The Bartlett School of Planning
UNIVERSITY COLLEGE LONDON

'AN IMPACT STUDY OF THE CLOSURE OF
HAMMERSMITH BRIDGE'

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This study titled 'An impact study of the closure of Hammersmith Bridge' highlights the impact that the closure, or more accurately the reallocation of road space over one of London's principal bridges had upon the local and wider areas.

The study is set within the context of sustainable development, and more specifically sustainable transport, principally because it is argued that the reallocation of road space to 'favoured classes of traffic' may present a means of reducing the use of, and reliance upon the private motor car.

The case study employed was that of Hammersmith Bridge, South West London. The bridge is situated in the London Borough of Hammersmith and Fulham, and provides a key link between areas North and South of the river. When the bridge 'closed' (to private vehicles) in early 1997, without a great deal of advanced warning there was major concern expressed as to what the 'impact' would be for both the immediate and wider areas. Pre closure 30,000 vehicles flowed across the bridge each day, however during the period of closure this was reduced to just 3,000. A key question was 'where would all this traffic go'? This case study presented a rare opportunity to see what happens when the amount of road capacity available to private vehicles is reduced.

This report considers a number of 'factors' in an attempt to draw conclusions as to what the 'impact' was. Specifically, data for the following was considered, vehicular flows across bridges and local roads, accident rates, bus services and air quality. These factors combined give a fairly good indication of what the impact of the closure of Hammersmith Bridge really was!
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1.0 INTRODUCTION

1.1 ‘The Challenge’

Transport today, perhaps more than ever before, is impacting the way we live. This is due to the fact that “the way we travel, and the continued growth in road traffic, is damaging our towns, harming our countryside and changing the climate of our planet. While cars in particular have brought great benefits, their increasing use is causing congestion, thereby reducing their convenience, undermining competitiveness and adding substantially to local air pollution that is damaging to our health, and contributing to greenhouse gases which cause global warming” (Draft PPG 13, 1999 pg. 1).

The motor car, has unquestionably had the most profound impact on modern society, and according to some, it “has enriched more lives, liberated more people, extended more horizons, and contributed as much – in the sense that education has” (The RT. Hon DR John Reid MP, Minister of Transport, DETR).

It is therefore important to recognise that the prospect of convincing private car users to ‘switch’ to an alternative mode of transport is not something, which is likely to be widely popular or easily achieved! The difficulty for the government therefor, is to find something which the public deems as being ‘acceptable’. The present Labour government are keen to emphasise that “there should be no question that the government fails to appreciate the benefits of car ownership – or that we want to penalise it” (DR John Reid MP).

Clearly, the ‘challenge’, presented by the prevailing transport system in the UK is unquestionably an enormous one! However, for the present time “the government has made clear its wish to see less reliance on the private motor car, and an approach to transport that provides more integration – not just between different modes, but between transport and different policy areas, such as land use planning” (London Borough of Hammersmith and Fulham, 2000, pg. 17).
1.2 The Context

The challenge is made all the more difficult if current traffic forecasts are proven to be correct. The 1997 National Road Traffic Forecast suggests that in the next fifteen years (2001-2031) car traffic could grow by 50%, the number of cars available could increase by 34% and the number of cars per household could increase by 12%. These figures are made all the more alarming by the predictions that in the same period the number of households could grow by 20%, whilst the population may only grow by 2% and household size could decrease by 15%.

In London, Government Statistical Service Data indicates that the total number of licensed private cars registered has increased by 6% between 1986 and 1996. The average daily total vehicle flow on major roads in London increased by about 1% between 1991 and 1996, of which cars and taxis accounted for over 80% of this total flow.

Unlike the rail networks, the primary and secondary road network in Inner London is presently only operating at capacity in terms of vehicle numbers “and on the basis of travellers’ current modal choice of vehicles – not in terms of the numbers of passengers being carried” (LBH&F, 2000, pg. 22). For example, in 1996, during the morning peak (7am – 10am) 2,345 London Transport buses entered Central London carrying 68,000 people (average occupancy 29 passengers), during the same time period 116,000 cars entered carrying 152,000 people (average occupancy, 1.31 passengers).

These figures serve to prove that the problem of congestion in London is one of too many cars, and not simply one of too many people!

Figure 1.1 below gives an indication of the modes of transport which are used for trips in London, it is clear to see that the ‘car driver’ forms the largest sector (36.1% of the total).
Over the last ten years or so factors such as rising population, growing tourism and increased employment have lead to increases in the demands placed upon London’s transport system. “At the same time, investment, ... has failed to adequately maintain the existing transport system, let alone add the new capacity vitally needed” (GLA, 2000, pg. 5). This has lead to (amongst other things) ‘ever-growing’ traffic congestion on the roads.

Traffic, in all of Britain’s major Towns and Cities, particularly London has been stated as a major concern of the present Labour Government. This concern has been addressed through the publication of a number of transport related documents over the past three or four years, for example, the revised PPG 13 and the new transport strategy, ‘A New Deal for Transport Better for Everyone’.

‘Road reallocation’, the topic addressed in this research “is a major policy interest” (Cairns, Hass-Klaau and Goodwin, 1998, pg. 1) due to the fact that it potentially, is a measure by which ‘the challenge’ set out above could be met! For the purpose of this research road reallocation has been placed within the context of sustainable development, and more specifically sustainable transport, principally because, “much of the focus of
interest in sustainability relates to the apparently inexorable rise in the demand for car travel and the ability/ desirability to supply sufficient road space to meet demand. This rise in demand is fuelled more by the increased spatial separation of homes and workplaces, shops and schools than any rise in trip making” (Smyth et al, 2000, pg. 193).

Clearly, the reallocation of road space away from private vehicles, to favoured classes of traffic, such as public transport, emergency vehicles, cyclists and pedestrians will have some impact on the number of vehicles entering an area. However, what this piece of research has attempted to discover is whether the reallocation of road space in South West London has, or could potentially have, a role to play in achieving a more sustainable transport system.

A key question is whether the reallocation of road space lead to ‘chaos’ and “a nightmare on every street” (Evening Standard, 29/01), which follows the assumption that the response of the ‘displaced’ drivers is simply to divert to another street or whether these assumptions and predictions are exaggerations.

Whilst having, necessarily, been placed within the context of sustainable development this research also attempts to place road reallocation within the framework of ‘measures’ applied to road traffic problems, which principally in this case is the proposed congestion charging scheme for London.

The transport crisis now being experienced in London “harms business efficiency, threatens to undermine the city’s competitive position in the world and worsens the quality of life of Londoners. Without vigorous action, all of these problems will worsen, as rising population and economic growth put more pressure on the system” (GLA 2000, pg. 3). It is for these reasons that this study does not simply look at traffic flows, a much wider perspective has been applied in order to gauge the impact of road reallocation.

The wider perspective which has been applied in this study, has taken into account ‘secondary effects’ such as LT bus service and bus usage, air pollution and road safety.
Sustainability is obviously key to all debates about transport, principally for the reasons which have been highlighted above. It is clear that if the sustainability issue is to be dealt with effectively then it must be addressed at all levels, from the local (Local Agenda 21) to the national, a key issue is just how this will be implemented.

What is still unclear is just how the Government actually proposes to ‘significantly’ reduce the use of the private vehicle in Urban areas. Clearly, congestion charging is one method which is currently high on the agenda, particularly in London, however this scheme is not without its critics. Many commentators argue that such a system simply ‘gets rid’ of car users whose consumption of road space is elastic, in reality the effect is that only those who could afford (in monetary terms) the premium would be able to enter the area. In effect this will further marginalize the less well off in society.

The analysis which appears in the latter part of this report has been achieved by the completion of an ‘impact study of the closure of Hammersmith Bridge’, West London. This piece of research has been undertaken with a number of aims and objectives in mind, these are outlined in section 1.3.

1.3 Aims and Objectives

Obviously, due to the size, scope and nature of this thesis it is necessary to establish a number of aims and objectives. These will be outlined below, however, the ‘principal’, over arching aim of this research topic has been defined as being:

- To compile a study which highlights the impact of the closure (to private vehicles) of one of London’s principal bridges.

Furthermore:
• to identify whether the reallocation of road space, away from the private motor car, has the effect of ‘significantly reducing congestion’ in the immediate area, reducing the overall volume of vehicular traffic in the wider area, and promoting the adoption of more sustainable forms of transport.

In more specific terms the aims are:

• identifying the ‘study area’;
• assessing whether vehicular flows over the bridge, on surrounding bridges and within the study area are significantly altered during the period of closure to private vehicles, and after re-opening (by comparison to pre closure volumes);
• identifying the changes (if any occur) in public transport operated bus service provision (taking into account frequency and reliability) and usage pre reallocation, during the period of reallocation and after re-opening to all classes of traffic;
• determine whether the reallocation of a significant route way would lead to an improvement in air quality at anything more than the local level;
• assess whether the reallocation of a major route way would lead to a reduction in the number of accident rates, both locally and in the wider area;
• produce a piece of research, which is prescriptive, in that it makes realistic proposals with regard to the feasibility of reallocating road space in London in order to combat traffic congestion.

The objectives are:

• identify the reasons for the closure and disclose whether there was advanced warning to the public;
• obtain data for traffic flows both over Hammersmith Bridge and in the surrounding ‘study area’ (pre closure, during the period of closure and after re-opening);
• obtain data for public transport operated bus services (frequency/ patronage), servicing both the bridge itself and the surrounding ‘study area’;
• gage opinion about the possibility of permanent road reallocation on the bridge, from professionals (i.e. local authority planners and engineers, and the general public);
• surmise, on the quality of the evidence collected, whether road reallocation, away from the private motor car, on principal London route ways is a realistic and feasible option.

1.4 Report Structure

The report has been structured in such a way as to make it easy for the reader to navigate their way through it. Chapter 2.0 provides a review of the literature, focusing specifically on sustainable development, sustainable transport, Sustainable transport in London and the London Borough of Hammersmith and Fulham. Chapter 3.0 outlines the methodology employed for the research, provides a borough profile, a history of Hammersmith Bridge and a background to the 1997 closure. This chapter ends with a brief look at road reallocation theories. Chapter 4.0 presents the results and analysis, and finally, Chapter 5.0 contains the conclusions of the study, and proposes some recommendations based on these.
2.0 Literature Review

2.1 Introduction

Much of the argument for reducing private car use/congestion in London, and indeed in many of the leading world cities is based on the need to find more ‘sustainable’ forms of transportation, than is presently offered by the private motor car.

It is argued that the reallocation of road space to ‘favoured classes of traffic’ may present a means of reducing the use of, and reliance upon the private motor car. Hence, a means of promoting more sustainable transport usage. It is for this reason that this literature review will principally focus on concept and issues of ‘sustainability’.

The ‘desire’ or ‘necessity’, depending on the individual’s perspective, to achieve sustainable transport, or at least transport which is more sustainable, is directly related to, and is a product of the concept of ‘sustainable development’. Therefore, this literature review will begin by defining sustainable development, and further moving on to a discussion of the sustainable development concept. Following this there will be a narrowing of the scope of sustainability to specifically look at sustainable transportation. The concept will again be principally defined and then discussed in detail.

Following on from this the scope will be narrowed again further, to study literature relating to sustainable transport in London. Finally, there will be a brief discussion of the ‘empirical studies’ which have been produced relating to road reallocation.

2.2 Sustainable Development

The concept of ‘sustainable development’, although not new, has undoubtedly achieved wide spread popularity and has been “firmly placed on the global agenda”
(Elkin, McLaren and Hillman, 1991, pg.1) since the report by the Brundtland Commission, 1987. This report produced, what is, the most widely accepted and cited definition of sustainable development to date. Sustainable development was defined in the Brundtland report as:

*Development which meets present needs without compromising the ability of future generations to achieve their needs and aspirations.*

There are concepts within this definition of sustainable development which require more precise definition. These concepts are (1) *Development*, (2) *Needs*, and (3) *Future Generations*.

1. *Development*

There are marked differences between development and growth; these should not be confused. Growth “conveys the idea of physical or quantitative expansion of the economic system”, whilst development, in contrast, “is a qualitative concept incorporating notions of improvement and progress and including cultural and social as well as economic dimensions”. In order to reach some level of sustainable development we must “have regard to the earth’s regenerative capacity, the ability of its systems to recuperate and maintain productivity” (Blowers, 1993, pg.5).

2. *Needs*

The concept proposed by Brundtland of ‘meeting needs’ is unquestionably a moral issue, and means the redistribution of resources. The act of redistribution could take on many different forms, such as “technology transfer, financial aid and compensation to prevent environmental degradation” (Blowers, 1993, pg.5). Increasingly, within the sustainable development debate, social equity, in both moral and practical terms is becoming of pivotal importance, for both the developed and the less developed world.
3. *Future Generations*

The UK Government's Environment White Paper, 'This common inheritance', 1990 states that "We have a moral duty to look after our planet and to hand it on in good order to future generations". This requires that we must not simply attempt to maintain the environment at its present standard, but it behoves us (the present generation) to hand on an environment which is 'better', particularly in areas where substantial levels of environmental degradation have occurred. One of the most important components of the sustainable development concept is that of inter and intra-generational equity.

This definition of sustainable development has however, been used "as a device for mobilising opinion rather than as an analytical concept for developing specific policies" (Blowers, 1993, pg. 5). This has largely been attributed to the fact that the concept of sustainable development is said to be "both constitutive of, and responsive to, changing social and political relations with the environment. The very lack of a simple operational definition is a sign of new ideas being conceived" (Owens, 1994, pg. 442).

The response of the UK government, according to Elkin et al, "to the agenda set by Brundtland has been limited, but included the commissioning of reports from David Pearce and his colleagues, published as a Blueprint for a green economy in 1989" (pg. 1).

Attempts to develop principals of sustainability have lead to the emergence of two broad themes. These can be identified as 'weak' and 'strong' definitions of sustainable development. These themes have been comprehensively covered by commentators such as Owens (1994) and Becknam (1995), generating a huge body of literature in their own right.
Elkin, McLaren and Hillman put forward a ‘framework of sustainable development’, which is based on four main principles:

(1) **Futurity**

In order to ensure that future generations have their needs met in an uncomprised manor “at least a minimum environmental ‘capital stock’ must be maintained, including the environmental support systems of the planet as a whole as well as stocks of more conventional renewable resources, such as forests” (Elkin, McLaren and Hillman, 1991, pg. 1).

(2) **Environment**

The full environmental costs of any activity must be considered. Such costs can be “affected through regulation, market based incentives or a combination of both” (Elkin, McLaren and Hillman, 1991, pg. 1). In the specific case of the environment the concept of sustainability constraints and of critical loads are also of value. One path which can move us further towards sustainable development is via the ‘precautionary principal’ which advocates that “where scientific doubt exists, the benefit of the doubt be given to the planet and its people” (Elkin, McLaren and Hillman, 1991, pg. 2).

(3) **Equity**

“A greater degree within the current generation (intra-generational equity) is [also] required. Even the average Western rate of resource consumption can not be achieved by the entire global population without ecological catastrophe, yet that is the aspiration of most developing countries” (Elkin, McLaren and Hillman, 1991, pg. 13). The Brundtland Report highlighted that the “effects of poverty in less developed countries are also ecological degradation, the only solution therefore is more equitable access to resources” (Elkin, McLaren and Hillman, 1991, pg. 2).
(4) Participation

"Unless individuals are able to share both in decision making and in the actual process of development it is bound to fail" (Elkin, McLaren and Hillman, 1991, pg. 2-3).

The fourth principle, 'participation' is of particular importance to this study. This is due to the fact that individuals living in both the immediate and 'affected' areas were invited to participate (via a referendum) in the decision making process which dictated whether or not Hammersmith Bridge should reopen to all classes of traffic upon the completion of works. The Hammersmith Bridge case, in this sense, also provides a useful mechanism by which to 'show' the principles of sustainable development in practice at the local level.

Blowers has identified 'five fundamental goals', which must be achieved if development truly is to be sustainable, these are:

1. Resource Conservation
   The principal goal of resource conservation is to “ensure the supply of natural resources for the present and future generations through the efficient use of land, less wasteful use of non renewable resources where possible, and the maintenance of biological diversity” (Blowers, 1993, pg. 6).

2. Built Environment
   The goal of the built environment is to “ensure that the development and use of the built environment respects and is in harmony with the natural environment, and that the relationship between the two is designed to be one of balance and mutual enhancement” (Blowers, 1993, pg. 6).

3. Environmental Quality
The goal of environmental quality is to “prevent or reduce processes that degrade or pollute the environment, to protect the regenerative capacity of ecosystems, and to prevent developments that are detrimental to human health or that diminish the quality of life” (Blowers, 1993, pg. 6-7)

4. Social Equality
The goal of social equity is to “prevent any development that increases the gap between the rich and poor, to encourage development that reduced social inequity” (Blowers, 1993, pg. 7).

5. Political Participation
The final goal, political participation, aims “to change values, attitudes and behaviour by encouraging increased participation in making and in innovating environmental improvements at all levels from local community upwards” (Blowers, 1993, pg. 7).

This is not to indicate however that the concept of sustainable development is universally accepted, there have been some major criticisms of it. For example, Beckerman (1995) states the concept of sustainable development is ‘fundamentally flawed’. Principally, “because it mixes up together the technical characteristics of a particular development path with a moral injunction to pursue it. And a definition of whether any development path is technically sustainable does not by itself, carry any special force” (Beckerman, 1995, pg. 126).

There is however general consensus that the issue of sustainable development is not simply ‘black and white’ as Beckerman would have it believed! From what has already been written in this chapter it is clear that the issues of sustainable development are much more complex than this.
In the context of national policy (in the UK), there are a number of documents which are of extreme importance when discussing sustainable development and its implementation. These documents are discussed below.

In 1990 the [then Conservative government] produced Britain’s ‘first comprehensive White Paper on the Environment’, titled ‘This Common inheritance: Britain’s Environmental Strategy’. Although the first publication is now eleven years old it still remains to be of significant importance, not least because it marked, what has perceived to be the ‘beginning’ of environmental issues coming to the forefront in the political arena. The White Paper “looks at all levels of environmental concern and describes what the Government has done and proposes to do” (1990, pg. 8), the stated overall objectives included:

- Protecting the physical environment through the planning system and other controls and incentives;
- The prudent use of resources, including increasing energy efficiency and recycling, and reducing waste;
- Controlling pollution through effective inspectorates and clear standards; and
- Making information available.

Also, importantly to the adoption of ‘sustainable development’ principles in the UK was the recognition in this document that the application of ‘precautionary action’ may be necessary and preferable in certain circumstances. “Where the state of our planet is at stake, the risks can be so high and the costs of corrective action so great, that prevention is better and cheaper than cure” (1990, pg. 11).

Following on from this, in 1994, a key document, titled ‘Sustainable development: The UK Strategy’ was published. This Strategy recognised the important role of the planning system both in the regulating of development and in the use of land for the public interest. The strategy stipulated that a ‘sustainable framework’ should:
• Provide for the nations 'needs' (i.e. commercial and industrial development, new homes, food production) whilst respecting environmental objectives;
• Use areas which have already been developed, in the most efficient way making them more attractive places to live and work in;
• Conserve both natural resources and cultural heritage;
• Shape new developments patterns in such a way as to reduce the need to travel.

This strategy was updated in 1999 with the publication of 'A better quality of life: A strategy for sustainable development in the UK'. The updated document acknowledged "although the idea is simple, the task is substantial" (1999, pg. 8), therefore it means meeting four objectives at the same time, both in the UK and throughout the world. These objectives are:

• Social progress which recognises the needs of everyone;
• Effective protection of the environment;
• Prudent use of natural resources; and maintenance of high and stable levels of economic growth and employment.

The specific priorities for the UK, are stated as:

• More investment in people and equipment for a competitive economy;
• Reducing the level of social exclusion;
• Promoting a transport system which provides choice, and also minimises environmental harm and reduces congestion;
• Improving the larger towns and cities to make them better places to live and work;
• Directing development and promoting agricultural practices to protect and enhance the countryside and wildlife;
• Improving energy efficiency and tackling waste;
• Working with others to achieve sustainable development internationally.
This strategy also introduced ‘an important new element’ which was a ‘subset of key headline indicators’, see Table 2.1 below. The inclusion of these indicators “intended to focus attention on what sustainable development means, and to give a broad overview of whether we are achieving a ‘better quality of life for everyone, now and for generations to come’.

Table 2.1

<table>
<thead>
<tr>
<th>Headline Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total output of the economy (GDP)</td>
</tr>
<tr>
<td>Investment in public, business and private assets</td>
</tr>
<tr>
<td>Proportion of people of working age who are in work</td>
</tr>
<tr>
<td>Qualifications at age 19</td>
</tr>
<tr>
<td>Expected years of healthy life</td>
</tr>
<tr>
<td>Homes judged unfit to live in</td>
</tr>
<tr>
<td>Level of crime</td>
</tr>
<tr>
<td>Emissions of greenhouse gasses</td>
</tr>
<tr>
<td>Days when air pollution is moderate or high</td>
</tr>
<tr>
<td>Road traffic</td>
</tr>
<tr>
<td>Rivers of good or fair quality</td>
</tr>
<tr>
<td>Populations of wild birds</td>
</tr>
<tr>
<td>New homes built on previously developed land</td>
</tr>
<tr>
<td>Waste arisings and management</td>
</tr>
</tbody>
</table>

It is generally accepted at all levels, that indicators do have a useful role to play, and that they are a ‘success’ in the sense that they have successfully focused attention, both at the national and the local level, on what sustainable development means. However there is also a note of caution! Although indicators ‘draw attention’, they only realistically refer to the problem and the increasing/decreasing scale of it. There is a danger that they may come to be viewed in their own right, rather than being seen as what they really are which is merely ‘indicators’ of sustainable development. For example, attention may be focused on the indicator figures rather than the ‘core
problem’, i.e. levels of greenhouse gas emissions rather than increasing levels of congestion.

PPG 1 (1997) carries forward the principles of sustainable development, set out in ‘Sustainable Development: The UK Strategy. It does this principally by stating that “the Government’s planning guidance notes set out the planning framework within which local planning authorities are required to draw their plans and take decisions on individual applications to secure these objectives” (5-004).

2.3 Sustainable Transport

“Sustainable transport is an elusive goal that seems to dominate much of the recent debates about transport policy” (Banister, 2000, pg. 1), these policies, strategies and Government guidance notes will be reviewed below. However, it is firstly worthy to note Banister (2000); “there does now seem to be a new realism that has evolved over the past 5 years:

- Stage I – Consensus that projected traffic growth is not sustainable.
- Stage II – proposed road schemes are not going to solve the problem. Even if substantial investment does take place, congestion on the road system would get worse. It can never keep pace with demand.
- Stage III – discussion about limitations on the use of the car and substantially raising the costs of travel so that demand can be matched to supply. But at the same time giving priority to particular users and modes of transport.
- Stage IV – the catalyst for the renewed interest has been the environmental consequences of unlimited mobility. But even if environmental issues can be resolved, there is still the underlying problem of congestion.
- Stage V – realisation that the only way to improve both environment and congestion is to use the car less – reducing the need to travel” (Banister, 2000, pg. 115).
This new realism is evident in the newer policy literature.

There is a clear paradox with the concept of sustainable transport as “in an absolute sense all transport is unsustainable as it consumes resources” (Banister, 2000, pg. 1). Walking and cycling are however the closest to being sustainable, due to the fact that they consume very little, if any unrenewable resources (See Table 2.2). However, it should be noted that even these modes of transport consume some resources, such as space.

Table 2.2
Primary Energy Consumption Figures by Mode for the United Kingdom

<table>
<thead>
<tr>
<th>Mode</th>
<th>Seats/ Spaces</th>
<th>MJ/ Vehicles Km</th>
<th>MJ/ Seat Km</th>
<th>MJ/ Passenger Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Boeing 727</td>
<td>167</td>
<td>243</td>
<td>1.45</td>
<td>2.42</td>
</tr>
<tr>
<td>Rail Electric and Diesel</td>
<td>377</td>
<td>168</td>
<td>0.45</td>
<td>1.65</td>
</tr>
<tr>
<td>Metro London Underground</td>
<td>555</td>
<td>141</td>
<td>0.25</td>
<td>1.69</td>
</tr>
<tr>
<td>Tram Light Rail</td>
<td>265</td>
<td>79.8</td>
<td>0.30</td>
<td>0.91 1.20</td>
</tr>
<tr>
<td>Bus</td>
<td>48</td>
<td>14.7</td>
<td>0.34</td>
<td>0.92 1.53</td>
</tr>
<tr>
<td>Lorry</td>
<td></td>
<td></td>
<td></td>
<td>2.94</td>
</tr>
<tr>
<td>Taxi</td>
<td>4</td>
<td>3.3</td>
<td>0.83</td>
<td>2.94</td>
</tr>
<tr>
<td>Car</td>
<td>4</td>
<td>3.7</td>
<td>0.92</td>
<td>2.10</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>2</td>
<td>1.9</td>
<td>0.95</td>
<td>1.73</td>
</tr>
<tr>
<td>Cycling</td>
<td>1</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>Walk</td>
<td>1</td>
<td>0.16</td>
<td>0.16</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Source: Banister, D. Pg. 1 (2000)

A set of ‘guiding principles for sustainability in transport’ have been put forward by Whitelegg (1993, pg. 157) these can be seen in the table below (Table 2.3).
Table 2.3

Guiding principles for sustainability in transport

<table>
<thead>
<tr>
<th></th>
<th>Guiding principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transport is a vital element in economic and social activities but must serve those activities rather than be an end to itself.</td>
</tr>
<tr>
<td>2</td>
<td>The consumption of distance by freight and passengers should be minimised as far as possible whilst maximising the potential for locally based social interaction and locally based economic activity.</td>
</tr>
<tr>
<td>3</td>
<td>All transport needs should be met by the means that is least damaging to the environment.</td>
</tr>
<tr>
<td>4</td>
<td>There should be a presumption in physical land-use planning against those activities which by nature of their size and importance attract car based users from a large area.</td>
</tr>
<tr>
<td>5</td>
<td>All transport investment plans should be subject to a full health audit notwithstanding the uncertainties surrounding epidemiological proof. Proposals which are potentially health damaging should be rejected.</td>
</tr>
<tr>
<td>6</td>
<td>All transport investment plans should have clear objectives designed to cover social, economic and environmental concerns and be evaluated by an independent authority with sufficient expertise to comment on value for money, costs and benefits and the availability of alternative strategies to achieve the same objectives.</td>
</tr>
<tr>
<td>7</td>
<td>All transport investment should be monitored over their lifetime to check on the degree to which they meet their objectives and their contribution to environmental damage.</td>
</tr>
<tr>
<td>8</td>
<td>All transport policy matters should be dealt with in a transport policy directorate that has no direct responsibilities for the management of individual modes. The responsibilities of the directorate are to deliver sharply focused policies that minimise danger, minimise air and noise pollution, maximise social interaction and urban quality of life and oversee the non-policy-making executives (for road, rail and air) whose role is to implement the directives of the transport policy directorate.</td>
</tr>
</tbody>
</table>

"A salient feature of the 20th century has been the extraordinary growth in motorised transport, particularly in the world’s richest countries and particularly by personal
automobile” (Gilbert, 2000, pg. 1). This has lead to a significant rise in both mobility and car ownership, a rise which appears likely to continue. For example, “in the EU15 there has been an increase of over 31% in the numbers of vehicles owned (1984-1994), and it is likely over the next 25 years (to 2020) that the number will increase by a further 50%” (Banister, 1998, pg. 1). Table 2.4 shows the ‘expected growth in vehicle ownership in Europe 1995-2020’.

Table 2.4
Expected Growth in World Wide Vehicle Ownership

<table>
<thead>
<tr>
<th>Thousands</th>
<th>1995</th>
<th></th>
<th>2020</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cars</td>
<td>Vehicles</td>
<td>Cars</td>
<td>Vehicles</td>
</tr>
<tr>
<td>Europe</td>
<td>160,215</td>
<td>203,429</td>
<td>244,720</td>
<td>300,054</td>
</tr>
</tbody>
</table>

Notes: All vehicles includes cars, light trucks, motorcycles and heavy trucks.
OECD Europe – Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, UK, Finland.

(Adapted from) Source: Banister (1998)

Sustainable transport has come to the fore at a time when “the amount of travel world-wide is on a steady upwards trajectory” (Banister and Marshall, 2000, pg. 1). In Europe, the so called ‘mobility explosion’ “is outstripping the growth in population by a factor of over ten” (Banister and Marshall, pg. 1).

Looking specifically at trends in road traffic in Great Britain motor vehicle traffic had increased by almost 500 per cent between 1956 and 1997, “with growth in traffic since 1987 up by almost 20 percent” (DETR, 1998, pg. 1).

It is in response to trends such as these that the concept sustainable transport attempts to reduce the use of the private car and promote more sustainable ‘alternatives’, such as high occupancy public transport, cycling and walking.
The massive growth in the ownership and use of the private automobile is largely attributed to the fact that more people now have a sufficiently high income to be able to afford a car, and “it allows comfort, speed, privacy and convenience in travel hardly dreamed of in former years” (Gilbert, 2000, pg. 3).

These ‘trends’ present one of greatest challenges to sustainable development. Banister (1997) identifies seven ‘key’ issues which need to be addressed if transport is to conform to the principles of sustainable development, which have previously been identified. The seven key issues are listed below:

1. Growing congestion
2. Increasing Air Pollution
3. Traffic Noise
4. Road safety
5. Degradation of Urban Landscapes
6. Use of Space by Traffic
7. Global warming.

In addition to these Banister suggests three other factors which ‘need to be added’, these are:

8. Decentralisation of cities
9. Development Pressures

Clearly, all of these factors are applicable at some level, from the international, to the national, to the local. Those which have been identified as being most applicable at the local level, which in this case is the London Borough of Hammersmith and Fulham are: growing congestion, increasing air pollution, traffic noise, road safety,
degradation of urban landscapes, use of space by traffic and development pressures. These are all areas factors which will be addressed in this report.

Similarly to the factors outlined by Banister, Tolley and Turton state “for transport to be sustainable it must satisfy three basic conditions:

1. its rates of use of renewable resources do not exceed their rates of regeneration;
2. its rates of use of non-renewable resources do not exceed the rate at which sustainable renewable substitutes are developed;
3. its rates of pollution emission do not exceed the assimilative capacity of the environment” (Tolley and Turton, 1995, pg. 352).

There is obviously serious and sustained concern amongst political, academic and environmental circles as to what can be done to achieve a more integrated transport system and ultimately to reduce the use of private vehicles in areas which suffer from congestion. It is clear that increasing road capacity is not an acceptable option, as this is not sustainable, nor (in most cases) locally desirable.

The UK Government has, and continues to attempt to try to achieve the principles of sustainable development from the level of international agreements, such as the Kyoto Protocol through which the UK Government committed itself to achieving an 8% reduction in the emission of greenhouse gasses over the years 2008-2012, through to more local initiatives such as the proposed congestion charging scheme for London, which is outlined later in this section.

In terms of transport, ‘This Common Inheritance: Britain’s Environmental Strategy’ (1990) aimed:

- To make people more aware of the environmental impact of their transport decisions;
- To improve vehicle fuel consumption;
- To encourage transport choice.

Sustainable Development: The UK Strategy (1994) set out a sustainable transport framework which aimed to:

- strike the right balance between the ability of transport to serve economic development and the ability to protect the environment and sustain future quality of life;
- provide for the economic and social needs for access with less need for travel;
- take measures which reduce the environmental impacts of transportation and influence the rate of traffic growth;
- ensure that users pay the full social cost of their transport decisions, so improving the overall efficiency of those decisions for the economy and bringing environmental benefits.

The more recent, 1999 Sustainable development strategy ‘A better quality of life’ states that “energy-efficient and resource-efficient vehicles are needed for sustainable transport, alongside measures to influence transport use” (1999, pg. 47). Within this document there is also support for the EU’s strategy to reduce average carbon dioxide emissions from new cars by up to 40% (by 2010). This is support has been further ratified by the UK Governments continued commitment to implementing the Kyoto Protocol, which has already been discussed.

The key ‘actions and commitments’ outlined in the strategy, relating to the ‘Cleaner Vehicles Task Force, which aims to “encourage production, marketing, purchase and use of vehicles that are more fuel efficient, less polluting, quieter and less resource intensive and to improve the environmental performance of existing vehicles”, are:

- mandatory labelling of motor vehicles;
- first report of the Cleaner Vehicles Task Force.
The principal indicators which will be employed to monitor these commitments are:

- energy efficiency of road passenger travel;
- average fuel consumption of new cars.

A New Deal for Transport: Better for Everyone’ is the new ‘integrated transport policy’, which attempts to respond to the challenge of achieving sustainable, or at least more sustainable transport. A New Deal for Transport attempts to integrate:

- within and between different types of transport,
- with the environment;
- with land use planning; and
- with policies for education, health and wealth creation.

This long term transport strategy stipulates that the need to achieve a sustainable transport system is pivotal to the provision of jobs and the existence of a strong economy, which in-turn “increases prosperity and tackles social inclusion”. “We also need a transport system which doesn’t damage our health and provides a better quality of life now – for everyone – without passing onto future generations a poorer world” (Chapter 2).

The strategy clearly links the ‘achievement’ of sustainable transport to wider environment, such as ‘better health’ (“the way we travel is making us a less healthy nation”), ‘more jobs and a strong economy’ and ‘a better environment’.

The implementation of the above mentioned documents, which are of national significance is a key responsibility of the ‘Planning Policy Guidance Note’ (PPG) system. Looking specifically at transport two PPG’s are of significant importance, these are PPG 13 (2001) and PPG 1(1997).
PPG 13 ‘Transport’ (2001) states that “land use planning has a key role in delivering the Government’s integrated transport strategy” (pg. 1), which principally is to (amongst others):

- ‘promote more sustainable transport choices’, and
- ‘reduce the need to travel, especially by car’.

With regard to managing travel demand draft PPG13 stipulated that “quick and easy interchange is essential for integration within and between different types of transport and to encourage more walking, cycling and public transport usage” (1999, pg. 3). The policy guidance note highlights demand management measures, these are briefly outlined below:

1. **Parking** – “Both trip frequency and modal choice are influenced by parking availability. As the availability of residential parking increase, the average number of trips per person decreases” (Banister, 1998, pg. 11).

2. **Traffic management** – It is suggested that a strategic approach, which considers how different measures can compliment each other should be adopted by local authorities. A ‘well designed traffic management measure can contribute to planning objectives in a number of ways, including:
   - Reducing community severance, noise, local air pollution and traffic accidents;
   - Promoting safe walking, cycling and public transport’.

3. **Demand management** – schemes such as the proposed congestion charging scheme for London needs to work in a fashion which is complementary so as the achieve the objectives of the guidance.

4. **Walking** – greater priority should be given to walking. Strategies which make it easier and safer to get around should be included in the local transport plan.

5. **Cycling** – cycling, which is believed to have the potential to substitute short car trips (under 5km) and link into longer journeys taken by public transport, has an important role to play if an integrated transport system is to be achieved.
6. *Public transport* – the availability and use of public transport is identified as being very important, whilst preparing development plans and determining applications local authorities are minded to:

- Identify the key routes for bus improvements and priority measures, and the measures that will be taken.

With regard to the reallocation of road space to favoured classes of traffic PPG13 states that local authorities should “give priority to people over traffic in town centres... Consider giving more road space to pedestrians, cyclists and public transport in these locations”.

Following on from this, PPG 1 (1997) aims to go some way to achieving the principles of sustainability (set out in ‘Sustainable Development: The UK Strategy’). It does this by aiming to shape new development patterns in ways which minimise the need to travel through the concentration of development for uses which generate a large number of trips in places well served by public transport. The ‘key’ objectives for the planning system are stipulated as:

- to influence the location of different types of development relative to transport (and vice versa); and
to foster forms of development which encourage walking cycling and public transport use.

Also, with regard to the wider implications of transport and travel patterns, it is important to mention the Environment Act (1995) and the Road Traffic Reduction Act (1997).

The 1995 Environment Act placed a duty on the Secretary of State to prepare and publish a strategy containing policies with respect to the assessment and management of air quality, the strategy was to include statements with respect to:
• standards relating to the quality of air;
• objectives for the restriction of the levels at which particular substances are present in the air;
• and measures which are to be taken by local authorities and other persons for the purpose of achieving those objectives.

This Act also required that each local authority carry out a review of the quality of air within its area, the key features of this review for Hammersmith and Fulham is outlined in the case study section.

The Road Traffic Reduction Act, which was passed through parliament in 1997, was principally to make ‘further provision for road traffic reduction targets’. This Act placed a duty on each local authority to prepare a report relating to the levels of road traffic in their areas at such time or times as the Secretary of States may direct.

The term ‘road traffic’ is defined (for the purpose of the Act) as “traffic consisting of mechanically propelled vehicles on roads, but excluding vehicles constructed or adapted to carry more than eight passengers in addition to the driver”. The Act stipulates that the Secretary of State is obliged to “set and publish in a report targets for road traffic reduction in England, Wales and Scotland”. In preparing his report, the Secretary of State is minded of the necessity to comply with the requirements set out in subsections (1) and (2) of the Act, these address the adverse impacts of road traffic, which include:

• The emission of gasses which contribute to climate change;
• Effects on air quality;
• Effects on health;
• Traffic congestion;
• Effects on land and biodiversity;
• Danger to other road users; and
• Social impacts.

However, it is considered that “traffic reduction should not be seen as an objective in itself, but rather as a means to achieving wider objectives that are considered important to the community” (Turner et al, 1999, pg. 186).

2.4 Sustainable transport in London

In terms of Regional Planning Guidance, there are two documents, RPG 9 and RPG 3, which are relevant to London, these are discussed below.

In RPG 9, Regional Planning Guidance for the South East (1994) the stated objectives in relation to transport are:

• To provide for safe and efficient movement and to facilitate accessibility in order to serve the existing and future pattern of development in the Region;
• To reconcile the demand for travel with environmental concerns, including impacts on human health and climate change;
• To reduce the growth in reliance on the motor vehicle;
• To increase the opportunity to choose modes of travel with less environmental impact, particularly walking, cycling, public transport, and rail and water for freight;
• To take account of the interaction between transport and land use; and
• To take account fully the high and rising economic and environmental costs of transport in the South East.

Strategic Guidance for London Planning Authorities, RPG 3 (1996) states that:

"In order to maintain its status as a world city, London requires a modern, efficient transport system which meets the needs of its residents, businesses and visitors while respecting and improving the environment. The Government’s sustainable
development strategy places the highest priority on the need to strike the right balance between the ability of transport to serve economic development and the ability to protect the environment and sustain future quality of life”.

The principal objective of RPG 3, with regard to transport is:

- [To] facilitate the development of transport systems which are safe, efficient and have proper respect for the environment.

In addition to this it states that “the government has the following strategic objectives for transport in London:

- to promote greater use of less polluting modes of transport, subject to the need to maintain competitiveness and safety;
- to plug major gaps in the road and rail network”.

RPG 3, although continually stating that key to the (then conservative) governments ‘Transport Strategy for London’ was a reduction in private vehicle use does not make any strong arguments or suggestions as to how this should be achieved! Although it does state that “the government recognises that it is not possible to resolve the problems of congestion and pollution through major new road construction”. Further more, it states “The Government’s policy is therefore to seek to change the trends in traffic growth, through the encouragement of alternative modes” (8-041/28).

The key themes which dominate this guidance with regard to private vehicle use are that private car users should be encouraged to seek alternative modes, but failing this, that vehicles are ‘encouraged’ “to make the fullest possible use of the Strategic London Road Network of trunk and designated roads”.

With particular regard to road based transport, it is felt that buses and coaches are of key importance “as the car becomes increasingly inappropriate for journeys in
London" and "improvements in the bus network represent the most flexible means of increasing the capacity of the public transport system quickly" (RPG 3, 1996, 6.11).

London, as a great world city, "the powerhouse of the British economy and the gateway to the UK for international investment and tourism" (GLA, 2001(a), pg. 3), must be able to compete with the rest of the world, not only in terms of the services it has to offer, but also in terms of its infrastructure and transport system.

Over the last decade or so the demands placed on London’s transport have increased immensely, principally as a result of rising population levels, "over the past two decades there has been a sustained growth in London’s population" (GLA 2001(b), pg. 18), continued economic growth and increased volumes of tourists. "Yet, over the same period, the city’s transport system has been starved by central government of the investment necessary to sustain the existing system, let alone meet rising demand"(GLA, 2001(a), pg. 3).

Perhaps the most important document produced for transport in London in recent times is the GLA’s ‘Mayor’s Transport Strategy’ (2001). This strategy outlines a number of priorities which are intended to make London’s transport system more efficient, reliable, of higher quality and of greater capacity. The stated key priorities are:

- Reducing traffic congestion, particularly in Central London and London town centres;
- Overcoming the backlog of investment in the Underground so as to safely increase capacity, reduce over crowding, and increase both reliability and frequency of services;
- Making radical improvements to bus services in London, including overcoming unreliability and slow journey times;
• Better integration of the National Rail system with London’s other transport systems to facilitate commuting, reduce overcrowding and move towards London-wide, high frequency ‘turn-up-and-go’ metro service;

• Facilitating car travel in outer London whilst developing and promoting the alternatives of public transport, walking and cycling, so that the proportion of trips made by car is reduced;

• Supporting boroughs’ local transport initiatives, including improved access to local town centres and regeneration areas, walking and cycling schemes, safer routes to school, road safety improvements, better maintenance of roads and bridges, and improved co-ordination of street works;

• Making the distribution of goods and services in London more reliable and efficient, whilst minimising environmental impacts;

• Bringing forward new integration initiatives to improve key interchanges, enhance safety and security, and provide much better information and waiting environments;

• Improving the accessibility of London’s transport system so that everyone, regardless of any disability, can enjoy the benefits of living, working and visiting the Capital, thus improving social inclusion; and

• Increasing the capacity of London’s transport system by major new cross-London rail links, improved orbital rail links in inner London, new Thames river crossings in east London, and new guided bus or tram projects in Central, inner and outer London.

(GLA, 2001(a), pg. 7)

One of the key proposals contained within this strategy is a congestion charging in London. The proposed charging area would be bounded by the ‘Inner Ring Road’ (Marylebone Road, Euston Road, Pentonville Road, Tower Bridge, Elephant and Castle, Vauxhall Bridge, Victoria and Hyde Park Corner), See Map 2.1. Areas contained within the Inner Ring Road include the city of London, parts of Westminster, Camden, Islington, Hackney, Lambeth, Southwark and Tower Hamlets. Present proposals (as the scheme is still going through the phases of consultation) are
that a standard charge for any vehicle entering the cordon area would be £5 per day (£25 per week). This charge would apply from 07.00-19.00, Monday to Friday.

A preliminary illustrative modelling scenario approach, applied in the ROCOL Report (1999) indicates that a scenario, similar to the proposals presently being put forward for London, would result in (amongst other things):

- A reduction in total car vehicle trips by 20%;
- A 7% increase in public transport passenger trips.

Clearly the proposed congestion charging scheme would not have a direct effect on the London Borough of Hammersmith and Fulham as it does not lie within the
charging area. However, the council did make representation to the GLA regarding the proposal. In general the borough supports the charging scheme, and goes so far as to say “as public transport improves and if the pilot congestion charging scheme achieves its stated objectives, it should be extended over a larger area to include Hammersmith and Fulham” (LBH&F, 2001), pg. 1). The borough also stated that the proceeds from congestion charging should be used to fund long term public transport investment programmes in the capital. They suggest “the priorities for spending the net proceeds in order to create a public transport network suitable to ensure the continued growth of London as a World City should include:

**Short-term**

- Flat fares on buses across the Capital
- Bus conductors
- New, accessible, low emission buses
- Better enforcement of bus lanes and waiting and loading restrictions on key routes
- Completion of the LBPN (London Bus Priority Network)
- Tube services operating through the night at weekends and the later running of mainline rail services.

**Medium-term**

- Development of services on London’s orbital rail network
- The development and implementation of the Uxbridge Road transit scheme – from Uxbridge to Shepherds Bush
- The development and programming for the Wimbledon-Hackney Line”.

(LBH&F, 2001, pg. 4-5)

In response to the already mentioned Road Traffic Reduction Act (1997) it was considered that the wider objectives should include:

- reduction of congestion;
- improvement of public transport reliability and regularity;
• improvement of conditions for non motorised modes;
• improvement of business operating environment;
• improvement of air quality;
• reduction of road accidents; and
• improvement of other environmental (‘quality of life’) conditions.

It is clear that if London is to successfully adopt more sustainable forms of transport then all of the policies which have been discussed up until now need to be applied at the local level. It is generally anticipated that the existence of the GLA will do a great deal to aid the delivery of policies, to the local authorities due to the fact that it can act as (almost) a regional form of government.

2.5 Sustainable transport in the London Borough of Hammersmith and Fulham

The London Borough of Hammersmith and Fulham (LBH&F) is located in South West London (see Map 2.2). The “Borough is a unique grouping of places each having a special identity” (UDP, 1994, pg. 17) such ‘places’ include Hammersmith in the north, Fulham in the south, College Park, White City, Shepherd’s Bush and Sands End.

The policies adopted by LBH&F are all contained within the Unitary Development Plan (UDP), which is made up of two parts. “Part I provides a framework for the authority’s detailed proposals in Part II....Part II contains a written statement of the authority’s proposals for the development and use of land; a map showing these proposals on an Ordinance Survey base; and a reasoned justification for the general policies in Part II of the plan” (Cullingworth and Nadin, 1997, pg. 87).
The 1994 UDP produced by the London Borough of Hammersmith and Fulham states that the council will "seek to provide adequate accessibility, and will monitor such provision, for persons and goods consistent with the safety of the individual and a satisfactory local environment through the application of an appropriate combination..."
of integrated land-use and transportation policies, taking full account of their regional implications. Imparticular the council will:

- promote traffic restraint policies so as to reduce road traffic congestion" (UDP, 1994, 5.2).

This is an important issue within the debate about whether Hammersmith Bridge should have, or could in the future, permanently be closed to private vehicles (The motivation for the closure in 1997 is outlined in section 3.2.3.). Principally because there are questions as to whether this would allow the council to 'provide adequate accessibility'. Inextricably linked with this is the (general) assumption that the response of displaced drivers is to divert to another route.

This relates to 'Wardrop's Principles' (1952) which attempted to provide a behavioural basis for the chaos, which is regularly predicted as a response to schemes such as road reallocation. Wardrop put forward rules by which drivers would make decisions to travel via other routes to minimise their own journey times (or less likely everybody's journey time). Taking Wardrop’s Principles at their most basic level, assuming that the only choice which the driver has to make is which route to take, the assumption is that all traffic which has been displaced deviates to some other route. If the new route/routes already suffer from congestion then “very substantial difficulties of congestion are predicted... In such circumstances, chaotic or gridlocked conditions may be predicted” (Cairns, Hass-Klau and Goodwin, 1998, pg. 7). However, current consensus dictates that other behavioural choices are also of potential significance (i.e. trip frequency, time of day and destination). This is a core issue which is addressed in this research.

The LBH&F UDP states that they “seek to promote traffic restraint policies designed to restrain the level of potential demand below the level of available road capacity and will seek to allocate the road space made available to essential traffic”, including cyclists and pedestrians (5.3). It would appear that the reallocation of road space on
Hammersmith Bridge during its period of enforced closure is an example of this policy being implemented.

Referring to the wider road network of the area LBH&F state that they “will seek to ensure that:

(i) the boroughs road network:
   - caters safely and efficiently for all essential traffic movements, and
   - discourages the generation of additional traffic.
(ii) the environmental impact of road traffic in the borough is kept to a minimum”.

(UDP, 1994, TN7)

This policy is particularly important in relation to this piece of research for a number of reasons. Firstly, it is reasonable to assume that the reallocation of road space on Hammersmith Bridge will have a direct effect, and generate additional traffic on surrounding roads and bridges, both within LBH&F and in neighbouring boroughs. These include Wandsworth, Richmond upon Thames and the Royal Borough of Kensington and Chelsea, as they have been identified as the areas which are potentially ‘affected’. Secondly, very much tied in with this is the assumption that increased traffic (on these roads) will lead to decreased levels of both safety and efficiency. Thirdly there is a very significant question as to whether the reallocation of road space over the bridge will have significant impact on the environment both in the area immediate to the bridge and the surrounding local area.

Much of LBH&F suffers from serious road traffic congestion “throughout much of the day time off-peak period (as well as peak periods)” (LBH&F, 1999, pg. 22). It is for this reason that the local authority has attempted, in recent years (since the publication of the 1994 UDP) to set out stringent policies aimed at curbing private car use in the borough. In their Transport Policies and Programme 1999/2000 the council state that they “will seek to allocate the road space made available by restraint
policies’ (LBH&F 1999, pg. 52). In developing this policy the council anticipate adopting ‘a priority ranking for essential traffic’ which is as follows:

i) emergency vehicles;

ii) pedestrians and cyclists;

iii) buses, and other vehicles available for public use;

iv) commercial vehicles, and cars being used for non-personal business;

v) cars (not included in sub-paragraph (iv)) being used for journeys not involving travel within areas subject to road traffic congestion and/or at times of off-peak traffic flow; and

vi) cars (not included in sub-paragraph (iv)) being used for journeys involving travel within congested areas subject to road traffic congestion and/or at times of peak traffic flow.

(LBH&F, 1999, pg. 52)

The priority ranking scheme which was applied, during the period of ‘closure’, over Hammersmith Bridge was similar to this incorporating the first three stages (emergency vehicles, pedestrians and cyclists, and buses).

2.6 Hammersmith Bridge

Hammersmith Bridge, a designated secondary road, crosses the river Thames, providing an extremely important link in local road network (see Map 2.3). Traffic flows over Hammersmith Bridge pre closure were in excess of 30,000 vehicles per day, which reduced to just 3,000 during closure.
The bridge lies within the jurisdiction of the London Borough of Hammersmith and Fulham, however, the roads and land immediately south of the river (and the bridge) is within the borough of Richmond Upon Thames(Map 2.4).
A borough profile, history of the Bridge, and background to the closure can be found in Chapter 3.0.

2.7 Empirical Studies

There is an absolute void in both planning and transportation literature with regard to the impact of road capacity reduction or reallocation. It is for this reason that this final section of the literature review is restricted to a very limited number of studies.
The ‘groundbreaking study’ with regard to this topic was written by S. Cairns, C. Hass-Klau and P. Goodwin, titled ‘The Impact of Highway Capacity Reductions: Assessment of the Evidence’ (1998). The study was sponsored by London Transport and the DETR, and “presents, for the first time, a comprehensive assessment of the evidence about the traffic impacts” of road capacity reduction or reallocation.

Although there are significant similarities between the Cairns, Hass-Klau and Goodwin study and the one which has been undertaken for this piece of research, the methodologies employed are significantly different. Cairns et al opted for a multi-case strategy, using 60 case studies drawn from all over the world, “the net has been deliberately cast as wide as possible” (Cairns, Hass-Klau and Goodwin, 1998a, pg. 3). This report is concerned with a single case study. This decision was made for a number of reasons, which are discussed below.

There are significant problems when attempting to compare evidence gathered from numerous sources (as Cairns et al did). This can be attributed to a number of factors such as the original data being collected for different monitoring purposes, different methods of data collection, points at which measurements were taken and databases used for data storage and/or collaboration. Another and perhaps more significant criticism which can be levelled at the work undertaken by Cairns et al is the fact that many of the cases used in the study, strictly speaking do not qualify as examples of road reallocation/road capacity reductions. Examples include traffic zones, restricted access to residential areas and the closure of through routes.

It is for these reasons that the decision was made to concentrate this study on one particular case.

The Cairns, Hass-Klau, Goodwin study, correctly identifies ‘technical feasibility as being key to the employment of road reallocation measures. Feasibility is most commonly calculated on “the assumption that all traffic displaced from one street will simply divert to another” (Cairns, Hass-Klau and Goodwin, 1998b pg. 348), clearly, a
central issue of this research is to attempt to find whether this is correct. In many cases where the assumption of feasibility has been made ‘traffic chaos’ has been a predicted outcome, however in the majority of cases ‘chaos’ never materialised. Of this Cairns, Hass-Klau and Goodwin say “such forecasts may not be well founded, particularly since (a) there is now practical experience that many cities have implemented policies to reallocate space successfully, and (b) SACTRA concluded that increases in road capacity in congested conditions were likely to induce additional traffic” (1998b, pg. 348).

The above mentioned SACTRA report (1994) produced conclusions to the effect of ‘increasing road capacity can induce additional traffic’, by reversal it may be reasonable to assume that road capacity reduction would lead to a reduction in traffic. “The mechanisms underlying suppression of traffic are the same as, but in the opposite direction to those resulting in induced traffic” (Design Manual for Highways and Bridges 1997).

The authors identify three ‘hypothesis’, in terms of the different types of responses to capacity reductions. These are outlines below:

**Hypothesis 1:** No real reduction in effective capacity:
No reduction in traffic.

In many of the cases looked at in the study there was no actual reduction overall road capacity, despite local perception. Any reductions which had been made were offset by increases in capacity elsewhere, the expected result was “little or no change in overall traffic levels, congestion or traveller choices” (1998b, pg. 353).

**Hypothesis 2:** A reduction in capacity, but alternative capacity exists:
Traffic re routes or re times.
The ‘reduction’ does not make a significant impact on traffic due to the fact that there is still adequate capacity on alternative routes, away from the ‘treated’ area, there are also no measures to discourage people from doing this. “Traffic does decrease in the place or at the time when it would experience (and cause) an unacceptable level of congestion, but it reappears on some other road or at some other time” (1998b, pg. 353).

**Hypothesis 3:** A reduction in capacity, and no suitable alternative capacity available; Traffic disappears.

In these situations capacity is significantly reduced, and there is not adequate spare capacity on alternative routes or at acceptable other times, due to the nature of the network and the prevailing level of congestion. “These are the circumstances thought to be most relevant to future policy development in London” (1998a, pg. 24).

It may be interesting to refer back to these hypothesis at the end of this report to ascertain whether the case of Hammersmith Bridge conforms to any of them.

The second part of the study on the traffic impact of highway capacity reductions was produced by D. Coombe, J. Bates and M. Dale. This report looked at ‘modelling the traffic impacts of highway capacity reductions’.

Interestingly, this report differentiates between individual schemes and strategic policies. Coombe et al point out that ‘schemes’ “do not involve simply the reallocation of road space away from general traffic to other uses, but they actually reduce the volume of general traffic which can pass through the system” (1998, pg. 430).
A roundtable on modelling concluded that “the dominant short-term effects were considered to be route choice and time of travel choice” (Coombe, Bates and Dale, 1998, pg. 431).

The paper produced by Coombe, Bates and Dale also offers some explanation as to why the predicted ‘chaos’ associated with road reallocation schemes rarely occurs in reality. There are “a number of demand responses which could account for this, the main ones being change of route and change of time of travel” (1998, pg. 431). I will be interesting to assess whether this ‘rule’ can also be applied to the case of Hammersmith Bridge.
3.0 Methodology

As highlighted in the previous chapter the major 'problem' facing transport, not only in London but also at the national and international scale, is finding the means of achieving more sustainable transport usage (i.e. less car travel particularly in urban areas). By looking at the micro level, at the 'impact of the closure of Hammersmith Bridge' this research attempts to highlight the impact that the 'closure' of a major route way, to private vehicles would have. This not only considers traffic counts in the surrounding area but also public transport provision and usage, air quality and accident rates.

Clearly, in order to do this the aims and objectives, set out in Chapter 1, needed to be fulfilled, this phase of the research is outlined in section 3.1 below. However, the overriding aim, and anticipated outcome, is to compile a study which highlights the impact of the closure (to private vehicles) of one of London's principal bridges.

3.1 Fulfilment of Aims and Objectives

'Specific' aims and objectives clearly needed to be fulfilled to facilitate the completion of the research. Each of the aims and objectives were carried out using different sources of evidence. These are specifically addressed below.

- Identifying the reasons for closure and disclosing whether there was **advanced warning to the public** – This was principally achieved through obtaining 'archival records' from both the local authority (LBH&F) and through the local media, the Hammersmith and Fulham Gazette, and through informal 'interviews undertaken with members of both the planning and Highway Engineers departments at LBH&F.

- Obtain data for traffic flows both over Hammersmith Bridge and in the surrounding 'study area' – this data was collected from a variety of sources, including LBH&F, the London Borough's of Wandsworth, Richmond Upon
Thames and the Royal Borough of Kensington and Chelsea. Data was also collected from the Highways Authority (who controls Chiswick Bridge).

- **Obtain data for public transport operated bus services, servicing both the bridge itself and the surrounding ‘study area’** – this data was obtained from the Bus Priority and Traffic Unit of London Transport Buses. Some information was also obtained from LBH&F and Wandsworth Borough Council.

- **Obtain air quality data for both the areas immediate to the bridge and the wider ‘study area’** – this was again collected from the local authorities within the ‘study area’ and a report produced by Halcrow Fox Consultants.

- **Obtain data on accident rates both in the area immediate to the bridge and in the wider ‘study area’** – data regarding accident rates was collected from the London Accident Advisory Unit, who provided information for the time period ‘before closure’, ‘during closure’, and in the period immediately after reopening. Information was also gathered from the respective local authorities.

- **Gage opinion about the possibility of permanent road reallocation on the bridge** – This has been achieved principally through a review of the response to the referendum which LBH&F and the London Borough of Richmond Upon Thames jointly held and an independent referendum which was undertaken by Wandsworth Borough Council. The opinion (which was gauged from responses received in ‘informal meetings’) of some planners and engineers from all of these authorities has also been taken into account.

### 3.2 The case Study

The research undertaken in this study has been placed in the context of Banister’s ‘new realism’ (2000, pg. 115), outlined in Chapter 2. These five stages serve to prove that a scheme such as road capacity reduction, in the form of the road reallocation may be the one way towards achieving sustainable transport. Banister’s work (2000) concludes for each stage, that:
• Stage 1: Projected traffic growth can not be sustainable.
• Stage 2: Increasing road capacity is not an option.
• Stage 3: Realisation that ‘demand management’ has an important role to ‘play’.
• Stage 4: Awakening of ‘environmental concerns’, not only regarding mobility, but also and perhaps more importantly congestion.
• Stage 5: Realisation that both environmental and congestion issues can only be addressed through less use of the car. This could be feasibly be achieved through reducing the road capacity which is available to private car drivers.

Before presenting any analysis of the data which has been collected and collaborated to fulfil the aims and objectives of this research, it is firstly necessary to provide a limited background on the case study area, and to highlight the ‘other’ factors which may have influenced the ‘effects’ of road reallocation. The crucial influences, according to Cairns, Hass-Klau and Goodwin (1998a, pg. 2-3), may include:

- The scope, scale and timing of the capacity reductions;
- The prevailing traffic conditions (including the amount of ‘spare’ road capacity available);
- Whether the reduction was planned as part of policy, or occurred due to accidents or events;
- the degree and type of advance publicity and/or marketing;
- the nature of the location, including the size and characteristics of the place;
- the geographical and topological features of the network;
- the time period when the impacts were observed;
- the social, economic and cultural characteristics of the local population.

Unlike the study compiled by Cairns, Hass-Klau and Goodwin this study also looks at what have been titled ‘second round effects’. These include public transport bus services and patronage levels, air quality data, and road accident data, for the period
of time before the 'closure', during the 'closure' and in the period soon after re
opening.

3.2.1 'The strategy'

The research strategy which has been employed in this study is the 'case study'.
"Case studies are the preferred strategy when “how” or “why” questions are being
posed, when the investigator has little control over events, and when the focus is on a
contemporary phenomenon within some real-life context" (Yin, pg. 1).

Clearly, studying road reallocation as a potential means of reducing road traffic
congestion in London meets all of these criteria due to the fact that the question being
posed is “how will the reallocation of road space effect local traffic flows, public
transport usage, air pollution...”. The investigator has no control over events, and the
focus is, unquestionably, on a contemporary phenomenon, which is the reduction in
private car usage, sustainable transport, and ultimately sustainable development.

Clearly, the case study strategy is very useful, however, the approach is not without
its critics. The ‘pros’ and ‘cons’ of the case study strategy are outlined in Table 3.1

Table 3.1
‘Pros’ and ‘cons’ of the case study strategy

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Access to ‘local information’</td>
<td>• Objectivity</td>
</tr>
<tr>
<td>• Access to up-to date qualitative and quantitative data</td>
<td>• Generalisations</td>
</tr>
<tr>
<td>• Ability to ‘participate’</td>
<td>• ‘The final product’ (‘massive unreadable documents’)</td>
</tr>
<tr>
<td>• Subject uniqueness</td>
<td></td>
</tr>
<tr>
<td>• Focus on a specific event</td>
<td></td>
</tr>
</tbody>
</table>
Multiple sources of evidence have been employed, principally because "better case studies rely on a wide variety of sources" (Gross et al, 1971). These sources include, documentation, archival records, observations and interviews. The rational behind using multiple sources of information is "triangulation" (Patton, 1987), see Figure 3.1.

**Figure 3.1**
Convergence of multiple sources of evidence (single study)

![Diagram showing convergence of multiple sources of evidence](image)

**3.2.2 The case study area**

**A Borough Profile: the London Borough of Hammersmith and Fulham**
The 1996 mid year estimate for the population of the borough was 156,700 (see Table 3.2), this shows a steady growth in the population which fell steeply before stabilising in the 1980s and 1990s. Predictions by the London Research Centre indicate that the population of the Borough will continue to increase steadily during the period 1995 to 2016. The most 'realistic' projection indicates that the population of the Borough will
reach 165,000 by 2016. This pattern is one which is ‘paralleled’ by Inner London as a whole, the components of the change in LBH&F, and London as a whole can be seen in Table 3.3.

Table 3.2
Mid Year Estimates 1989-1996

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H&amp;F</td>
<td>152.2</td>
<td>153.9</td>
<td>156.2</td>
<td>156.0</td>
<td>155.0</td>
<td>156.6</td>
<td>156.1</td>
<td>156.7</td>
</tr>
</tbody>
</table>

Source: LBH&F, 1998a

Table 3.2
Components of Population Change 1991-1996

<table>
<thead>
<tr>
<th></th>
<th>Natural change</th>
<th>Net migration and other changes</th>
<th>Net change</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>H&amp;F</td>
<td>4,000</td>
<td>-3,500</td>
<td>500</td>
<td>0.3</td>
</tr>
<tr>
<td>Inner Boroughs</td>
<td>90,700</td>
<td>-10,300</td>
<td>80,400</td>
<td>3.1</td>
</tr>
<tr>
<td>Outer Boroughs</td>
<td>97,200</td>
<td>-6,700</td>
<td>103,900</td>
<td>2.4</td>
</tr>
<tr>
<td>Greater London</td>
<td>187,900</td>
<td>-36,000</td>
<td>184,300</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Source: LBH&F, 1998a

The composition of the Boroughs population can be seen in Table 3.4. This data shows that the Borough contains smaller proportions of children (0-14s) than do Inner, Outer or Greater London, although this number did grow during the 1980s. Conversely, the Borough does have a higher proportion of young adults (15-44), over half of the population (54%) than do the Inner, Outer and Greater London.
### Table 3.3
Age Structure 1996

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>10,300</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>+9</td>
</tr>
<tr>
<td>5-14</td>
<td>14,900</td>
<td>9</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>+10</td>
</tr>
<tr>
<td>15-29</td>
<td>41,100</td>
<td>26</td>
<td>24</td>
<td>21</td>
<td>22</td>
<td>-18</td>
</tr>
<tr>
<td>30-44</td>
<td>43,600</td>
<td>28</td>
<td>27</td>
<td>24</td>
<td>25</td>
<td>+22</td>
</tr>
<tr>
<td>45-PA</td>
<td>26,100</td>
<td>17</td>
<td>16</td>
<td>19</td>
<td>18</td>
<td>+7</td>
</tr>
<tr>
<td>PA-75</td>
<td>12,100</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>-10</td>
</tr>
<tr>
<td>75+</td>
<td>8,600</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>-8</td>
</tr>
<tr>
<td>Total</td>
<td>156,700</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>-</td>
</tr>
</tbody>
</table>

PA= Pensionable Age (60 for women/ 65 for men)

Source: LBH&F, 1998a

Road traffic is a particular ‘problem’ for the LBH&F, and according to recent forecasts this may just be the ‘tip of the iceberg’.

The 1997 National Road Traffic Forecast indicates that between 2001 and 2031, within the borough, car traffic could grow by 42%, the number of cars available could increase by 43%, and number of cars per household could increase by 15%. These figures can be closely correlated with the ‘socio-economic change in the area’, (see Table 3.5), as the area has become more affluent (i.e. more people occupying professional jobs) there has also been an increase in the level of car ownership.

It is a stated strategic aim of the London Borough of LBH&F “to restrain unnecessary car use, particularly car use for commuting to and from work”. Furthermore this is complemented by “policies for improving the performance and accessibility of public

59
transport, for improving conditions for cyclists and for making improved provision
for pedestrians” (LBH&F, 1998b, pg. 17).

This strategic aim is an example of the principles of sustainable development (see
Chapter 2.0) being put into practice at the local level.

Table 3.5

<table>
<thead>
<tr>
<th>Socio-Economic Group</th>
<th>1971 Total (%)</th>
<th>1981 Total (%)</th>
<th>1991 Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employers, Managers and Professionals</td>
<td>10</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Other non-manuals</td>
<td>38</td>
<td>36</td>
<td>37</td>
</tr>
<tr>
<td>Skilled Manual</td>
<td>21</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Semi-Skilled Manual</td>
<td>17</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Unskilled Manual</td>
<td>9</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

SOURCE: LBH&F 1998a, pg. 24

A brief history of Hammersmith Bridge

“Hammersmith Bridge has had its share of problems in the past, but, like the London
sewerage system, it has coped with pressures far beyond anything imagined by its
Victorian builders” (M. Foster, 1984).

The architects of the ‘first’ Hammersmith Bridge (See Plate 1) was William Tierney
Clark, an engineer who was said to have flourished at the heights of the Industrial
Revolution. His bridge, costing £43,000, was opened on Sunday 6 October 1827 amid
“mounting excitement and anticipation in and around Hammersmith and the villages
across the river” (C. Haulstone, 1992, pg. 35). Clarks Hammersmith Bridge was opened as a toll bridge and was “a commercial success, taking £2,000 in tolls in its first year, and £6,000 half a century later” (M. Foster, 1984). Hammersmith bridge was freed of tolls in 1880 after being purchased by the Metropolitan Board of Works (MBW) from the Hammersmith Bridge Company for a total of £152,000 (including the purchase of three approach roads!). It was at about this time that Clarks bridge first started displaying signs of strain.

The added pressures placed upon Clarks bridge, which lead to the structure having to carry more substantial weights than had been anticipated in 1820, were attributed to “the expansion of public transport, along with the development of London’s suburbs” (M. Foster, 1984). After witnessing considerable decline the MBW came to the conclusion that a replacement bridge would be necessary. Clarks original suspension bridge was ‘torn down’ and a temporary bridge was ‘thrown’ across the river.

Plate 1

William Tierney Clark’s Suspension Bridge at Hammersmith
The Hammersmith tollgate and turnstiles where a halfpenny was demanded of passengers. The river bend is idealised with Chiswick church moved eastwards. The parapet design is repeated on Marlow bridge. Lithograph by T. M. Baynes after A. Mee. Print by Hullmandel. SOURCE: Haulstone, 1982, pg. 37.
The 'new' Hammersmith bridge, the one that remains in use today, designed by Sir Joseph Bazalgette cost £82,000 and was officially opened on Saturday 18th June 1887, by Prince Albert Victor of Wales.

The present day Hammersmith bridge (see Plate 2) has been closed “several times in the past for major repairs, and was substantially reinforced between 1973 and 1977, at a cost of £1.3 million” (M. Foster, 1984). The bridge was closed once again in 1984 due to structural failures.

Care and control of the bridge has changes hands on numerous occasions since the first bridge was constructed in 1827. As already mentioned it was initially under the control of the Hammersmith Bridge Company, it was then sold on to MBW, who in turn were overtaken by the London County Council (LCC) in 1889. “The LCC was abolished in 1964, when the Greater London Council (GLC) was created” (C. Haulstone, 1992, pg. 60), upon the abolition of the GLC in 1984 the bridge came under the control of the London Borough of Hammersmith and Fulham, with whom it still resides.
A background to the 1997 closure

In 1987, the then Conservative government announced a bridge rehabilitation programme spanning a period of fifteen years which was to include the assessment and strengthening of bridges. It was intended that by January 1st 1999, “where possible, bridges will be strengthened to carry lorries up to the EC limit of 40 tonnes” (Wandsworth Borough Council, Paper No. 98/14). In November 1996, LoBEG (the London Bridge Engineers Group), which is the co-ordinating body on London’s bridges, concluded that Hammersmith bridge was “inadequate as a result of theoretical computer based analysis” (Wandsworth Borough Council, Paper No. 98/14). The “London Borough of Hammersmith and Fulham, as the highway and traffic authority for the bridge, were forced to close it [the bridge] in February 1997 following an adverse structural report” (London Borough of Richmond Upon Thames, June 1998).

Severe structural problems became apparent “following a routine inspection by consultant engineers Rendel Parmer and Tritton Ltd (RTP)” (S. Pook, 1997), in late 1996. These initial findings were later confirmed by a separate firm of consultants, Hyder Consulting.

RPT consultants “told the council that there was a likelihood that the bridge would need to be closed” and stipulated that their report “gave severe warnings and highlighted a number of things which we [RPT consultants] thought were serious” (J. Barr, RPT Technical Director). The findings of Hyder Consulting were in agreement with this, they stated “if you have a structure that could have a loading problem you have to do something. You have to act” (J. Gill, assistant director of Hyder consulting). Both however, advocated that prior to closure “further tests be carried out before such as far-reaching decision be made” (S. Pook, 1997).

RPT and Hyder Consulting identified four main areas of remedial work necessary to bring the structure back to its former load carrying capacity of 7.5 tonnes; “these works consisted of:
(i) refurbishment of corroded girders and corroded parts of the footway cantilevers;
(ii) bearing replacement and strengthening of girders;
(iii) masonry refurbishment; and
(iv) deck replacement.”

(Wandsworth Borough Council, Paper No. 98/390)

Hammersmith Bridge was finally closed on February 3rd 1997. During the period of closure the bridge was subject to a Temporary Closure Order, which excluded all but emergency vehicles, public transport, pedestrians and cyclists from crossing the bridge (see Plate 3).

After being closed for two and a half years, Hammersmith bridge finally reopened at the end of Autumn 1999. Unfortunately, on the 1st June 2000 the bridge had to be closed again, this time due to an explosion on the southern side of the bridge which caused significant damage to the structure.

3.3 Road Reallocation - Theories

Although the core of this report relates to the empirical evidence which will highlight the ‘impact of the ‘closure of Hammersmith Bridge’ there is a need to, all be it briefly, refer to a number of theories which potentially provide ‘justification’ for a reduction in road capacity.

Theoretical ‘justifications’ for road capacity reduction

It is important to define just what is meant by ‘capacity’, as “if capacity is considered in terms of potential for people flow rather than vehicle flow, then even quite drastic reallocation to public transport may be seen as an increase in capacity” (Cairns, Hass-Klau and Goodwin, 1998a, pg. 8). However, when looking at congestion, the cause of
the 'problem' is not people, but vehicles, so the question must be considered, 'when is it theoretically acceptable to reduce road capacity'? Four key theories have been identified in order to shed some light on this.

There is a distinct possibility that there is currently 'excessive road provision' due to the fact that construction of roads (in many cases) took place on the basis of separate schemes which, in isolation were deemed to be of a 'negligible' size with regards to the amount of induced traffic. It was also thought, during the road building era of 'predict and provide', that traffic growth would never be constrained. Clearly, applying present standards, some roads which were built in the past, would not be permitted today, however, this in itself is not a justification for road closure.

'Braess's paradox' (Braess, 1968), which is the mathematical irregularity in the 'science of traffic flow, states there are "certain properties of the links in a road network where provision of an extra road results in increases overall journey time". This, theoretically at least, establishes the possibility that the reallocation, or reduction in road capacity could lead to improvements in traffic flows.

Mogridge et al (1987) discuss 'positive feedback', which highlights the dynamic relationship between the private car and public transport. They note that at a point of equilibrium, "car and public transport must be about equally attractive for the marginal traveller". However, in the eventuality that there is an 'improvement' to the road network i.e. a new road leading to increased speeds then this will attract some travellers to the car from public transport. The result being not only a reduction in speeds, but also, due to a decline in demand, the public transport operator may reduce the frequency of services and/or increase fares. "This encourages more people to use a car. A new equilibrium will not be reached until the increased traffic congestion has once again made the two modes equally attractive" (Cairns, Hass-Klau and Goodwin, 1998a pg. 9).
There is also a growing consensus that streets have a very important non transport function. In an age when the principles of sustainable development are being so widely applied there is a growing realisation that streets have play a part in the process of social inclusion and interaction, service provision and utilities. This makes a realistic case for the reallocation of some road space to them.

Plate 3

It’s a pleasure: No cars, only cyclists on Hammersmith Bridge

4.0 Results and Analysis

4.1 Traffic Flows: London's Bridges

Table 4.1 shows average two way traffic flows over Thames bridges for 1994, 1996, 1998 and 2000. Map 4.1 shows the location of some of the Thames bridges in relation to Hammersmith Bridge. Between the period 1994 to 1996 the ‘trend’ appears to be a stabilising of traffic flows. 1998 saw a reduction in flows over some bridges, but more significantly for this research is the indication that, upon the closure of Hammersmith Bridge the traffic on neither Wandsworth or Putney bridges increased significantly (flows over Wandsworth Bridge actually decreased by 3716 vehicles). The identified ‘trend’, displaying a declining volume of traffic across the Thames bridges, is also evident in the data for 2000. Of the bridges for which traffic counts were available four had experienced reductions in the number of vehicles. Obviously, due to reopening the count for Hammersmith Bridge displayed a significant increase (upon the previous year), however, the total was no where near the pre closure total.

This data indicates that the closure of Hammersmith Bridge did not simply mean that ‘affected’ drivers, displaced by the closure, adopted another route, crossing the Thames over a neighbouring bridge. It suggests that some traffic ‘disappeared’.

Table 4.1
Average Two Way Traffic Flows Across Thames Bridges (24 hours)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chelsea</td>
<td>36650</td>
<td>38238</td>
<td>36392</td>
<td>-</td>
</tr>
<tr>
<td>Albert</td>
<td>25417</td>
<td>21799</td>
<td>19647</td>
<td>-</td>
</tr>
<tr>
<td>Battersea</td>
<td>23679</td>
<td>26659</td>
<td>26860</td>
<td>25997</td>
</tr>
<tr>
<td>Wandsworth</td>
<td>46138</td>
<td>51457</td>
<td>47741</td>
<td>44325</td>
</tr>
<tr>
<td>Putney</td>
<td>57072</td>
<td>53284</td>
<td>54076</td>
<td>56268</td>
</tr>
<tr>
<td>Hammersmith</td>
<td>32766</td>
<td>31668</td>
<td>3000</td>
<td>15989</td>
</tr>
<tr>
<td>Chiswick</td>
<td>44301</td>
<td>45467</td>
<td>50977</td>
<td>51002</td>
</tr>
<tr>
<td>Kew</td>
<td>51491</td>
<td>49781</td>
<td>51220</td>
<td>44802</td>
</tr>
<tr>
<td>Twickenham</td>
<td>56596</td>
<td>55693</td>
<td>58451</td>
<td>48032</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>374110</strong></td>
<td><strong>374046</strong></td>
<td><strong>348364</strong></td>
<td><strong>286415</strong></td>
</tr>
</tbody>
</table>

Totals Source: (Adapted from) DETR Screenline; LBH&F 1998c
However, Table 4.2, which displays more specific data, ‘average two way weekday flows across bridges’, for Hammersmith Bridge and the three bridges ‘either side’, paints a rather different picture.

Table 4.2
Average Two Way Weekday Flows Across Bridges (24 hours)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Battersea</td>
<td>25087</td>
<td>36034</td>
<td>31581</td>
<td>27803</td>
<td>27160</td>
<td>26816</td>
<td>27900</td>
<td>+2813</td>
<td>-8134</td>
<td></td>
</tr>
<tr>
<td>Wandsworth</td>
<td>56840</td>
<td>55001</td>
<td>52501</td>
<td>46325</td>
<td>56488</td>
<td>47919</td>
<td>46212</td>
<td>-10628</td>
<td>-8789</td>
<td></td>
</tr>
<tr>
<td>Putney</td>
<td>55003</td>
<td>70754</td>
<td>57103</td>
<td>68958</td>
<td>67921</td>
<td>63913</td>
<td>58543</td>
<td>+3540</td>
<td>-12111</td>
<td></td>
</tr>
<tr>
<td>Hammersmith</td>
<td>30678</td>
<td>3000</td>
<td>3092</td>
<td>3000</td>
<td>3000</td>
<td>17940</td>
<td>12738</td>
<td>+14940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiswick</td>
<td>49715</td>
<td>51352</td>
<td>40760</td>
<td>48313</td>
<td>51323</td>
<td>50166</td>
<td>50098</td>
<td>+383</td>
<td>-1264</td>
<td></td>
</tr>
<tr>
<td>Kew</td>
<td>44587</td>
<td>63742</td>
<td>60115</td>
<td>51733</td>
<td>50601</td>
<td>46997</td>
<td>44980</td>
<td>+393</td>
<td>-18762</td>
<td></td>
</tr>
<tr>
<td>Twickenham</td>
<td>49595</td>
<td>50192</td>
<td>48440</td>
<td>40610</td>
<td>53609</td>
<td>46009</td>
<td>46768</td>
<td>-2827</td>
<td>-3424</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>311505</td>
<td>330075</td>
<td>293592</td>
<td>284742</td>
<td>310102</td>
<td>284820</td>
<td>293541</td>
<td>-19064</td>
<td>-37644</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Adapted from) LOBEG 1998
This indicates that 24 hour traffic flows on Putney Bridge, Kew Bridge, Battersea Bridge and (to a lesser extent) Chiswick Bridge increased dramatically in the period immediately after Hammersmith Bridge was closed (March 1997). Flows increased by 15,751, 19,153, 10,947 and 1,637 respectively.

Interestingly, between the period 1994 to 2000 the total number of vehicles crossing the bridges declined by just over nineteen thousand. This is clearly a very significant reduction in vehicles, with the most obvious reductions taking place over Hammersmith Bridge and Wandsworth Bridge in the six year period.

Some caution should be applied here, due to the fact that these figures may not only be a response to the closure of Hammersmith Bridge, for example in 1996 Putney Bridge was subject to repair works, see Figure 4.1 below.

Figure 4.1
'Trouble Spots'

[Map showing traffic disruptions and roadworks.]
It would appear that the ‘initial response’ to the closure, which was anticipated by all parties concerned, was not the same as the long-term response. Traffic counts for March 1998 clearly show a reduction (from March 1997 totals) in traffic flows over all bridges. Interestingly, totals for Wandsworth Bridge, Chiswick Bridge and Twickenham Bridge were lower than the ‘base year’ (1994) totals, pre closure.

This data indicates that the initial behavioural choice displayed by drivers displaced from Hammersmith Bridge was initially to divert to alternative bridges either side of Hammersmith Bridge. It is reasonable to assume that, as a reaction to experiencing increased levels of congestion, and longer journey times drivers adopted alternatives, such as other modal choices, alternative route selection or non trip making. Table 4.3 shows ‘the main changes made (to journeys) once Hammersmith Bridge was closed.

There is also evidence to support the assertion that drivers choose to vary their routes crossing the river over bridges located further away, (see Figures 4.2 and 4.3).

Figure 4.2

![Vehicular Flows Across Bridges at AM peak (7am to 10am)](image-url)
A report titled the ‘Mayors Board Report’, which was produced by LBH&F in 1998, identified an overall reduction in vehicles crossing the London Bridges of 6.3% during the period over which Hammersmith Bridge was closed. A report compiled by Accent Marketing and Research for London Transport Buses also implied that there
were not only traffic reductions in the immediate local area, but perhaps also in the wider area, in the long term. This assertion appears to be confirmed in Table 4.4.

Table 4.4

<table>
<thead>
<tr>
<th></th>
<th>Putney, Hammersmith &amp; Chiswick Bridges</th>
<th>Battersea, Wandsworth, Putney, Hammersmith, Chiswick, Kew &amp; Twickenham Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. 1994</td>
<td>135,396</td>
<td>311,505</td>
</tr>
<tr>
<td>Mar. 1997</td>
<td>125,106</td>
<td>330,075</td>
</tr>
<tr>
<td>Oct. 1997</td>
<td>100,955</td>
<td>293,592</td>
</tr>
<tr>
<td>After 1 month</td>
<td>Overall change</td>
<td>-10,290 (-7.6%)</td>
</tr>
<tr>
<td></td>
<td>Change as % of traffic over Hammersmith Bridge</td>
<td>-33.5%</td>
</tr>
<tr>
<td>After 8 months</td>
<td>Overall Change</td>
<td>-34,441 (-25.4%)</td>
</tr>
<tr>
<td></td>
<td>Change as % of traffic over Hammersmith Bridge</td>
<td>-112.2%</td>
</tr>
</tbody>
</table>

Source: LBH&F, 1998c, pg. 13

Data for Putney, Hammersmith and Chiswick Bridges (after 1 month) indicates that approximately 30% of the trips which were previously made over Hammersmith Bridge (pre closure) were not made during the closure. Furthermore it appears from the data which is available for the period after re opening that many of the cars which 'disappeared' from the Thames bridges during the closure have not reappeared!
However, as highlighted by Cairns et al, there is a need for the application of caution, due to certain 'factors' when interpreting these figures. Specifically, such factors include:

- Day-to-day and seasonal variability
- Other changes in the surrounding area, such as the 'Putney' example which has already been mentioned
- Some traffic may have diverted further afield, although findings presented in the already mentioned report by Accent Marketing and Research indicates that this may only apply to a very small proportion of journeys.

4.2 Traffic Flows: Local roads

Complete data sets covering the full period 'pre closure, during closure and after reopening' are limited. The roads for which comprehensive data has been made available are Kings Road (SW10), Fulham Road (SW10), Upper Richmond Road (SW14), Sheen Lane (SW14), Mortlake Road (SW14) and Kew Road (TW9), See Map 4.2.

Figures 4.4 (a) to (g) below show the am and p.m. peak flows along the roads for which full data sets were available.

Figure 4.4
(a)
AM peak flows along the Kings Road did not alter significantly either during the period which Hammersmith Bridge was closed or after it’s reopening. Interestingly, totals for both the am and p.m. flows both during closure and after reopening display a reduction in the number of vehicles on the road.

(b)

In the immediate aftermath of the closure morning peak traffic, on Fulham road, increased significantly, from 3,615 to 4,691 (29.7%), which may indicate that some (1,000) of the vehicles displaced from Hammersmith Bridge adopted a route which brought them onto Fulham Road. This assertion is further enhanced by the fact that upon the reopening of Hammersmith Bridge ‘morning peak’ traffic dropped back to near 1996 totals (3603). An interesting anomaly however is that ‘evening peak’ traffic stayed relatively constant in the period before and during the closure, yet when Hammersmith Bridge re opened it dropped very significantly to 1,665 vehicles (40% of the previous total).
Traffic flows on Upper Richmond Road, during both the am and p.m. peak ‘peak’, decreased slightly during the period of closure (am –2% p.m. –4.7%). After the re opening of Hammersmith Bridge there was only a very slight increase in the number of vehicles on Upper Richmond Road. The am peak rose from 5793 vehicles during closure to 5804 vehicles after re opening, and the p.m. peak rose from 6003 (during closure) to 6124.

Data suggests that the am peak was relatively unaffected by the closure or re opening of Hammersmith Bridge, however, the p.m. peak appears to have been! Traffic on Sheen Lane decreased significantly during the p.m. peak, in the period of time that Hammersmith Bridge was closed. There was a reduction from 938 to 611 vehicles (almost 35%). After the re opening of Hammersmith Bridge traffic levels increased
again (to 805 vehicles), although it should be highlighted that they did not reach pre closure levels.

(e)

### Mortlake Road (SW14)

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Pre Closure</th>
<th>During Closure</th>
<th>After reopening</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM Peak</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flows on Mortlake Road decreased significantly during both the morning and evening peak during the period of closure. There was a reduction of nearly 8% in the total volume of am traffic, and a very significant reduction of 28% during the p.m. peak. The re opening of Hammersmith Bridge lead to an increase in the number of vehicles using the road during the evening peak (3501 vehicles during closure to 4092 vehicles after re opening), whilst the morning peak appears to have been relatively unaffected by the closure or indeed the re opening.

(f)

### Kew Road (TW9)

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Pre Closure</th>
<th>During Closure</th>
<th>After reopening</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM Peak</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
During the time which Hammersmith Bridge was closed peak flows over Kew Road increased by almost 7% and 3% respectively during morning and evening peaks. However, upon the re opening of the bridge totals did not decrease, as may have been expected, but they actually increased!

Figure 4.5 which shows ‘24 hour two way vehicular traffic flows on local roads’ presents some interesting findings. Traffic on Kings Road declined steadily over the time period 1996 – 2000, this may suggest one of two things. Firstly, that the closure of Hammersmith Bridge had a positive effect on traffic levels, or secondly that traffic on the road was reducing any way. Traffic on Fulham road increased dramatically upon the closure of Hammersmith Bridge, however once Hammersmith Bridge was reopened the volume of traffic fell below pre closure levels. Alterations in the level of flow along Upper Richmond Road were minimal. There was a minor reduction in traffic upon the closure of Hammersmith Bridge (from 34381 to 33121 in 1998), which was reversed to near pre closure flows when the bridge re opened (33871 in early 2000).

24 Hour Two Vehicular Traffic Flows on Local Roads

Figure 4.5
LBH&F acknowledged, in research which they undertook upon the reopening of the bridge that traffic flows over the following roads and bridges increased during the period of time that Hammersmith Bridge was closed. These roads and bridges were identified as:

- Putney Bridge*
- Chiswick Bridge
- Fulham Road*
- Fulham Palace Road*
- Putney High Street*
- Lower Richmond Road

*marks roads highlighted in Map 4.3, on the following page
ROADS IDENTIFIED AS HAVING INCREASED FLOWS

Hammersmith

Fulham Palace Road

Fulham Road

Putney Bridge

Putney High Street

Wandsworth

Barnes

Fulham

River Thames

Castelnau
However, they also identified some roads and bridges ‘positively’ (i.e. traffic reductions) affected by the closure of Hammersmith Bridge, these were:

- Hammersmith Bridge
- Upper Richmond Road
- Castelnau
- Hammersmith Flyover

All Of these have been highlighted in Map 4.4, which appears on the following page.

Clearly, it would have been ‘preferable’ to have obtained data for all of the road/bridges identified, however, traffic counts for these locations were either not made available or studies had simply not been compiled.

Residents living in close proximity to these roads/bridges have provided the most insight into the ‘conditions’ before, during and after closure through ‘anecdotal’ evidence. For example residents of Castelnau have spoken of the (obvious) benefits experienced from the vast reduction in traffic levels during the closure. It was a conclusion of LBH&F that “there is anecdotal evidence that other roads (e.g. Fulham Palace Road) are suffering from increased congestion”, however, “further evidence of changes in journey times and/or traffic flows would be required to confirm this inference” (LBH&F, 1998c, pg. 20).
ROADS IDENTIFIED AS HAVING REDUCED FLOWS

HAMMERSMITH

Hammersmith Flyover

Hammersmith Bridge

CASTELNAU

CASTELNAU

FULHAM

RIVER THAMES

BARNES

BARNES

WANDSWORTH

Upper Richmond Road
4.3 Road Accidents

Data relating to road accidents, although ultimately being provided by the same source, the London Research Centre, previously the London Accident advisory Unit, was interpreted in significantly different ways by the relevant local authorities, particularly LBH&F and Wandsworth Borough Council.

LBH&F have stated that statistics covering all roads within a boundary affected by the closure (as defined by the London Accident Advisory Unit) see Map 4.5, suggest that "accident numbers appear to have decreased overall in the year following the closure by 6%" (LBH&F, 1998c, pg. 6). This claim appears to be confirmed by the contents of Table 4.5.

Map 4.5

'Accident Statistics Study Area'

Data relating to accident statistics after the bridge re opened presents a slightly more problematic scenario, in that it, inexplicably, does not 'follow' the trends which may have been expected. It would appear that road traffic accidents increased in all of the...
boroughs within the study area upon the re-opening of Hammersmith Bridge. It was anticipated that the number of accidents in the borough of Hammersmith and Fulham would have been higher in the nine months after the bridge re-opened than in the corresponding nine months of the previous year. However, the opposite trend was anticipated for the other boroughs, Figure 4.6 shows that this clearly was not the case!

Table 4.5
Summary of Accident Statistics

<table>
<thead>
<tr>
<th>Authority</th>
<th>Before</th>
<th>During Closure</th>
<th>Difference</th>
<th>%Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/1/1996 to 31/12/1996</td>
<td>1/2/1997 to 31/1/1998</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB Wandsworth</td>
<td>474</td>
<td>460</td>
<td>-14</td>
<td>-3%</td>
</tr>
<tr>
<td>LB Kensington &amp; Chelsea</td>
<td>303</td>
<td>318</td>
<td>15</td>
<td>5%</td>
</tr>
<tr>
<td>LB Hammersmith &amp; Fulham</td>
<td>967</td>
<td>869</td>
<td>-98</td>
<td>-10%</td>
</tr>
<tr>
<td>LB Richmond Upon Thames</td>
<td>199</td>
<td>159</td>
<td>-40</td>
<td>-20%</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>1943</strong></td>
<td><strong>1806</strong></td>
<td><strong>-137</strong></td>
<td><strong>-6%</strong></td>
</tr>
</tbody>
</table>

Source: LBH&F, 1998c, pg. 24
It was initially thought that the data covering the period after reopening may have been recorded using a different method, however, all the surveys originate from the London Research Centre, who stated that neither survey methods nor recording methods were altered in this time period.

More specific localised data, produced by the London Accident Analysis Unit (Provided by Wandsworth Borough Council) suggests a slightly different scenario, for the period that the bridge was closed, particularly with the borough of Wandsworth. This data is displayed in Table 4.6.
Table 4.6
Accident Statistics on Local Roads

<table>
<thead>
<tr>
<th>Location</th>
<th>BEFORE February 1996 - January 1997</th>
<th>AFTER March 1997 - February 1998</th>
<th>%age Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingston Road</td>
<td>14</td>
<td>19</td>
<td>+36%</td>
</tr>
<tr>
<td>Lower Richmond Road</td>
<td>18</td>
<td>25</td>
<td>+39%</td>
</tr>
<tr>
<td>Putney Bridge</td>
<td>3</td>
<td>6</td>
<td>+100%</td>
</tr>
<tr>
<td>Putney Bridge Road</td>
<td>14</td>
<td>22</td>
<td>+57%</td>
</tr>
<tr>
<td>Putney High Street</td>
<td>22</td>
<td>28</td>
<td>+27%</td>
</tr>
<tr>
<td>Putney Hill</td>
<td>29</td>
<td>31</td>
<td>+7%</td>
</tr>
<tr>
<td>Roehampton Lane (leads to Hammersmith Bridge)</td>
<td>30</td>
<td>22</td>
<td>-27%</td>
</tr>
<tr>
<td>Upper Richmond Road</td>
<td>13</td>
<td>16</td>
<td>+23%</td>
</tr>
</tbody>
</table>

Source: London Accident Analysis Unit, 1998

Although this data provides significant 'back up' to Wandsworth Boroughs claim that accident rates increased 'significantly' (which they attribute to increased levels of traffic) within the borough during the time period over which Hammersmith Bridge was closed, it may be misleading. The data contained within this table is referring to relatively small numbers of accidents taking place over a relatively long period of time. For example, it indicates that accidents occurring over Putney Bridge increased by 100% after Hammersmith Bridge closed. However, no reference is made to the fact that traffic flow over Putney Bridge was severely restricted in 1996 due to strengthening works. It is for this reason that this figure for accident rates can clearly not be viewed as reliable or significant.
More recent data (October 1999 to May 2000), provided by the London Research Centre, for these roads has been used in conjunction with the data for the corresponding time period in 1995-96 and 1997-98 (see Figure 4.7). This was to assess whether the re opening of Hammersmith Bridge had any impact on the number of accidents taking place on these roads.

Figure 4.7

The data presented in Figure 4.7 does not conclusively prove the assertion put forward by Wandsworth that the increases in road traffic accidents were directly related to, or a product of the ‘increased traffic’ following closure of Hammersmith Bridge. Clearly, there were some minor reductions, on a number of roads, in the number of accidents which occurred once Hammersmith Bridge had re opened, however these could not realistically be described as ‘significant’.

What is clear from these two conflicting sets of data is that the ‘levels’, at which accident statistics were discussed and highlighted, were consciously adopted by the respective local authorities to meet their own ends. Wandsworth Borough Council
were very keen to highlight the negative impact that the closure of Hammersmith Bridge had upon them, whilst LBH&F attempted to ‘play down’ the negative impacts.

From the data which has been presented in this section would appear to be accurate to make two key statements. Firstly, that the closure of Hammersmith Bridge actually had a ‘positive effect’ on the total number of accidents occurring both within the London Borough of Hammersmith and Fulham, and in the surrounding boroughs. And, secondly, that despite the vociferous claims of Wandsworth Borough Council, road accident data does not confirm their assertion that the closure of Hammersmith Bridge lead to a significant rise in road traffic accidents on local roads. The reduction in the number of accidents, once Hammersmith Bridge re opened, was minimal, with three out of the eight roads highlighted not experiencing any reductions at all. The most ‘significant reductions’ took place on Putney Bridge Road and Putney Hill, both of which had an actual reduction of three accidents in a nine month period.

4.4 **Bus Services**

Data for the following bus services was obtained, (the routes which these services follow can be seen on Map 4.6):

- Route 14 (stages 22-28)
- Route 28 (stages 16-24)
- Route 33 (stages 7-16)
- Route 72 (stages 7-15)
- Route 74 (stages 2-13)
- Route 220 (stages 11-19)
- Route 337 (stages 1-11)
Figure 4.8

(a)

Route 14 (outward)

Route 14 (back)
(b) Route 28 (outward)

(c) Route 28 (back)

(c) Route 33 (outward)
(c)

**Route 74 (outward)**

<table>
<thead>
<tr>
<th>Stage</th>
<th>1996 (outward)</th>
<th>1998 (outward)</th>
<th>2000 (outward)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td></td>
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<td>6-7</td>
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<td>7-8</td>
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<td>8-9</td>
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<td></td>
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<td>9-10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Route 74 (back)**

<table>
<thead>
<tr>
<th>Stage</th>
<th>1996 (back)</th>
<th>1998 (back)</th>
<th>2000 (back)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td></td>
<td></td>
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<tr>
<td>4-5</td>
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<td>5-6</td>
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<td></td>
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<tr>
<td>6-7</td>
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<tr>
<td>7-8</td>
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<td>8-9</td>
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<td>9-10</td>
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<td>10-11</td>
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<td>11-12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The data, covering the period before closure (1996) and during closure (1998) clearly indicates that the amount of time taken by buses to travel through the given stages, crossing over Putney bridge (routes 14, 74 and 220) increased on both the outward, and return journey. The only notable exception being the return journey on route 14, where the total journey time decreased by slightly over two minutes. Journey times covering a six month period after Hammersmith Bridge reopened (January 2000 – June 2000) show that most of the routes (principally those crossing Wandsworth Bridge and Putney Bridge) experienced a reduction in the time taken to travel through the given stages.

Once the decision had been made to reopen Hammersmith Bridge (see section 4.6) to all classes of traffic LBH&F committed themselves to maintaining the improvements which had been achieved on bus services during the period of closure.

They attempted to do this by implementing ‘proposals for traffic restraint and bus priority measures on Hammersmith Bridge’. At the core of this scheme has been the implementation of bus priority measures, the central elements of this scheme are:
• Barriers on the bus lanes on the bridge approaches which existed during closure have been maintained, and are operated by Selective Vehicles Detection (SVD) on the approaches to the bridge. This has principally to prevent HGVs from ‘abusing’ the bus lane.

• General traffic flow over the bridge is regulated by traffic signals. These signals are triggered (to turn red) by an approaching bus.

• On the South side of the bridge traffic signal timings at Castelnau/ Lonsdale Road junction have been adjusted to enable bus priority along Castelnau.

• In the northbound direction a bus gate has been constructed (outside number 147 Castelnau). Traffic signals have been provided for general traffic, whilst the bus lane is free flow past the facility.

• On the Hammersmith side approach to the bridge a 24 hour bus lane has been installed (just west of Queen Caroline Street) up to the roundabout with the A4.

It was anticipated that these proposals “will maintain the bus priority established during the closure of Hammersmith Bridge” (LBH&F, 1999, pg. 9), and will facilitate buses to by-pass queued traffic off the bridge.

Data for route 33 (figure 4.8 c) shows that the average journey time for the outward leg of the route has stayed relatively constant since the reopening, and although the return leg of the route has increased the figure overall is still lower than it was pre closure. Route 72 has experienced (overall) increases in journey times, although there are fluctuations at particular stages, for example, stages 9-10, 10-11, 11-12 all have experienced reductions in time taken. Interestingly, both of these routes have experienced increases in journey times over Hammersmith Bridge, however, times are still not at the level experienced pre closure.

This data suggests that although the bus priority scheme has had a limited effect on the journey times of buses travelling over the bridge, it has not (in the first six months of being imposed) achieved the initial objective which was to “maintain the bus
priority established during the closure of Hammersmith Bridge” (LBH&F, 1999, pg. 9).

The average total time taken (in minutes and seconds) by routes 14, 74 and 220 to travel through all there given stages, pre closure, during closure and after reopening is highlighted in the tables below.

**Route 14**

<table>
<thead>
<tr>
<th>Year</th>
<th>Outward</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>24.18</td>
<td>26.21</td>
</tr>
<tr>
<td>1998</td>
<td>24.21</td>
<td>24.18</td>
</tr>
<tr>
<td>2000</td>
<td>23.47</td>
<td>24.96</td>
</tr>
</tbody>
</table>

**Route 74**

<table>
<thead>
<tr>
<th>Year</th>
<th>Outward</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>35.10</td>
<td>42.53</td>
</tr>
<tr>
<td>1998</td>
<td>40.20</td>
<td>44.56</td>
</tr>
<tr>
<td>2000</td>
<td>35.31</td>
<td>41.74</td>
</tr>
</tbody>
</table>

**Route 220**

<table>
<thead>
<tr>
<th>Year</th>
<th>Outward</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>28.30</td>
<td>32.48</td>
</tr>
<tr>
<td>1998</td>
<td>29.43</td>
<td>37.08</td>
</tr>
<tr>
<td>2000</td>
<td>23.25</td>
<td>32.00</td>
</tr>
</tbody>
</table>

It is not surprising that total journey times for all of these routes reduced once Hammersmith Bridge had reopened however, it was not necessarily solely as a response to the reopening. This is due to the fact that in late 1999 Wandsworth Borough Council designated one lane in either direction across the bridge to busses. This would clearly have had an impact on the time taken for buses to travel across the
bridge, specifically see route 14 stage 25-26, route 74 stage 8-9 and route 220 stage 15-16.

Route 28, which crosses over Wandsworth Bridge, also experienced increased journey times in the period between 1996 and 1998, the table below clearly shows this. The route also experienced significant reductions in journey times once Hammersmith Bridge reopened, neither LBH&F, Wandsworth Borough Council nor Bus Wayfarer have been able to offer any explanation for this.

**Route 28**

<table>
<thead>
<tr>
<th>Year</th>
<th>Outward</th>
<th>Back</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>32.45</td>
<td>35.28</td>
</tr>
<tr>
<td>1998</td>
<td>34.16</td>
<td>39.50</td>
</tr>
<tr>
<td>2000</td>
<td>29.83</td>
<td>35.33</td>
</tr>
</tbody>
</table>

Routes 33 and 72, which cross over Hammersmith Bridge, at first glance would seem to confuse the scenario which has been presented up until now. Although journey times on route 72 decreased, the time taken for route 33 to travel through the selected stages increased on the outward leg of the journey (which according to bus Wayfarer could be attributed to increased congestion in the Sheen area). As has already been highlighted the bus priority measures applied over Hammersmith Bridge had a limited impact on bus journey times. Route 33 experienced the most significant overall reductions in both the outward and return journeys, whilst route 72 experienced overall increases, however, the outward journey was still significantly faster than pre closure.

The tables below show the total journey times for both routes.
Overall, this data shows that the impact which the closure of Hammersmith Bridge had upon bus journey times over Hammersmith Bridge (and in the immediate area) was a positive one, i.e. journey times decreased. However, adversely, bus journey times over surrounding bridges and roads increased. As would be expected, journey times for buses travelling over surrounding roads and bridges reduced once Hammersmith Bridge reopened, however, it is difficult to ascertain just how much this can be attributed to the reopening of Hammersmith Bridge, or whether it is as a result of (particularly over Wandsworth Bridge) the expanding bus priority network in London.

Referring back to data collected during the period of closure, the assertion that the effect was positive for journey times over Hammersmith Bridge, and negative for journey times over surrounding bridges is further reinforced by specifically identifying the stages of each route which cross over a bridge, these key stages are highlighted on the next page.
Route 14  stages 24 to 28  Route 74  stages 7 to 10  
Route 28  stages 20 to 24  Route 220  stages 13 to 17  
Route 33  stages 7 to 10  Route 72  stages 7 to 9  
*route 337 at no point crosses a bridge

Times for these stages clearly highlight the fact that some of the greatest increases in times between stages occurred at these points, whilst, as would be expected, over Hammersmith Bridge some of the largest reductions were achieved.

The improvements in journey times, experienced during the period of closure, over Hammersmith bridge also resulted in increased frequency (Table 4.7), which in turn (according to Bus Wayfarer) resulted in increased passenger usage. Table 4.8 clearly shows substantial increases in patronage figures on routes over Hammersmith Bridge.

Table 4.7  
Excess Waiting Time (EWT) before and during closure

<table>
<thead>
<tr>
<th>Route</th>
<th>EWT (mins) Before Closure</th>
<th>EWT (mins) During Closure</th>
<th>Change (mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>2.15</td>
<td>1.23</td>
<td>0.92</td>
</tr>
<tr>
<td>72</td>
<td>2.65</td>
<td>1.7</td>
<td>0.95</td>
</tr>
</tbody>
</table>

(Accent Marketing and Research Group)

Excess waiting times decreased (on routes 33 and 72) during the period that the bridge was closed, this is clearly the result of the increased frequency of bus services. For example, route 33 increased from eight to twelve buses per hour in the peak period, and from six to ten in the off peak period. After the reopening of Hammersmith Bridge Excess waiting time increased for both routes, route 33 increased to 1.46 minutes, whilst route 72 increased to 2.14 minutes. Clearly, these times are still significantly lower than pre closure times, however it is further evidence that the priority measures imposed have not totally achieved the initial objective (in the short term at least).
Table 4.8

Number of Passengers Per Week on Services Using Hammersmith Bridge

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>55,384</td>
<td>61,219</td>
<td>14.7</td>
</tr>
<tr>
<td>72</td>
<td>23,228</td>
<td>28,333</td>
<td>22</td>
</tr>
</tbody>
</table>

(Bus Wayfarer data)

Referring specifically to bus patronage, the level of change experienced during the closure of Hammersmith Bridge was more dramatic in some areas than others. For example, the number of passengers boarding buses on route 33 in Barnes and Castelnau increased by a very significant 46%, whilst the number of passengers boarding buses on route 72 increased by 75% in Roehampton (according to London Buses Transport). Patronage levels, once the bridge had reopened, dropped to 59,612 and 27,134 for routes 33 and 72 respectively. This indicates that some bus users (during the period of closure) reverted to alternative modes of transport once Hammersmith Bridge reopened, presumably the private car.

The data on bus services, journey times, waiting times and patronage figures gives a clear indication that the closure of Hammersmith Bridge had a significant impact on all of these facets of public transport service provision. This is a very significant element of the impact of the closure of Hammersmith Bridge.

4.5 Air Quality

From the findings which have already been presented regarding levels of vehicular traffic on both bridges and local roads it is reasonable to assume that the impact which the closure of Hammersmith Bridge had upon air quality depends very much on the location from which the monitoring has taken place in. For example, it is obvious that air quality improved significantly in the Castelnau and Barnes areas.
(Richmond Upon Thames) as the volume of traffic was vastly reduced (>40%) when Hammersmith Bridge was closed to private vehicles.

A study undertaken by Halcrow Fox Consultants, during the closure indicated that air quality improved in areas immediately local to Hammersmith Bridge (on the river frontage), whilst areas such as Putney experienced decreased air quality. A diagrammatic representation of these findings can be found in Figure 4.9. Table 4.9 below shows the specific variations in air quality by ‘type’ of pollutant.

Table 4.9
Percentage Change in Peak Hour Network-Wide Emissions*

<table>
<thead>
<tr>
<th>Area</th>
<th>CO</th>
<th>THC</th>
<th>Nox</th>
<th>TSP</th>
<th>CO2</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammersmith</td>
<td>-8.73</td>
<td>-8.13</td>
<td>-6.83</td>
<td>-6.54</td>
<td>-6.6</td>
<td>-6.73</td>
</tr>
<tr>
<td>Fulham</td>
<td>10.32</td>
<td>9.64</td>
<td>9.17</td>
<td>7.89</td>
<td>7.38</td>
<td>7.61</td>
</tr>
<tr>
<td>Chelsea</td>
<td>0.73</td>
<td>0.75</td>
<td>0.73</td>
<td>0.72</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>Chiswick</td>
<td>6.62</td>
<td>5.96</td>
<td>4.60</td>
<td>4.05</td>
<td>3.93</td>
<td>4.09</td>
</tr>
<tr>
<td>Barnes</td>
<td>-51.08</td>
<td>-48.25</td>
<td>-46.11</td>
<td>-42.37</td>
<td>-43.09</td>
<td>-43.68</td>
</tr>
<tr>
<td>Putney</td>
<td>7.37</td>
<td>6.44</td>
<td>5.19</td>
<td>2.80</td>
<td>4.72</td>
<td>4.93</td>
</tr>
<tr>
<td>Wandsworth</td>
<td>6.02</td>
<td>5.49</td>
<td>4.89</td>
<td>4.21</td>
<td>4.45</td>
<td>4.56</td>
</tr>
<tr>
<td>Mortlake</td>
<td>9.19</td>
<td>8.57</td>
<td>8.08</td>
<td>4.21</td>
<td>8.91</td>
<td>8.92</td>
</tr>
<tr>
<td>Richmond</td>
<td>12.08</td>
<td>9.98</td>
<td>8.63</td>
<td>4.23</td>
<td>2.04</td>
<td>2.82</td>
</tr>
</tbody>
</table>

Percentage Change  percentage change over the BASE 1996
CO  Carbon Monoxide
THC Total Hydrocarbons
TSP Total Suspended Particulate
CO2 Carbon Dioxide

(LBH&F, 1998c, Appendix 4)

It is not surprising that by far the most significant reductions in emissions were in Barnes (-43.86), with Hammersmith coming a distant second (-6.73). All of the other
areas however showed an increase in emissions, which in turn signifies a negative effect on air quality in the wider ‘local’ area.

Overall, the statistics (referred to in Figure 4.9) show that there was a reduction in overall emissions during the period which the Bridge was closed (-29.7). However, it is very important to recognise that the huge reductions experienced in Barnes have had a very significant effect in this calculation.

Establishing the impact that the reopening of Hammersmith Bridge has had on air quality has proven problematic due to the fact that neither LBH&F nor the Borough of Richmond Upon Thames has air quality monitoring stations on or around the bridge/ river frontage. Comprehensive (riverside) data was only available for the period of closure due to the fact that the Halcrow Fox report was especially commissioned by LBH&F.

However the boroughs of Wandsworth and Kensington and Chelsea do have monitoring stations based near Putney bridge and close to a road previously identified as having been ‘affected’ by the closure (Fulham Road) respectively.

As mentioned in Chapter 2 of this report the 1995 Environment Act required each local authority to carry out a review of the air quality within its area, and as a result has lead to local authorities setting specific standards for each type of pollutant.

All of the London Boroughs mentioned in this section have such targets in place, specifically, the objective is that by 31st December 2005 each of the following pollutants will have reduced or have fallen below these levels (annual mean if not otherwise stated):

**Nitrogen Dioxide** 21ppb

**Carbon Monoxide** 10ppm (as an eight hour running average)
Yearly averages collected at the Wandsworth site for 1996, 1997, 1999 and 2000 are displayed in Table 4.10 below, similarly comparable data from the Kensington and Chelsea site is in Table 4.11.

Figure 4.9
Table 4.10
Yearly Average Air Quality Data Collected at Wandsworth Monitoring Site

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>1996</th>
<th>1997</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO ppb</td>
<td>66.42213</td>
<td>63.5927</td>
<td>64.3752</td>
<td>64.8945</td>
</tr>
<tr>
<td>NO2 ppb</td>
<td>26.7121</td>
<td>27.63305</td>
<td>26.7819</td>
<td>26.2138</td>
</tr>
</tbody>
</table>

(Calculated from data on National Environmental Technology Centre Web Site)

Table 4.11
Yearly Average Air Quality Data Collected at Kensington and Chelsea Monitoring Site

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CO Ppm</td>
<td>0.853</td>
<td>0.669</td>
<td>0.559</td>
<td>0.551</td>
<td>0.389</td>
<td>0.3</td>
<td>0.324</td>
</tr>
<tr>
<td>NO2 ppb</td>
<td>30.991</td>
<td>28.189</td>
<td>27.913</td>
<td>29.778</td>
<td>27.002</td>
<td>28.562</td>
<td>28.391</td>
</tr>
<tr>
<td>NO Ppb</td>
<td>39.424</td>
<td>35.630</td>
<td>35.063</td>
<td>39.753</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nox Ppb</td>
<td>70.427</td>
<td>63.805</td>
<td>63.510</td>
<td>69.509</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>


Neither of the data sets presented above conclusively reveal whether the closure or reopening of Hammersmith Bridge had a significant impact on the air quality in that locality. However, one point worthy of note is that in Wandsworth nitrogen dioxide (NO2) emissions increased in 1997 (the year of the bridge closure). This can be attributed to the fact that there was a significant increase in the number of vehicles crossing Putney Bridge in this time period, although it must also be remembered that prior to this (1996) there were road works on the bridge.

The nearest monitoring site to Hammersmith Bridge, within LBH&F, is located at Hammersmith Broadway (a roadside site). Due to the fact that this site is a significant
distance from the bridge it was felt (by LBH&F) that data collected from this site would not be useful in determining the impact that the bridge closure had on local air quality.

This assertion is questioned by the data in Table 4.12. The data in this table clearly indicates at the level of all pollutants reduced significantly between 1997 and 1999, with the notable ‘blip’ being 1999. However, due to the fact that figures returned to near 1998 totals in 2000, the first six months of which Hammersmith Bridge was opened, there is a suggestion that the reductions/increases are not as a direct result of the closure/reopening of Hammersmith Bridge.

Table 4.12
Yearly Average Air Quality Data Collected at Hammersmith Broadway Monitoring Site

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NO2 Ppb</td>
<td>28</td>
<td>25</td>
<td>21</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

SOURCE: LBH&F, 2001

It is very clear that the closure of Hammersmith Bridge had a significant impact on overall air quality (within the ‘study area’), however, the more localised information displays huge disparities between areas. Quite obviously the area which benefited most (in terms of air quality) from the closure was Barnes (on the Richmond side of the river) which experienced roughly a 40% reduction in emissions. It may also be reasonable to assume that the area immediately around Hammersmith Bridge Road (on the Hammersmith side) experienced similar benefits, however this can not be confirmed due to the fact that no monitoring was, or is presently undertaken in the immediate locality. More moderate reductions were experienced in Hammersmith (5%) and Roehampton (7%). Similarly, moderate increases in emissions were experienced in Putney (10%), Mortlake (9%) and Fulham (8%).
Data covering the period of time when the bridge reopened does on present such a clear picture! The Boroughs for which relevant information was available do not appear to have been significantly affected by the reopening of Hammersmith Bridge.

The only firm conclusion which can be drawn from this data is that the closure of Hammersmith Bridge did not lead to any deterioration in overall air quality. Relevant data covering the period when the bridge reopened does not allow any conclusions to be drawn.

4.6 Consultation

In 1998 LBH&F produced and funded a leaflet/questionnaire in conjunction with the London Borough of Richmond Upon Thames on the ‘options for the future of Hammersmith Bridge’ (Consultation leaflet is in Appendix 1). The options proposed in this ‘consultation exercise’ were:

1. To reopen the bridge with its 7.5 tonne weight limit.
2. To restrict the bridge to public transport, school busses, black cabs, pedestrians, cyclists, motorcyclists and emergency vehicles.

In this consultation exercise LBH&F aimed to seek the views of:

- elected bodies;
- statutory bodies;
- representative organisations (both inside and outside the borough).

Interestingly, although LBH&F resolved to give ‘other’ boroughs an input into the consultation they did not specifically seek the views of the residents and businesses in the London Borough of Wandsworth! Wandsworth responded by producing and distributing their own consultation leaflet (Appendix 2).
4.6.1 Residents Responses

LBH&F received a total of 6,371 responses to the consultation leaflet (the borough population in 1996 as estimated at 156,700). Of those who responded 2,648 supported option 1, whilst 3,639 supported option 2 (84 respondents were uncommitted). This clearly shows that the majority of respondents living within LBH&F wanted the bridge re-opened, especially residents within the SW6 postal district (Fulham). Residents of SW6 were particularly keen that Hammersmith Bridge should be reopened, due to the fact that traffic flows on Fulham Palace Road (SW6) had increased significantly during the period of closure. Residents of W6 (Hammersmith) were most keen to see the bridge remain closed. This is not surprising, as it is the area closest to the bridge. Figure 4.10 breaks responses down by postal code.

The responses received from residents within the London Borough of Richmond Upon Thames were much more split, a total of 48.8% of respondents wanted the bridge to reopen, 50.4% wanted it to remain closed (0.8% undecided). These have again been broken down into postal districts, Figure 4.11 to display the significant disparities between responses as a result of location.
Residents of Kew (TW9) were most in favour of reopening the bridge whilst residents of Barnes (SW13 & SW15) were least in favour. This display of preference is very closely related to the increases/decreased in road traffic which were identified in these areas (see section 4.2), i.e. traffic on Kew Road increased during the closure of Hammersmith Bridge, whilst traffic in Barnes decreased during this period.

The response received by Wandsworth (to their independent consultation) was unsurprisingly, overwhelmingly in favour of reopening Hammersmith Bridge, Figure 4.12 shows this.
Figure 4.12

Responses from Wandsworth


The responses made, and the option favoured by people on the consultation leaflet greatly reflected the location of the respondent, there were two sets of polarised views expressed. Those in favour of keeping the bridge closed relayed their experience that closure had lead to:

- less traffic, congestion, noise and pollution, leading to a better environment;
- improvements in public transport, more buses and quicker journeys;

Whilst also suggesting that there was a
- need for greater restrictions on car use, must encourage people not to use cars;
- consider peak hour closures

At the other end of the spectrum people expressed the opinion that:

- the bridge is an integral and strategic part of London’s transport system, therefore it must be reopened;
- London needs *more* and better bridges;
- Traffic levels have increased with consequent noise and pollution.

4.6.2 Responses by district

The responses received from ‘districts’ have been broken down into smaller sub categories, these are:
• Adjacent Boroughs
• Inner London Area
• Outer London Area

The responses from these areas can be seen in Figures 4.13 to 4.15.

Figure 4.13

The responses received from adjacent boroughs overall displayed a preference for ‘Option 1’ (reopening the bridge), with the exception of Ealing and Richmond Upon Thames. This was really not surprising due to the fact that as ‘local boroughs’, residents may have felt that they had been negatively affected by the closure, particularly those in Wandsworth and Kensington and Chelsea. The overall expressed preference from each borough can be seen in Map 4.7.

Map 4.7

RESPONSES FROM ADJACENT BOROUGHS

London Borough of Hammersmith and Fulham

- Option 1
- Option 2

- Brent
- Ealing
- Hounslow
- Kensington & Chelsea
- Wandsworth
- Richmond upon Thames
Residents of the ‘Inner London Area’ responded overall by proposing ‘Option 2’ as the preferred choice (Map 4.8). It was thought that the rational behind these responses was that many of the residents in these boroughs had not been (negatively) affected by the closure of Hammersmith Bridge. Therefore it would be ‘better’ to keep the bridge closed due to the fact that it would discourage private car usage in London, and encourage more sustainable modes of transport (i.e. public transport).
Map 4.8

RESPONSES FROM THE INNER LONDON AREA

- HARROW
- HARINGEY
- WESTMINSTER
- ISLINGTON
- CITY
- SOUTWARK
- LAMBETH
- KINGSTON UPON THAMES

Option 1
Option 2
Clearly, the overriding preference expressed by respondents from ‘Outer London’ was to restrict the bridge to ‘favoured classes of traffic’ (Option 2), again this is not a surprising response for the same reasons outlined previously. However, this response may not be wholly representative due to the extremely low level of responses. Map 4.9 shows the dominant response from each borough.
4.6.3 Elected Bodies

Formal responses, by way of committee decisions were received by LBH&F from the London Boroughs of Hounslow, Ealing, Richmond Upon Thames, and Wandsworth.
The Royal Borough of Kensington and Chelsea “formally decided not to take a view” at that time. (A. Reid, Planning Officer, K&C).

The responses received were:

**London Borough of Hounslow**: wish to see the bus priority/car restrictions to remain, as many benefits have been reaped due to improved bus services. The level of priority given to public transport will need to be maintained if sustainability and air quality targets are to be achieved.

**London Borough of Richmond Upon Thames**: “on balance, the longer term objectives of current Council and national policies and the development of high quality public transport services favours supporting the option of the Bridge remaining closed” (London Borough of Richmond Upon Thames, 1998, pg. 8).

**London Borough of Wandsworth**: the council objects to any permanent change in the traffic Management Order and asks Hammersmith and Fulham Council to reopen the bridge as soon as possible.

**London Borough of Ealing**: recommended that Hammersmith and Fulham adopt Option 2.

The elected bodies, generally, were in favour of maintaining the restrictions, with the notable exception being Wandsworth Borough Council. However, without the ‘support’, or at least compliance, of Wandsworth, LBH&F would have found it very difficult indeed to secure a permanent Traffic Order restricting the bridge to favoured classes of traffic. This is due to the fact that if a new closure order had been progressed, Wandsworth Borough Council “would be a statutory consultee under Part II of the Local Authority Traffic Orders (Procedure) (England and Wales) Regulations 1996” (Wandsworth Borough Council, 1998, pg. 1).
4.6.4 Statutory Bodies

Statutory bodies formally responded by supporting ‘Option 2’, Table 4.13 shows their responses.

Table 4.13

<table>
<thead>
<tr>
<th>Statutory Body</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Transport</td>
<td>Formally responded in favour of keeping current restrictions</td>
</tr>
<tr>
<td>Licensed Taxi Drivers Association</td>
<td>Supports continuing restrictions</td>
</tr>
<tr>
<td>London regional Passengers Committee</td>
<td>Sees several compelling grounds for the retention of the present closure</td>
</tr>
</tbody>
</table>

SOURCE: LBH&F, 1998c, pg. 10

4.6.5 Representative Organisations

Representative organisations who responded to the consultation expressed a broad range of views, these have been summarised in the tables below.

Table 4.14

Residents Associations out of the Borough

<table>
<thead>
<tr>
<th>Association</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Chiswick Protection Society</td>
<td>Restore vehicular traffic use of Hammersmith Bridge</td>
</tr>
<tr>
<td>Hammersmith Bridge Barnes Action</td>
<td>Unable to express a unanimous view and would welcome a public enquiry</td>
</tr>
<tr>
<td>Group</td>
<td></td>
</tr>
<tr>
<td>North Barnes Residents Association</td>
<td>Support for a London level decision, and the continued closure of the bridge to private vehicles</td>
</tr>
<tr>
<td>Barnes Community Association</td>
<td>Refer to public enquiry</td>
</tr>
<tr>
<td>Barnes Residents Survey</td>
<td>Wants bridge to remain closed to private cars</td>
</tr>
</tbody>
</table>
East Chiswick residents Association  | Urge...more and reliable research into the true effects before making a decision

Residents Associations in the Borough

<table>
<thead>
<tr>
<th>Association</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digby Mansions Residents Association</td>
<td>Supports existing use of the bridge to public transport, taxis, pedestrians, cyclists and emergency vehicles</td>
</tr>
<tr>
<td>North End House Residents Association</td>
<td>Supports continuing restrictions</td>
</tr>
<tr>
<td>Stamford Brook Residents Association</td>
<td>For keeping the bridge open with a 7.5 tonne weight limit</td>
</tr>
<tr>
<td>Parkview Court Residents Association</td>
<td>Voted to reopen bridge in-order to ease congestion in Fulham Palace Road and Fulham High Street</td>
</tr>
<tr>
<td>Hammersmith and Fulham Chamber of Commerce</td>
<td>Bridge traffic could be restricted to cars and public transport, commercial vehicles could be excluded to appease the local residents</td>
</tr>
</tbody>
</table>

‘Other’ Organisations in the Borough

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammersmith and Fulham Group of London Wildlife Trust</td>
<td>Supports continuing restrictions</td>
</tr>
<tr>
<td>Niton Action Group</td>
<td>102 signature petition in favour of reopening the bridge</td>
</tr>
<tr>
<td>The Hammersmith Society</td>
<td>Unable to offer definite conclusions</td>
</tr>
<tr>
<td>Hammersmith and Fulham Friends of the Earth</td>
<td>Bridge should remain permanently closed to cars and lorries</td>
</tr>
<tr>
<td>The Fulham Society</td>
<td>Urge the council to reopen Hammersmith Bridge to its previous capacity</td>
</tr>
<tr>
<td>The Hammersmith Hospital NHS Trust</td>
<td>Urges to reconsider present restrictions and reopen if possible</td>
</tr>
</tbody>
</table>
### 'Other' Organisations out of the Borough

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Position/Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cyclists Touring Club</strong></td>
<td>Supports continuing closure of bridge to all vehicles except public transport, taxi, cycles and motorcycles</td>
</tr>
<tr>
<td><strong>Barnes and Mortlake Traffic Action Group</strong></td>
<td>Advocates the use of pricing as a system both to control the use of the bridge and also to provide on going funding for bridge repair</td>
</tr>
<tr>
<td><strong>West London Road Watch</strong></td>
<td>Preferred option would be to continue closure for three to five years and then review the position</td>
</tr>
<tr>
<td><strong>Group of London Wildlife Trust</strong></td>
<td>Wants bridge closed to cars, but open to public transport, bicycles and pedestrians</td>
</tr>
<tr>
<td><strong>National Federation of Bus Users</strong></td>
<td>Urges the borough to consider retaining use of the bridge by buses and cycles only</td>
</tr>
<tr>
<td><strong>The Putney Society</strong></td>
<td>No conclusions</td>
</tr>
<tr>
<td><strong>A Bridge Too Far</strong></td>
<td>Recommends reopening the bridge in the interests of residents of the London Borough of Richmond</td>
</tr>
<tr>
<td><strong>Richmond Cycling Campaign</strong></td>
<td>Hammersmith Bridge restrictions should be made permanent</td>
</tr>
<tr>
<td><strong>London United Busways Ltd</strong></td>
<td>Bridge should remain closed to all vehicles except buses, emergency services and bicycles</td>
</tr>
<tr>
<td><strong>London Cycling Campaign</strong></td>
<td>Members overwhelmingly believe that current restrictions should be maintained on a permanent basis</td>
</tr>
</tbody>
</table>

**SOURCE:** Adapted from LBH&F 1998c, pg. 16
All of this evidence clearly shows that the views expressed regarding the future role of Hammersmith Bridge were very mixed. Twelve out of Twenty Seven groups who made representations favoured the restrictions being kept in place. Only seven categorically called for the bridge to be reopened whilst the others either could not come to any conclusions, called for more robust research into the impact of the closure, or for a public enquiry.

Clearly, as has already been stated, the possibility of the closure or reallocation of Hammersmith Bridge to favoured classes of traffic has been an extremely contentious issue, not just locally, but on a London wide scale. Obviously, following this consultation process Hammersmith Bridge did reopen to its pre closure 7.5 tonne weight limit. This decision, according to LBH&F was based on two principal factors. Firstly, public preference was strongly expressed (through the consultation process) in favour of opening the bridge, and secondly, Wandsworth Borough Council exerted severe pressure on LBH&F to reopen the bridge. Ultimately, LBH&F felt that it was the only option open to them.

Obviously, the ‘consultation exercise’ offered residents/interested parties a choice of only two options, which in short were to keep the bridge ‘closed’ or to open the bridge to all traffic. There could however have been a third option. It has been suggested that LBH&F should have presented some other choices, such as:

- ‘Closing’ the bridge to private vehicles during the weekday peak periods (am and pm);
- Keeping the bridge closed, but ‘opening’ it for the weekday peak periods (am and pm);
- ‘Closing’ the bridge at weekends.

Clearly, one or all of these options may have been preferable and more acceptable to certain individuals and groups. Had one of these options been offered/ implemented,
perhaps as a 'compromise' scenario, the benefits experienced during the closure of Hammersmith Bridge may have been evident in the longer term.

In conclusion, it was felt important to include the details of the consultation process and the outcomes, to highlight the fact that it was a contentious and difficult decision, and not one that was supported by everyone!
5.0 Conclusions

5.1 The 'Impact'

Before attempting to draw any conclusions it is firstly necessary to refer back to the initial overarching aim of this research topic, which was:

To compile a study which highlights the impact of the closure (to private vehicles) of one of London’s principal bridges.

Furthermore:

To identify whether the reallocation of road space, away from the private motor car, has had the effect of ‘significantly reducing congestion’ in the immediate area, reducing the overall volume of vehicular traffic in the wider area, and promoting the adoption of more sustainable forms of transport.

Clearly the evidence presented in Chapter 4.0 facilitates the drawing of some conclusions. Specifically, and most importantly for this research, the evidence presented confirms that the reallocation of road space over Hammersmith Bridge (away from the private motor car):

- had the effect of ‘significantly reducing congestion’ in the immediate area specifically in Barnes and Castelnau;
- did lead to an overall reduction in the volume of vehicular traffic in the wider area; and
- did prompt the adoption of more sustainable forms of transport particularly in the area immediate to the bridge. Principally due, to what in essence was, the creation of a ‘high quality public transport corridor’.
Whilst it is important to have addressed the research aims and objectives, it is equally important to consider the 'wider picture' which has been presented by the 'evidence'. Obviously, the reallocation of road space over Hammersmith Bridge did have some positive impacts, however, it would be naive and inappropriate to simply ignore the negative impacts.

The London Borough of Wandsworth argued fiercely that Hammersmith Bridge must be reopened due to the negative impacts which were experienced in the borough. These impacts included increased traffic flows over Putney Bridge (Table 4.1), and local roads (Map 4.3), increased road traffic accidents on local roads (Table 4.5), increased bus journey times, and a moderate decline in air quality (Table 4.8). There was also evidence of increased traffic flows on roads in the London Boroughs of Kensington and Chelsea, Richmond Upon Thames and within LBH&F (Fulham Palace Road).

Another, and yet unmentioned facet of the negative impacts of the closure was the problem created by ‘commuter parking’, "park and Ride commuters" (C. Tever, Traffic Engineer, London Borough of Richmond Upon Thames) experienced in some areas within Barnes. This lead to (during the period of closure) the introduction of a ‘residents parking scheme’, whereby local residents paid £50 per year for a parking permit.

Clearly there were positive and negative facets of the impact that the closure of Hammersmith Bridge had. However, it is important to recognise that when the evidence is viewed in the wider realm, (i.e. London) the impact of the closure of Hammersmith Bridge was, overall, positive. During the period of closure there was an overall reduction in the number of vehicles crossing Thames Bridges, in the number of accidents, improvements in air quality and public transport provision.

As we move towards strategic, perhaps regional forms of planning (i.e. the GLA), it is increasingly necessary to consider the whole picture rather than just the 'local' or
simply at the ‘borough’ level. It is, in my opinion, for this reason that ‘Option 2’
(permanent reallocation) did gain such wide support from elected, statutory and
representative bodies.

However, LBH&F were only too aware that if they had attempted to permanently
close/reallocate the bridge, by obtaining a Traffic Order, Wandsworth Borough
Council would certainly have raised an objection (via their right to make
representation). This would have lead to a lengthy, and costly public enquiry
requiring LBH&F to ‘justify’ the reallocation, which they may well have been able to
do, based on evidence such as is presented in Chapter 4.0. Whilst Wandsworth
Borough Council, presenting the juxtaposed position would have claimed that the
‘improvements’ experienced in some areas had simply been levelled by the
degradation of others. This, very apparent conflict, between LBH&F and
Wandsworth Borough Council, has been evident throughout this research. For
example, the conflicting road accident statistics and the consultation exercise.
However, it appears that this ‘disagreement’ has not simply been confined to the
Hammersmith Bridge scenario, for example below is a recent quote from a traffic
engineer with LBH&F:

After the big political hu-ha they [Wandsworth] created about the bridge they
have now shown it to have been disingenuous, by implementing that bus
priority scheme over Wandsworth Bridge. (M. Olizar, 2001)
It is the opinion of LBH&F, expressed by Mr. Olizar, that the bus priority scheme implemented over Wandsworth Bridge, which obviously has led to a reduction in road capacity, has had more of a negative impact on the 'local area' than the closure of Hammersmith Bridge ever did!

Clearly, ‘policy’ would have been a significant consideration if a public enquiry had been held, the policy context of the ‘closure’ (to private vehicles) of Hammersmith Bridge is discussed in the following section.

5.2 Policy Context

At this point it is appropriate to refer back to the policies (national, regional and local) which were outlined in Chapter 2.0. This is principally to establish whether, based upon the results presented in Chapter 4.0, these policies would/could support the continued, long term closure or reallocation of a major route way such as the case of Hammersmith Bridge, South West London.

The following policies appear, based upon the evidence in this report, to support the case for closing/reallocating route ways, such as Hammersmith Bridge, to private vehicles.

- PPG 13 (2001) states that ‘land use planning has a key role in delivering the Government’s integrated transport strategy’ by (amongst other things) promoting more sustainable choices. The case of Hammersmith Bridge clearly shows that land use planning can have a dramatic effect on transport modal choices. The data in sections 4.1, 4.2 and 4.4 combine to reveal that by reducing the road capacity which is available to private vehicles more sustainable transport choices have been made. In this case the experience has principally been switching to high occupancy modes (such as public transport buses) and an overall reduction in the number of trips made.
• PPG13 states that a 'well designed traffic management measure can contribute to planning objectives in a number of ways, including: reducing community severance, noise, local air pollution and traffic accidents'. It was clearly the experience of residents in the Barnes area that the temporary closure/reallocation of Hammersmith Bridge (although not initially intended as a traffic management scheme) achieved all of these planning objectives.

• RPG 3 places emphasis on promoting alternatives to the car, whilst also supporting a comprehensive network of bus priority measures. The reallocation of road space over Hammersmith Bridge achieved this (to a degree) due to the fact that it gave priority to high occupancy public transport over the private motor car. This has clearly not been the 'norm' in large metropolitan cities, such as London in the recent past.

• In response to the wider 'objectives' outlined for the Road Traffic Reduction Act (1997), it could be argued that within LBH&F the reallocation of road space over Hammersmith Bridge achieved improvements in: public transport reliability and regularity (with the result being increased passenger figures), conditions for non motorised modes, air quality, and reductions in road traffic accidents.

• The LBH&F UDP states that it will “seek to provide adequate accessibility...and promote traffic restraint policies” (LBH&F, 1994, 5.2). In Chapter 2 this was highlighted as an important issue within the debate as to whether Hammersmith Bridge should have, or could in the future, permanently be closed to private vehicles. Having studied the evidence, and taken account of the representations made to the council during the consultation exercise (4.6) there is no significant reason to suggest that the permanent reallocation of road space over Hammersmith Bridge would lead to a reduction in accessibility. It is important to recognise that none of the objections voiced to the proposal of permanent reallocation were made on the grounds that there had been a reduction in accessibility.

It is clear that the policy framework, which presently exists in the UK, could lend itself to supporting a transport measure such as road reallocation.
5.3 Since reopening

The evidence covering the time period after the bridge reopened on 29th October 1999, until it had to be closed again, due to structural damage caused by a bomb, on the whole shows that some of the positive impacts which were experienced during the closure have not been maintained. Realistically, this is not surprising! Tables 4.1 and 4.2 clearly show that the volume of vehicular traffic crossing Hammersmith bridge did not reach pre closure levels, however, these tables also show that traffic flows over neighbouring bridges appear to have been relatively unaffected by the reopening (particularly Putney and Chiswick Bridges). This suggests that some of the increases experienced during the period of closure may not have been solely as a result of the closure of Hammersmith Bridge.

Perhaps the most significant ‘change’ since the reopening was the dramatic increase in the number of road traffic accidents in all four of the identified boroughs (Figure 4.6). Neither the individual boroughs, nor the London Research Centre (suppliers of the data) could offer an explanation for this.

The ‘traffic restraint and bus priority measures’ implemented by LBH&F, over Hammersmith Bridge, in an attempt ‘to maintain the improvements which had been achieved on bus services during the closure’, appear to (in the first six months at least) have failed to achieve the initial objective. This is based on the evidence that the scheme had only a limited effect on bus journey times, increased excess waiting times and a reduction in the number of passengers using Hammersmith Bridge (per week).

Clearly the biggest difficulty with all of the data regarding the period of time after Hammersmith Bridge reopened is that it only covers a six month period. If the bridge had been open for a longer period of time then perhaps more definite conclusions could be drawn.
5.4 The future

All of the evidence incorporated into this study indicates that ‘the impact of the closure of Hammersmith Bridge’ was far more complex than simply the displacement of traffic.

Perhaps the most interesting, and positive (in terms of achieving sustainable transport) finding has been that the doomsdayers predictions, which anticipated "chaos in West and South West London" and "a nightmare on every street when they close the bridge" (Evening Standard, 29/01/97) never materialised. The reaction of ‘displaced drivers’ was much more measured than perhaps was initially predicted. Relating this finding back to the hypotheses’ outlined in the ‘groundbreaking study’ (‘The Impact of Highway Capacity Reductions: Assessment of the Evidence’) by Cairns, Hass-Klau and Goodwin it is clear that the case of Hammersmith Bridge fits most comfortably into ‘hypothesis 3’. This hypothesis states that ‘where there is a reduction in capacity, and there is no suitable alternative available, traffic disappears’. Applying the evidence collected from the case of Hammersmith Bridge it appears that Cairns, Hass-Klau and Goodwin correctly identified that “these are circumstances thought to be most relevant to future policy development in London (1998 (1), pg. 24).

The possibility of the permanent reallocation of road space over Hammersmith Bridge is certainly something which deserves serious attention, due to the fact that the overall finding has been, that there is evidence to support the assertion that during the period of closure (February 1997 to October 1999) there was an overall improvement in the number of road accidents, air quality, public transport service, and a reduction in traffic flows.
The reallocation of Hammersmith Bridge has provided an insight into the impact of road reallocation, and presents a serious example of just how a reallocation scheme can/could contribute to achieving the all important objectives of sustainable transport.

Clearly, congestion charging is high on the political agenda, particularly for cities such as London, at present, however, this research could contribute something to the suggestion that the reallocation of road space deserves more serious consideration. It is unquestionable that something needs to be done, and it is my view that schemes such as these will prove pivotal in dictating the success or failure of the transport network, sustainable transport, and ultimately sustainable development.

5.5 Recommendations

The recommendations which are proposed, based upon this research are as follows:

1. Road reallocation should be seriously considered as an alternative or employed in conjunction with other schemes such as congestion charging, in large metropolitan areas such as London.

2. If the situation should ever arise again that there is an ‘option’ regarding the future use of Hammersmith Bridge it should be taken at the regional level, principally by the GLA.

3. Other ‘intermediate’ options, such as those outlined at the end of section 4.4, should have been offered in the consultation process.

4. If Hammersmith Bridge has to be closed again at any time in the future the immediate, and local areas must be closely and correctly monitored to ensure that clear, applicable data is available for all key areas.
APPENDIX 1
HAMMERSMITH BRIDGE CONSULTATION

Have your say on its future

LONDON BOROUGH OF RICHMOND UPON THAMES

Environment
HAMMERSMITH BRIDGE

Have your say on its future

Hammersmith & Fulham Council and Richmond Upon Thames Council would like to hear your views about the future of Hammersmith Bridge. Should it stay closed to cars or should it re-open? This is an important decision with far-reaching implications, so we would like to make sure everyone has the chance to have their say.

Background
In January 1997 routine load tests, based on national safety standards, were carried out on the bridge by independent consultants. Their report said that the bridge could not continue safely with its 7.5 tonne weight limit but further detailed analysis showed that the bridge could cope with limited use by buses, pedestrians and cyclists. Repair work to the Grade 2 listed structure has begun and is due to be finished by September 1999.

Have your say
The Council is using the opportunity provided by the works to consult on the future use of a bridge constructed in 1887 for horses and carts. Richmond Upon Thames Council is cooperating with Hammersmith and Fulham Council in the consultation exercise. A number of groups and individuals have suggested that the bridge should stay shut to general traffic in order to reduce pollution and congestion in the area.
The two main points of view expressed to the Council about the closure can be summarised as follows:

1. Those who support maintaining the closure state that giving public transport and cycling priority for access has encouraged car drivers to switch to buses. Journey times have reduced, giving long term sustainable environmental gains for bus passengers, cyclists, pedestrians and the wider community.

2. Those who want to see the bridge re-opened as before argue that it is a vital link, essential to traffic systems across London, but crucially to the whole of West London. Private and light goods vehicle accessibility has been reduced, journeys are longer and there is some increased congestion, pollution and delay in the areas affected by the overspill traffic.

Options investigated
Hammersmith & Fulham Council has looked into a number of possible alternatives, including:
- Building a new bridge;
- Strengthening the bridge to carry 44 tonne vehicles;
- Constructing a new footbridge;
- Constructing a piggy-back bridge;
- Installing a temporary or bailey bridge during the bridge works;
- Completely closing the bridge during the works to speed up the process;
- Setting up a ferry service;
- Operating a park and ride scheme.

None of the above options have been pursued for either practical, financial or environmental reasons.

The two options which are viable and which we would like your views on are:

Option 1. to re-open the bridge with its 7.5 tonne weight limit.

Option 2. to restrict the use of the bridge to public transport, taxis, pedestrians, cyclists, motorcyclists and emergency vehicles.

The Consultation process
There is a tear-off slip at the back of this leaflet. Simply fill it in and hand it in to any council office or post it to:
Chris Smith,
Principal Engineer (Traffic),
London Borough of Richmond upon Thames,
Civic Centre,
44 York Street,
Twickenham TW1 3BZ.
Please return by 29th May 1998.

Both Councils will be seeking the views from all interested residents, local businesses and organisations as well as statutory bodies. Richmond Upon Thames Council will forward its views following the consultation exercise and Hammersmith and Fulham Council will then decide upon which option to pursue.
APPENDIX 2
Hammersmith Bridge Closure
Consultation

Please answer the questions by ticking the appropriate box and return this questionnaire by the end of March.

Please give your address to enable the responses to be analysed by street.

Address

Are you a resident or business within the area?

Resident [ ] Business [ ]

Do you want Hammersmith Bridge to be re-opened to all traffic up to its previous operating capacity following completion of repairs?

Yes [ ] No [ ]

Do you want Hammersmith Bridge to be limited to buses, taxis, disabled transport, emergency vehicles, motor cycles, cycles and pedestrians? Cars would be banned.

Yes [ ] No [ ]
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Beckerman, W. 1995 Small is Stupid, Duckworth Publishing


Cairns, S. Hass-Klau, C. Evidence on the effects of road capacity reduction
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D of E 1990 This Common Inheritance. HMSO

DETR 1994 RPG 9

DETR 1994 Sustainable Development: The UK Strategy

DETR 1996 Design Manual for Highways and Bridges Vol. 12a

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