24.9	28.8
u/ground	9.5	15.0	7.8	10.6	12.1	11.0
Total	48.2	71.7	45.2	51.8	67.1	56.0%

Public transport is the predominant mode, with rail being most heavily used generally, but bus being the main mode for production staff and females. One-third of those using rail and underground have a car available for the journey to work but do not use it. An insignificant proportion of bus users have a car available. One-third of those travelling by public transport have home locations in Hackney or the contiguous boroughs (predominantly bus users). The corridor centred on rail services to the east is also a major catchment, and there is some rail travel from Kent. Origins of those using underground tend to be more dispersed. Only 6% of all public transport users travel from the northern corridor beyond Harringey. Further background data is contained in Working Paper 145 (ref. 6).

4.2 Nature and severity of problems

4.2.1 General. The scale of problems based on the results of the management interview and employee questionnaire is summarised, using measures of problem effects where possible, and if not by giving respondents' perception of the seriousness of problems.

4.2.2 Management interview. The management of 16 firms considered there to be public transport problems associated with the journey to work of their employees (7 firms unprompted, and a further 9 on prompting). The major

problems were seen as those of congestion (for bus trips), service frequency (but not coverage), reliability, cost, and long walk distances to the firm. The main direct effect was lost time through late arrival, estimated by management to be 58 minutes/employee/month, averaged over all 19 firms and all modes. This time lost due to transport factors represented some 70% of all late arrival.

Other effects of public transport difficulties included staff dissatisfaction, inconvenience and reduced efficiency, adjustments to salary structure, introduction of flexitime, and adverse effects on absenteeism, staff turnover and recruitment.

4.2.3 Employee questionnaire. Table 4.2 summarises the perceived problems of existing public transport users and shows the mean scores of the degree of severity of the problems. (See Appendix I for description of calculation of mean scores.)

Table 4.2 Employee Response to Public Transport Problems (Inner London)*

	BUS			RAIL			UNDERGROUND		
	un-prompted (%)	total (%)	mean score	un-prompted (%)	total (%)	mean score	un-prompted (%)	total (%)	mean score
Traffic delays	23.7	73.1	54	4.1	26.2	15	6.1	10.6	6
Indirect route	0.0	13.4	12	0.6	31.4	21	0.0	19.7	10
Inadequate service frequency	20.6	69.1	58	9.3	45.3	32	6.1	42.4	25
Inadequate service coverage	3.1	†	†	0.6	†	†	0.0	†	†
Reliability	23.7	68.0	62	58 7	79.1	50	25.8	51.5	30
Walk distance from stop/station	2.1	11.3	7	1.2	28.5	18	1.5	28.8	14
Cost	1.0	27.8	25	2.3	74.4	64	0.0	71.2	54
Transfers	1.0	13.4	11	2.3	32.0	23	1.5	27.3	15
Crowded	9.3	†	†	15.7	†	†	9.1	†	†
Comfort	0.0	†	†	3.5	†	†	1.5	†	†
Danger walking	0.0	13.4	14	1.2	17.4	13	0.0	13.6	7
Others	5.2	6.2	†	14.5	17.4	†	13.6	21.2	†

* Percentage of employees using mode who mentioned problem. Those respondents who did not specify the severity of a particular problem were excluded from the calculation of its mean score.

† Not asked.

4.2.4 Discussion. Service frequency and reliability is a problem with all public transport modes. Congestion and traffic delays affect bus travel, and, when prompted, cost is seen as a problem by users of rail and underground.

Crowded and uncomfortable services were also mentioned, particularly for rail, but these problems are less likely to affect firms, excpet perhaps as regards recruitment.

There was general agreement on the types of public transport problems mentioned by both management and employees, and, to the extent which the surveys permitted, on the severity of those problems. The high response rates by both management and employees, the high mean socres of problem severity in Table 4.2, and the effects on the firm of journey to work difficulties all indicate the solutions to public transport difficulties are likely to result in considerable benefit to firms and to their employees.

4.3 Distribution of problems

4.3.1 General. The main categories within which problems can be disaggregated and analysed are mode, service, home location, firm and by employee type.

Mode has been treated in the previous section, where Table 4.2 indicated that the perceived problems of employees varied according to the mode used. Trip characteristics such as travel time, cost etc. vary by mode (Table 4.3). It is also possible that the users of the different modes have different threshold levels of problem severity.

Within each mode, the data allow problems to be analysed in terms of the services used. Disaggregation to this level is satisfactory for the more frequently used services, but for others requires caution because of small sample sizes. As demonstrated in subsequent sections services are most satisfactorily treated in terms of thresholds of problem severity determined from aggregate data for each mode.

Table 4.3 Public transport trip data

	car	rail	u/ground	all pub. tpt.
Average travel time (mins):				
all trips	42.6	70.2	49.8	58.3
trips of one stage	37.6	61.8	48.2	50.2
trips of two stages	61.7	78.0	52.1	69.3
trips of three or more stages	44.3	80.1	48.7	70.8
Stated variability (%[2]):				
less than 5 mins.	5.4	5.8	11.1	6.7
5-10 mins.	37.6	52.6	57.1	49.2
greater than 10 mins.	57.0	41.5	31.7	44.0
	100%	100%	100%	100%
Average cost (one-way)[1]				
Number of stages on trip (%[2])				
one	78.1	50.3	53.8	59.0
two	19.8	39.8	41.5	34.3
three or more	2.1	10.0	4.6	6.7
	100%	100%	100%	100%
States walk dist. (yards) (%[2])				
0-50	6.9	0.6	6.3	3.5
50-100	18.3	5.6	1.6	8.7
100-200	21.6	7.5	6.3	11.2
200-400	20.5	9.4	12.5	13.1
400-800	21.6	21.2	26.6	22.4
800+	10.2	55.6	46.9	41.0
	100%	100%	100%	100%

1. June 1980 prices
2. Percentage of all respondents using respective modes

4.3.2 Home location. Employees' home location affects both mode and services available, and also the quality of those services. For example, employees using bus services for which most of the route is along congested roads are likely to experience reliability difficulties. Similarly travel from some catchment areas will require transfers during the trips, and clearly home location will affect trip cost.

A possible approach is to consider employees' rating of problems by home location, (which was coded to the 1971 GLTS zoning system) so enabling those zones where problems were rated most severly by users to be identified. An analysis of overall rating of journey to work by origin zone indicated 11 London Boroughs and three areas outside Greater London from which journeys by public transport were given a mean score of 40 or more. Three of these, Camden, Islington and Hackney were origins from which bus was the main mode.

4.3.3 Firm. The location of the firm within the study area affects access to public transport services although there was little difference by firm in employees' rating of walk distance. There was some evidence that employees of the firms least accessible to rail services relied more on bus and underground as modes, so that while a firm's location was not an important factor for existing employees, it may have implications for recruitment.

4.3.4 Employee type. Taken over all modes there was little difference in overall rating of journey to work by job category. Managerial/professional staff were somewhat less concerned with problems of reliability, while cost was seen as less of a problem by office/technical staff. For bus users only, office/technical staff gave a slightly higher mean score for overall journey dissatisfaction while production staff gave a much higher score to problems with the cost of the trip.

4.3.5 Discussion. Taken overall, the disaggregated results suggest that perceived problems are most likely to be influenced by mode, and individual services within each mode, and that the problem orientated approach could most usefully consider each mode in turn in order to identify thresholds above which action is warranted.

4.4 Comparison of perceptions with objective measures: BUS travel

4.4.1 General. The objective measures from the employee questionnaire against which the major problems can be judged are listed below; Table 4.3 indicates these measures for each mode.

problem	measure
congestion	travel time travel time variability
frequency	travel time variability number of stages (possibly)
reliability	travel time variability number of stages (possibly)
cost	fare paid number of stages
walk distance	walk distance danger walking
transfers	number of stages

The following analysis is limited to particular measures; those with low mean scores are excluded. In order to demonstrate the method, ONLY BUS TRAVEL is considered.

4.4.2 Mean scores of problem secerity. Tables 4.4 to 4.8 show mean scores of problem severity by travel time, travel time variability, cost, transfers, and walk distance.

Table 4.4 Mean scores of public transport problems by travel time

Travel time (min)	≤ 20	21-30	31-40	41-50	51-60	>60
Mean score for:-						
Overall journey	31	33	47	58	52	71
Congestion	46	38	67	62	50	61
Reliability	37	47	65	73	67	75

Table 4.5 Mean scores of public transport problems by travel time variability

Travel time variability (min)	< 5	5-10	>10
Mean score for:-			
Overall journey	17	42	56
Congestion	8	50	60
Reliability	8	56	70
Frequency	0	55	64

Table 4.6 Mean scores of public transport problems by cost

Cost (one-way fare, pence)	≤ 20	21-30	31-40	>40
Mean score for:-				
Overall journey	45	53	49	56
Cost	14	15	42	40

Table 4.7 Mean scores of public transport problems by transfers

Number of stages on trip	1	2 or more
Mean score for:-		
Overall journey	49	50
Reliability	62	63
Frequency	56	67
Cost	23	33
Transfers	3	31

Table 4.8 Mean scores of public transport problems by walk distance

Walk distance (yards)	< 50	50-100	100-200	200-400	400-800	>800
Mean score for:-						
Overall journey	25	33	50	46	65	50
Walk distance	0	0	0	8	19	11

4.5 Possible Thresholds

Comparison of measures of problem severity with employees' rating of the problem enables the following conclusions regarding the existence of a threshold, and if so its level:

(i) Travel time. Scores are clearly higher, particularly for congestion, above a 30 minute journey time.

(ii) Travel time variability. Scores are very much higher for variations in excess of 5 minutes for overall journey time.

(iii) Fare. Scores for the fare itself are higher above 30 pence, but fare seems to have no effect on overall journey rating. It is doubtful whether a threshold is appropriate.

(iv) Number of stages. This seems to have little effect on most scores, except for transfers. A requirement not to transfer may be appropriate.

(v) Walk distance from stop. Walk distance itself receives a very low score even at distances in excess of 400 metres, and no threshold seems appropriate.

4.6 Possible Solutions

4.6.1 Targets for solution. The previous sections have the following implications for choice of solutions:

(i) Solutions are probably appropriate to all firms in the area and should improve staff recruitment and retention at all levels.

(ii) Improved reliability and reduced delay are the most important aims of such solutions

(iii) There is some justification for concentrating improvements on services from Hackney, Islington and Camden.

(iv) Particular emphasis should be given to journey times in excess of 30 minutes, and employers should consider concentrating recruitment on areas less than 30 minutes away by bus, which do not require transfers.

(v) In improving reliability, the aim should be to reduce variability to less than 5 minutes.

(vi) As a secondary consideration, a maximum fare of 30p (at 1980 prices) could be considered as a threshold for employee recruitment.

4.6.2 Solutions for local authorities. Table 2.2 lists a number of possible solutions to public transport problems which are open to local authorities. It is possible to comment on some of these in the light of the above comments. Figure 4.2 indicates the bus services on which 50% or more experience a variability of over 10 minutes,* a rough 30 minute journey time contour from the centre of the study area, and the origin boroughs of Hackney, Islington and Camden. This indicates where improvements in reliability could be concentrated, and one or two residential areas which might usefully be given new services to expand firms' recruitment areas. It appears that these will be the most important journey to work improvements for bus travellers; the low score for walk distance suggests that there is little need for bus stop relocation or service rescheduling in the study area; there is little evidence that work hour rescheduling is needed† and, for buses, little concern over fares. However, it may be that

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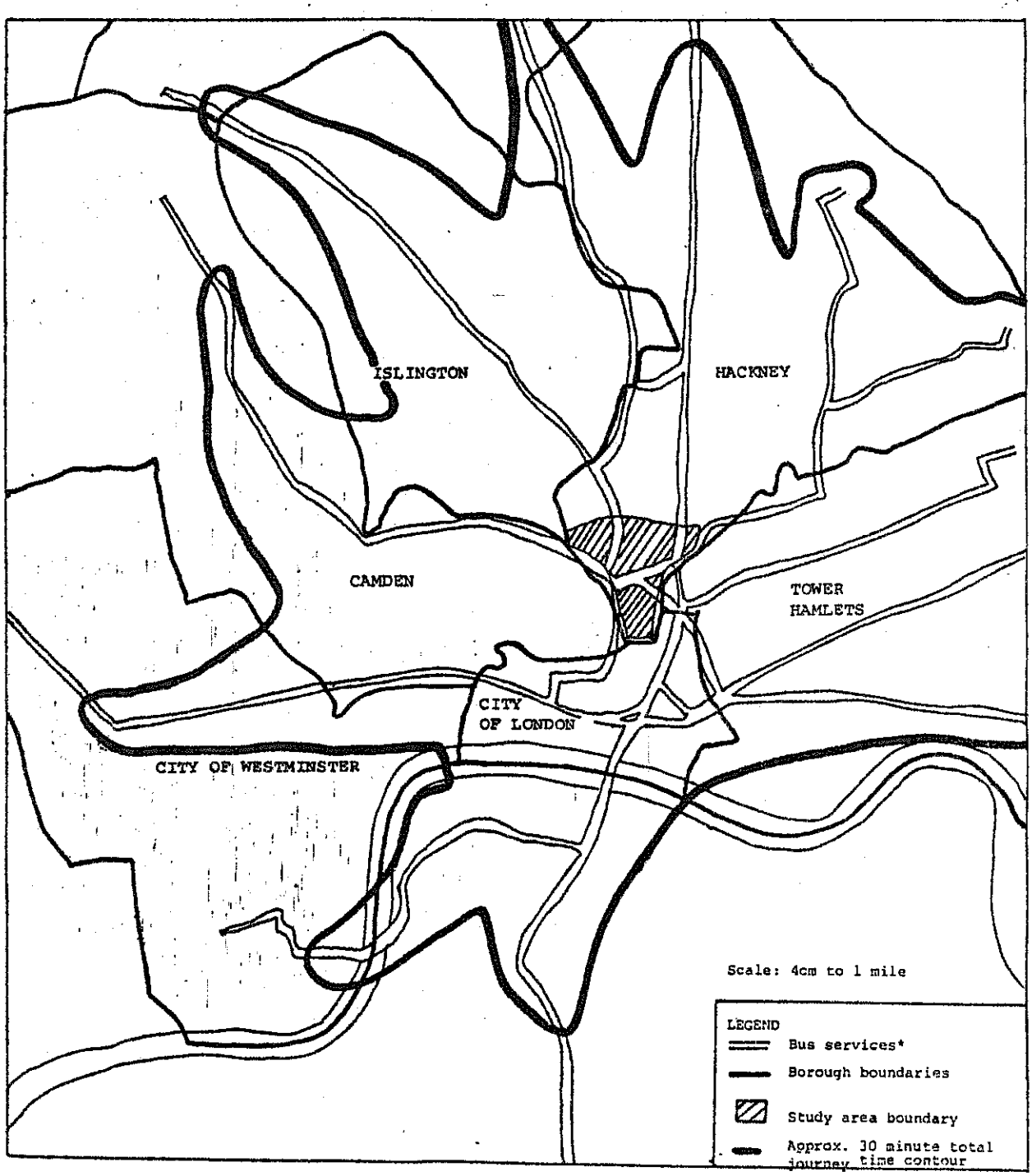
* Only 5% of respondents specified a variability of under 5 minutes.

† It is worth noting, however, that firms working flexitime perceive lower costs from late arrival, presumably because these costs are transferred from employer to employee.



* On all services except No. 8 (Bethnal Green - Liverpool Street Station) and No. 149 (Ponders End - Liverpool St.Sta) at least half the respondents stated that travel time varied by more than 10 mins.

Figure 4.2 Bus services and employee catchment areas; South Shoreditch

other solutions in the list will be appropriate for train travellers or for employees' personal trips.

4.6.3 Solution for firms. Among those listed in Table 2.2, the only solutions appropriate for bus travellers to work are recruitment in particular areas (as shown in Figure 4.2) and, possibly, the introduction of work buses. The latter may be worth considering if existing bus services cannot be improved, but only the borough of Hackney has a large enough number of existing users to justify a special service. Even so, their detailed origins would need to be considered more carefully in assessing a possible service.

5. EXAMPLE 2 : PARKING

5.1 Background

5.1.1 Problems assessed. This chapter applies the approach outlined in chapter 3 to the problems of parking. Again South Shoreditch is used as the case study since it clearly suffers the most severe problems.

The surveys indicated several types of parking related problem:-

- inadequate on site parking for employees, visitors and commercial vehicles.
- the resulting need to use off site (largely on street) parking, and the inadequacy of such parking, resulting in time spent finding spaces, and walking to and from them, and in payment for parking.
- delays to personal and goods vehicle movements caused by on street parking and loading.
- problems for business travellers of finding parking away from the site (e.g. in the central area).

The following analysis considers the first two of these and also, to the extent that it occurs within the study area, the third. Because of the dispersed nature of business parking it has not been possible to analyse the last problem, but it seems likely that similar solutions would be appropriate. Although loading problems are clearly related to parking problems, they are excluded from this analysis for simplicity.

5.1.2 Background information. Of the 19 firms, 2 had no on site space and a further 5 had between one and five spaces. The average number of spaces was 16.4 per firm and 0.33 per employee. Other evidence suggests that these figures are high for the area; one survey in part of South Shoreditch found that only 10% of firms questioned had on site spaces (8).

Most firms were within the Inner London Parking Area. All had yellow line parking within 100 yards of the site, 10 had meters (averaging 5.1 meters per firm) and only 2 had any unrestricted space. Only 426 public off street spaces in five car parks existed at the time of the survey.

29.3% of employees drove to work, 87.9% of visitors were car drivers and over half arrived between 09.30 and 12.00. 35% of commercial vehicles arrived between 09.30 and 12.00, and 35% stayed (at site) for 10 minutes or more.

Among employees driving to work 55% parked in the firm's car park, 40% on street and only 6% in public car parks. The figures for visitors were 46%, 52% and 2% respectively. Percentages are not clear for commercial vehicles, since only drivers parking on site were interviewed. However, some on street loading was required at 17 of the 19 firms.

5.2 Nature and severity of problems

5.2.1 General. This section summarises the statements on the scale of parking problems from different groups of respondent. Where possible direct indications of severity, effect and cost are given, but in most cases only a perception of the seriousness of the problem is available.

5.2.2 Management interview. Numbers of firms indicating different problems were as follows:-

Problem	Number of firms			
Inadequate on site parking	mentioning unprompted	problem prompted	specifying effect	specifying cost
- for employees	1(1)	10	n/a	3(2)
- for visitors	0	12	lost orders, inconvenience	1(3)
- for commercial vehicles	0	6	n/a	4(3)

(1) severity rating : not very serious
(2) £2.91, £1.00, £0.73/employee/month
(3) cost incurred but unspecified.

5.2.3 Employee interviews. Percentages of employees driving to work who experience problems, and mean scores, were as follows:-

Problem	% of employees mentioning	mean score
finding a space	18	10
cost of parking	20	14
walking distance	20	8
danger walking	10	5
time spent searching	10	n/a

For those parking on street the figures were, not surprisingly, higher:-

Problem	% of employees	mean score
finding a space	46	24
cost of parking	46	33
walking distance	41	16
danger walking	33	13
time spent searching	75	n/a

Relatively few employees gave direct indications of time or cost incurred; however 41% of on street parkers specified a cost, and 20% specified a time spent searching. Most specified their walking distance; for on street pearkers 42% walked more than 200 yards.

5.2.4 Visitor questionnaire. Percentages of visitors experiencing problems and mean scores, were as follows:-

Problem	% of visitors	mean score
finding a space	49	35
cost of parking	16	5
delay by parked vehicles	47	21

Visitors parking on street gave a mean score of 47 for difficulty finding a space.

5.2.5 Discussion. While a majority of firms, when prompted, specified parking problems, relatively few specified effects or resulting costs. Employee and visitor responses are mostly in terms of perceived severity, and large percentages of visitors and of employees parking on street perceive problems, with mean scores more than twice those for parkers generally.

There was some evidence of inconsistency in responses of different groups. Similar numbers of firms cited shortfalls in visitor and employee parking yet, while 54% of visitors had problems finding parking space only

22% of employees did so. Similarly, while management is primarily concerned with on site parking problems, 50% of visitors specified problems en route caused by parking and loading. It appears generally that management's reactions may be determined largely by direct effects on the firm, and thus be somewhat misleading as indicators of the range and severity of problems.

That said, there is little in these overall reactions to suggest the need for solutions, or the most important ones to persue, although it may be appropriate to place more stress on visitor parking.

5.3 Distribution of problems

5.3.1 General. The most obvious categories under which differences in costs or perceptions of problems can be considered are by firm, and hence specific location, by type of parking space used, which clearly varies with firm, and by time of arrival. The following paragraphs analyse each of these in turn. A comparison is also made by type of employee.

5.3.2 Differences by firm. Figure 5.1 indicates for each firm whether management perceived a shortfall for employees and visitors and the mean score for employees' and visitors' rankings of problems finding parking spaces. Some gaps in the data make the analysis less than complete but it is clear that circumstances differ markedly from firm to firm. While most problems are concentrated around Great Eastern St., there are some firms here with only limited problems, and conversely there is a group of firms near Shepherdess Walk which also experience problems.

5.3.3 Differences by parking type. As already indicated, drivers parking on street were much more likely to perceive difficulty in finding a parking space. Mean scores were as follows:-

Location	Employee mean score	Visitor mean score
Firm's park	2	22
On street	24	47
Public car park	13	n/a
All	10	35

These results are not surprising, but emphasise the increased problems resulting from being required to park on street.

5.3.4 Differences by arrival time. Results for employees by time of starting work were as follows:-

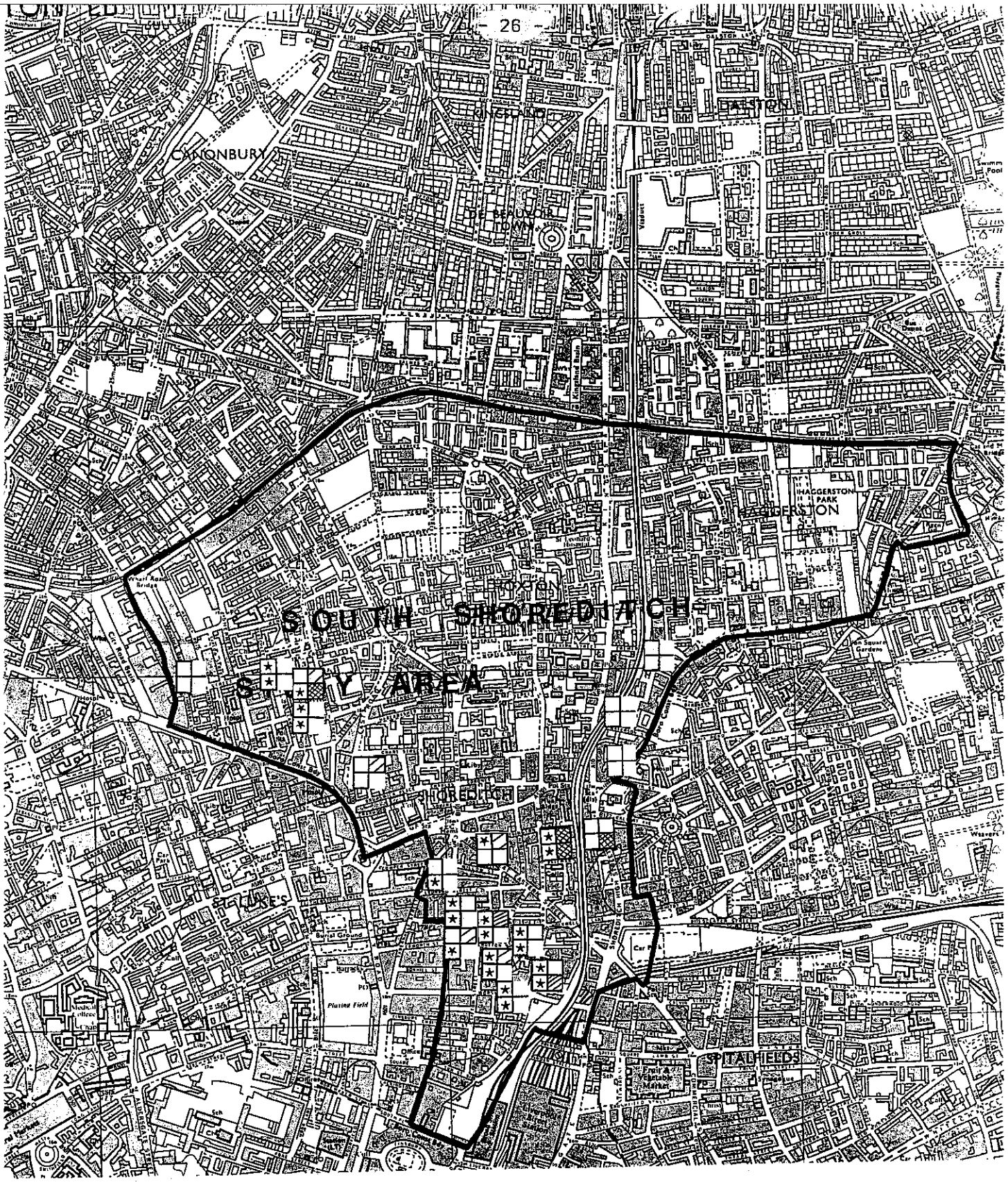


Figure 5.1 Distribution of parking problems by firms: South Shoreditch

KEY

Management response

shortfall

no shortfall

Management reponse

Employees

Visitors

Employee or visitor mean score

Employee or visitor mean score

over 40

21 - 40

21 - 40

0

insufficient response

Start time	mean score
Up to 0730	22
0731 - 0830	9
0831 - 0930	11
After 0930	4

These results are unexpected; it appears that finding a parking space becomes progressively easier later in the peak period. However, it appears that both the early and late results are dominated by individual firms: a firm which starts before 0600 and requires employees to park on street, and a firm with a night shift starting at 1700, when presumably parking problems are much reduced.

Results by arrival time for visitors demonstrate few differences, although it appears that those few arriving after 1400 have marginally greater problems.

5.3.5 Differences by employee type. While less than 10% of managerial, professional and office staff experience problems finding parking space, 23% of production staff and 43% of drivers[1] do so. This result could be taken to suggest that these staff are less well provided for by employers. This may be the case with production staff, since none of the three firms with large numbers of such staff considered that there was a parking problem for employees. However, the responses from drivers were dominated by one firm which clearly had serious problems; this firm required its staff to arrive well before 0630 and hence also dominated the early arrival category identified above.

5.3.6 Discussion. Overall these disaggregated results indicate that perceived problems are influenced largely by individual firms' conditions. Staff having to park on street are clearly more likely to perceive problems; there is some evidence that production staff are also more likely to do so, and this may have implications for many managements' concern to retain skilled staff. The results suggest that it may be appropriate to concentrate solutions on firms in the Great Eastern Street area, on firms whose employees, and particularly production staff, park on street, and on visitors.

5.4 Comparison of perceptions with objective measures

5.4.1 General. The surveys conducted provide several opportunities for comparison of perceived problems with objective measures. These are listed below.

---

1 Those who spend the majority of their working day driving firms' commercial vehicles.

perceived problem	measure	source
(a) management		
inadequate on site parking	on site supply	OSS
(1) for employees	minimum spare capacity	OSS
(2) for visitors	mininum spare on street spaces	OSS
(3) for commercial vehicles		
(b) employees		
(all drivers, and those parking off site)		
finding a parking space	walk distance from parking	EQ
	cost of parking	EQ
	time spent looking for parking space	EQ
	minimum spare on site spaces	OSS
	spare public car park / unrestricted on street spaces at 10.00	OSS
parking cost	parking charge paid	EQ
walk distance from parking	distance walked	EQ
danger walking	distance walked	EQ
(c) business		
finding a space on return	on site supply	OSS
	minimum spare capacity	OSS
	minimum spare on street spaces	OSS
(d) visitors		
finding a parking space	parking location	VQ
	walk distance from parking	VQ
	on site supply	OSS
	minimum spare capacity	OSS
	minimum spare on street spaces	OSS
(e) delays en route by parked and loading vehicles	no direct measure	

Given the large number of possible comparisons, the following analysis is necessarily selective; in particular it concentrates on those issues which give the greatest cause for concern.

5.4.2 Management. Table 5.1 compares the numbers of firms citing a parking shortfall for groups of firms with different levels of on site parking availability. Shortfalls are indicated separately for employees, visitors and commercial vehicles. Measures of parking availability are in terms of employees per space and employees per spare space at the time of maximum occupancy. Firms with less than 0.2 spaces per employee seem more likely to perceive a shortfall for employees and visitors, as do firms with less than 0.02 spare spaces (at peak occupancy) per employee. Commercial vehicle parking shortfalls are less clearly related to parking space availability.

Table 5.1 Numbers of firms perceiving shortfalls by category of on site parking availability

Employees per site space	Total Firms	Firms indicating shortfall for		
		Employees	Visitors	Commercial Vehicles
Under 2	5	2	2	1
2 to 5	5	2	2	1
5 to 10	4	3	4	2
Over 10	5	3	4	2
Employees per spare site space				
Under 20	5	2	2	2
20 to 50	4	1	2	0
Over 50	10	7	8	4

5.4.3 Employees. Table 5.2 indicates the way in which on site space availability (in terms of total numbers and minimum spare spaces) affects employees' perception of difficulty finding a space. Firms with less than 0.2 spaces per employee and less than 0.02 spare spaces per employee produced higher mean scores, although it is clear that they included some firms with relatively low scores. Table 5.3 indicates the way in which perception of various problems is related to distance walked from the parking place. While there is no pattern to the scores for difficulty finding a space, the two walking related problems are clearly perceived as more severe for walking distances in excess of 200 yards. Finally an analysis of the effect of time spent searching for a parking space indicates that this is strongly related

to perceived difficulty in finding a space; those who had to search gave a mean score of 55, while those who did not gave one of 7.0.

Table 5.2 Mean score of employees' difficulty finding a parking space by employees per site space and per spare space

Employees per site space	Number of firms	Mean Score	Employees per space spare	Number of firms	Mean Score
Under 2	5	0	under 20	5	0
2 to 5	5	5	20 to 50	4	4
5 to 10	4	30	over 50	10	13
over 10	5	19			

Table 5.3 Mean score of parking problems for employees by distance walked

Distance walked (yds)	0-50	50-100	100-200	200-400	>400
mean score with:-					
Difficulty finding a space	10	19	12	22	11
Distance walked	4	14	2	19	27
Danger walking	4	3	0	22	27

5.4.4 Visitors. Table 5.4 indicates the mean score for perceived difficulty finding a parking space for firms with different ratios of on site spaces and spare spaces per employee. There is no evidence of any relationship between space availability and perceived difficulty

Table 5.4 Means score of visitors' perceived difficulty finding a space by category of on site parking availability

Employees per site space	Number of firms	Mean Score	Employees per space spare	Number of firms	Mean Score
Under 2	3	40	Under 20	3	40
2 to 5	4	27	20 to 50	3	42
Over 5	3	48	Over 50	4	25

An analysis of perceived difficulty against parking distance produced no clear relationship, since 74% of respondents parked within 50 yards of the site, but delay in finding a parking space again produced a marked effect on perceived difficulty; those who were delayed gave a mean score of 70, while those who were not gave one of 23.

5.5 Possible thresholds

5.5.1 Objective measures. The previous section considered the following objective measures in searching for possible thresholds:-

(i) on site supply
(ii) spare on site capacity
(iii) walk distance from parking
(iv) need to search for a parking space.

This section summarises the findings for each of these in turn.

5.5.2 On site supply. While the classifications used for this measure were fairly coarse, it appears that there is a threshold, at about 0.2 spaces per employee, above which employers are more likely to perceive a shortfall and employees to state a high mean score for difficulty finding a space. There is no similar threshold for visitor responses.

5.5.3 Spare on site spaces. Similar comments to those in 5.5.2 apply. The appropriate threshold appears to be 0.02 spare spaces (at peak occupancy) per employee.

5.5.4 Walk distance from parking. A reasonably fine classification was used for this. There appeared to be a threshold at about 200 yeards, above which employees' mean scores for distance walked and danger walking were higher. There was no apparent relationship with employees' perceptions of difficulty finding a space or more generally, for visitors' parking difficulties.

5.5.5 Need to search for a parking space. Unfortunately relatively few respondents specified the time which they spent searching for a parking space, and all that is available therefore is an indication that certain respondents had to search for spaces. It is clear that this had a major effect, for both employees and visitors, on perceived difficulty in finding a space.

5.5.6 Other measures. Several other potential measures were excluded from the analyses. Cost of parking was excluded because relatively few paid, or cited cost as a problem. Public car park capacity (and spare capacity) was excluded because relatively few respondents parked there. Spare on street

space was omitted because legal on street space was almost always fully used.

5.6 Possible solutions

5.6.1 Targets for solutions. The previous sections have the following implications for choice of solutions:-

(i) Because firms' conditions vary considerably, an individual assessment of each firm is ideally merited.

(ii) However, the number of firms experiencing problems in the Great Eastern Street area suggests the need to concentrate on firms in that area.

(iii) Firms with less than 0.2 spaces per employee or 0.02 spare spaces (at peak occupancy) per employee merit particular attention, as do ones with high levels of visitors, or of production staff parking on street.

(iv) Provision of additional space should aim initially at providing at least 0.2 spaces per employee for each firm.

(v) Any additional space should be within 200 yards of the firm if possible.

(vi) Emphasis should be placed on ensuring that those requiring spaces do not have to search for them; if space is to be restricted, parking availability should be known before the person affected starts his journey.

(vi) Similarly clearer indications of the location of available space may be merited.

(vii) Although not studied in this section, reduction of delays caused by on street parking may be an important contribution to reducing problems.

5.6.2 Solutions for local authorities. Firms, their employees and particularly their visitors perceive the need for more parking space and more certainty in finding parking space. Provision of additional space must however, be carefully balanced against cost of provision and the need to limit travel, and hence congestion in the area. It may be, therefore, that better control of on street space and a new balance between use of road space for parking and movement would provide the best solution to the problem. Investigation of such measures should concentrate on streets adjacent to firms with less than 0.2 spaces per employee; extra on street spaces should be provided where possible, and spaces allocated to those with the greatest need, perhaps by extending the business permit system. Where on street space

is insufficient new off street sites should be found ideally within 200 yards of such firms. This had already been done since the study in one location. There are clear benefits in ensuring through pricing and enforcement that those wishing to park, and permitted to do so, do not have to search for a space. It appears, therefore, that all the solutions listed in Chapter 2 have some merit, and that the main aim should be to concentrate them on underprovided firms.

5.6.3 Solutions for firms. Again, all of the solutions listed are worth considering, and local authorities may be able to help underprovided firms to find extra space. Of particular importance is the need for firms to realise that improvement of parking for visitors may necessitate control of employee parking. This will need to be carefully imposed, selecting those most readily transferable to public transport or most easily replaced.

6. ASSESSMENT AND FURTHER DEVELOPMENTS

6.1 Assessment of the method

The method outlined in Chapter 3 uses responses from the various surveys to determine the worst problems and the situations in which they are most severe. By doing so it helps to identify the most appropriate solutions and the best way of applying them. The examples in Chapters 4 and 5 have demonstrated the use of this problem-orientated technique to direct the design of solutions to particular public transport services or firms or types of traveller.

However, Chapters 4 and 5 have indicated, too, how dependent such an approach is on respondents' stated perceptions of problem severity and on the identification of thresholds above which problems are perceived as more severe. This imposes two important limitations on the approach. First, it is by no means clear that a marked threshold will necessarily exist. It may be that perceived severity for a particular problem has a linear relationship with a particular objective measure, or rises rapidly at low values of that measure but reaches a plateau. In neither case will there be a clear threshold, and in general any threshold identified must be at best approximate. This means that concentration on solving problems in excess of a particular threshold must inevitably involve an element of rough justice. Secondly, while a threshold may help to identify particular problem locations, it says nothing about the benefits to be gained by reducing conditions to below the threshold. It may be possible, for instance, to estimate that a given number of employees will have their mean score reduced by a given amount,

but no estimate is available of the value which those employees will place on such a reduction. More importantly, since we are mainly concerned with benefits not to the employee but to the firm, we know little about the ways in which employees would respond to such an improvement, or about the resulting benefits, for example in reduced recruitment costs, to the firm.

6.2 Further requirements

These shortcomings demonstrate the need for three further developments if solutions to firms' transport problems are to be more reliably identified and more thoroughly assessed.

The first of these is a more thorough quantification of individual problems. By determining direct costs for more effects of problems this would help to ensure that the need for solutions was not undervalued, and would reduce the reliance on somewhat approximate thresholds. Where thresholds still had to be used it could provide a fuller understanding of the relationship between perceived problems and objective measures and, ideally, an estimate of the trade-off between resulting annoyance and money values. It seems sensible to address this requirement by selecting one (or more) of the main problems and examining in detail the costs to a single firm (or small group of firms) which are unambiguously the result of that problem. The problem to be selected would depend on local conditions and the requirements of the relevant local authority. As with the previous work, the primary source of data would be the firm's management, supported where necessary by information from employees, visitors, and commercial vehicles, together with objective measures of transport conditions. In view of the difficulty which management has in costing the effects of problems, considerable thought and effort will be required in designing the data collection phase of the work. It is also clear that a high degree of co-operation will be required from the participating firm(s).

The second requirement is for a fuller assessment of the benefits and costs of particular solutions, to determine more reliably which of several shortlisted solutions (as identified by the process described in Chapter 3) provides the greatest net benefit to the firms and to society generally. This again requires a more complete understanding of the costs generated by a particular problem. In addition, however, it requires an assessment of the costs of implementing the solution, of the costs and benefits of effects on other members of the travelling public and, most importantly, of the responses of those travelling to and from the firm, and the resulting benefits to the firm. The approach required would be similar to that

described above but, by concentrating on a number of specific solutions to the problem(s), would reduce the detail of the surveys. It would almost certainly involve assessment in advance of the solution, and therefore would require the development of hypotheses, either by the analysts or the travellers themselves, as to the responses which might be generated.

The third requirement, which would reduce the uncertainty involved in such hypothesis, is for monitoring of the effects of specific solutions. Monitoring has the advantage of not only allowing the effects on individual firms to be quantified, but also of providing an opportunity to assess scheme effectiveness in terms of overall policy objectives. Comparison of predicted with actual performance over time provides the opportunity of giving guidance for future decisions, either for extending or supplementing the scheme in question, or preparing and evaluating solutions in other locations.

Importantly, the monitoring process should be concerned not only with measuring and evaluating physical changes to the transport environment within which firms operate, but also with how firms (and their employees) adapt and alter behaviour under these new conditions. While the former is likely to be the more important in assessing short term cost effectiveness, the latter provides supporting data for a clearer understanding of how and why firms (and employees) react as they do, and also, for predicting effects in the longer term.

Ideally, monitoring is concerned with conditions before and after a positive change in the transport system. In practice, it may be difficult to identify a suitable scheme about to be implemented and which would permit a full before and after study. If this were the case, measurement of operating conditions and the effects and costs of firms' problems after a scheme had become operational would nevertheless provide adequate information for an assessment of its impact on firms. Equally it would be informative to monitor the effects of restrictions on, as opposed to improvements in, firms' operating conditions.

An after study could either use data taken from one time period or could monitor changes over time. In either case the data should be sufficient to describe changes in transport operating conditions, flows, variability, frequency etc., explain how and why firms react to these changes, predict how they are likely to react in the future, and identify and quantify the benefits of firms. Primary source of data would be management of a firm

or relatively small group of firms affected by the scheme and also most probably employees, visitors and drivers of commercial vehicles.

7. CONCLUSIONS

The study, whose results are summarised and reported in more detail elsewhere (5, 6, 7) has demonstrated more clearly the types of transport problem which industrial firms face, the similarity of those problems by type of firm and location, the nature of their effects and the way in which those effects vary in magnitude from firm to firm.

The differences in severity of effect have made it difficult to specify solutions which are of widespread applicability. Instead a problem-orientated approach has been developed, using the data collected, to shortlist appropriate solutions and to identify the situations in which they should first be applied. This approach has been demonstrated, using two examples, and has been shown to be effective in directing the design of solutions to the areas of greatest need.

The inability of management to specify the costs arising from transport problems has, however, made it difficult to determine the relative merits of alternative solutions. This, together with the undesirable reliance which the solution identification approach places on thresholds in problem perception and the lack of understanding of the responses of employees, visitors and suppliers to particular solutions, suggests three requirements for further work. It is proposed that further work should concentrate on

- more precise quantification and costing of specific problems.
- analysis of the costs and benefits of potential solutions.
- monitoring the effects of an implemented or programmed scheme.

8. REFERENCES

1. PATTERSON, N.S. and A.D. MAY (1979) The impact of transport problems on inner city firms: a review. Leeds: Univ. of Leeds, Inst. Transp. Stud., WP 112 (unpublished).

2. McINTOSH, A. and V. KEDDIE (1979) Industry and employment in the inner city. Inner Cities Directorate, Department of the Environment, London.

3. Industrial renewal in the inner city: an assessment of potential and problems. Joint Unit for Research on the Urban Environment, University of Aston in Birmingham, 1979.

4. Technical Appendix to Working Paper 152. Leeds: Univ. of Leeds, Inst. Transp. Stud., 1981 (see reference 7).

5. PATTERSON, N.S. and A.D. MAY (1980) Transport and inner city firms: results of the Leeds surveys. Leeds: Univ. of Leeds, Inst. Transp. Stud., WP 139 (unpublished).

6. PATTERSON, N.S. and A.D. MAY (1980) Transport and inner city firms: results of the London surveys. Leeds: Univ. of Leeds, Inst. Transp. Stud., WP 145 (unpublished).

7. PATTERSON, N.S. and A.D. MAY (1981) The impact of transport problems on inner city firms: summary report. Leeds: Univ. of Leeds, Inst. Transp. Stud., WP 152 (unpublished).

8. HACKNEY, L.B. (1978) Willow Street study area; results of parking surveys. Report S6. Directorate of Technical and Contract Services.

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APPENDIX I. CALCULATION OF MEAN SCORES

Four and five point equal interval rating scales were used in the management interview, employee questionnaire and visitor questionnaire to assess degree of importance, difficulty, and dissatisfaction of a series of issues and problems. Mean scores were calculated by assigning values at equal intervals in the range 0 to 100 for each individual response, summing over all respondents, and dividing by the total number of respondents. Values were assigned as follows:

Degree of importance and degree of difficulty	
extremely	100
very	75
fairly	50
not very	25
not at all	0

Degree of dissatisfaction	
very unsatisfactory	100
unsatisfactory	75
neither	50
satisfactory	25
very satisfactory	0

Rating of a prompted problem	
very serious	100
serious	66.7
slight	33.3
not at all	0

Example of calculation:

Inner London, service reliability as rated by all employees using public transport modes on the journey to work.

rating	no. of respondent	score value	sum of score values
a very serious problem	59	100	5900
a serious problem	65	66.7	4334.4
a slight problem	112	33.3	3729.6
not a problem at all	48	0	0
	284		13965.1

$$\text{Mean score} = \frac{13965.1}{284}$$

$$= 49$$

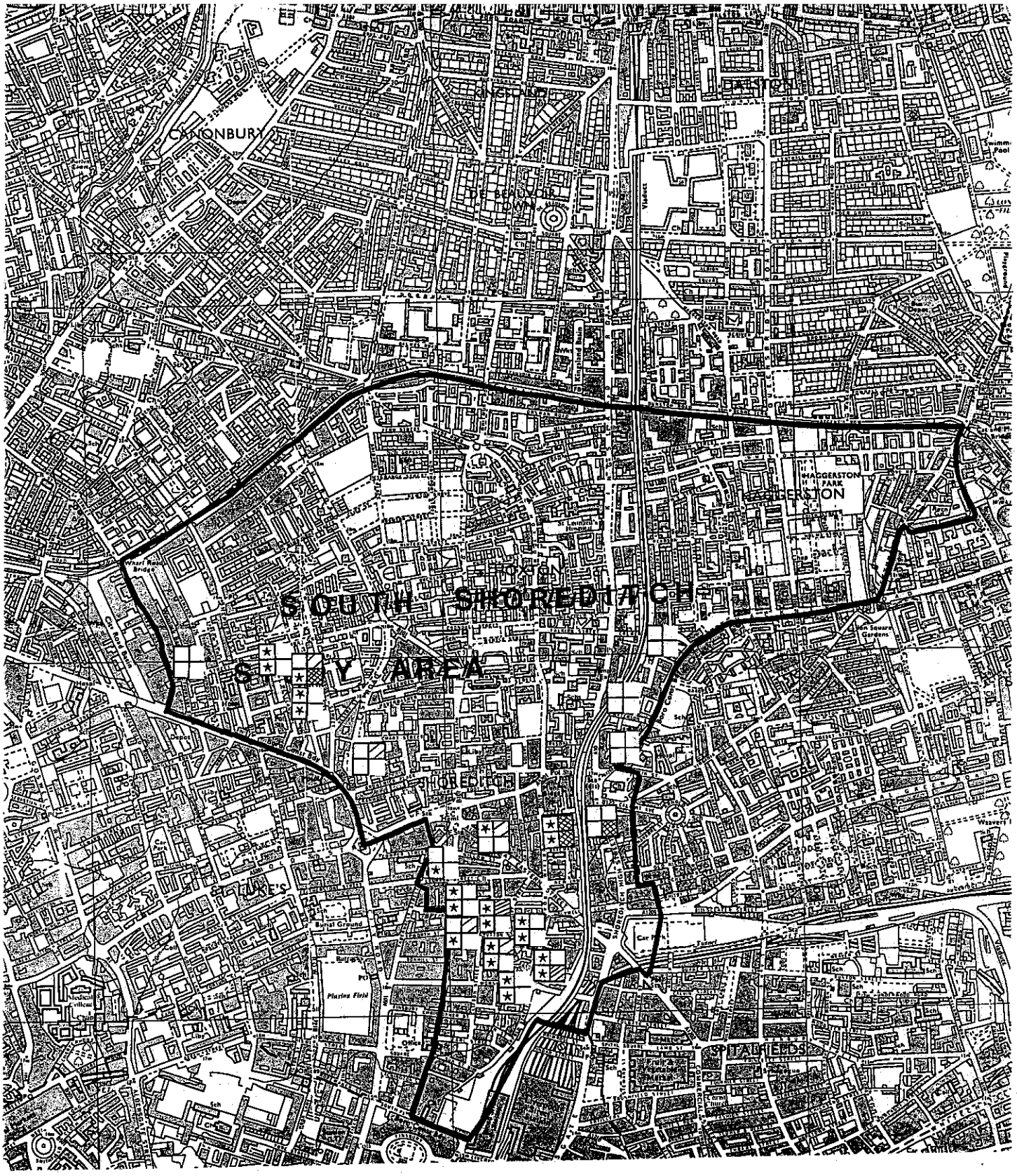


Figure 5.1 Distribution of parking problems by firms: South Shoreditch

KEY

Management response

shortfall

no shortfall

Management reponse

←Employees

←Visitors

Employee or visitor mean score

Employee or visitor mean score

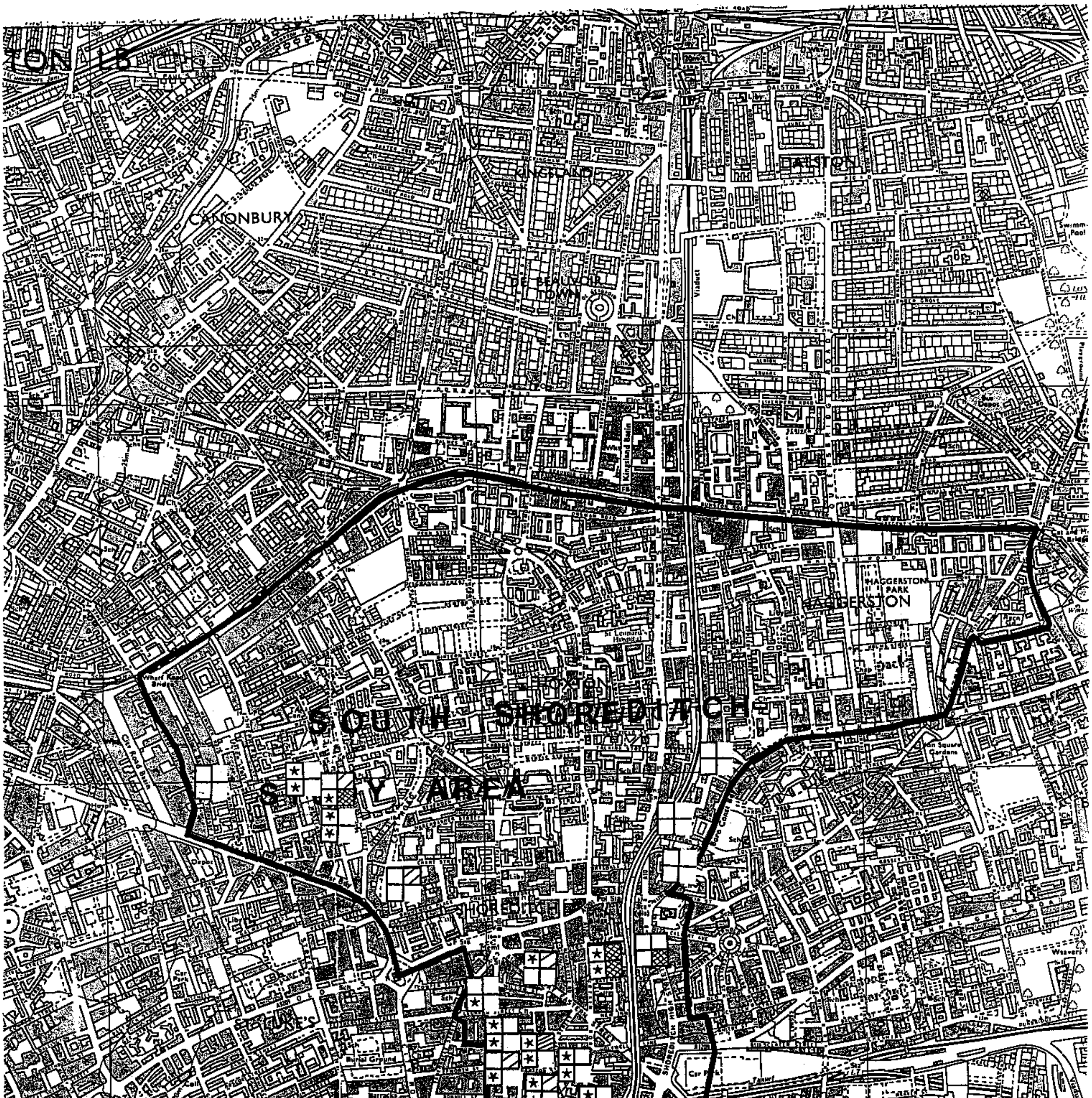
over 40

21 - 40

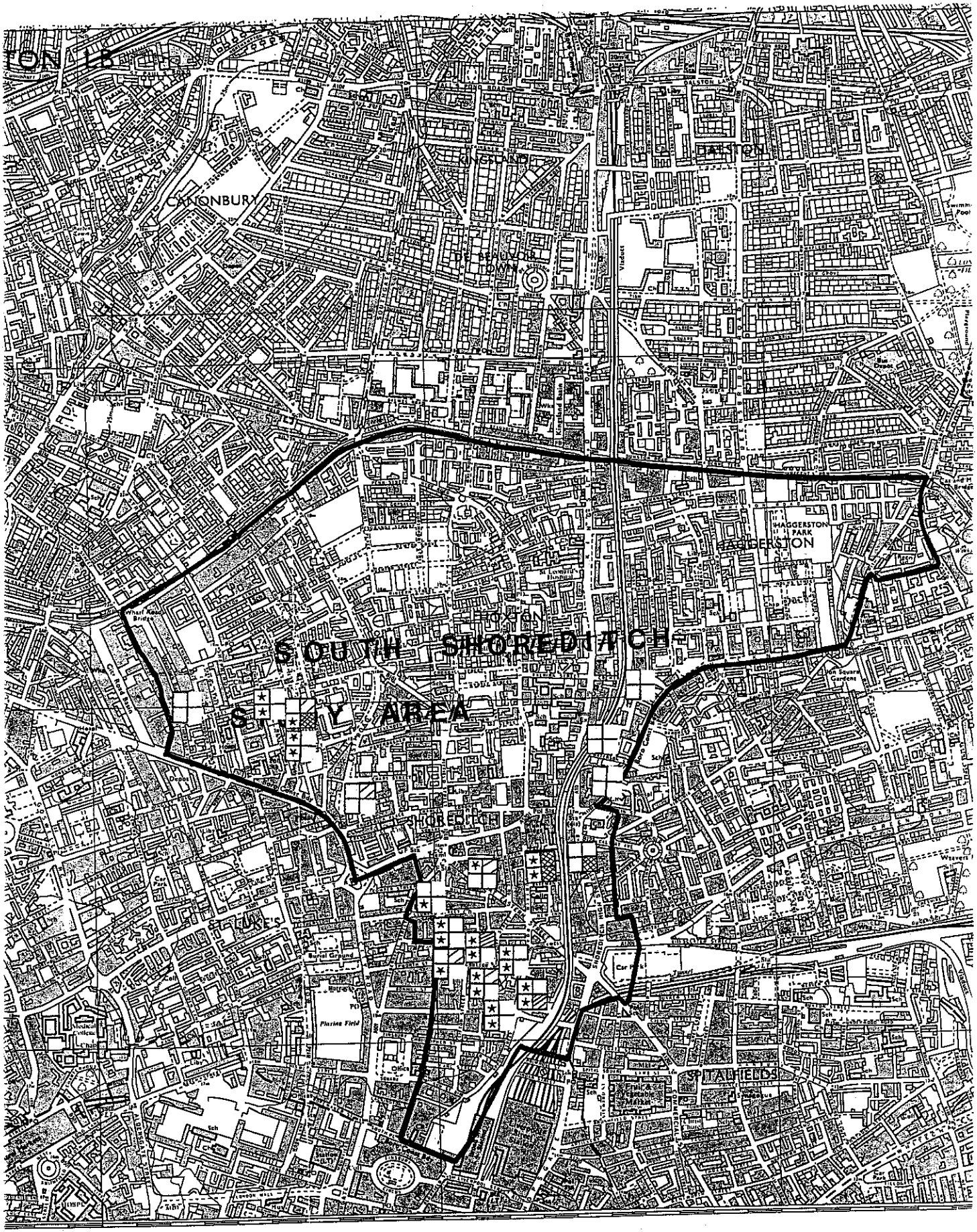
21 - 40

0

insufficient response



SOUTH SHOREDITCH
STUDY AREA
CANONBURY
DALSTON
HAGGERSTON
HAGGERSTON PARK
SHOREDITCH
SPITALFIELDS


CANONBURY
DE BEAUVOIR TOWN
HACKNEY
HAGGERSTON
HOXTON
SOUTH SHOREDITCH
STUDY AREA
SHOREDITCH
ST LUKE'S
SPITALFIELDS