



Visibility

Accessibility

Royal Borough of Kensington and Chelsea

Spatial Analysis of Pedestrian Movement for the Royal Borough of Kensington and Chelsea 27 March 2009

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Introduction

Atkins Intelligent Space has been commissioned to produce a set of spatial analyses that cover the entire extent of the Royal Borough of Kensington and Chelsea.

Introduction

The Royal Borough of Kensington and Chelsea (RBKC) is a local authority that is located just west of central London (Figure 1).

It encompasses world famous universities, museums, department stores and embassies. It also contains many of the well known residential districts in London. This contributes to the borough being one of the most densely populated local authorities in the United Kingdom.

RBKC are currently planning a series of policies for their Local Development Framework for the entire borough. Transportation is an important consideration which will impact on development of these policies. Given the large number of residents the borough has and the many different land uses that attract people to the area, the nature of pedestrian movement and accessibility is a fundamental concern which must be addressed in the planning process.

As part of the Development Framework, RBKC require an evidence base to act as a tool for advising their policy decision making process. This report sets out to provide such evidence by undertaking a spatial analysis for the area that is the responsibility of the RBKC (Figure 2).

About this report

This document presents the findings of the spatial analysis of RBKC undertaken by Atkins Intelligent Space.

This analysis takes into the account the natural wayfinding and the visibility of routes for the entire borough and considers such factors as:

- Key movement links within the street grid, showing the extent to which these are constrained by urban blocks and barriers.
- ‘Desire lines’ for pedestrians, showing the routes that are most visible and therefore easy to follow.
- How accessible and connected pedestrian routes are throughout the borough.

Spatial analysis providing modelling of pedestrian routes was undertaken using Atkins Intelligent Space’s ‘Fathom’ software. This uses a recognised and established best practice technique called Visibility Graph Analysis.

Report Outline

The report begins with the presentation of the results of the spatial analysis, examining firstly pedestrian visibility throughout the entire street network.

Next, the results are examined in more detail, focusing on the visibility for the northern, central and southern areas of the borough.

Following this, a discussion of the overall pedestrian accessibility within the borough takes place. Additional comments on accessibility for the northern, central and southern areas of RBKC are then presented.

Lastly, a conclusion chapter brings together the findings of this study.

About Intelligent Space

Intelligent Space is a consultancy providing expertise on pedestrian movement and space use. We work to help improve public space, minimise social risks and maximize economic benefits. The practice uses science-based methods to turn pedestrian movement from an undervalued resource into a tangible and manageable asset.

As a business operation within Atkins since 2007, Intelligent Space is based in central London and carries out projects on an international level. Since our foundation in 2000, we have been working for renowned clients among government bodies, property owners, developers and consultants. The work of the practice is cited in the Department for Transport’s good practice casebook “Walking: The Way Ahead”. Intelligent Space won the 2002 AGI Innovation Award for the analysis of crowding at Notting Hill Carnival and were independent cross party technical advisors to the 2002 UK Parliamentary Debate on Walking in Towns and Cities.

Developing public spaces that are vibrant and economically sustainable depends on understanding the problems that are faced and created by pedestrians. Our state of the art modelling tools provide stakeholders in urban development masterplans with effective strategies for pedestrian movement and safety issues. We work alongside architects and engineers to test and develop strategic ideas.

Intelligent Space works together with transport planners, urban designers and architects to ensure that pedestrians’ needs are fully incorporated into transport planning and masterplan developments. Our aim is to redress the balance between vehicles and pedestrians to meet the requirements of the site. We work on schemes from individual junctions to city wide strategies.

In the past eight years, Intelligent Space has worked on over two hundred projects ranging from the

development of a safety strategy for Notting Hill Carnival to the redesign of Parliament Square. Alongside our work in London, we have worked across the UK and internationally, including Duisburg in Germany, Canberra and Melbourne in Australia, Boston and Washington DC in the USA.



Figure 1 Map of the greater London area showing the extent of RBKC



Figure 2 Map of the Royal Borough of Kensington and Chelsea



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Spatial Analysis

This chapter presents the findings of the spatial analysis produced by Atkins Intelligent Space's Fathom software.

About Visibility Analysis

Visibility Analysis is a measure of how much space pedestrians can see as they move around at ground level. Pedestrians are highly sensitive to the complexity of routes and they tend to choose the simplest path. This means that overall, movement flows tend to become concentrated on routes that offer the simplest visual links through the built environment.

Visibility (the area of usable space visible to a pedestrian at any point in the street grid) is one of the most important factors determining the pattern of pedestrian flows in models of movement. Pedestrian movement flows tend to be greater on routes that provide clear and direct visual links through the built environment (so-called desire lines) than on complex routes where people cannot see directly where they want to go¹. Pedestrians rely heavily on visual information to orient themselves and move about, so their movement is highly influenced by this.

Visibility is defined as the area of pedestrian space in square metres that is visible from each point. The maps in this section shows the visibility analysis for the Royal Borough of Kensington and Chelsea. The most visible areas are shown in red, through a spectral range to the least visible in blue.

Street Network Visibility

From examining the results of the visibility analysis shown in Figure 4, it is clear that there is a dominant pattern of high visibility along the footways that are orientated on an east-west axis.

For example, Holland Park Avenue, Kensington High Street and Cromwell Road are very visible for pedestrians due to their length and limited number of bends and as such these roads form key pedestrian routes through the borough.

It is possible that the dominance shown by these east-west links is due to the historical importance of these roads going into and out of central London. Figure 3 shows a map² drawn in 1900. Again, it is visible in this map that the east-west links are dominant, with a street network similar to that of today. North-south links are less in number and do not provide connectivity throughout the entire area.

In comparison, the roads that run from north to south are less visible with the exception of Ladbroke Grove and Queen's Gate. This would mean that for pedestrians trying to navigate themselves from north to south, the limited visibility provided would make wayfinding less clear.

It is of note that the broad pavement along the embankment also renders the riverfront area highly visible for pedestrians.

Visibility for pedestrians tends to decrease from being high on the London strategic and distributor routes (such as Ladbroke Grove), moderate on RBKC distributor roads to low on local roads.

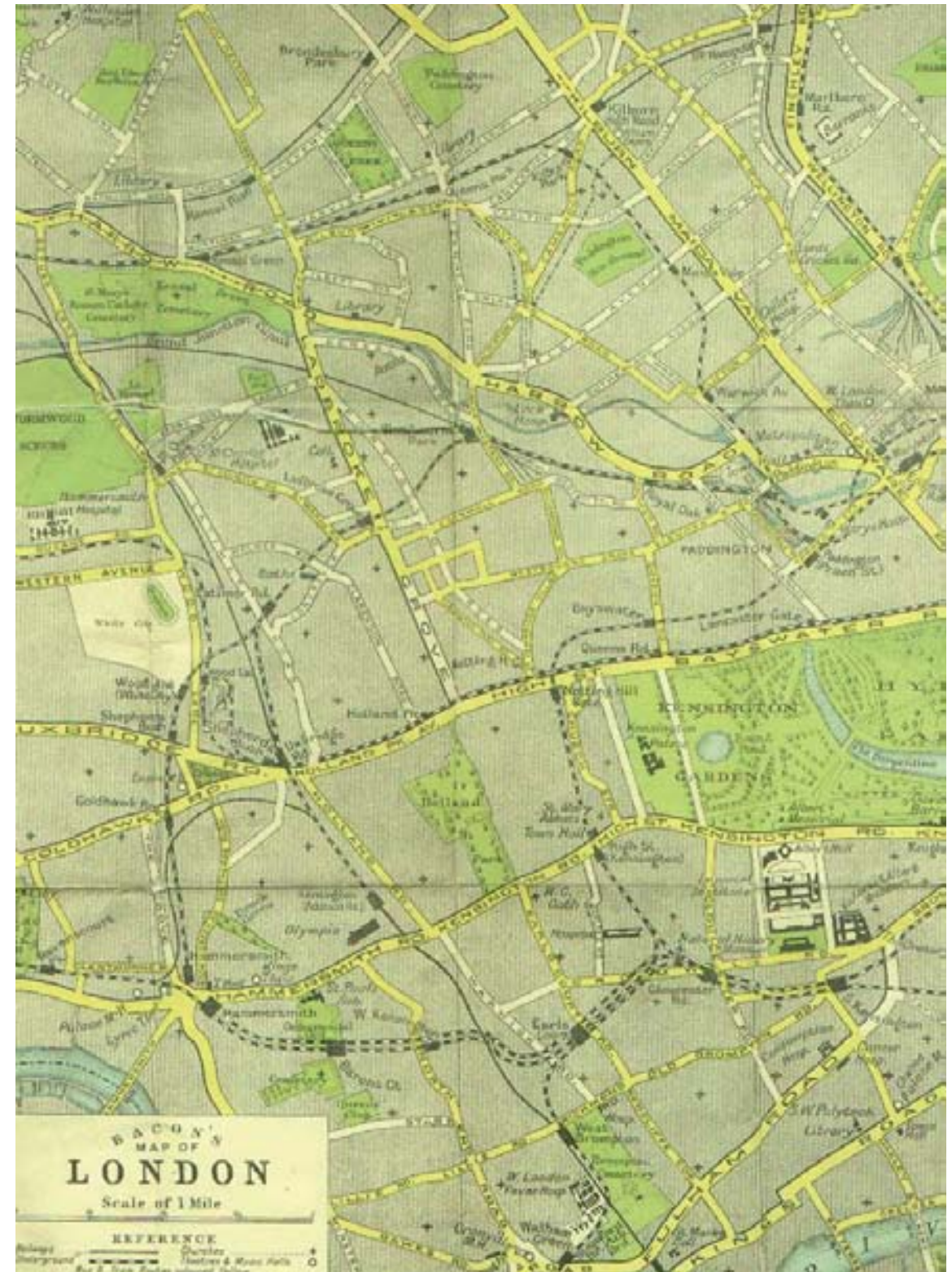


Figure 3 Map of RBKC in 1900



Figure 4 Visibility analysis of the RBKC

Street Visibility in the North of the Borough

The map on the right (Figure 5) shows the results of the visibility analysis in the north of the borough.

Key findings in this area are:

- Ladbroke Grove is one of the most visible routes in the north of the Royal Borough of Kensington and Chelsea. On a north-south axis, this road is straight and of a considerable length with few barriers to visibility caused by the built environment.
- The Westway acts as barrier to north-south visibility and thus may hinder pedestrian movement as this elevated roadway obscures the viewshed beyond it.
- Ladbroke Grove Underground Station is well positioned to afford the pedestrians exiting this facility a highly visible outlook in which to orientate themselves.
- The Holland Park area has the lowest visibility for pedestrians in northern section of RBKC. This is due to the street configuration of the area where there is a series of short, local streets. In the absence of any major east-west distribution routes, these local streets are joined to the strategic routes via a limited number of north-south roads.



Figure 5 Visibility analysis of northern RBKC

Street Visibility in the Centre of the Borough

The map on the right (Figure 6) shows the results of the visibility analysis in the centre of the borough.

Key findings are:

- The central area of RBKC is the most visible for pedestrians in comparison to the north and south of the borough. Holland Park Avenue, Kensington High Street and Cromwell Road are highly visible roads for pedestrians. As such, these strategic and distributor roads for London form the key pedestrian desire lines when travelling from east to west.
- The roads running between these east-west arterials are less visible for pedestrians. There are relatively few straight roads on a north-south axis that directly connect between the main east-west routes. Three of these, Kensington Palace Gardens, Queen's Gate and Exhibition Road are in the east of the borough and do not provide connectivity between areas of high pedestrian concentration, for example the retail centres along Kensington High Street and Holland Park Avenue.



Figure 6 Visibility analysis of central RBKC

Street Visibility in the South of the Borough

The map on the right (Figure 7) shows the results of the visibility analysis in the north of the borough.

Key findings in this area are:

- Unlike in the northern and central sections of RBKC, the routes that follow the east-west axis (for example Fulham Road) are not as prominent in terms of pedestrian visibility. This may be due to the smaller pavement area that is associated to these routes as well as the subtle changes in direction that these routes experience as they traverse the area.
- Like the other areas of RBKC, the southern area has a lack of highly visible north-south pedestrian routes. The only one that appears to exist is along Chelsea Bridge Road/Sloane Street. Because this route is in the eastern side of RBKC, pedestrians trying to find a more centrally located route from the south of the borough may struggle to find an obvious path.
- Broad pavements along the Chelsea Embankment lead to high visibility in this area. However, the north-south routes that link to this road are not as visible for pedestrians as the embankment itself. Therefore, this may restrict the natural wayfinding of pedestrians to and from the Chelsea embankment.



Figure 7 Visibility analysis of southern RBKC

About Accessibility

Another factor for pedestrian movement is the amount of space than can be reached within a simple journey into the surrounding network, such as a single change of direction. Areas that are well connected within a short and simple journey are more likely to support pedestrian activity. This is because having more movement routes nearby makes movement easier and allows access to a greater number of destinations. Like visibility, the street network accessibility can be measured using a computer analysis of this borough.

Within this section the maps present a measure of how accessible a particular area is. The maps use a spectral colour range from red, showing the primary circulation routes, through to blue, representing the minor movement routes.

Street Network Accessibility

Figure 8 shows the results of the spatial analysis in terms of pedestrian accessibility. Similar to the visibility analysis, the results of the accessibility analysis show a dominant pattern of highly accessible routes on an east-west axis.

Key routes such as Holland Park Avenue, Kensington High Street and Cromwell Road that have high visibility also provide access to many smaller local roads. Road such as Fulham Road and King's Road that offer less visibility to pedestrians do still offer high accessibility. This indicates that while some roads in the borough do not allow for natural wayfinding by pedestrians, they do play an important role in providing access to local roads.

In comparison, the roads from north to south are relatively less accessible, providing access to those streets immediately surrounding them. However, Ladbroke Grove and Queen's Gate are two north-south routes providing a high degree of access to other streets.

Of note is Kensington Palace Gardens which while highly visible for pedestrians, does not provide access to many other points in the street network. The same can be said for Chelsea Embankment which has high levels of visibility but again only has moderate levels of accessibility.

Examining the general relationship between accessibility and land use shows there is a strong relationship between routes that have high accessibility and levels of retail activity. This is understandable given that due to the important role these routes play in providing access to other parts of the borough the number of people using them is likely to be higher making them prime locations for retail premises.



Figure 8 Accessibility analysis of RBKC

Street Accessibility in the North of the Borough

Figure 9 shows the accessibility results in the north of the borough.

Key findings in this area are:

- When comparing the visibility analysis to that of accessibility, it shows that many streets within northern RBKC are more accessible for pedestrians than they are visible.
- Ladbrooke Grove is still the most accessible road connecting with Holland Park Avenue. As the main north-south axis, Ladbrooke Grove connects to most east-west roads which increases its accessibility considerably.
- While Ladbrooke Grove is highly accessible, other local distributors such as Oxford Gardens and St Marks Road immerge as being important for providing access to local streets.
- The Westway blocks north-south accessibility, truncating this area. From the analysis only two highly accessible routes cut through the Westway - Ladbrooke Grove and St Marks Road.
- Compared to visibility, the accessibility within the area of Holland Park is slightly better in terms of pedestrians being able to navigate their way through the local streets, even though they are not well connected to the main pedestrian thoroughfares in the vicinity.



Figure 9 Accessibility analysis of northern RBKC

Street Accessibility in the Centre of the Borough

Figure 10 show the results of the accessibility analysis in the centre of RBKC.

- Holland Park Avenue, Kensington High Street and Cromwell Road are highly accessible routes, providing connections to many more local streets along their length.
- These three main corridors of pedestrian accessibility through this section of RBKC indicate three primary routes for pedestrian movement in and out of central London.
- In terms of north-south routes, Queen's Gate is highly accessible providing a pedestrian connection on the eastern periphery of the borough. In addition, Exhibition Road is highly accessible to pedestrians which is beneficial given the number of pedestrian attractions on this road, for example the Natural History Museum.
- While not highly visible, Earl's Court Road does play a role in providing high pedestrian accessibility between Kensington High Street and Cromwell Road, one of the few highly accessible north-south pedestrian routes in the centre of RBKC.



Figure 10 Accessibility analysis of central RBKC

Street Accessibility in the South of the Borough

Figure 11 shows the results of accessibility analysis in the south of RBKC.

The key findings are as follows:

- Compared to the number the of highly visible routes in the southern area of RBKC, there are more highly accessible routes for pedestrians in this part of the borough. Where Fulham Road, King's Road and Old Brompton Road were not assessed as being highly visible for pedestrians, the accessibility analysis shows their importance in forming the backbone for pedestrian movement in the area by connecting local streets together.
- The southern area of RBKC suffers from the lack of any highly accessible north-south pedestrian routes. The only one that appears to exist is along Sloane Street. Because this route is in the eastern side of RBKC, pedestrians trying a more central route from the south of the borough may struggle to find a well connected path that takes them directly.



Figure 11 Accessibility analysis of southern RBKC



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Conclusion

This chapter presents the conclusions of the spatial analysis undertaken for the Royal Borough of Kensington and Chelsea.

Conclusions

Atkins Intelligence Space have undertaken a spatial analysis of the Royal Borough of Kensington and Chelsea.

In terms of pedestrian visibility, there are four main routes which afford pedestrians a high degree of visibility. Three of these are aligned on an east-west axis. These are Kensington High Street (Figure 13) Holland Park Avenue (Figure 14), and Cromwell Road (Figure 15). There is only one highly visible pedestrian route that is orientated north-south - Ladbrooke Grove. This distribution may have occurred due to the history of the area where roads were constructed as east-west routes heading towards central London.

In terms of pedestrian accessibility there are six main roads which are highly accessible for pedestrians within RBKC. Again, roads on an east-west axis dominate. These are Holland Park Avenue, Kensington High Street, Cromwell Road, Fulham Road and King's Road. In terms of a north-south orientation only Ladbrooke Grove is highly accessible.

In addition to those mentioned above, there are a number of north-south routes (for example, Kensington Palace Gardens, Queen's Gate and Exhibition Road) that are highly visible and/or highly accessible. However, these roads tend to be shorter and are concentrated on the eastern side of RBKC and will only assist pedestrian movement locally.

Overall, pedestrian visibility and accessibility is related to the function of the road. High visibility and accessibility is generally related to those roads which are part of the Strategic London Road Network or those that form the RBKC London distributor roads. Local distributor roads and those that are less important in the roading hierarchy generally have lesser degrees of pedestrian visibility and accessibility. This means that the main arterial routes through RBKC for motorised traffic are also the same routes that pedestrians will be more inclined to use.

A key finding of this analysis is to show that major

vehicular routes in RBKC are also very important connectors for pedestrian movement. Roads that are often thought of as traffic through routes into central London are also pedestrian thoroughfares. The analysis presented here can be used to inform the planning of these streets for all users.

Next Steps

The spatial analysis presented in this report can also be used to assess the accessibility of key attractions for pedestrian movement, such as transport interchanges. Figure 12 provides an example of underground station accessibility for central London. In the next steps of this project we could provide a similar analysis for RBKC. This can be used to inform planning decisions concerning transportation and land uses.



Figure 12 Example of underground station accessibility for central London. High accessibility is shown as red, moderate accessibility is green and low accessibility is blue.



Figure 13 Kensington High Street



Figure 14 Holland Park Avenue



Figure 15 Cromwell Road

