# NEW CITY COURT

Pedestrian Forecast & Landscape Assessment

SPACE SYNTAX

Space Syntax

21 Brownlow Mews
London
WC1N 2LG
United Kingdom

T +44 (0) 20 7400 1320
F +44 (0) 20 7400 1333

london@spacesyntax.com
**www.spacesyntax.com**

**TEAM**

**Max Martinez**

m.martinez@spacesyntax.com

**Nora Karastergiou**

n.karastergiou@spacesyntax.com

**José Luís Krug**

j.krug@spacesyntax.com

**DOCUMENT REFERENCE**

2379B_LBSou New City Court_Pedestrian forecast and landscape assessment_Report_Final

Space Syntax is a registered trademark of Space Syntax Limited
All rights reserved

Space Syntax Limited © 2018

Disclaimer
The scope of this Report, and all Services performed in connection with it, are limited to the Project as disclosed to us and defined in the Proposal. Any models created, and any evaluations and/or recommendations made by Space Syntax Limited in connection with the Project are specifically designed for the parameters of the Project and may only be used in the context of the Project. Space Syntax Limited excludes all liability for any use made by the Client or by its customers of any Space Syntax Deliverables or Services in any other context including in respect of any changes subsequently made to the parameters of the Project.

## CONTENTS


page

**Executive Summary** **7**

1. Pedestrian movement forecast 11
2. Pedestrian Comfort Level assessment 27
3. Landscape design assessment 37

**Appendices** **41**

**Appendix 1** 43
Summary of Urban Baseline Study - Space Syntax, December 2016

**Appendix 2** 65
Glossary and Methodology Urban Form and Function

**Appendix 3** 71
Agent analysis methodology

**Appendix 4** 75
TfL Pedestrian Comfort Level on Footways

**Appendix 5** 79
Detailed data

**Appendix 6** 87
Landscape assessment: Option testing

# Executive summary Introduction and approach

## Introduction

GPE (St Thomas Street) Limited assembled a design team lead by Allford Hall Monaghan Morris (or “AHMM”) to carry out a comprehensive redevelopment of the New City Court (or “NCC”) site to include demolition of existing 1980s office buildings and erection of a 37-storey building (including ground and mezzanine) of a maximum height of 144m (AOD), restoration and refurbishment of existing listed terrace, and redevelopment of Keats House with retention of existing façade to provide a total of 46,374 sqm of Class B1 office floorspace, 765 sqm of Class A1 retail floorspace, 1,139 sqm of Class A3 retail floorspace, 615 sqm of leisure floorspace (Class D2), 719 sqm hub space (Class B1/D2) and a 825 sqm elevated public garden, associated public realm and highways improvements, new station entrance, cycling parking, car parking, servicing, refuse and plant areas, and all ancillary or associated works.

The site is located on St Thomas Street in the London Borough of Southwark, an area that is undergoing significant changes to transport infrastructure and residential and commercial density, including the redevelopment of the London Bridge Station which will continue to have an impact on pedestrian movement patterns.

In 2016 Space Syntax (or “SSx”) was asked to provide evidence-based design advice on pedestrian activity patterns, land use patterns and the public realm character of the development site. The results of the analysis were issued as an Urban Baseline Study in December 2016. A summary of this study is included in Appendix 1.

The ground floor layout and overall land use distribution was developed through 2017 and 2018. Space Syntax was asked to assess the impact of the proposed masterplan on the overall movement patterns and to assist in the development of landscape proposals for the open spaces within the scheme.

At the time of the survey London Bridge Station was being redeveloped finally opening in early 2018 with further work continuing through the year. Therefore, we have used the 2016 survey as a baseline for the forecast model and we have added layout and land use changes to reflect a fully operational station and ancillary facilities.

This study addresses the following key questions:

- If the site remains unchanged from current condition, what is the likely pedestrian environment in 2031 relative to the surveyed conditions?
- If the site is redeveloped as proposed, what will be the impact on the pedestrian environment in 2031 compared to a ‘do nothing’ option?
- How should the landscape be designed to accommodate expected pedestrian flows in order to maximise the benefit to the pedestrian environment?

## Approach

Space Syntax applies an evidence-based approach to measure the properties of the spatial network and how these relate to the functioning of the site.

This report presents the key findings of the **Pedestrian movement forecast and landscape assessment** in three sections.

1. Space Syntax integrated the datasets from the Urban Baseline Study with information on the building’s trip generation data and agreed committed developments to construct a **Pedestrian Movement Forecast** model for the site for a 2031 scenario. The model has been used to test the impact of changes in the pedestrian movement patterns with and without the New City Court scheme.

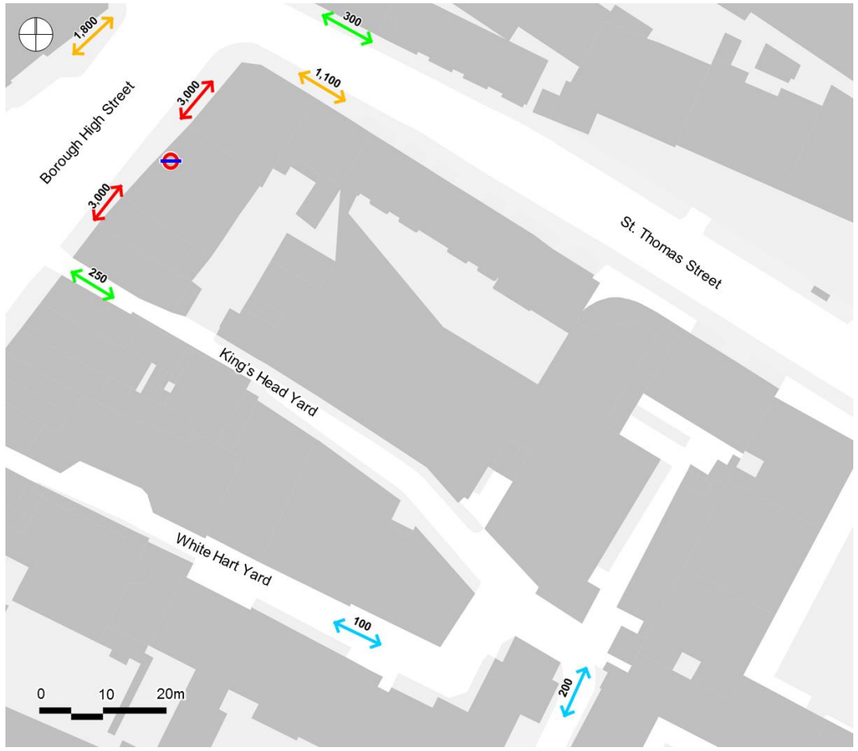
2. Space Syntax used TfL’s Pedestrian Comfort Levels (PCL) to measure how the proposal compares to the ‘do nothing’ 2031 scenario and to the 2016 pedestrian baseline.

3. Using the flows from the pedestrian forecast we constructed a Public Space Model to identify the key pedestrian desire lines through the site and to inform the landscape design. The model was also used for the **Landscape Assessment** of the proposed design.

## 2031 Future baseline - Do nothing

The pedestrian movement forecast for the “Do nothing” scenario shows that the projected transport growth and committed developments in the area around the site will increase overall movement levels adding pressure on the already congested public realm, particularly at the intersection of Borough High Street with St Thomas Street.

Compared to the 2016 baseline, the forecast flows for this scenario during the AM Peak show an **increase of 17% on the eastern footway of Borough High Street and 21% on the southern footway of St Thomas Street.**



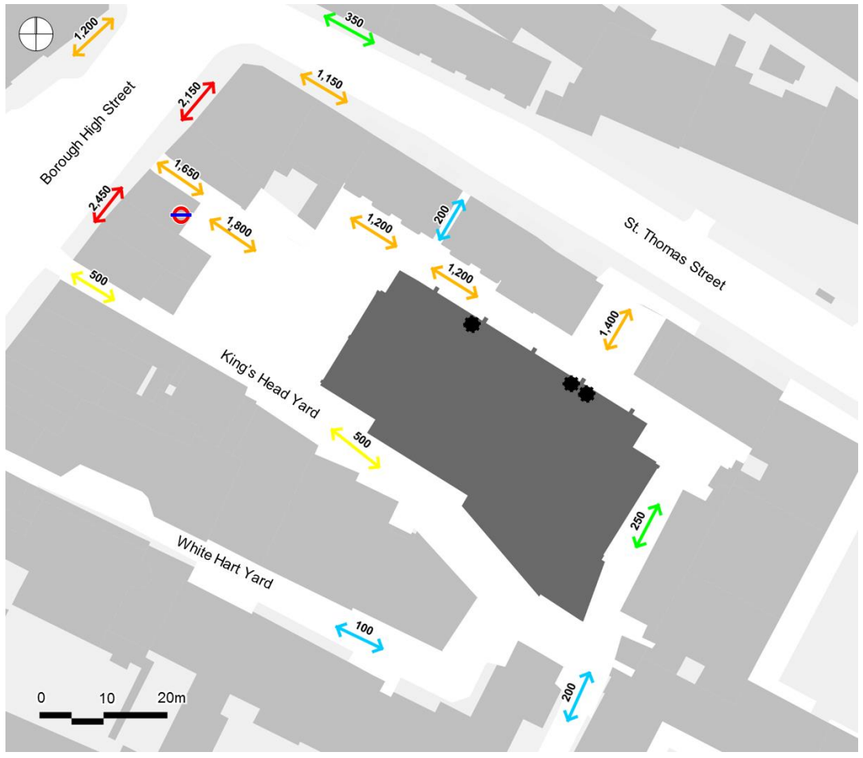

**2031 Future baseline - Do nothing**
**AM Peak forecast**

## 2031 Future baseline with New City Court

In line with the overall improvements to public realm quality, the new routes proposed by the New City Court scheme creates more permeability adding circulation choices and alternative routes which helps to evenly disseminate movement at this busy junction, and therefore takes pressure off Borough High Street and St Thomas Street.

Compared to the 2031 Future baseline “do nothing scenario”, the forecast flows during the AM Peak **decrease by 28% along Borough High Street eastern footway (16% lower than the existing).**

The movement levels along St Thomas Street in both scenarios remain at a similar level, with a minor increase related to NCC trips arriving from the west and the overall increase in background through movement in the area as a result of the additional connectivity that the proposed scheme creates.




**2031 Future baseline with New City Court**
**AM Peak forecast**

**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

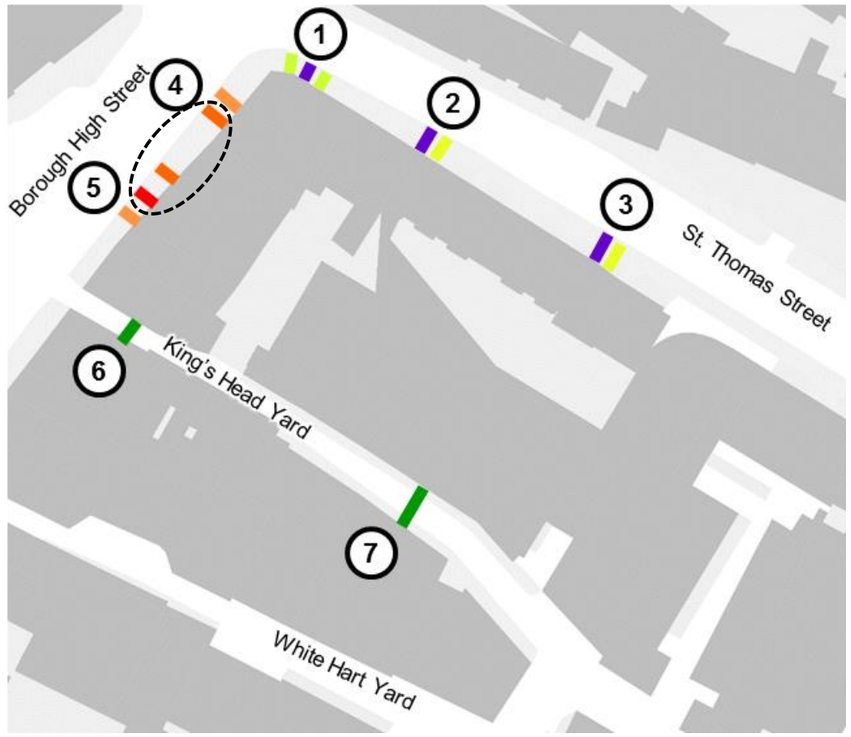
# Executive summary Key findings and conclusions Pedestrian Comfort Level assessment

**2031 Future baseline - Do nothing**

The Pedestrian Comfort Level ("PCL") assessment for the "do nothing scenario" highlights the increased pressure at the intersection of Borough High Street with St Thomas Street.

Along the eastern footway of Borough High Street, the PCL at three locations - 4b, 5a and 5c (in dashed circle) - is less than the TfL recommended minimum for Office and Retail areas during the two all day average and AM peak time scenarios.

Locations 1b, 2a and 3a (highlighted in purple) have an effective footway width of less than 1.50m, which is the acceptable minimum to allow wheelchair users and a walking person to pass each other[1].

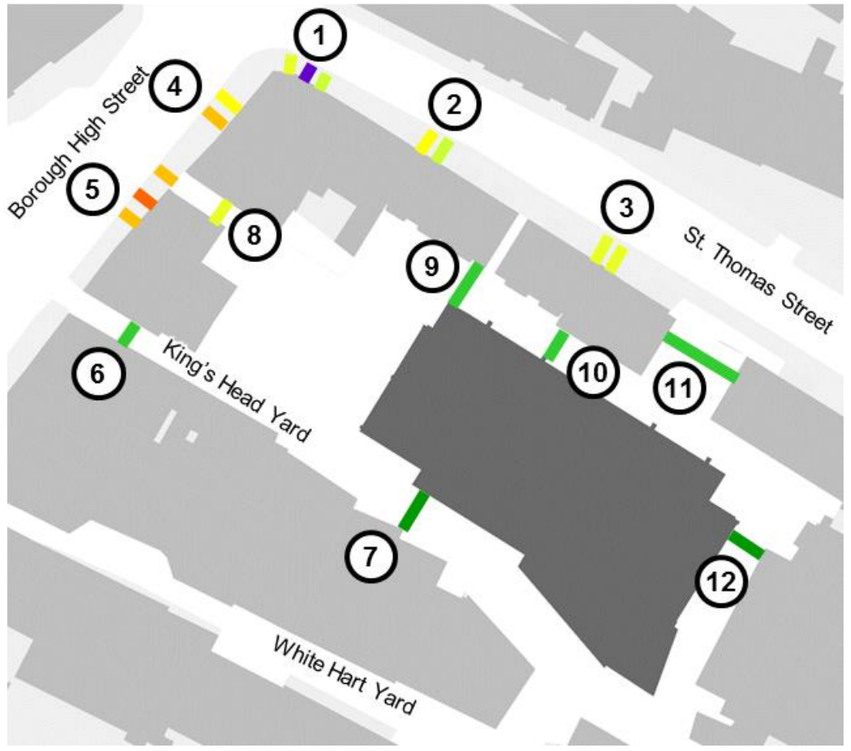



**2031 Future baseline - Do nothing**
**Level of Service assessment (AM Peak)**

**2031 Future baseline with New City Court**

The additional permeability and the improved public realm of the proposed scheme results in a significant improvement of pedestrian comfort levels around the site. The footway width at locations 2 and 3 has increased and the overall permeability and new routes reduces pressure on Borough High Street.

All locations within the development are comfortable and well above the minimum recommended.




**2031 Future baseline with New City Court**
**Level of Service assessment (AM Peak)**

**Legend 1 Pedestrian Comfort Levels**

TfL recommended minimum for Office and Retail areas

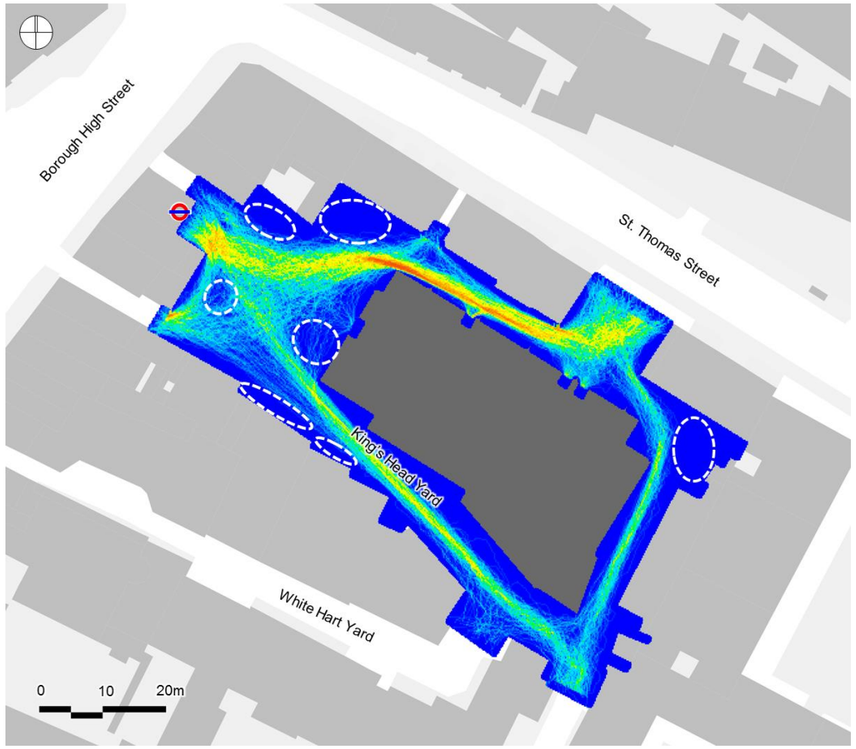
- A+ comfortable
- A
- A-
- B+
- B
- B-
- C+
- C
- C-
- D
- E very uncomfortable
- F effective width < 1.50m

Space Syntax Limited © 2018

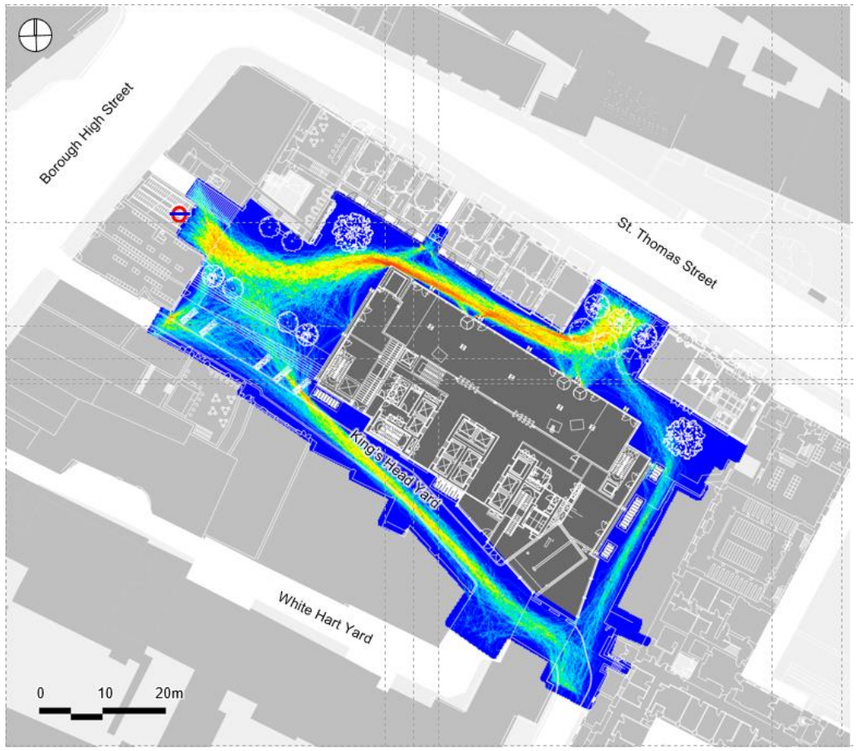
# Executive summary Key findings and conclusions Landscape design assessment

The proposed landscape design successfully accommodates the key pedestrian desire lines.

It locates landscape features and furniture at suitable locations that do not obstruct dominant movement lines and allow visibility at key orientation points.




**2031 Future baseline with New City Court**
**Pedestrian desire lines**
**Tabula rasa - AM Peak**




**2031 Future baseline with New City Court**
**Pedestrian desire lines**
**Proposed landscape design - AM Peak**

**Path overlap**

low high

# Pedestrian Movement Forecast

# Pedestrian movement model Methodology

## Pedestrian Movement Model

### Spatial Layout Attraction

The spatial structure of an urban place determines its accessibility, which can be defined as the degree of ease that users have when moving around any environment.

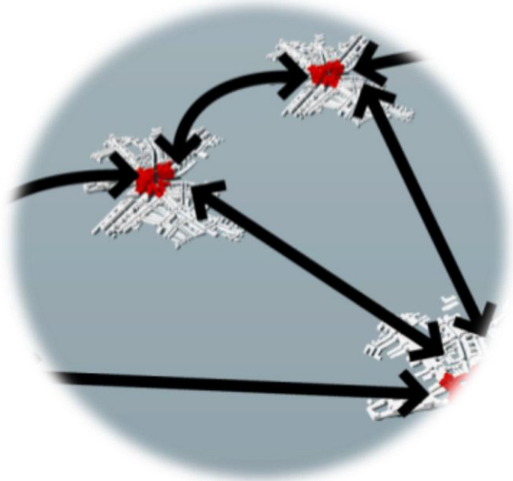
.

Pedestrian movement patterns are fundamentally influenced by the degree to which the design of the development creates an accessible, intelligible spatial layout in which all routes and public spaces are sufficiently activated.

### Land Use Attraction

The strength of attraction of movement-sensitive land uses, especially retail and community facilities, as well as additional development quantum in the area.

### Transport Attraction



The degree to which public and private transport systems integrate with the development.

A multivariable Pedestrian Movement Model explains the relationship between spatial and land-use components and its combined influence on pedestrian movement patterns.

It has three elements:

1. Spatial Layout Attraction

2. Transport Attraction

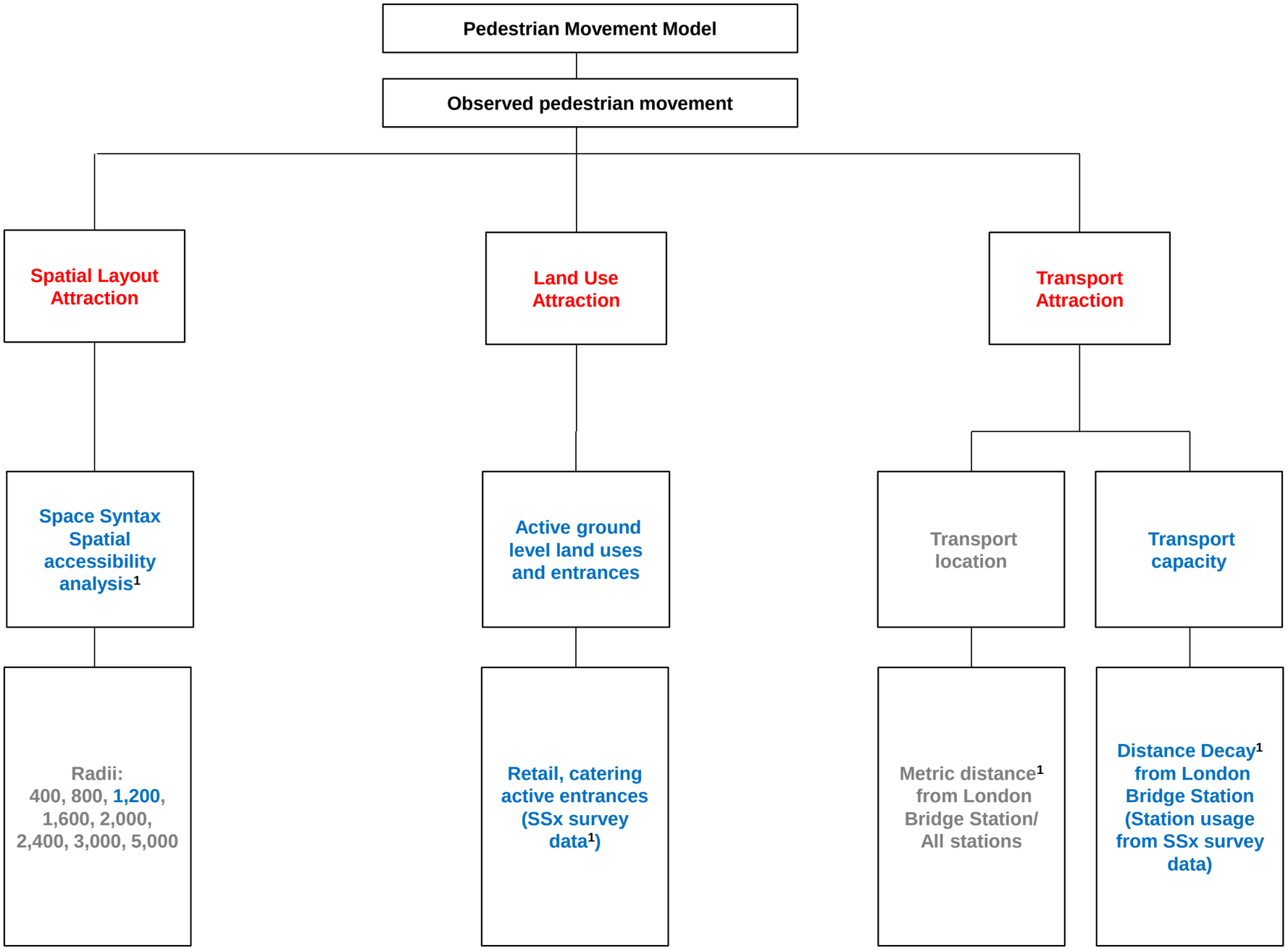
3. Land Use Attraction

## Pedestrian movement data

## Pedestrian forecast

Space Syntax Limited © 2018

# Pedestrian movement model Variables




The **first stage** of the Pedestrian Movement Model is to establish the relationship between observed pedestrian movement and a number of variables analysed in the baseline study. To do so we used a correlation matrix to identify the impact of each of the variables.

In the **second stage**, three categories: Spatial Layout Attraction, Transport Attraction and Land Use Attraction were analysed as variables using **multiple regression analysis. R-Square values** were used to identify the model with the highest goodness-of-fit. The results were incorporated into a Pedestrian Movement Model.

The variables in the diagram to the left indicate the ones that have been tested in the analysis.

The ones highlighted in blue, spatial accessibility at 1,200m radius, active ground level land use/ entrances and distance from London Bridge Station entrances, are the variables that were found to have a higher impact on the observed movement in the area.

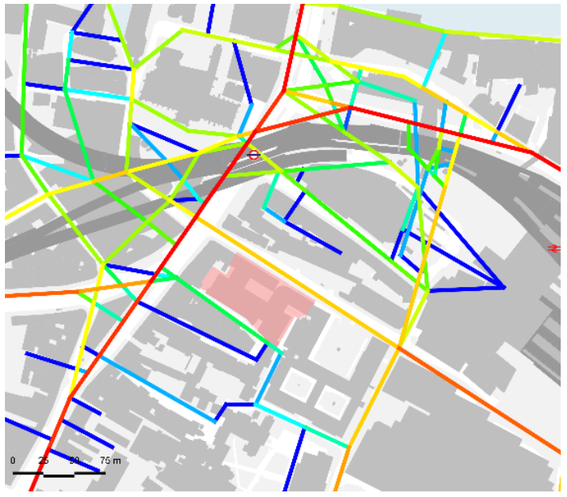
**Notes**

[1] Detailed methodology description in Appendix 2.

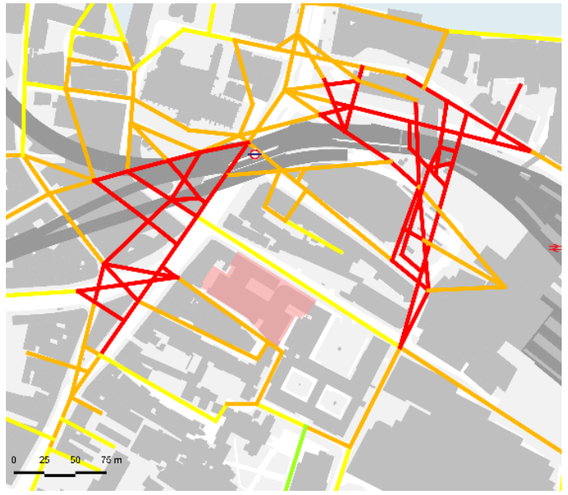
Space Syntax Limited © 2018

# Pedestrian movement model

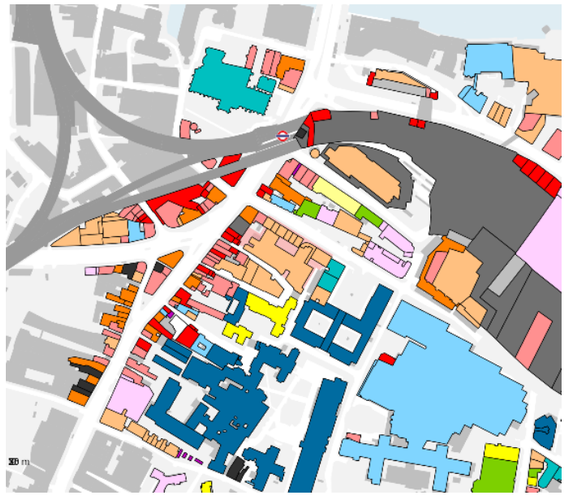
Crown copyright. OS Licence No 0100192252




**Spatial layout attraction**
**Weekday All Day Avg R square = 59%**

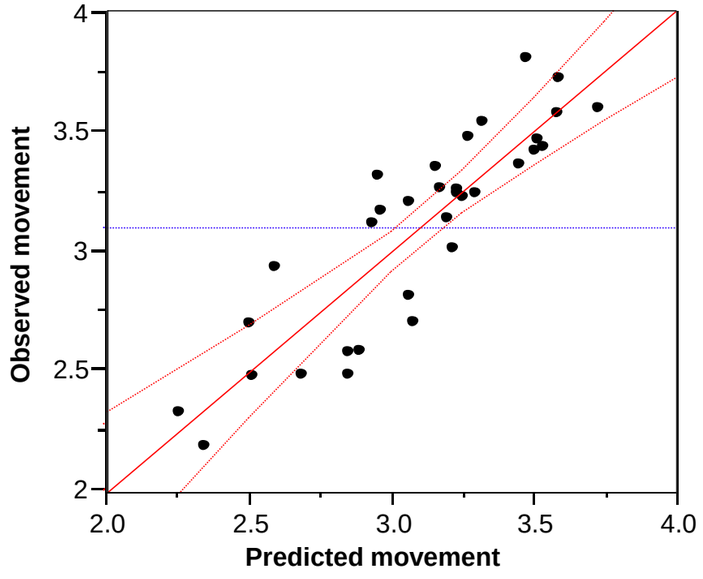



**Transport attraction**
**Weekday All Day Avg R square = 26%**



**Land use attraction**
**Weekday All Day Avg R square = 23%**

**Weekday All Day Avg R square [1] = 78%**




**Parameter Estimates**

| Term | Estimate | Std Error | t Ratio | Prob>\|t\| | |
|---|---|---|---|---|---|
| Intercept | -0.811124 | 0.569967 | -1.42 | 0.1654 | |
| Active_Both[1-0] | 0.1696789 | 0.079517 | 2.13 | 0.0414 | **Land use** |
| log_DD_2 | 0.5022315 | 0.131007 | 3.83 | 0.0006 | **Transport** |
| NACh1200 | 1.4551695 | 0.205019 | 7.10 | <.0001 | **Spatial Layout** |

The observed movement in the study area around the site has a good level of correspondence with the spatial accessibility values of the street network.

**The statistical correlation analysis for each variable individually showed that 59% of the observed movement can be explained based solely on Spatial Layout Attraction.**

The inclusion of transport and land use attraction in the model improves the correlation.

The following variables were found to have an influence on pedestrian movement:

1. Spatial accessibility at 1,200m

2. Linear Distance Decay from London Bridge Station entrances

3. Active ground level land use/ entrances.

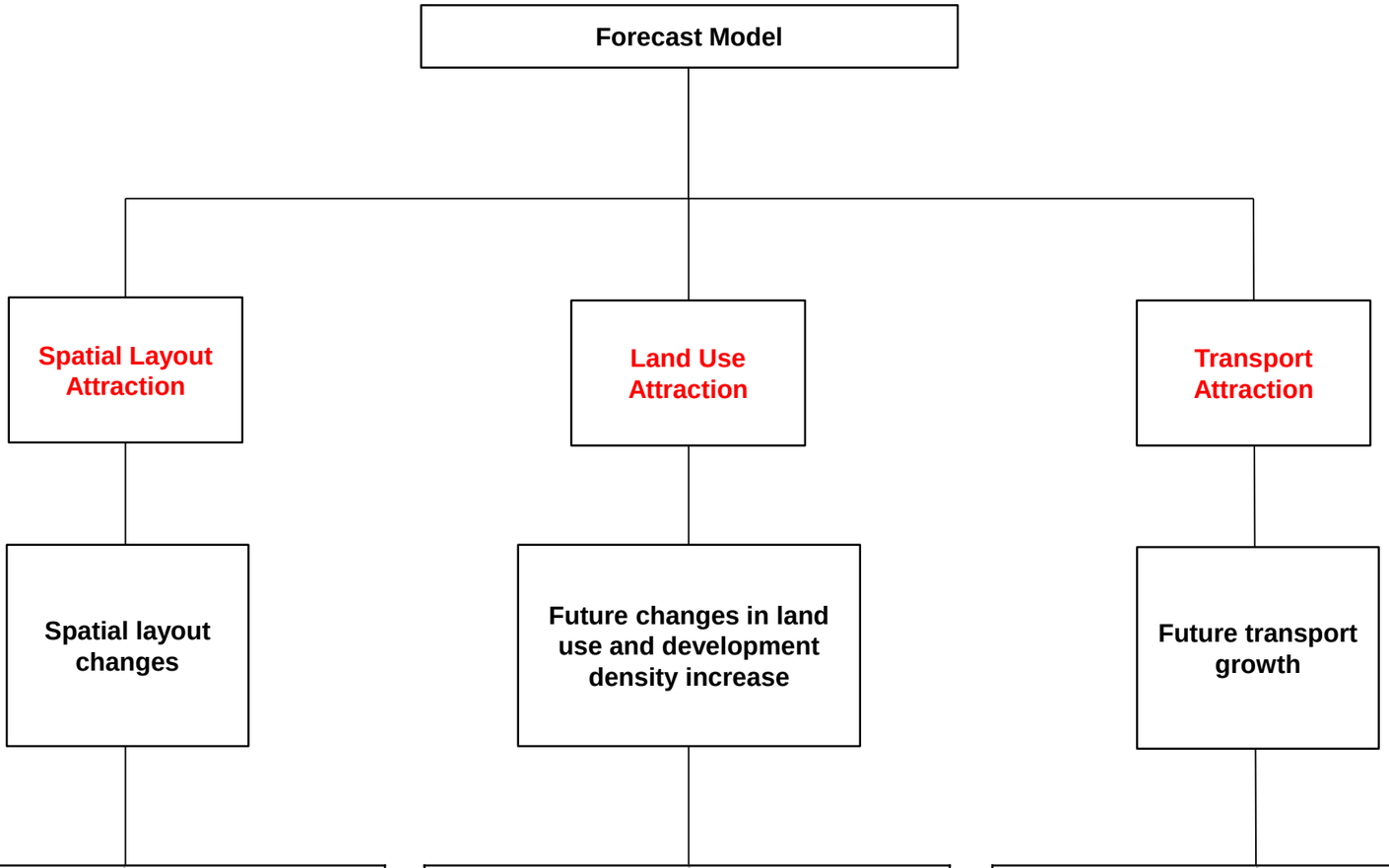
The inclusion of additional variables results in a higher correlation where **78% of the observed movement can be explained by the model.**

The graph to the left shows the fit between the modelled and observed data.

The values of **t-ratio** [1] highlighted in the Parameter Estimates table (below the graph) show that the most significant variable in the models is the spatial layout, followed by transport and land use.

[1] See Glossary- Appendix 2

# Pedestrian movement forecast




| Data input | Source |
|---|---|
| New City Court scheme | AHMM |
| Selected committed developments | LB Southwark |

| Data input | Source |
|---|---|
| New City Court scheme active uses | AHMM |
| Selected committed developments active uses | LB Southwark |
| New City Court scheme trip generation and modal split | TPP |

| Data input | Source |
|---|---|
| London Bridge projected station demand (per entrance) | TfL, Network Rail Infrastructure Investment Thameslink Programme, June 2011[1] |

The calibrated Pedestrian Movement Model has been used as a Forecast Model to evaluate how changes in spatial layout, land use and the transport growth will impact pedestrian movement patterns under two scenarios:

**Scenario 1:**
**2031 Future baseline - Do nothing scenario**
All Day Average and AM Peak

**Scenario 2:**
**2031 Future baseline with New City Court scheme**
All Day Average and AM Peak.

The chart on the left shows data used in the model.

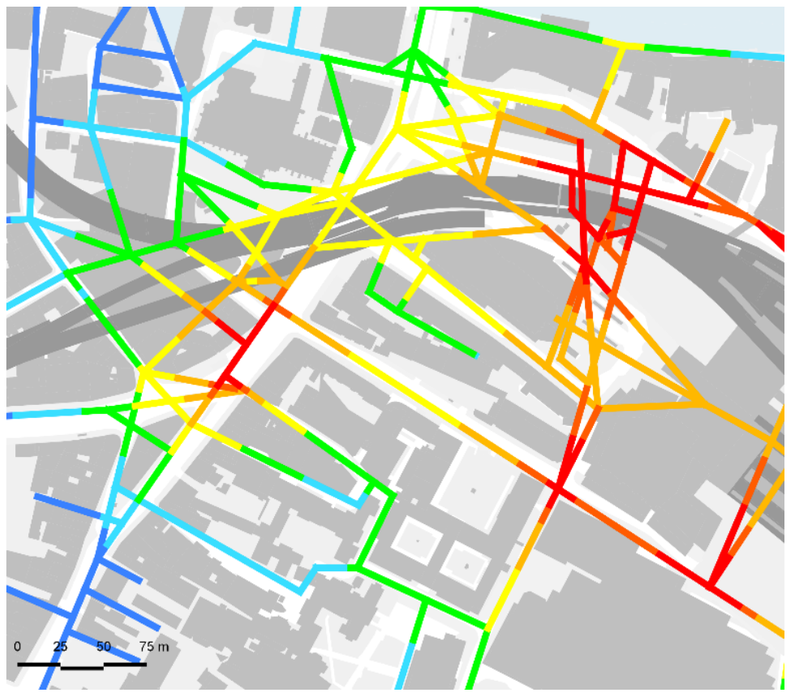
**Notes**
[1] See Appendix 5

# Pedestrian movement forecast Scenario 1 2031 Future baseline - Do nothing

Crown copyright. OS Licence No 0100192252

**Spatial Layout Attraction**
**Future baseline model**
**Spatial accessibility r1,200**

**Land use attraction**
**Future developments**
**Active ground level land use/ entrances.**




**Transport attraction**
**Future transport growth**
**Linear Distance Decay from London Bridge Station entrances**

Selected number of planned developments which propose changes to the street network connectivity. These include:
1. London Bridge
2. Low Line
3. Fielden House apartments
4. 1 Tower Bridge apartments
5. KCL Science Gallery
6. The Quill apartments
7. Guy's Cancer Centre
8. Brandon House
9. 185 Park Street

TfL's predicted footfall distribution for the total commuter forecast in 2031. TfL's prediction is based on RODS 2016 and Railplan 2031 combined Standard Forecasting approach (source TfL).

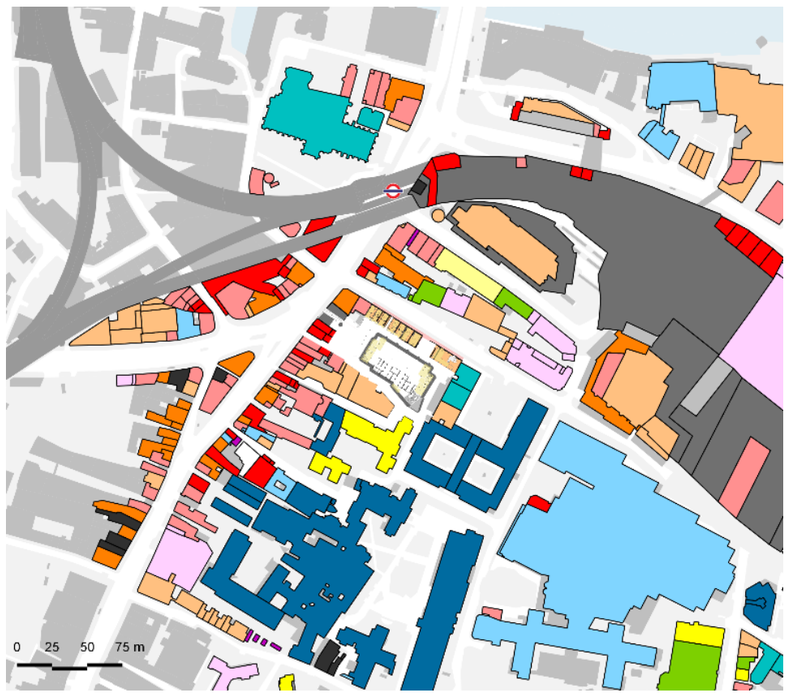
Network Rail, Infrastructure Investment Thameslink Programme, London Bridge Station, June 2011

# Pedestrian movement forecast Scenario 2 2031 Future baseline with New City Court

Crown copyright. OS Licence No 0100192252

**Spatial Layout Attraction**
**Future baseline and New City Court scheme model**
**Spatial accessibility r1,200**

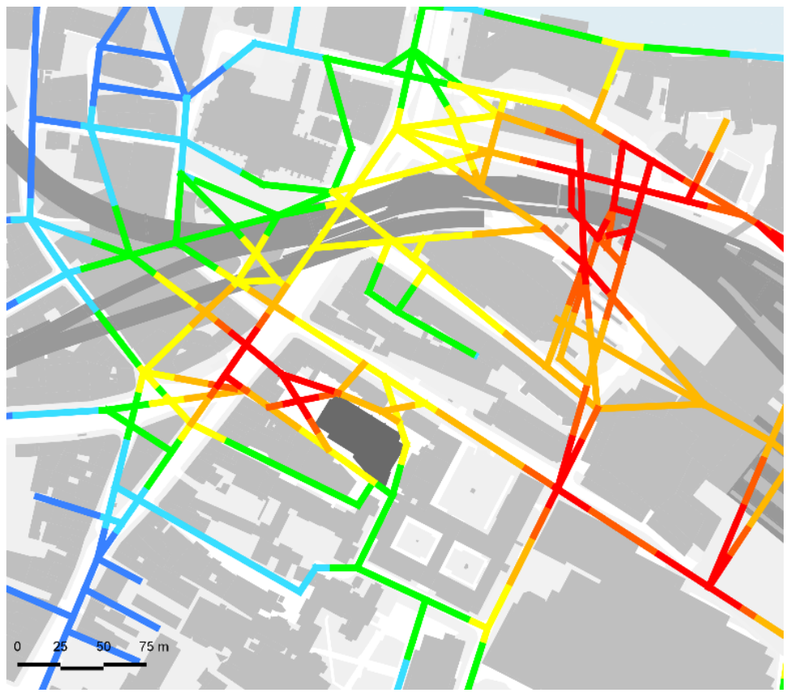
Selected number of planned developments which propose changes to the street network connectivity. These include:
1. London Bridge
2. Low Line
3. Fielden House apartments
4. 1 Tower Bridge apartments
5. KCL Science Gallery
6. The Quill apartments
7. Guy's Cancer Centre
8. Brandon House
9. 185 Park Street




**Land use attraction**
**Future developments and New City Court scheme**
**Active ground level land use/ entrances.**
**New City Court development density increase**

Active frontages as a result of the future developments and the New City Court scheme.

New City Court scheme trip generation and modal split data.



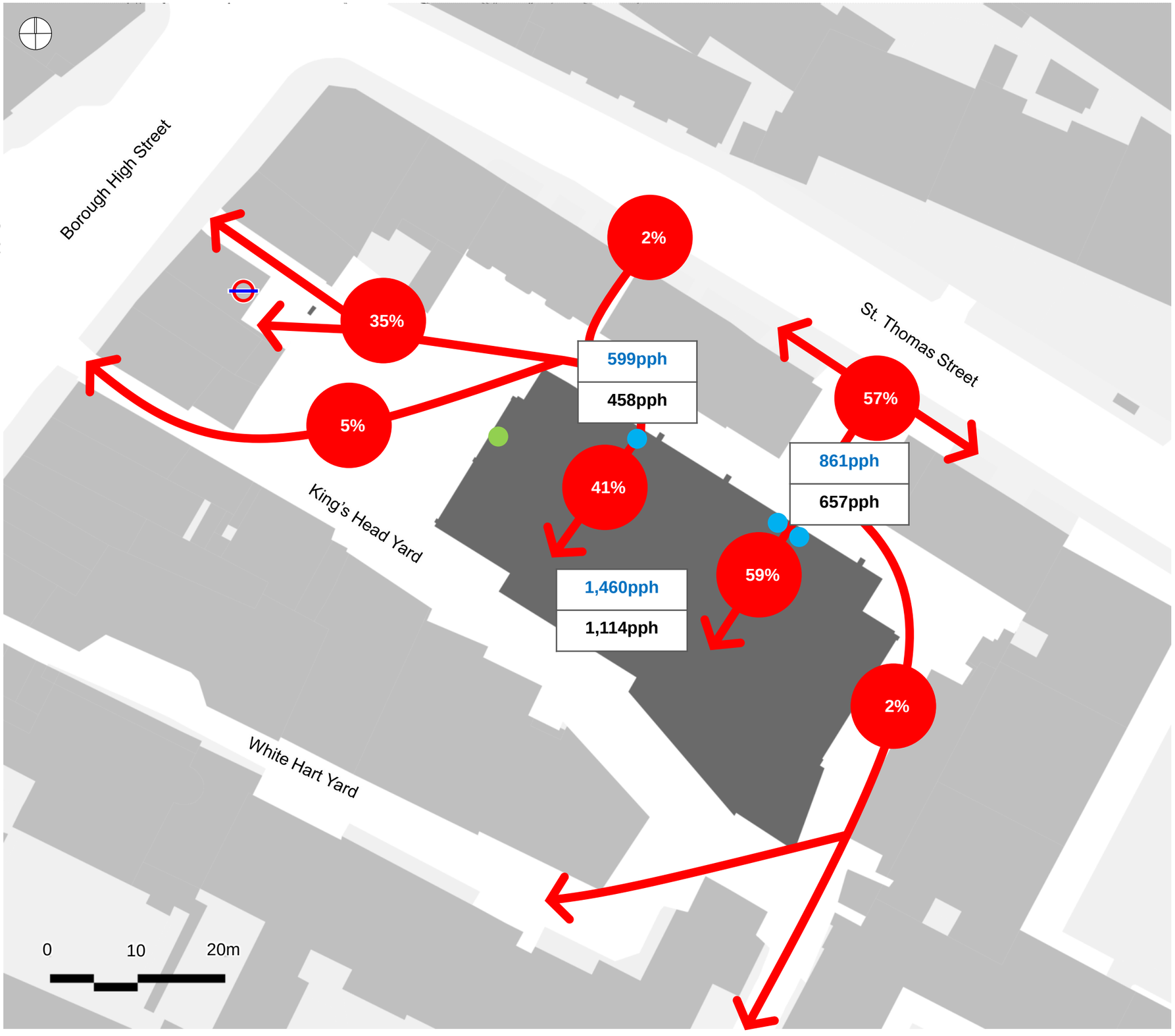

**Transport attraction**
**Future transport growth**
**Linear Distance Decay from London Bridge Station entrances**

TfL's predicted footfall distribution for the total commuter forecast in 2031. TfL's prediction is based on RODS 2016 and Railplan 2031 combined Standard Forecasting approach (source TfL).

Network Rail, Infrastructure Investment Thameslink Programme, London Bridge Station, June 2011

# Pedestrian demand analysis New City Court office trips distribution

Crown copyright. OS Licence No 0100192252




The image shows the expected AM peak and all day average demand flow in and out of New City Court (NCC) scheme.

The AM peak (08:30-09:30) demand in and out of the NCC is 1,460pph and the all day average pedestrian demand is 1,114pph (excluding bicycle trips). The peak demand is based on TPP's trip generation and mode split data for a 5.6% cycle modal split for the NCC (see Appendix 5). The 5.6% cycle modal split was used instead of the 25% in order to assess a worst case scenario for pedestrian demand.

The distribution of movement for each of the office entrances is based on the mode split table provided by TPP (see Appendix 5). The same distribution has been assumed for AM peak and all day average.

160 people per hour (pph) have been added at the Garden entrance to the tower and distributed using the same mode split as the office trips.

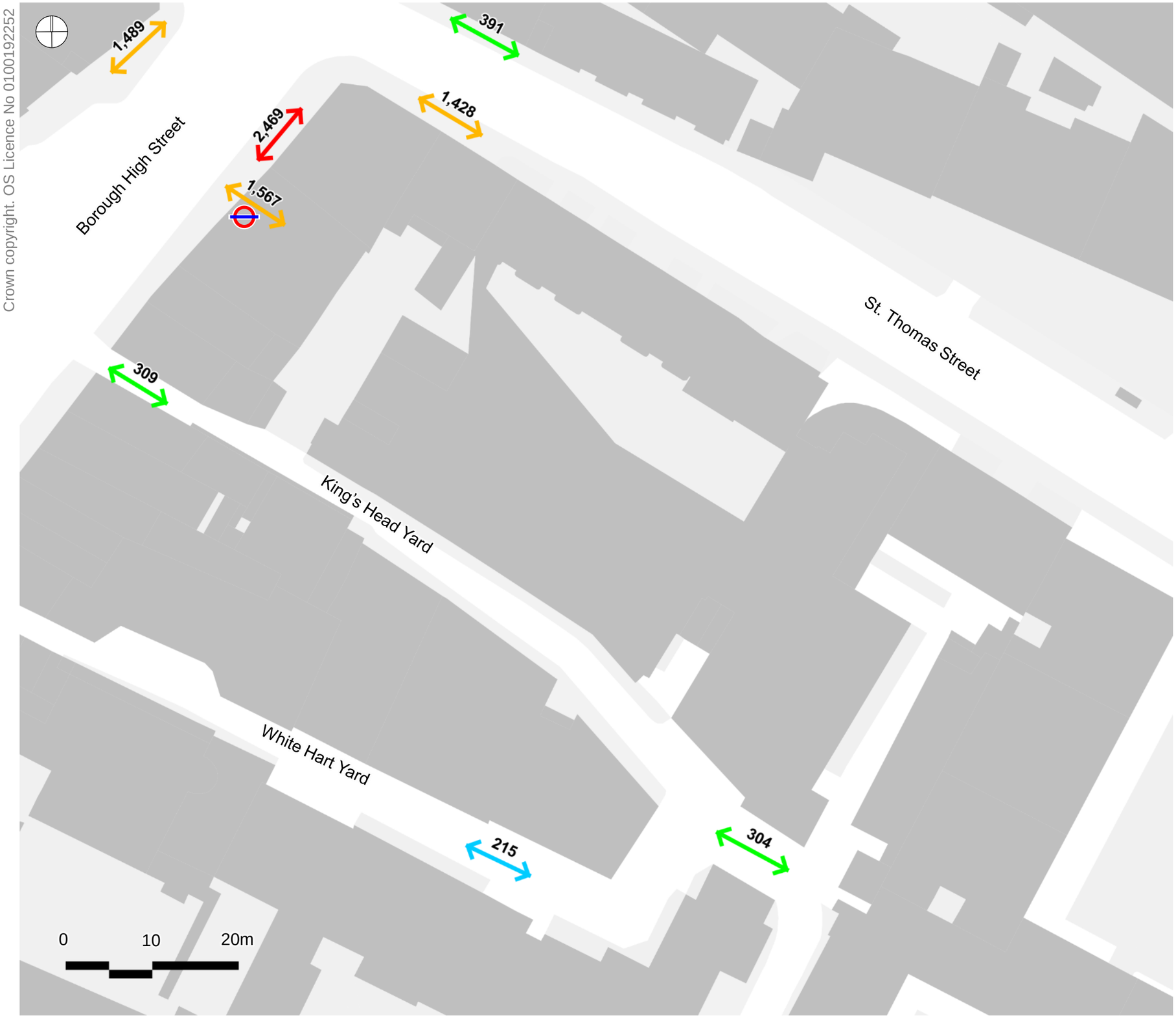
| NCC AM peak trips (in/out excluding bicycles) |
| --- |
| **NCC All day average trips (in/out)** |

- Office entrances
- Garden entrance
- Underground
- Pedestrian movement lines

Space Syntax Limited © 2018

# Pedestrian movement 2016 Baseline All day average weekday

Crown copyright. OS Licence No 0100192252




The eastern footway of Borough High Street was the busiest location in the immediate context of the site, with all day average movement levels at 2,469pph.

The southern footway of St Thomas Street was also busy with significantly higher movement than the northern one.

King's Head Yard and White Hart Yard were relatively quieter, but were well used.

**Note:**
London Bridge Station was under redevelopment during the surveys and the new southern exit on St Thomas Street was not open.

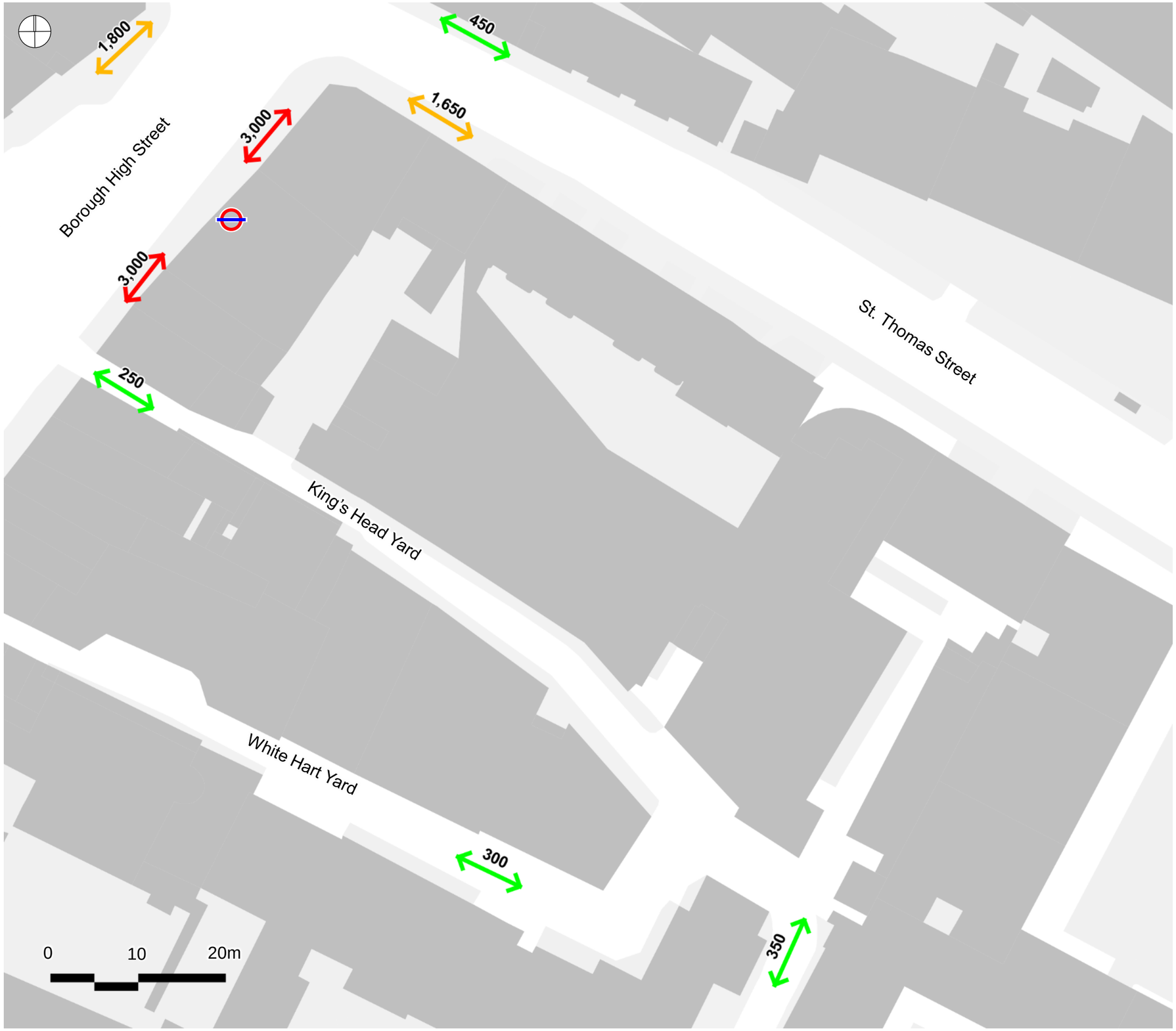
**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100
- Underground

Space Syntax Limited © 2018

# Pedestrian movement 2031 Future baseline - Do nothing All day average weekday

Crown copyright. OS Licence No 0100192252




The image shows the results of the cumulative impact on all day average pedestrian movement patterns of:

a) changes to the layout (planned developments)

b) changes in active ground level land use/ entrance (planned developments)

c) future transport growth (London Bridge projected station demand).

The pedestrian movement forecast for the "do nothing" scenario shows a significant increase of movement along Borough High Street and St Thomas Street.

**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100
- Underground

Space Syntax Limited © 2018

# Pedestrian movement 2031 Future baseline with New City Court All day average weekday

Crown copyright. OS Licence No 0100192252

The image shows the results of the cumulative impact on all day average pedestrian movement patterns of:

a) changes to the layout (planned developments and New City Court scheme)

b) changes in active ground level land use/ entrance (planned developments and New City Court scheme)

c) future transport growth (London Bridge projected station demand)

d) New City Court all day average trips

The additional permeability of the proposed New City Court scheme improves permeability and circulation choices. The result is a more even distribution of movement relieving pressure off Borough High Street and St Thomas Street.

Office entrances

**Pedestrian movement**
People per hour

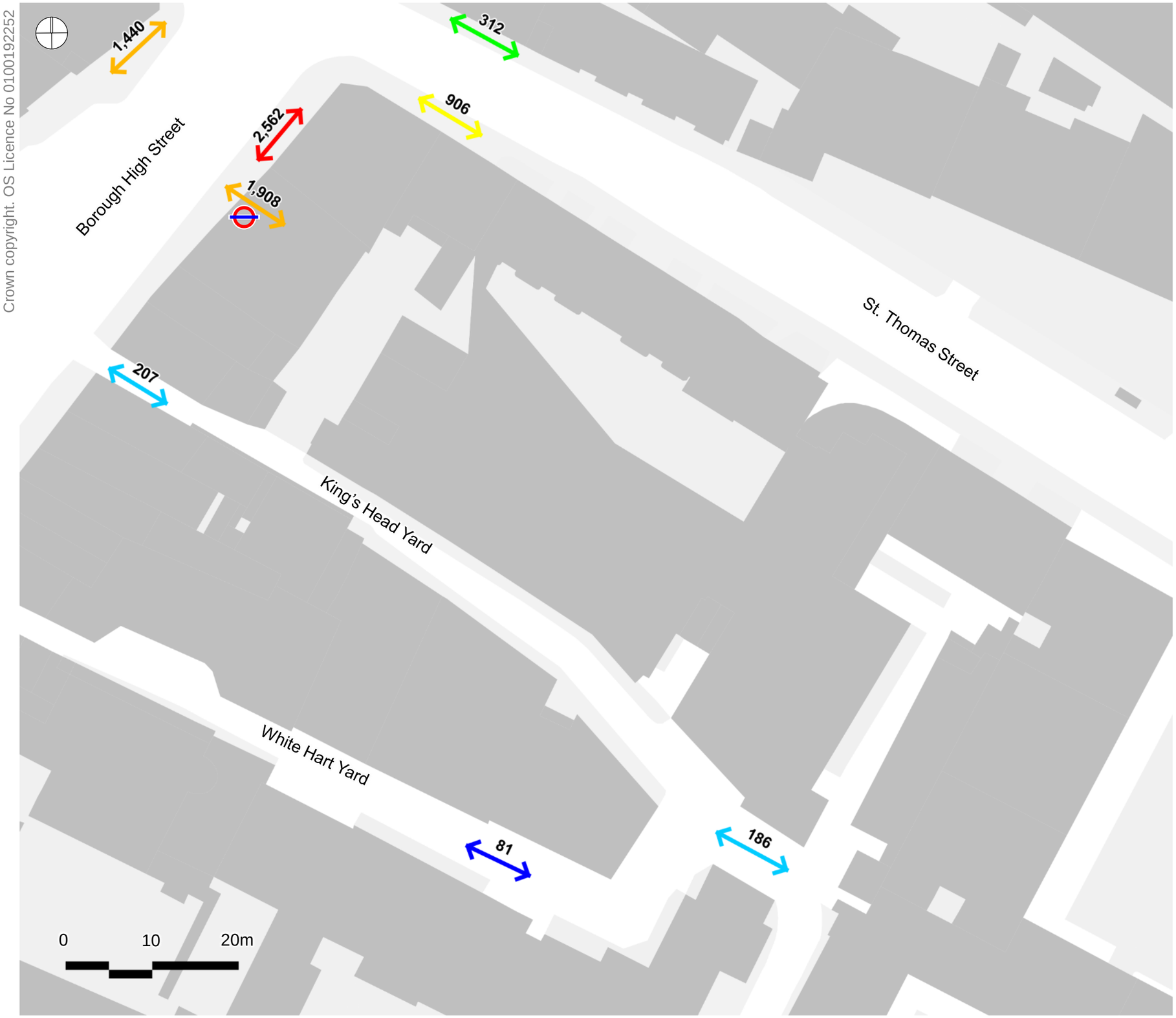
- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

Underground

Space Syntax Limited © 2018

# Pedestrian movement 2016 Baseline AM Peak

Crown copyright. OS Licence No 0100192252

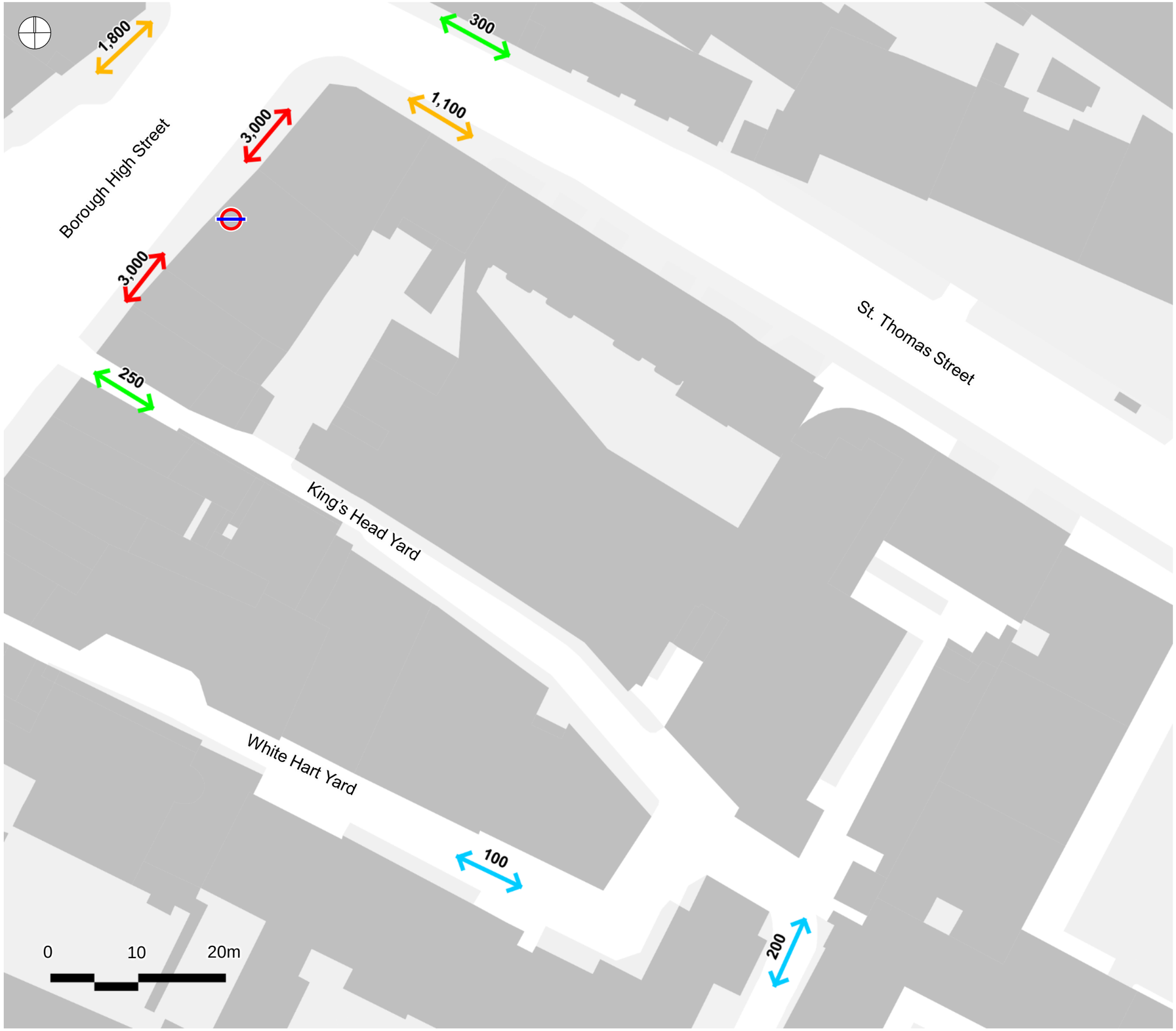



**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100
- Underground

# Pedestrian movement 2031 Future baseline - Do nothing AM Peak

Crown copyright. OS Licence No 0100192252




The image shows the results of the cumulative impact on AM Peak pedestrian movement patterns of:

a) changes to the layout (planned developments)

b) changes in active ground level land use/ entrance (planned developments)

c) future transport growth (London Bridge projected station demand).

**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100
- Underground

Space Syntax Limited © 2018

# Pedestrian movement 2031 Future baseline with New City Court AM Peak

Crown copyright. OS Licence No 0100192252

The image shows the results of the cumulative impact on AM Peak pedestrian movement patterns of:

a) changes to the layout (planned developments and New City Court scheme)

b) changes in active ground level land use/ entrance (planned developments and New City Court scheme)

c) future transport growth (London Bridge projected station demand)

d) New City Court AM Peak trips

Office entrances

**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

Underground

Space Syntax Limited © 2018

# Pedestrian Comfort Level Assessment

**2016 Baseline**

**Scenario 1: 2031 Future baseline - Do nothing**

**Scenario 2: 2031 Future baseline with New City Court**

# TfL Pedestrian Comfort Level on Footways Methodology

**Pedestrian Comfort Level**

The Level of Service (LoS) at key locations has been assessed using the Pedestrian Comfort Levels (PCL) assessment developed by Transport for London (TfL) (Transport for London, 2010. Pedestrian Comfort Level Guidance, London: Transport for London).

PCL is an indicator of comfort in relation to the usable footway width.

PCL is based on the pedestrian density in relation to footway width. It is calculated as people per minute per metre (ppmm). The resulting scores are graded into six ranges from comfortable (A) to very uncomfortable (E) as shown to the right. For example: 1,088 (pedestrians per hour) ÷ 60 (minutes per hour) = 18.13 (pedestrians per minute) ÷ 9.6 (effective width of route in metres) ≈ 1.89 ppmm = A+.

TfL Spreadsheet Version 1.4 has been used to assess Pedestrian Comfort Levels. Average Flow is used for average PCL and Peak Hour Flow for Peak PCL.

**Pavement width**

PCL can be applied to different footway conditions found in urban environments. Effective width is estimated by adapting gross width by taking into account unusable spaces related to furniture and/or obstructions according to a set of rules which include:

1) a 20 cm buffer is deducted from the clear footway width from kerb edges, guard railings or building edges/walls;
2) a 20 cm buffer is deducted from stationary objects; and
3) any width under 60 cm is considered unusable.

In this assessment, where street furniture/objects are shown in the layout, the assessment of effective width of footway makes allowance for these.

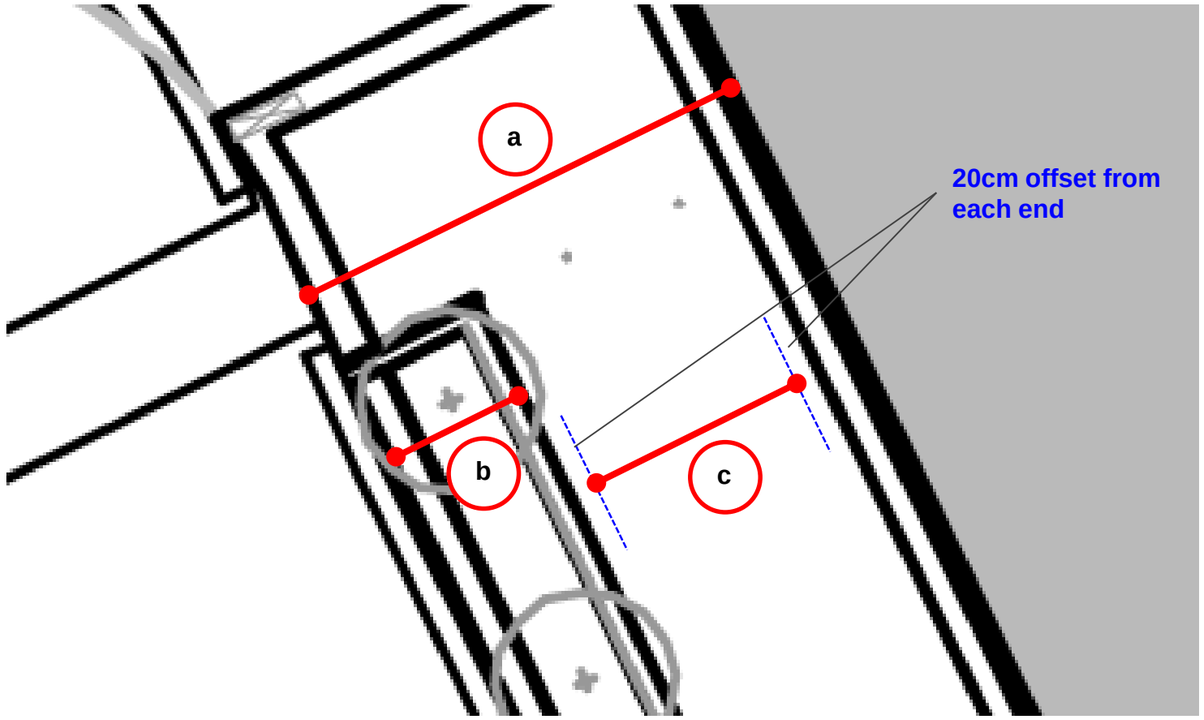
The figure to the right shows an example of a location assessment.
Total width (a) = 7.50 metres
Planter width (b) = 2.36 metres
Effective width = (a) – (b) – 0.2 (from the A1 building edge) – 0.2 (from the planter)
= 4.74 metres.

**Pedestrian Comfort Levels**

TfL recommended minimum for High Street

| | | |
|---|---|---|
| A+ | < 3 ppmm | comfortable |
| A | 3 - 5 ppmm | |
| A- | 6 - 8 ppmm | |
| B+ | 9 - 11 ppmm | |
| B | 12 - 14 ppmm | |
| B- | 15 - 17 ppmm | |
| C+ | 18 - 20 ppmm | |
| C | 21 - 23 ppmm | |
| C- | 24 - 26 ppmm | |
| D | 27 - 35 ppmm | |
| E | > 35 ppmm | very uncomfortable |

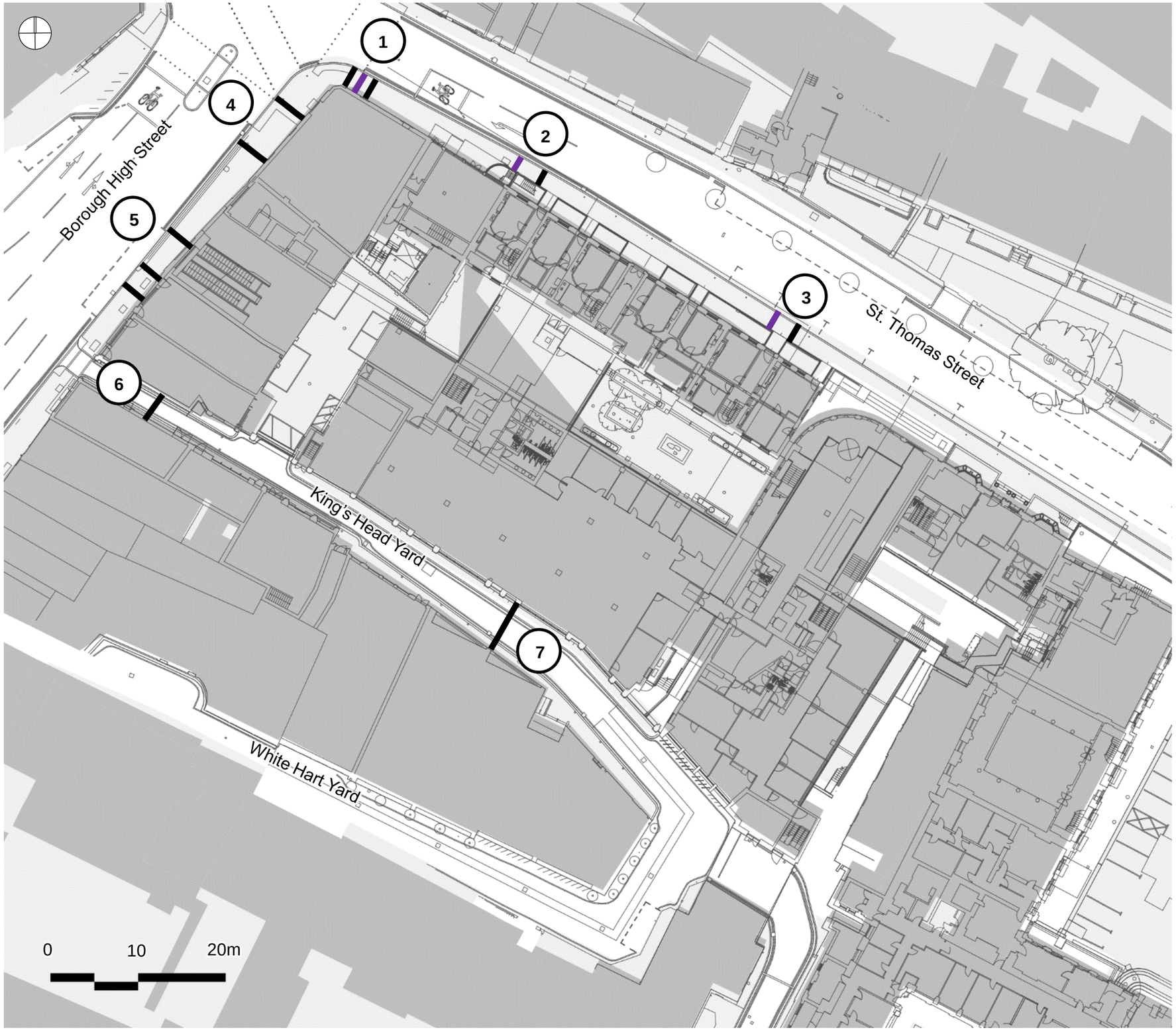
**Pavement width calculation**




Space Syntax Limited © 2018

# Pedestrian Comfort Level Assessment Locations 2016 Baseline and Do nothing scenario

Crown copyright. OS Licence No 0100192252




The PCL for the Existing and Do nothing scenario has been assessed at 7 key locations.

The footway width at locations 1-5 varies due to street furniture and other obstructions such as railings, sign posts, bollards etc. resulting in a reduction of the effective width used for movement.

Different points of this locations were therefore measured in order to assess the pinch points as well as the average footway width.

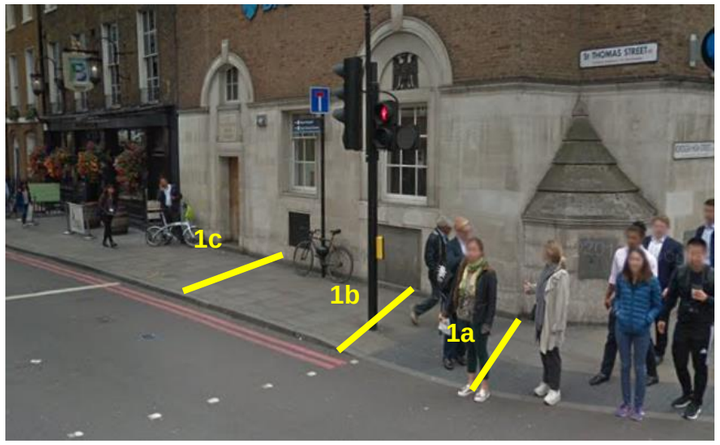
Three points - highlighted in purple – have an effective footway width of less than 1.50m, the acceptable minimum to allow wheelchair users and a walking person to pass each other[1].

[1] Transport for London (TfL), 2010. Pedestrian Comfort Guidance for London.

PCL assessment locations

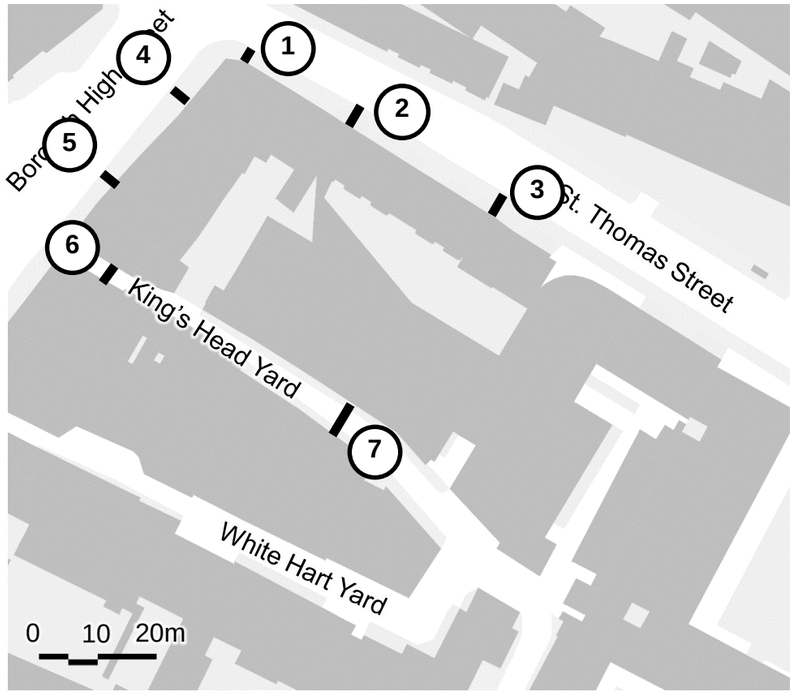
# Pedestrian Comfort Level Assessment Locations 2016 Baseline and Do nothing scenario

Crown copyright. OS Licence No 0100192252




**Location 1**
**1a**
Total width: 2.60m
Effective width: 2.20m
**1b**
Total width: 2.60m (traffic light)
Effective width: 1.30m
**1c**
Total width: 2.70m
Effective width: 2.30m

**Location 2**
**2a**
Total width: 1.90m (bollard)
Effective width: 0.90m
**2b**
Total width: 2.0m
Effective width: 1.60m



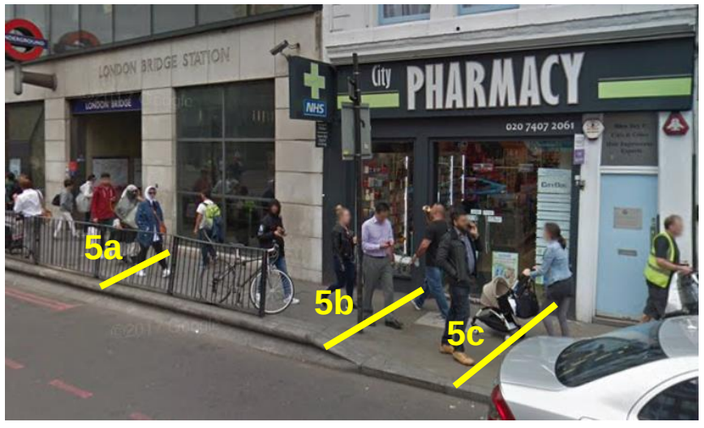
**Location 3**
**3a**
Total width: 2.10m (bollard)
Effective width: 1.20m
**3b**
Total width: 2.10m
Effective width: 1.70m

**Location 4**
**4a**
Total width: 4.10m (traffic light and box)
Effective width: 2.50m
**4b**
Total width: 3.80m (lamp post and railing)
Effective width: 2.40m

Footway widths are based on measurements from CAD Survey Drawing- Existing Level00 (14032_X_(01)_P120) provided by AHMM.

# Pedestrian Comfort Level Assessment Locations 2016 Baseline and Do nothing scenario

Crown copyright. OS Licence No 0100192252




**Location 5**

**5a**

Total width: 3.40m (railing)
Effective width: 2.40m

**5b**

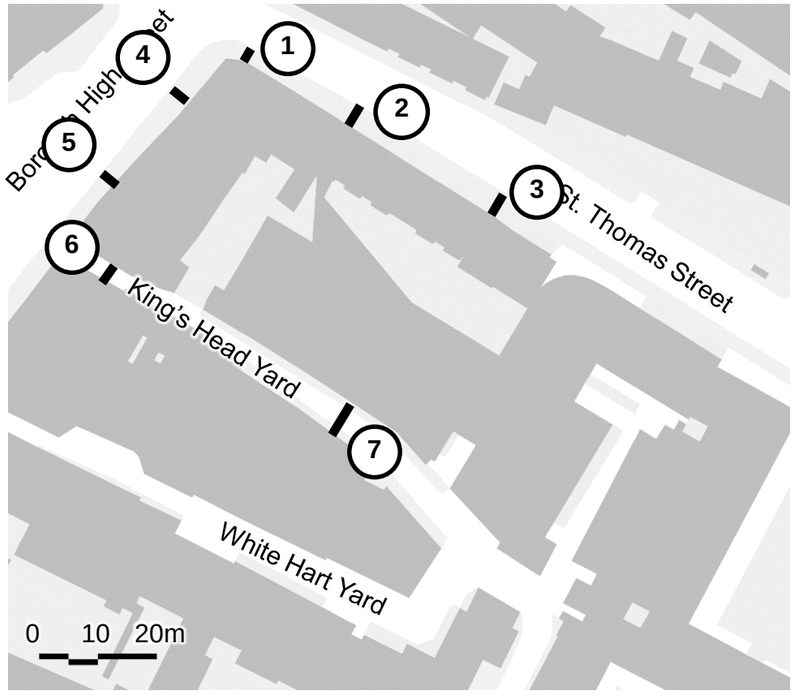
Total width: 3.10m (sign post and railing)
Effective width: 1.80m

**5c**

Total width: 2.90m
Effective width: 2.50m

**Location 6**

Total width: 2.70m (full street width-shared space)
Effective width: 2.30m



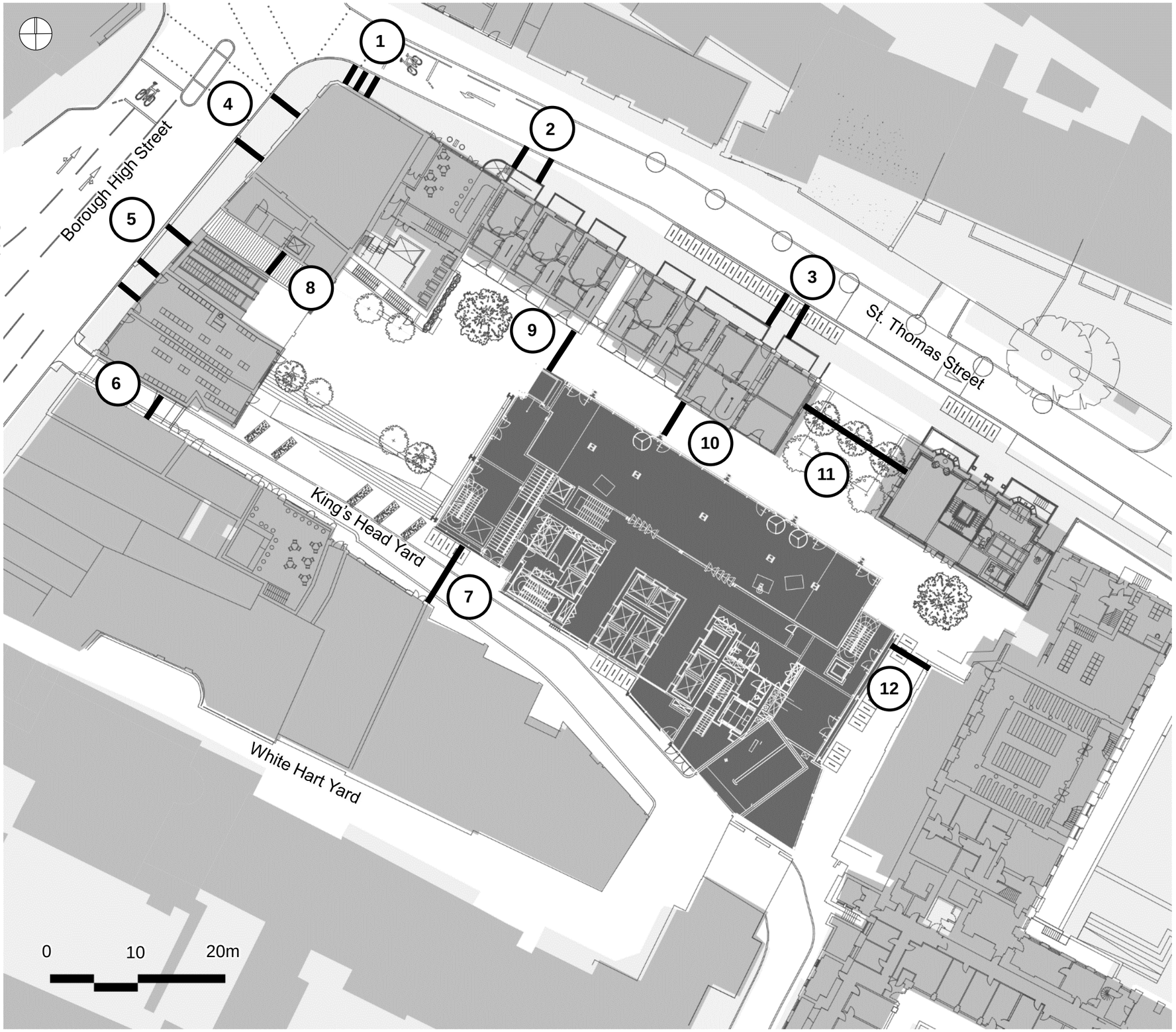
**Location 7**

Total width: 5.70m (bollard) (full street width-shared space)
Effective width: 4.4m

Footway widths are based on measurements from CAD Survey Drawing- Existing Level00 (14032_X_(01)_P120) provided by AHMM.

# Pedestrian Comfort Level Assessment Locations New City Court scheme

Crown copyright. OS Licence No 0100192252




Footway widths at locations 1, 4, 5 and 6 are the same for the Existing, Do nothing and New City Court scheme scenarios.

The width at locations 2 and 3 has increased as a result of the widening of the footway along St Thomas Street.

The PCL for the future layout scenario has five new locations (8-12). The proposed landscape design has been taken into account in the assessment.

PCL assessment locations

# Pedestrian Comfort Level assessment 2016 Baseline

Crown copyright. OS Licence No 0100192252

| Location | Street width (m) | | Movement (pph) | | PCL (ppmm) | | PCL | |
|---|---|---|---|---|---|---|---|---|
| | Total Width | Effective Width | Average | AM Peak Hour | Average | AM Peak | Average | AM Peak |
| **1a** | 2.6 | 2.2 | 1,428 | 906 | 11 | 7 | B+ | A- |
| **1b** | 2.6 | 1.3 | 1,428 | 906 | 18 | 12 | F | F |
| **1c** | 2.7 | 2.3 | 1,428 | 906 | 10 | 7 | B+ | A- |
| **2a** | 1.9 | 0.9 | 1,428 | 906 | 26 | 17 | F | F |
| **2b** | 2 | 1.6 | 1,428 | 906 | 15 | 9 | B- | B+ |
| **3a** | 2.1 | 1.2 | 1,428 | 906 | 20 | 13 | F | F |
| **3b** | 2.1 | 1.7 | 1,428 | 906 | 14 | 9 | B | B+ |
| **4a** | 4.1 | 2.5 | 2,469 | 2,562 | 16 | 17 | B- | B- |
| **4b** | 3.8 | 2.4 | 2,469 | 2,562 | 17 | 18 | B- | C+ |
| **5a** | 3.4 | 2.4 | 2,469 | 2,562 | 17 | 18 | B- | C+ |
| **5b** | 3.1 | 1.8 | 2,469 | 2,562 | 23 | 24 | C | C- |
| **5c** | 2.9 | 2.5 | 2,469 | 2,562 | 16 | 17 | B- | B- |
| **6** | 2.7 | 2.3 | 309 | 207 | 2 | 2 | A+ | A+ |
| **7** | 5.7 | 4.4 | 309 | 207 | 1 | 1 | A+ | A+ |

**Table 1 Pedestrian Comfort Level - Existing**

Locations 1b, 2a and 3a have an effective footway width of less than 1.50m, which is the acceptable minimum to allow wheelchair users and a walking person to pass each other[1].

The PCL at location 5b was less than the TfL recommended minimum for Office and Retail areas during both All day average and AM peak time.

**Figure 1 Level of Service assessment locations (AM Peak)**

**Legend 1 Pedestrian Comfort Levels**

TfL recommended minimum for Office and Retail areas

- A+ comfortable
- A
- A-
- B+
- B
- B-
- C+
- C
- C-
- D
- E very uncomfortable
- F effective width < 1.50m

[1] Transport for London (TfL), 2010. Pedestrian Comfort Guidance for London.

# Pedestrian Comfort Level assessment 2031 Future baseline - Do nothing

Crown copyright. OS Licence No 0100192252

| Location | Street width (m) | | Movement (pph) | | PCL (ppmm) | | PCL | |
|---|---|---|---|---|---|---|---|---|
| | Total Width | Effective Width | Average | AM Peak Hour | Average | AM Peak | Average | AM Peak |
| **1a** | 2.6 | 2.2 | 1,650 | 1,100 | 13 | 8 | B | A- |
| **1b** | 2.6 | 1.3 | 1,650 | 1,100 | 21 | 14 | F | F |
| **1c** | 2.7 | 2.3 | 1,650 | 1,100 | 12 | 8 | B | A- |
| **2a** | 1.9 | 0.9 | 1,650 | 1,100 | 31 | 20 | F | F |
| **2b** | 2 | 1.6 | 1,650 | 1,100 | 17 | 11 | B- | B+ |
| **3a** | 2.1 | 1.2 | 1,650 | 1,100 | 23 | 15 | F | F |
| **3b** | 2.1 | 1.7 | 1,650 | 1,100 | 16 | 11 | B- | B+ |
| **4a** | 4.1 | 2.5 | 3,000 | 3,000 | 20 | 20 | C+ | C+ |
| **4b** | 3.8 | 2.4 | 3,000 | 3,000 | 21 | 21 | C | C |
| **5a** | 3.4 | 2.4 | 3,000 | 3,000 | 21 | 21 | C | C |
| **5b** | 3.1 | 1.8 | 3,000 | 3,000 | 28 | 28 | D | D |
| **5c** | 2.9 | 2.5 | 3,000 | 3,000 | 20 | 20 | C+ | C+ |
| **6** | 2.7 | 2.3 | 250 | 250 | 2 | 2 | A+ | A+ |
| **7** | 5.7 | 4.4 | 250 | 250 | 1 | 1 | A+ | A+ |

**Table 2 Pedestrian Comfort Level - 2031 Future baseline - Do nothing**

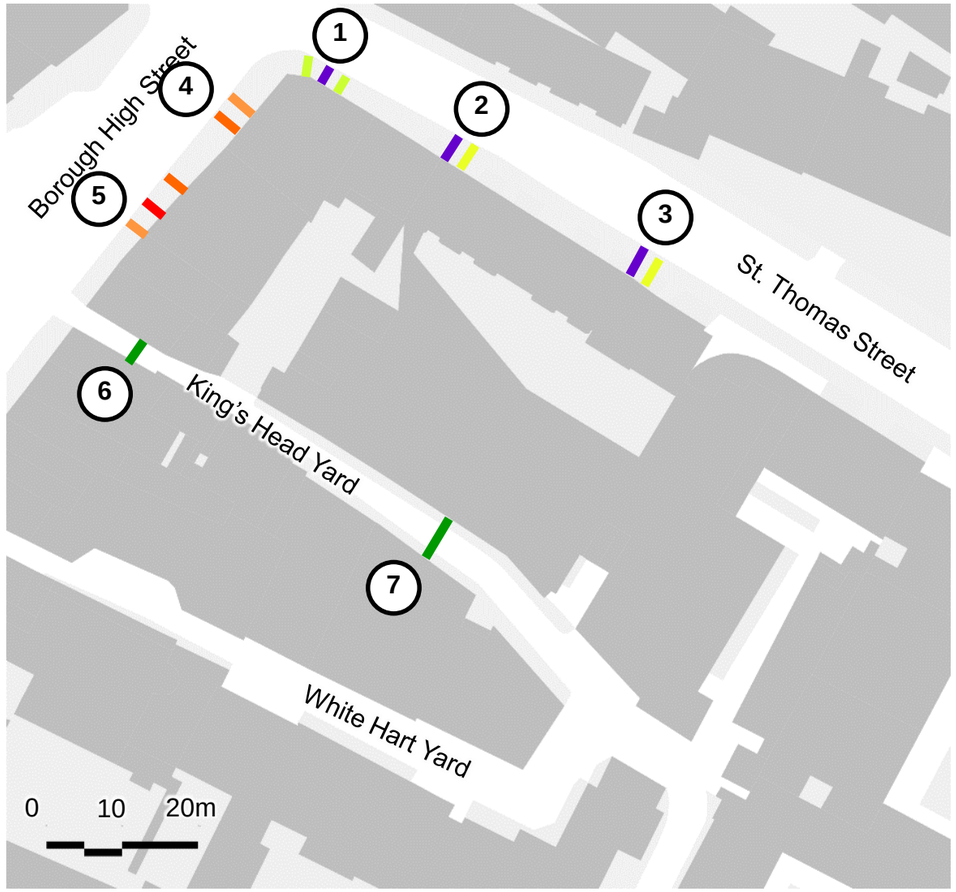



**Figure 2 Level of Service assessment locations (AM Peak)**

Similar to 2016 Baseline, locations 1b, 2a and 3a have an effective footway width of less than 1.50m, which is the acceptable minimum to allow wheelchair users and a walking person to pass each other[1].

Due to the increase of movement levels, there is additional pressure, particularly along the eastern footway of Borough High Street with the PCL at three locations - 4b, 5a and 5c - being less than the TfL recommended minimum for Office and Retail areas during both All day average and AM peak time.

**Legend 1 Pedestrian Comfort Levels**

TfL recommended minimum for Office and Retail areas

- A+ comfortable
- A
- A-
- B+
- B
- B-
- C+
- C
- C-
- D
- E very uncomfortable
- F effective width < 1.50m

[1] Transport for London (TfL), 2010. Pedestrian Comfort Guidance for London.

# Pedestrian Comfort Level assessment 2031 Future baseline with New City Court

Crown copyright. OS Licence No 0100192252

| Location | Street width (m) | | Movement (pph) | | PCL (ppmm) | | PCL | |
|---|---|---|---|---|---|---|---|---|
| | Total Width | Effective Width | Average | AM Peak Hour | Average | AM Peak | Average | AM Peak |
| **1a** | 2.6 | 2.2 | 1,650 | 1,150 | 13 | 9 | B | B+ |
| **1b** | 2.6 | 1.3 | 1,650 | 1,150 | 21 | 15 | F | F |
| **1c** | 2.7 | 2.3 | 1,650 | 1,150 | 12 | 8 | B | A- |
| **2a** | 2.6 | 1.6 | 1,650 | 1,150 | 17 | 12 | B- | B |
| **2b** | 3 | 2.6 | 1,650 | 1,150 | 11 | 7 | B+ | A- |
| **3a** | 4.5 | 1.8 | 1,650 | 1,150 | 15 | 11 | B- | B+ |
| **3b** | 4.5 | 1.8 | 1,650 | 1,150 | 15 | 11 | B- | B+ |
| **4a** | 4.1 | 2.5 | 2,100 | 2,150 | 14 | 14 | B | B |
| **4b** | 3.8 | 2.4 | 2,100 | 2,150 | 15 | 15 | B- | B- |
| **5a** | 3.4 | 2.4 | 2,500 | 2,450 | 17 | 17 | B- | B- |
| **5b** | 3.1 | 1.8 | 2,500 | 2,450 | 23 | 23 | C | C |
| **5c** | 2.9 | 2.5 | 2,500 | 2,450 | 17 | 16 | B- | B- |
| **6** | 2.7 | 2.3 | 700 | 500 | 5 | 4 | A | A |
| **7** | 7.7 | 4.4 | 600 | 500 | 2 | 2 | A+ | A+ |
| **8** | 3.5 | 3.1 | 1,350 | 1,650 | 7 | 9 | A- | B+ |
| **9** | 5.3 | 4.9 | 1150 | 1,200 | 4 | 4 | A | A |
| **10** | 4.3 | 3.9 | 1,300 | 1,200 | 6 | 5 | A- | A |
| **11** | 9.2 | 6.7 | 1,200 | 1,400 | 3 | 3 | A | A |
| **12** | 4.7 | 2.1 | 200 | 250 | 2 | 2 | A+ | A+ |

**Table 3 Pedestrian Comfort Level 2031 Future baseline with New City Court scheme**

All locations within the site boundary are comfortable and well above the minimum recommended.

The additional permeability and the improved public realm that the proposed scheme offers significantly improves the pedestrian comfort levels around the site, by increasing the footway width at locations 2 and 3 and by taking away pressure off Borough High Street.

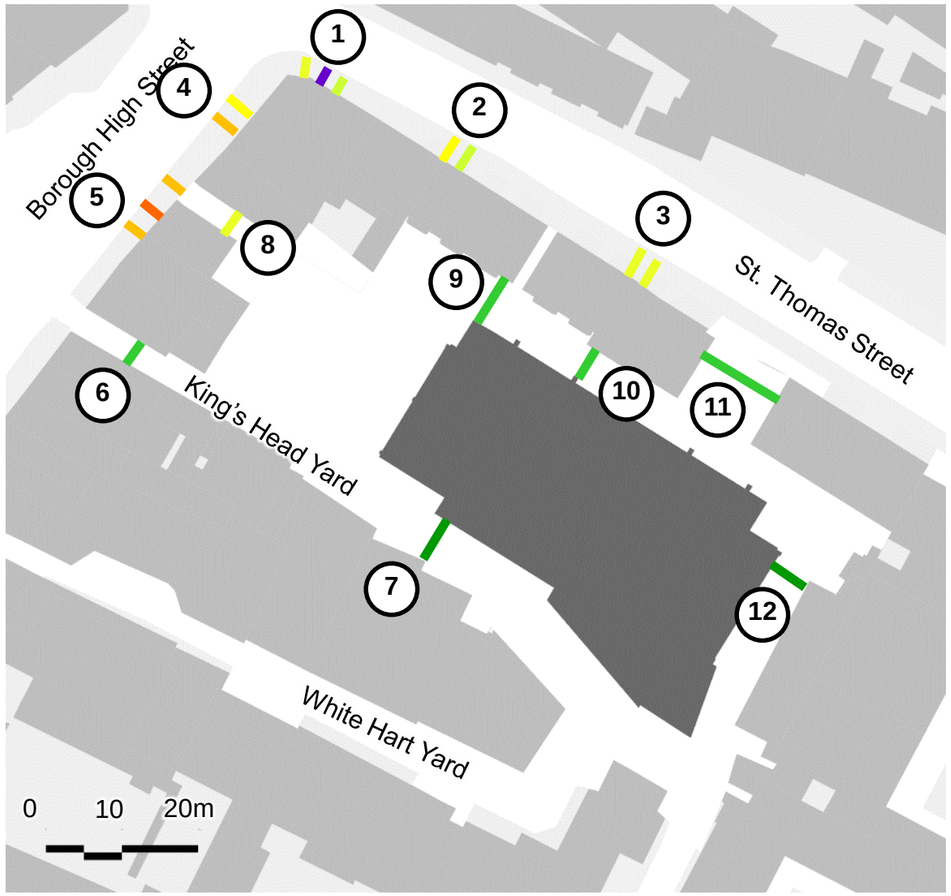



**Figure 3 Level of Service assessment locations (AM Peak)**

**Legend 1 Pedestrian Comfort Levels**

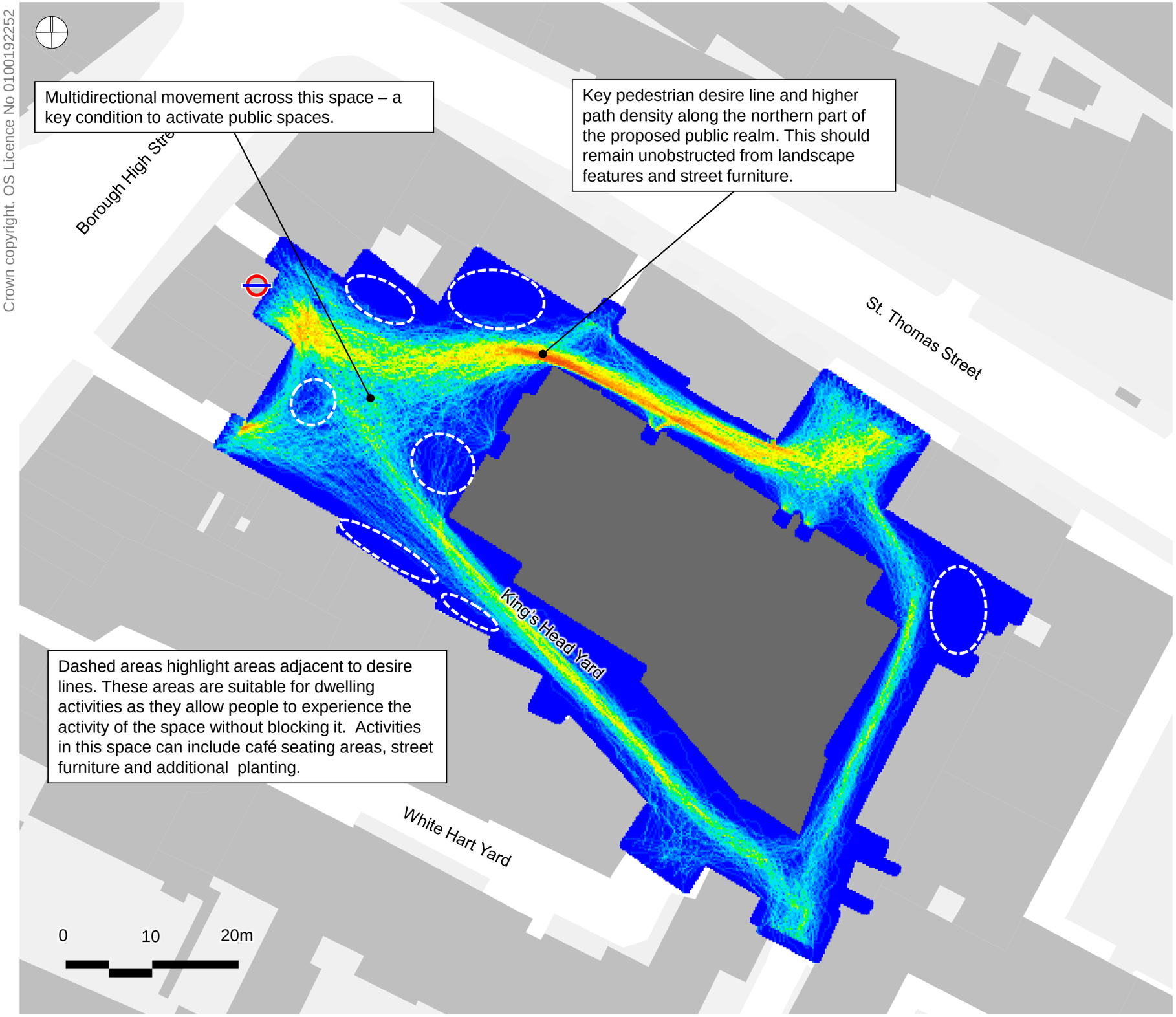
TfL recommended minimum for Office and Retail areas

- A+ comfortable
- A
- A-
- B+
- B
- B-
- C+
- C
- C-
- D
- E very uncomfortable
- F effective width < 1.50m

# Landscape design assessment

# Agent Based Model AM peak Cumulative Tabula rasa

Crown copyright. OS Licence No 0100192252




Agent Based Models (ABM) simulate human behaviour in two key ways. First, individual agents can 'see' and therefore make wayfinding and navigation decisions based on the legibility of the layout. Secondly, agents can be programmed to move between origins and destinations.

The model therefore identifies emergent pedestrian desire lines, in this case for an AM peak scenario.

The model has two components:

**a) through movement**

Movement between all access points of the proposed development, including the LUL entrance (flows are based on the pedestrian movement forecast).

**b) to movement - New City Court development trips**

New City Court development trips between access points and office entrances/ garden entrance (distribution based on pedestrian demand analysis p.15).

The resulting analysis represents the density of movement according to the number of times an agent 'steps' on a specific point. The warmer colours represent higher density of path overlap.

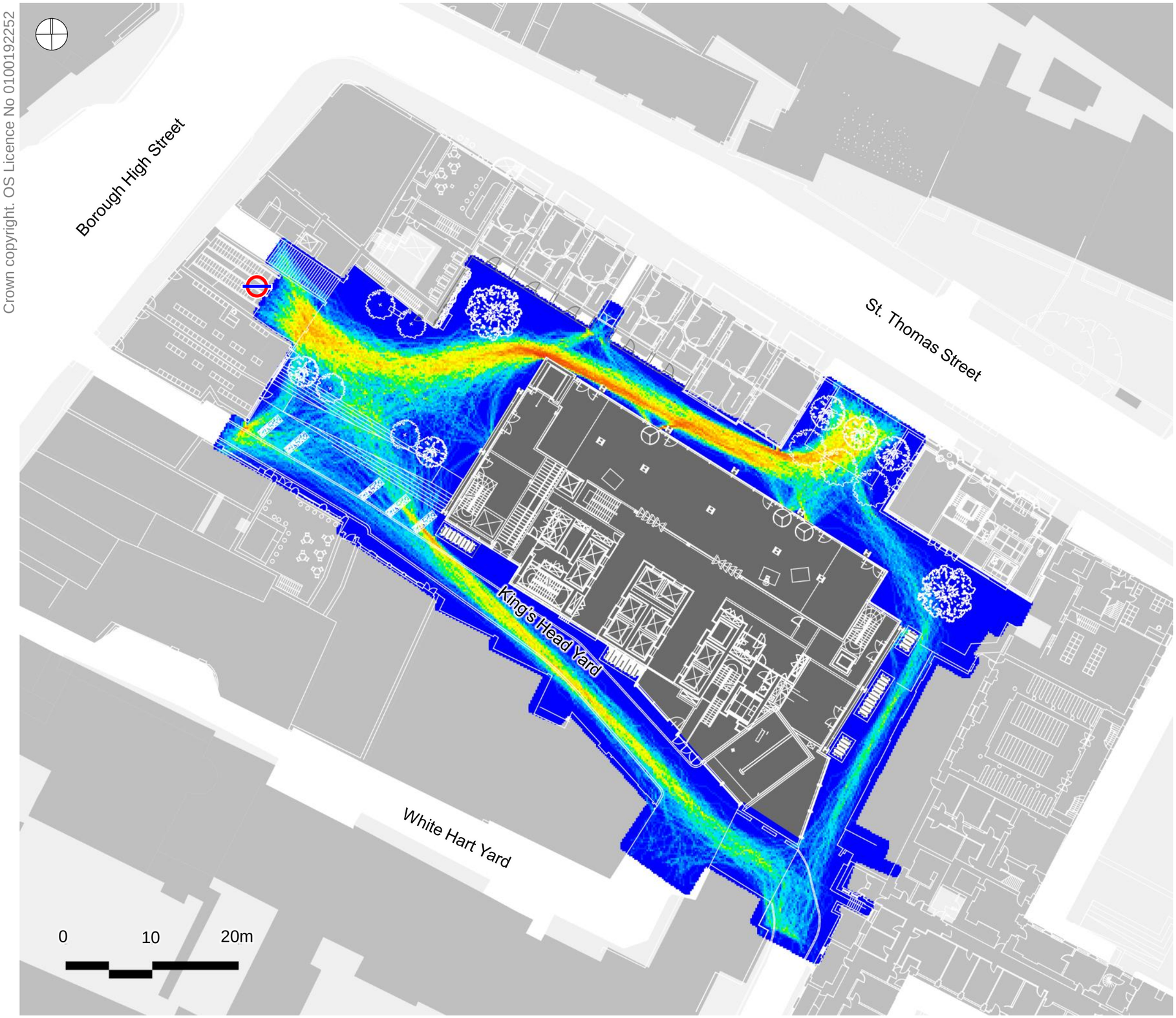
For more details see Appendix 3.

**Path overlap**

low high

# Landscape design assessment Pedestrian desire lines AM peak Design freeze

Crown copyright. OS Licence No 0100192252




The proposed landscape design successfully accommodates the key pedestrian desire lines.

It locates landscape features and furniture at suitable locations that do not obstruct movement lines and allow visibility at key orientation points.

**Path overlap**

low — high

# Appendices

# Appendix 1

**Summary of Urban Baseline Study -**
**Space Syntax, December 2016**

# Key findings Urban form Spatial layout and land use patterns

Crown copyright. OS Licence No 0100192252

**Existing spatial accessibility**
The site sits behind Borough High Street, a key primary north-south route at both city-wide and local scales.

St Thomas Street, Borough High Street, Great Maze Pond and Newcomen Street form the primary local network structure.

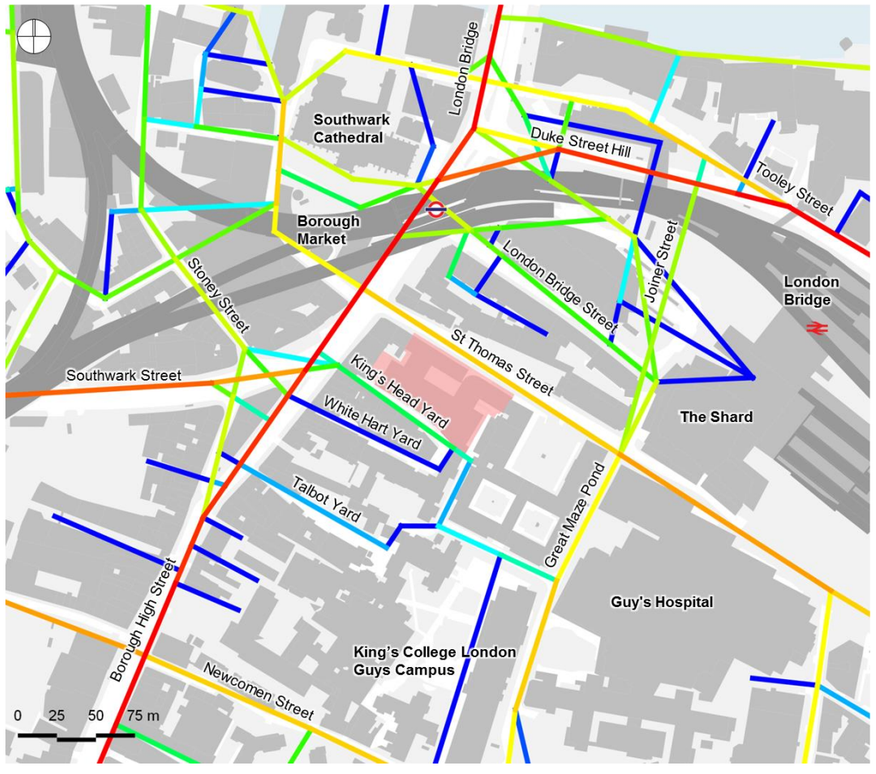
King's Head Yard, White Hart Yard and Talbot Yard have average to low accessibility levels; however they provide additional permeability through the large urban block.

**Land use patterns**
The site has a rich variety of land uses that creates distinct character areas and attract a mix of different users: tourists, office workers, commuters and locals.

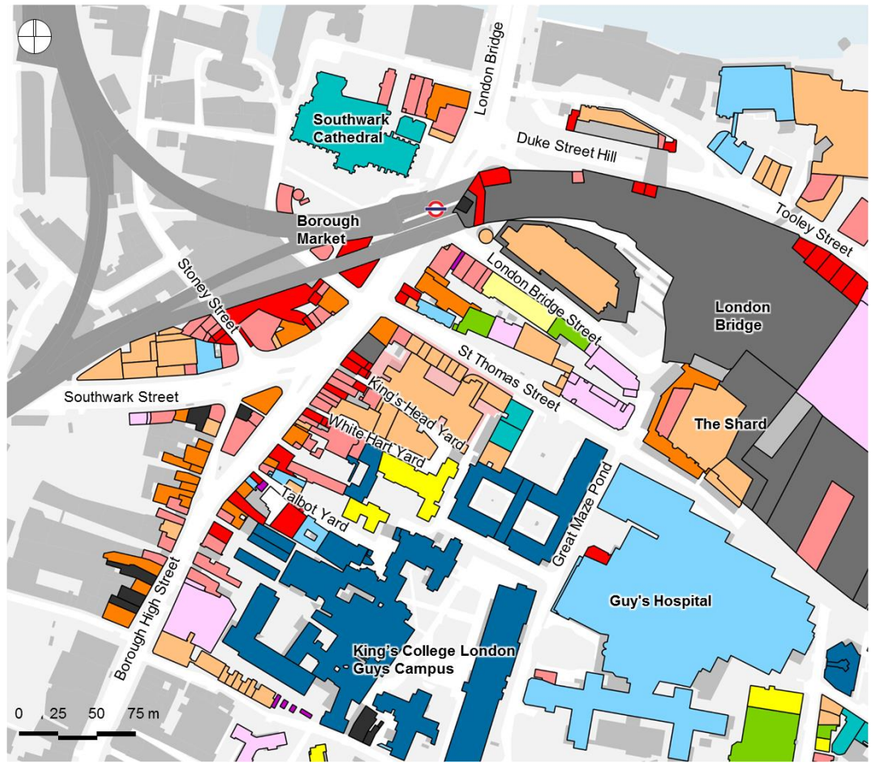
Borough High Street has as a mix of small scale retail, catering and services.

Key movement attractors in the area include London Bridge Station, with entrances along Borough High Street and St Thomas Street, Guy's Hospital, King's College and Borough Market, used by both locals and tourists.

Commercial uses are also found across the area as well as a number vacant and under construction sites, including the major redevelopment of London Bridge Station.




**Existing spatial accessibility**
high
low




**Ground floor land use**
- Retail
- Residential
- Medical
- Storage
- Catering
- Offices
- Education
- Leisure
- Under construction
- Industry
- Parking
- Community
- Services
- Hotels
- Vacant
- Institutional
- Transport

# Key findings Urban form Transport attraction

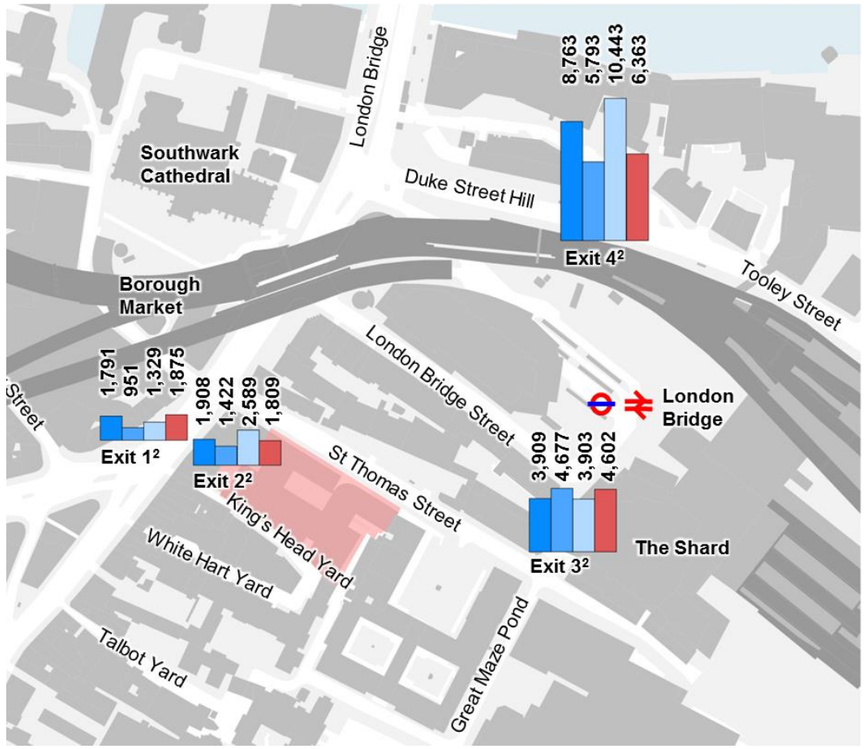
Crown copyright. OS Licence No 0100192252

London Bridge Station is a key movement generator in the area and accounts for high movement levels to the north of the site, particularly during commuting periods.

**Borough High Street east – station exit**
On average, the three dominant pedestrian routes were found along the eastern pavement of Borough High Street, north and south, as well as towards east along the southern pavement of St Thomas Street.

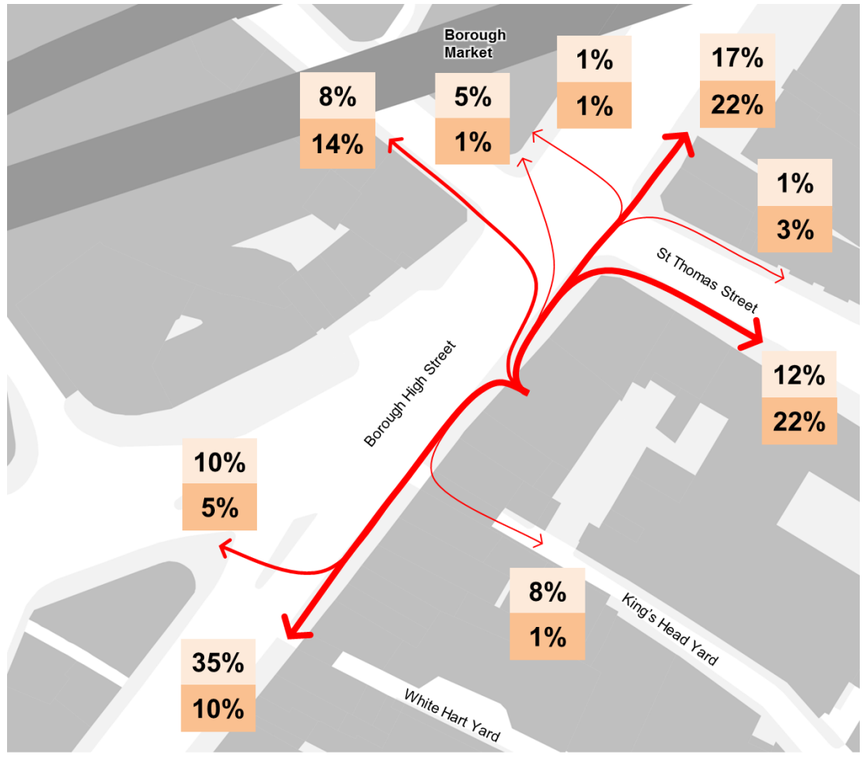
In the morning, 21% of the pedestrians that exited the station walked towards the east, along St Thomas Street and King's Head Yard.

This percentage was higher during lunchtime, at 26%.




**Average movement in and out of the station (pph)**

- Weekday, AM Peak
- Weekday, Lunch Peak
- Weekday, PM Peak
- Weekend, Lunch Peak




**Pedestrian routes from station exit**

- -% Morning 08:00 -10:00
- -% Lunch 12:00 - 14:00

**Note:**
London Bridge Station was under redevelopment during the surveys and the new southern exit on St Thomas Street was not open.

Crown copyright. OS Licence No 0100192252

**Pedestrian movement patterns**

Overall movement levels in the study area were 23% higher during the weekday (1,369pph) than during the weekend. However, the area remained busy during the weekend with good movement levels (1,113pph).

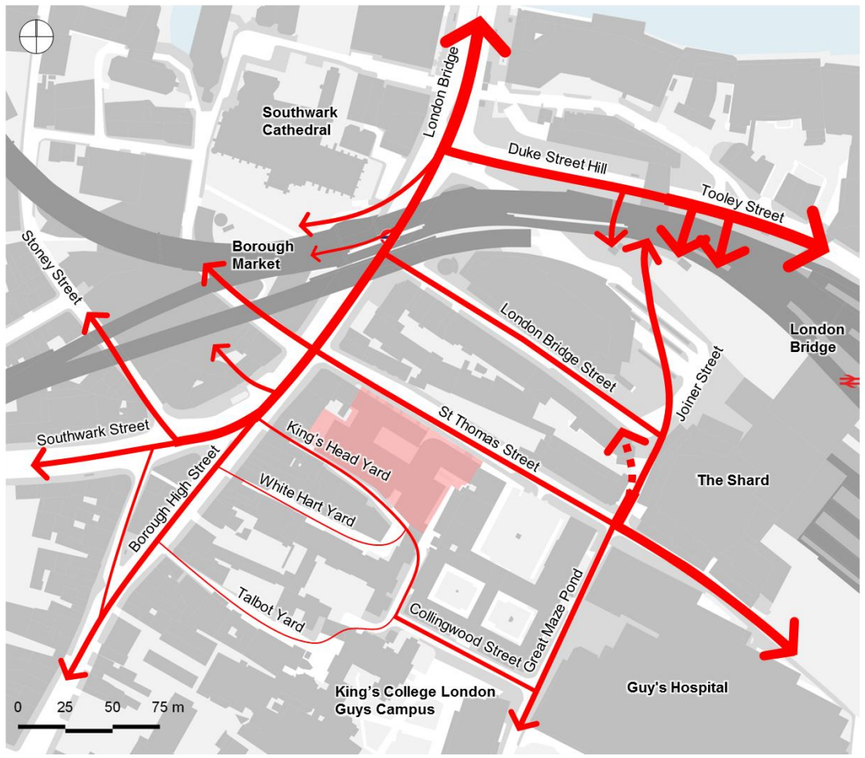
The weekday movement had three clear peaks: a morning and evening commute and a lunch time peak. The “w” shape pattern is typical of office areas. However in this area, the movement levels remained high in the evening, due to the presence leisure land uses in the area.

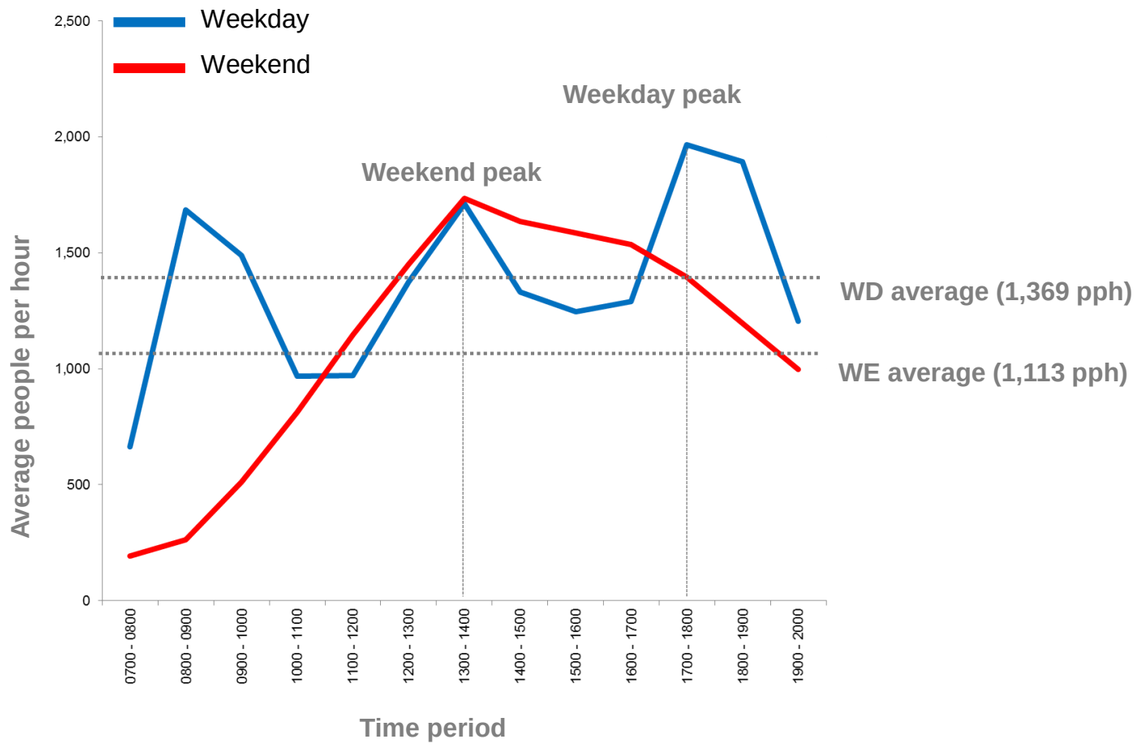
During the weekend, movement gradually increased towards the afternoon peaking at lunchtime. This is typical of areas with shopping or leisure profiles.

The movement distribution on both weekday and the weekend days is consistent. Borough High Street and St Thomas Street remained busy on both weekday and weekend days with similar daily average movement (3,958pph and 3,672pph respectively for weekday and weekend movement for Borough High Street, and 1,819pph and 1,620pph respectively for St Thomas Street). Although the daily averages are similar, most of the weekend movement happens between midday and the early evening.

In contrast, movement along London Bridge and Tooley Street decreased during the weekend, indicating that this area is used by weekday commuters.

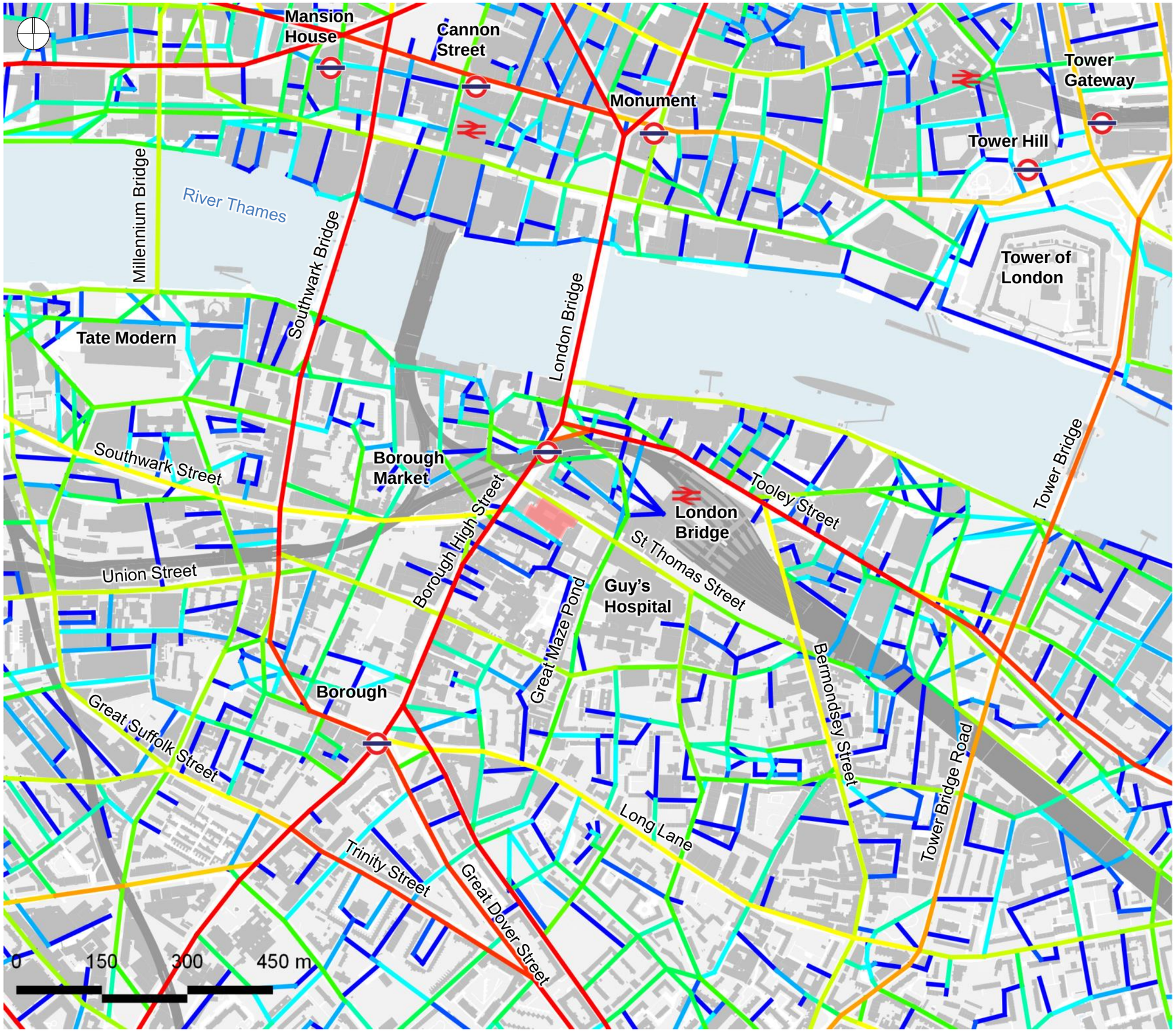
There is an important movement line running between Borough High Street and Great Maze Pond. King’s Head Yard and Collingwood Street were well used, particularly during lunchtime (669pph and 1,656pph respectively). These were quieter over the weekend, potentially due to the impact of the King’s College campus and Guy's Hospital as important attractors in the area.



# Spatial accessibility City-wide route hierarchy Existing

Crown copyright. OS Licence No 0100192252




The spatial accessibility analysis highlights the route hierarchy of an area. Highly accessible streets are likely to attract more through-movement.

This image shows a city-wide spatial analysis and highlights the large scale route structure across London. These routes are the ones that relate to long distance vehicular flows and commuter's movement.

Southwark Bridge, London Bridge/Borough High Street and Tower Bridge are key north-south routes with Tooley Street providing east-west links.

**Spatial accessibility**

high

low

Underground station

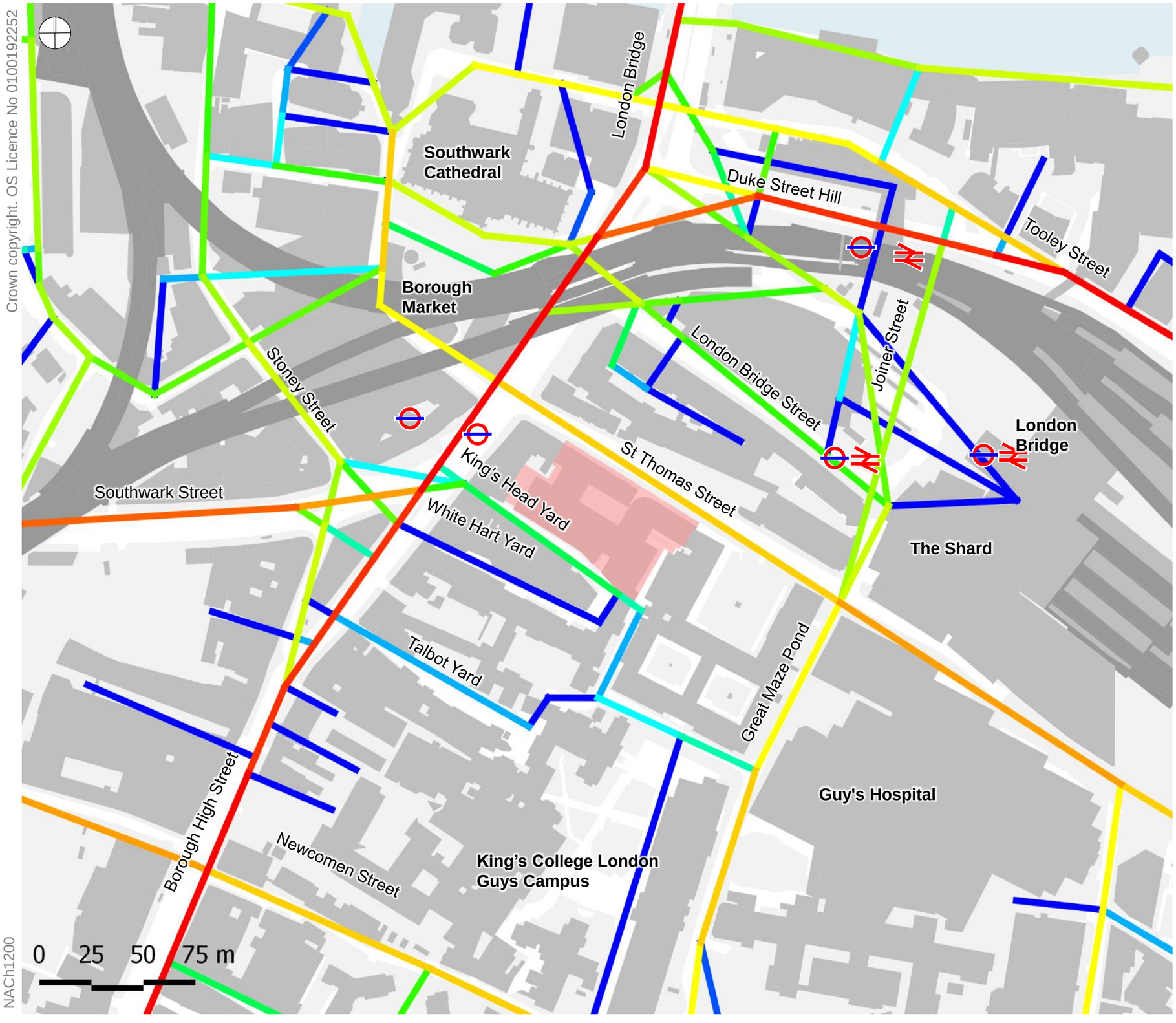
Railway station

Project site

NAChn

# Spatial accessibility Local route hierarchy Existing 15min walk

Crown copyright. OS Licence No 0100192252




The local route hierarchy highlights routes which form part of the local or walking catchment of the area, estimated at 1,200 metres or a 15min walk.

Borough High Street and Tooley Street are part of the primary network at both city-wide and local scales.

Southwark Street and St Thomas Street are also highlighted as important routes at the local scale.

King's Head Yard, White Hart Yard and Talbot Yard have average to low accessibility levels, however they provide additional permeability and alternative routes to those provided by the primary route network.

**Spatial accessibility**

high

low

Underground station

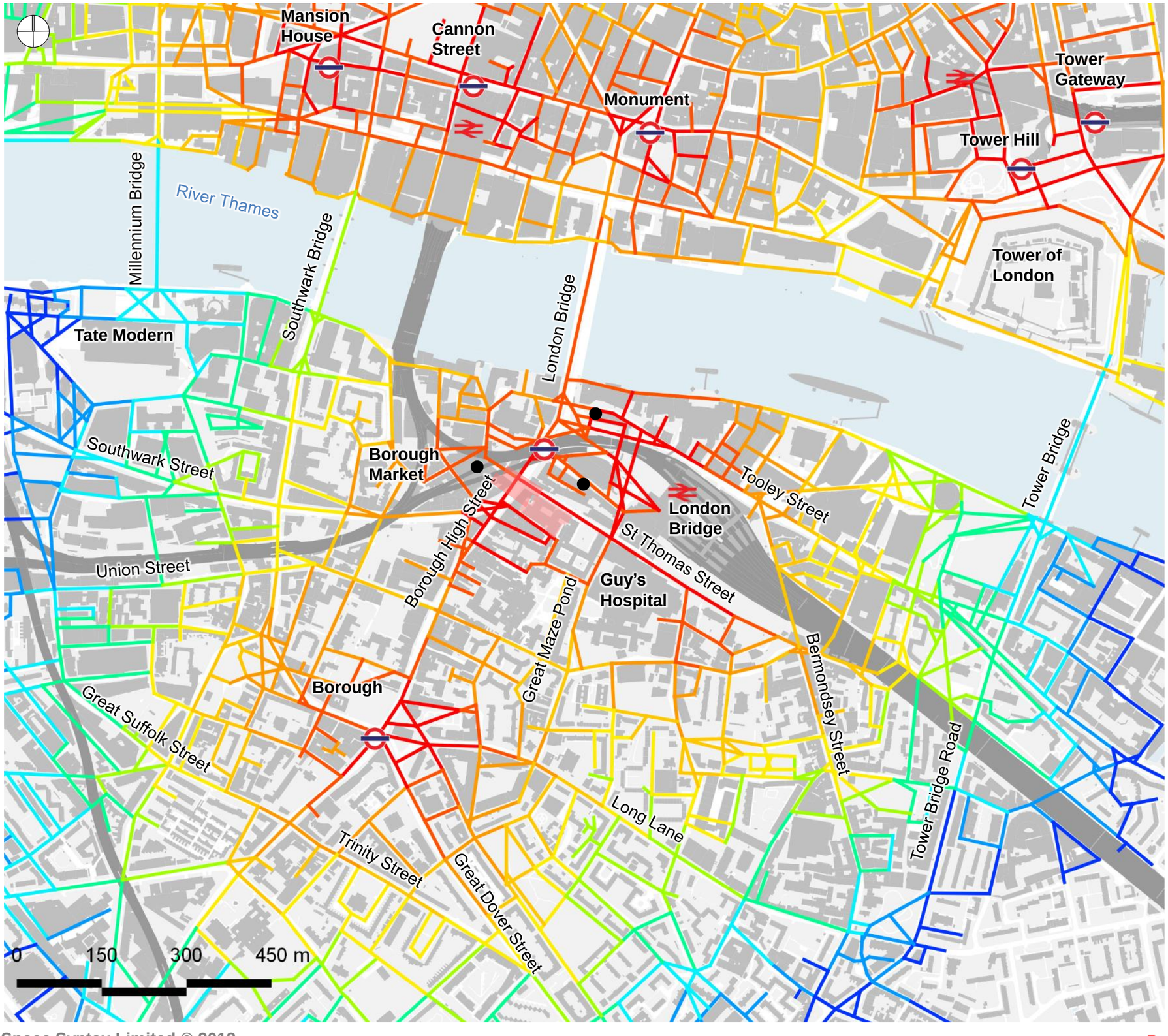
Railway station

Project site

NACh1200

# Transport attraction Walking distance from major transport nodes

Crown copyright. OS Licence No 0100192252




This image shows the accessibility of transport nodes in terms of distance and walking time.

London Bridge Station, under redevelopment during the surveys, is adjacent to the site and has significant impact on the pedestrian movement patterns along St Thomas Street and Borough High Street at the perimeter of the site.

**Metric distance (m) and walking time (min)**

- 900 – 1000 m
- 800 – 900 m
- 700 – 800 m (10min walk)
- 600 – 700 m
- 500 – 600 m
- 400 – 500 m
- 300 – 400 m (5min walk)
- 200 – 300 m
- 100 – 200 m
- 0 – 100m
- London Bridge Station exits

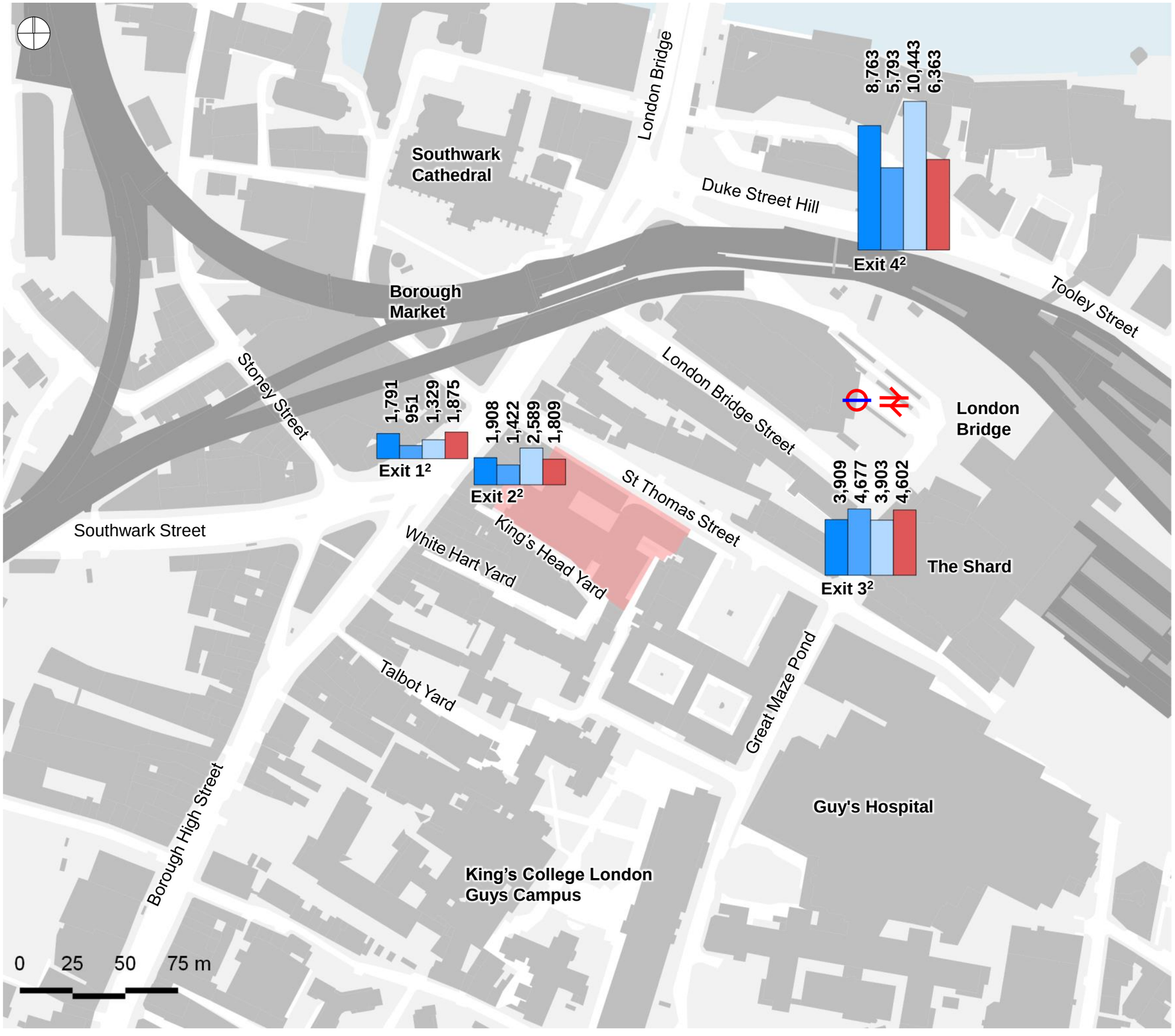
- Underground station
- Railway station
- Project site

NAChn

Space Syntax Limited © 2018

# Transport attraction London Bridge Station

Crown copyright. OS Licence No 0100192252




**London Bridge Station usage data**

**Annual entries and exits[1]:**
74.98 millions

**Daily entries and exits[1]:**

**Weekday**

| Entry | Exit | Total |
|---|---|---|
| 116,460 | 115,763 | 232,223 |

**Saturday**

| Entry | Exit | Total |
|---|---|---|
| 93,996 | 90,158 | 184,154 |

**Data sources:**
[1] Counts - 2014 - Annual entries & exits
London Underground Limited, 2015
Transport for London.
[2] Space Syntax survey data, September 2016

**Note:**
Exit 3 data refers only to counts at the London Bridge Station passageway on St Thomas Street and does not include any movement up/down the escalator.

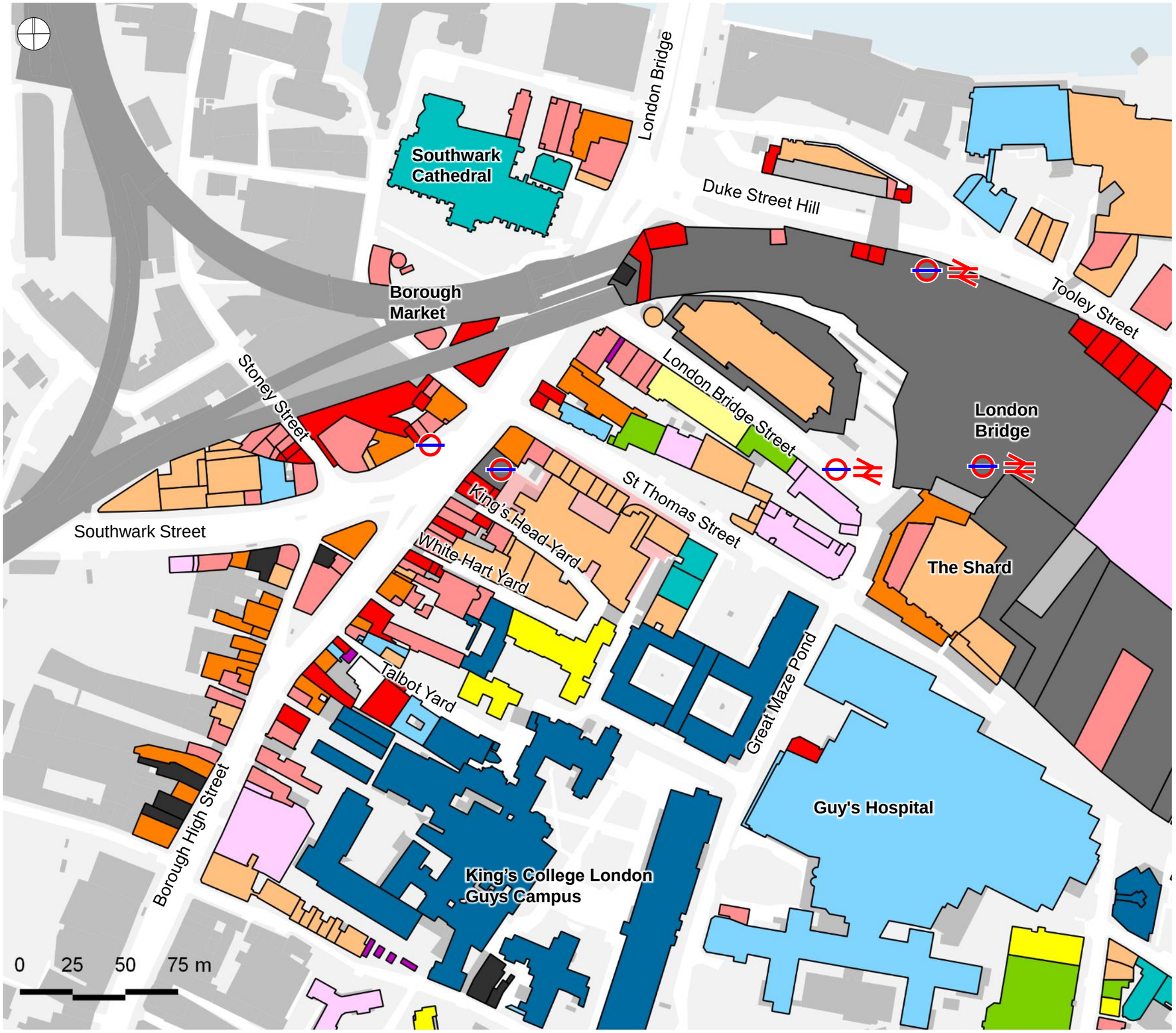
**Pedestrian flows[2]**
People per hour

- Weekday, AM Peak
- Weekday, Lunch Peak
- Weekday, PM Peak
- Weekend, Lunch Peak

- Underground station
- Railway station
- Project site

# Land use patterns Ground floor

Crown copyright. OS Licence No 0100192252




The land use mix found around the site creates a distinctive character and user profiles in the area.

A mix of small scale retail, catering and services clusters along Borough High Street.

The character of St Thomas Street is defined by London Bridge Station and Guy's Hospital, and the Shard to the east of Great Maze Pond, King's College.

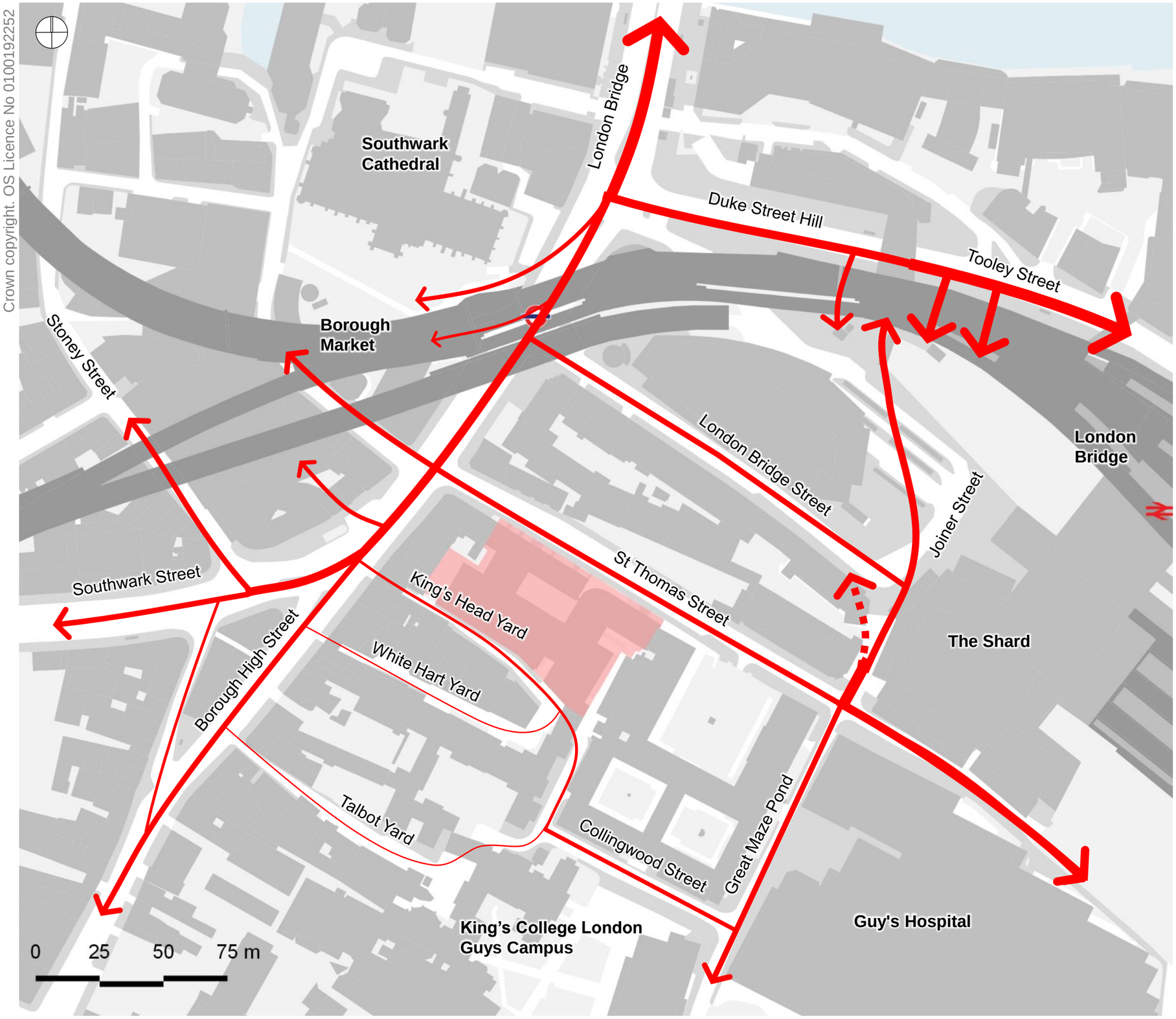
**Ground floor land use**

- Retail
- Residential
- Medical
- Storage
- Catering
- Offices
- Education
- Leisure
- Under construction
- Industry
- Parking
- Community
- Services
- Hotels
- Vacant
- Institutional
- Transport

- Underground station
- Railway station
- Project site

# Pedestrian movement patterns Weekday summary All day average

Crown copyright. OS Licence No 0100192252




London Bridge Station is a key movement generator with a significant impact in the area immediately adjacent to its entrances, particularly during commuting hours.

London Bridge and Tooley Street had high movement levels with all day average movement at 6,373 pph and 5,292pph respectively.

Pedestrian movement levels were also high along Borough High Street, particularly around the London Bridge Station entrances at the intersection with St Thomas Street (3,958pph). Observed movement levels were higher during lunch time at this location.

Movement levels decreased to the south part of Borough High Street.

St Thomas Street had consistently high movement levels, particularly to the east of Great Maze Pond (3,477pph). It's overall movement levels also increased during lunchtime.

King's Head Yard and Collingwood Street are well used, particularly during lunchtime (669pph and 1,656pph respectively) .

**Pedestrian movement**

High

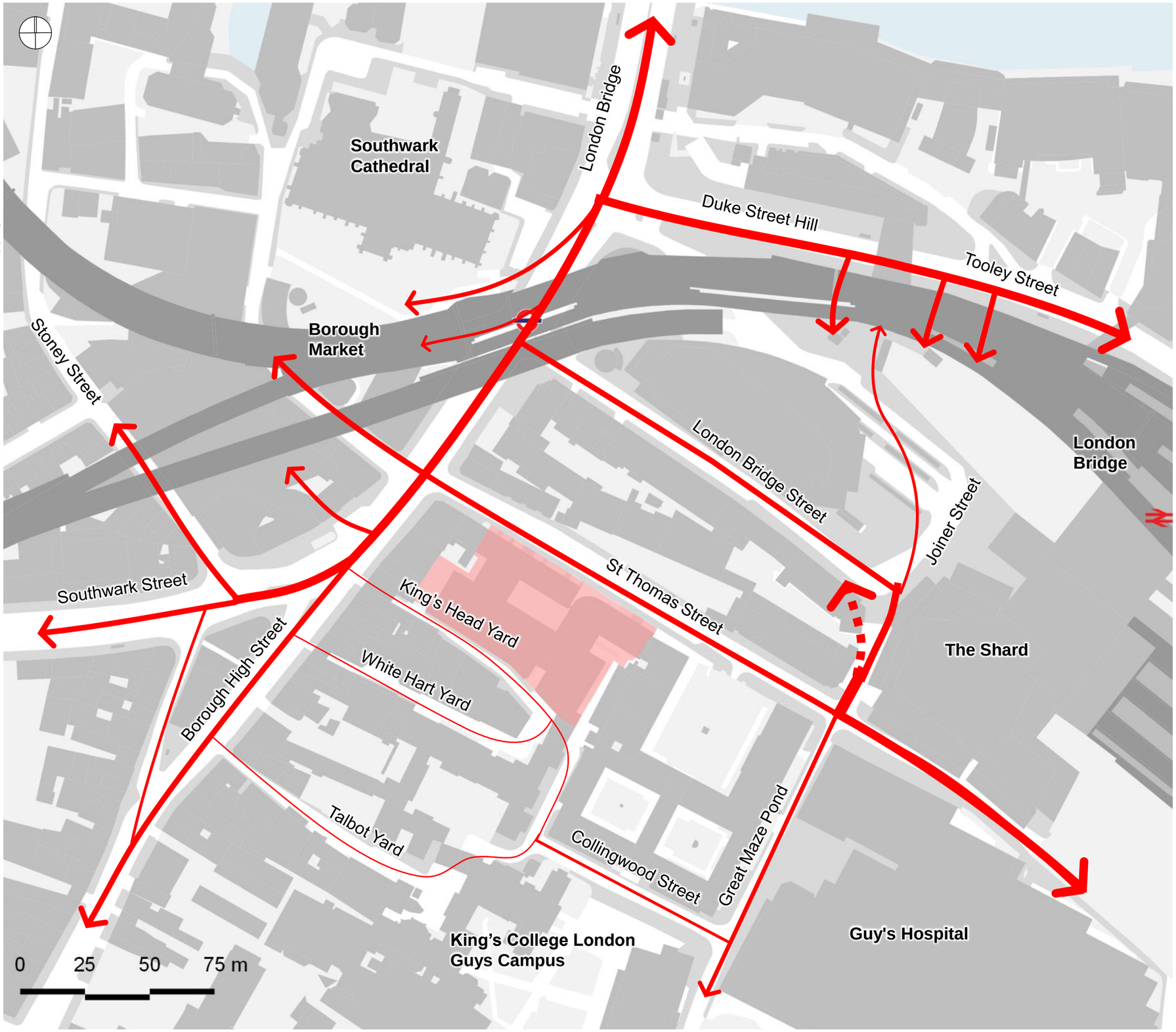
Low

Project site

Space Syntax Limited © 2018

# Pedestrian movement patterns Weekend summary All day average

Crown copyright. OS Licence No 0100192252




Movement distribution is consistent on both weekday and weekend days. However, movement along London Bridge and Tooley Street decreased during the weekend, indicating that the route is used by commuters.

Movement levels along Borough High Street and St Thomas Street remained high.

King's Head Yard and Collingwood Street had less movement during the weekend.

**Pedestrian movement**

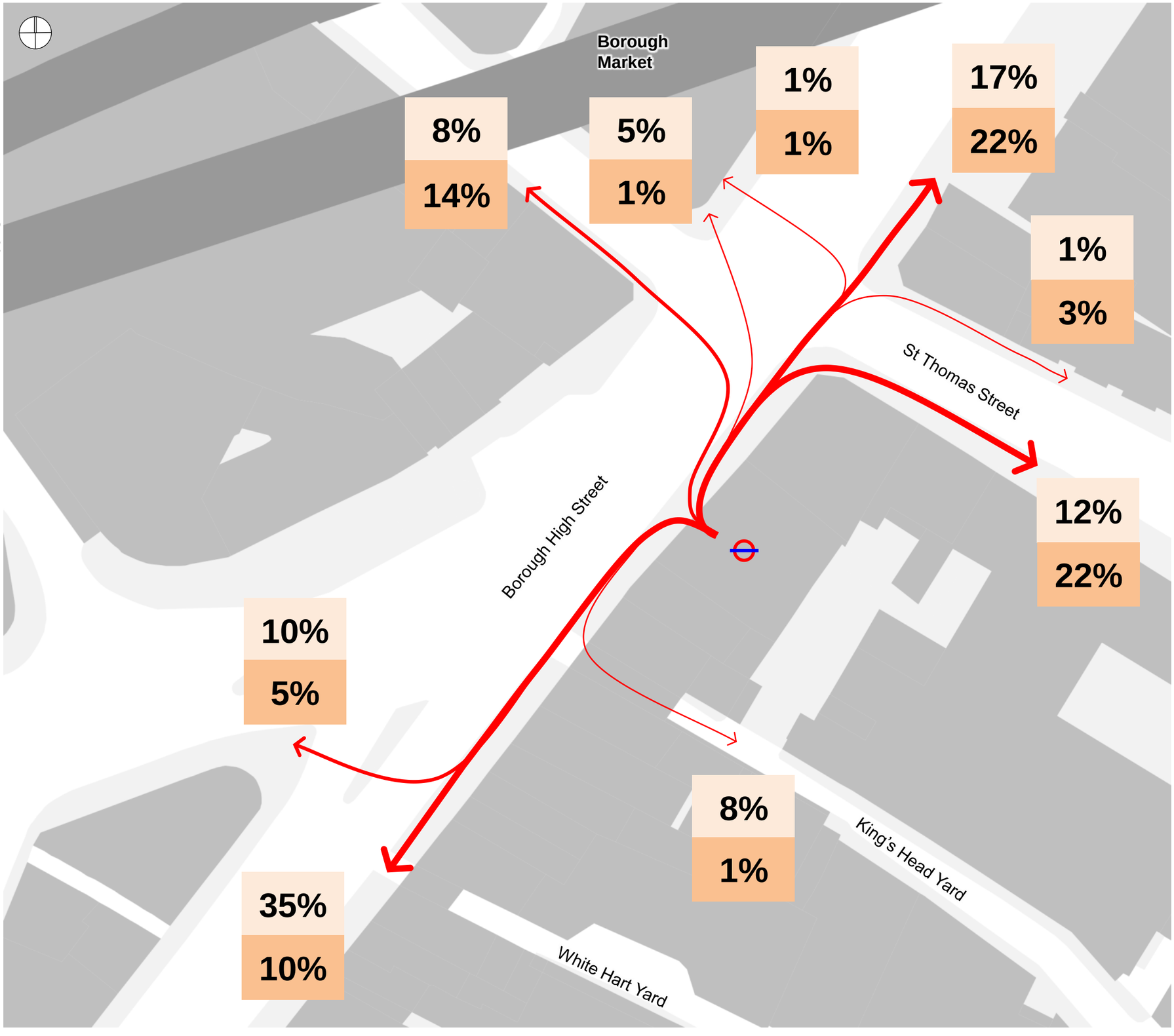
High

Low

Project site

# Pedestrian routes Station exit Morning and lunchtime 08:00 - 10:00 and 12:00 - 14:00

Crown copyright. OS Licence No 0100192252




In order to understand the movement distribution from the Borough High Street London Underground entrance and the potential impact of a new entrance, we conducted a route survey.

Individual routes of people exiting the Borough High Street underground entrance were recorded on Thursday 20th October 2016 from 08:00 to 10:00 and from 12:00 to 14:00.

The analysis shows that the three dominant pedestrian routes were along the eastern pavement of Borough High Street, and then east along the southern pavement of St Thomas Street.

In the morning, 21% of the pedestrians that exited the station walked towards the east, along St Thomas Street and King's Head Yard.

This percentage was higher during lunchtime, at 26%.

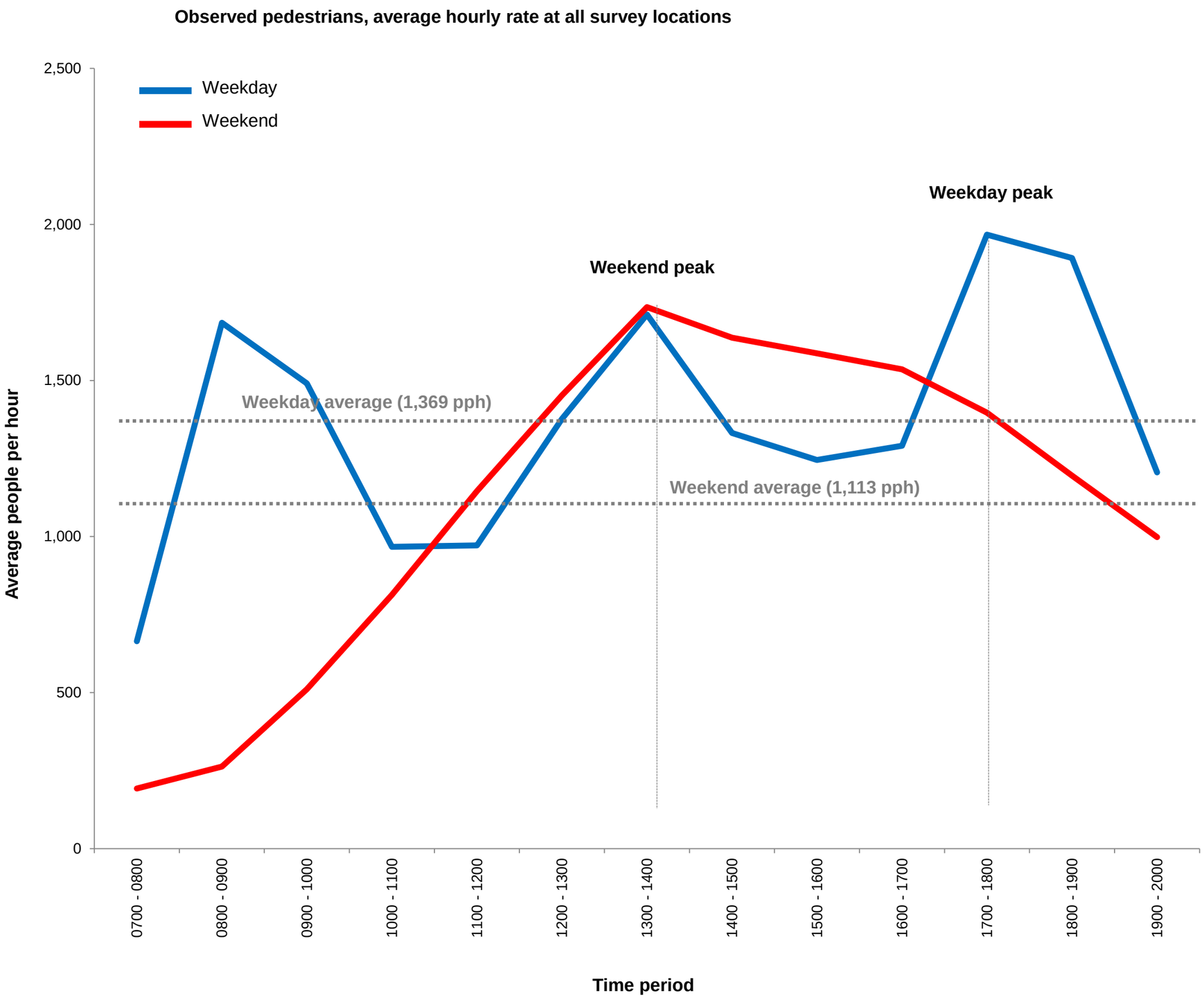
**Note:**
3% of the pedestrian routes in the morning peak (08:00-10:00) entered a building within the survey area, while during lunchtime the percentage was 21%. These are not shown in the diagram.

-% Morning 08:00 -10:00

-% Lunch 12:00 - 14:00

Space Syntax Limited © 2018

# Pedestrian movement patterns Distribution across the day Weekday and weekend




Overall movement levels in the study area were 23% higher during the weekday than during the weekend.

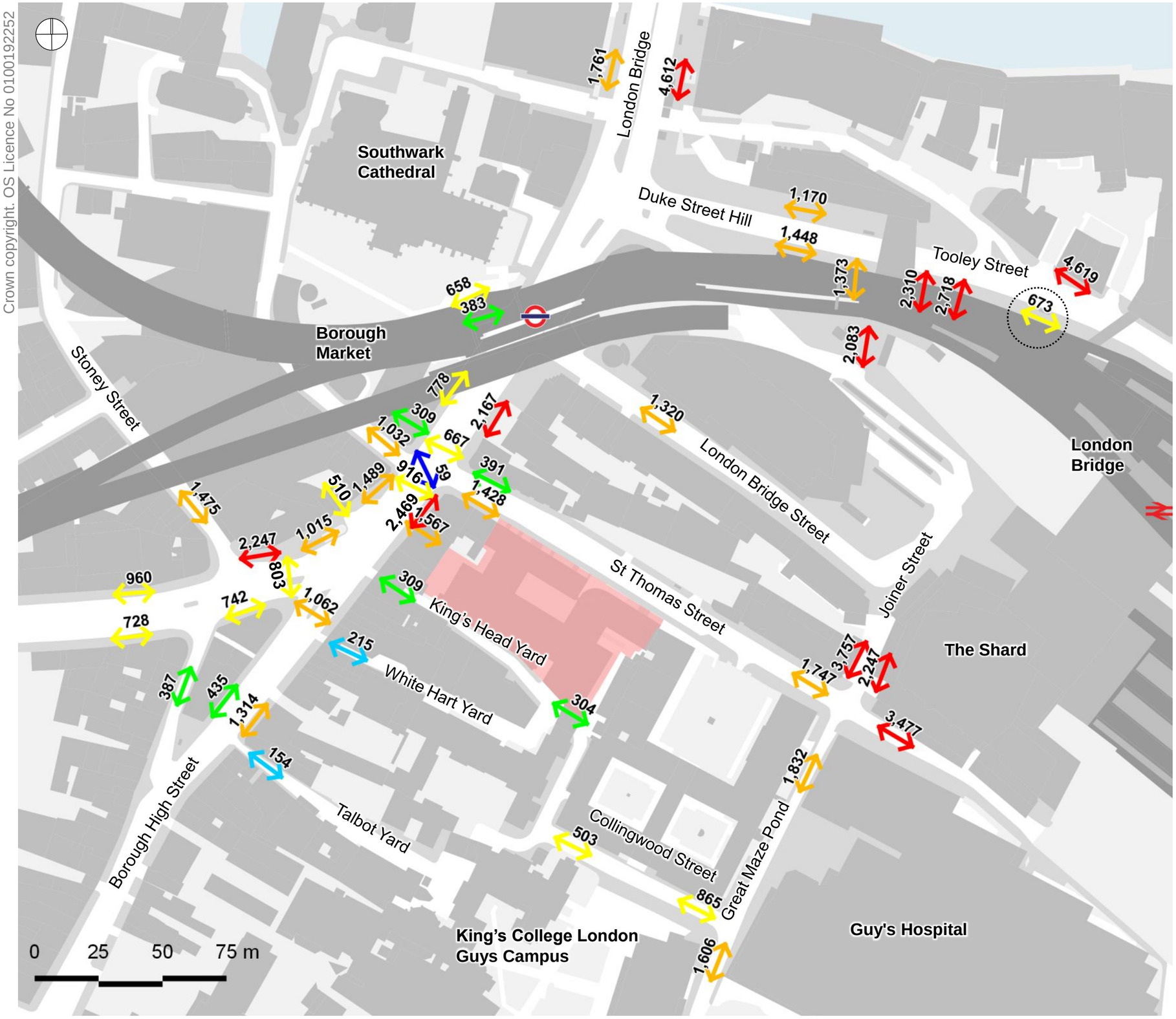
Weekday movement patterns show three clear peaks: morning and evening commute peaks and a lunch time peak. This “w” shape pattern is typical of office areas. However, movement levels remained high in the evening, suggesting a combination of longer dwell-time as well as people arriving in the area because it works as a leisure destination.

The weekend movement pattern shows a gradual increased towards the afternoon, with its peak at lunchtime. This is typical of areas with shopping or leisure activity.

Space Syntax Limited © 2018

# Pedestrian movement patterns Weekday All day average

Crown copyright. OS Licence No 0100192252




There were consistently higher flows along the eastern pavement of Borough High Street.

Footway closed during some of the survey time periods

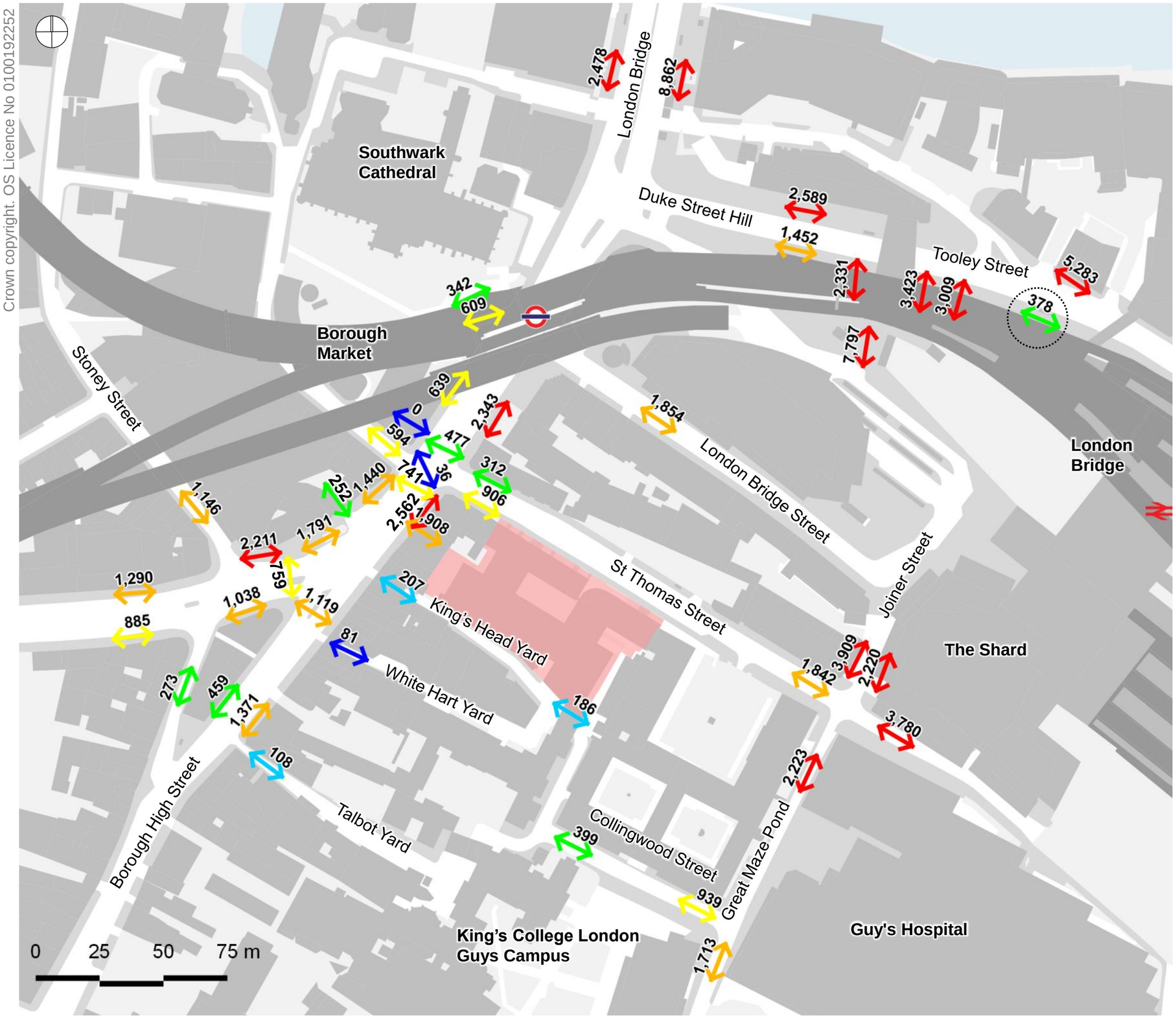
**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

Project site

# Pedestrian movement patterns Weekday Morning peak 08:00 - 09:00

Crown copyright. OS Licence No 0100192252




Footway closed during some of the survey time periods

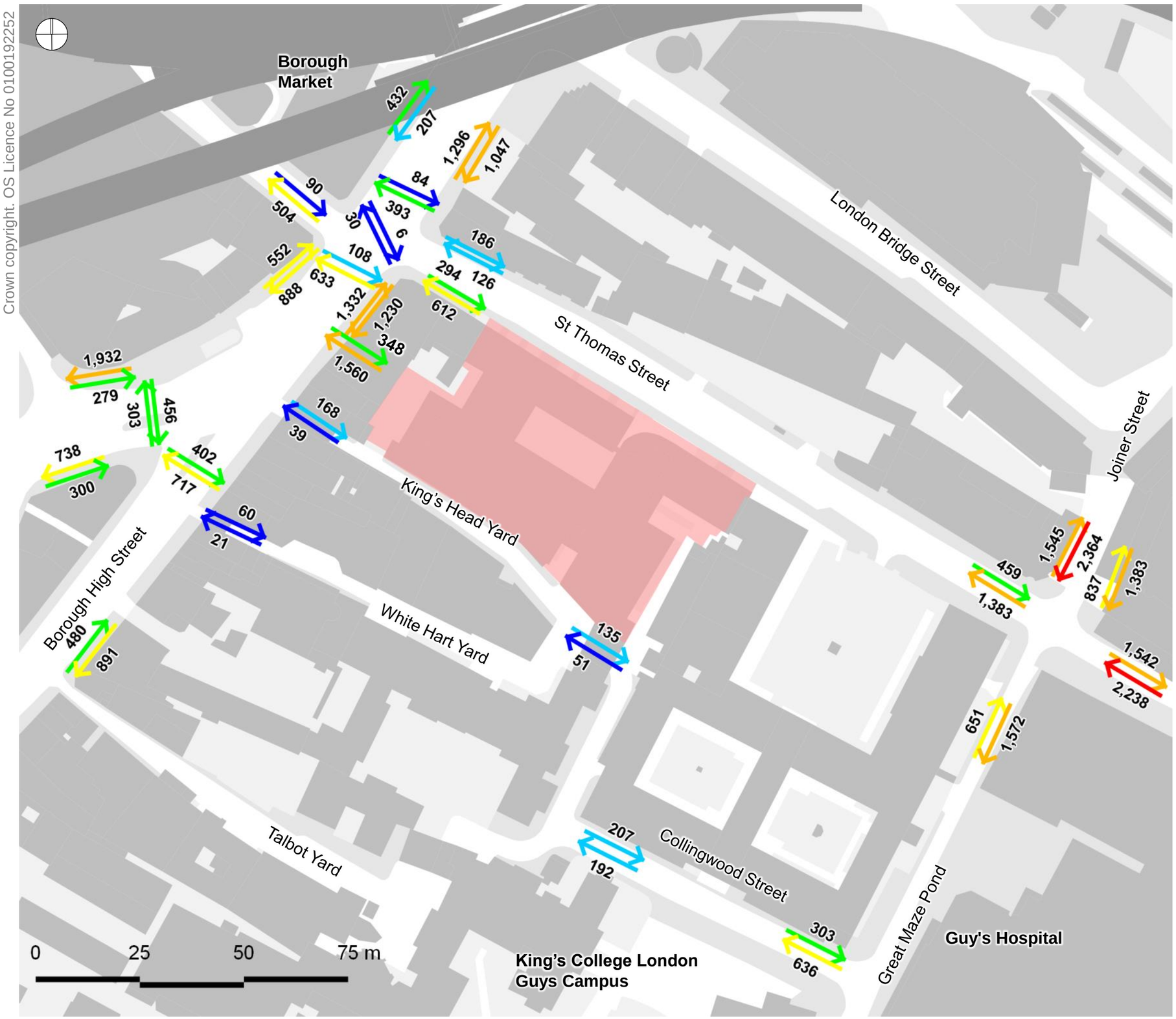
**Pedestrian movement**
People per hour

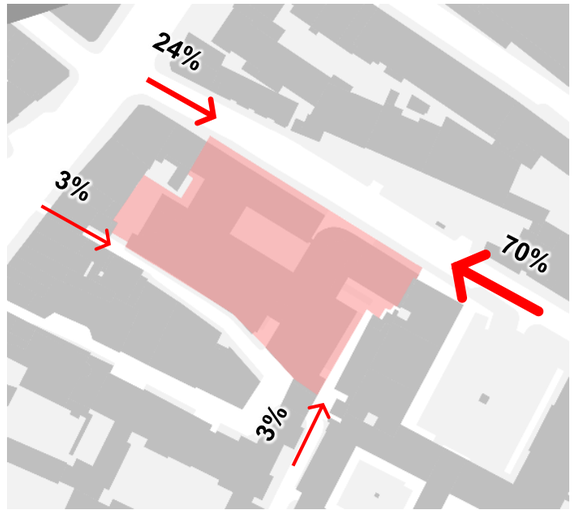
- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

Project site

# Pedestrian movement patterns Weekday Morning peak 08:00 - 09:00 Directional

Crown copyright. OS Licence No 0100192252



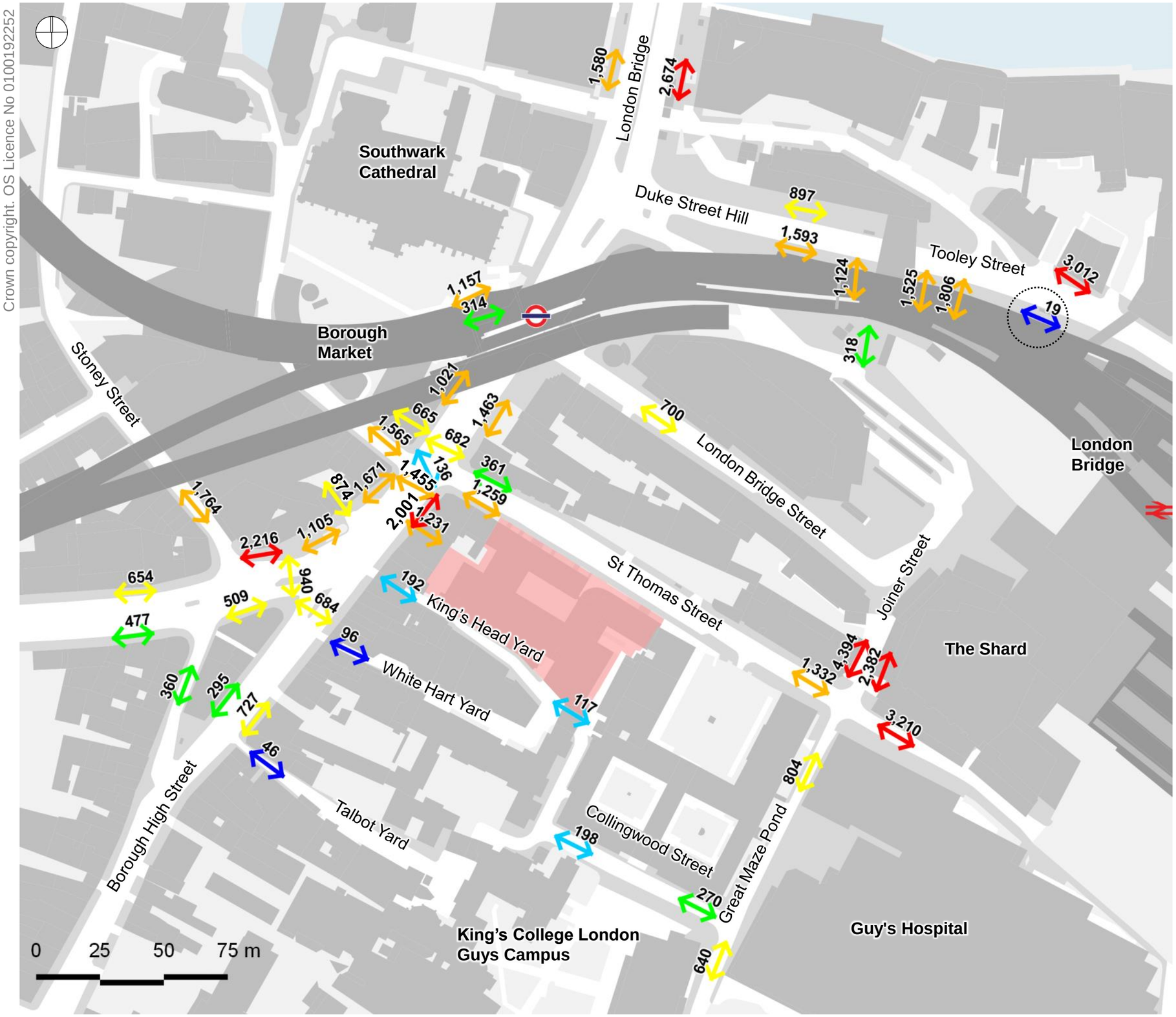

**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

Project site

# Pedestrian movement patterns Weekend All day average

Crown copyright. OS Licence No 0100192252



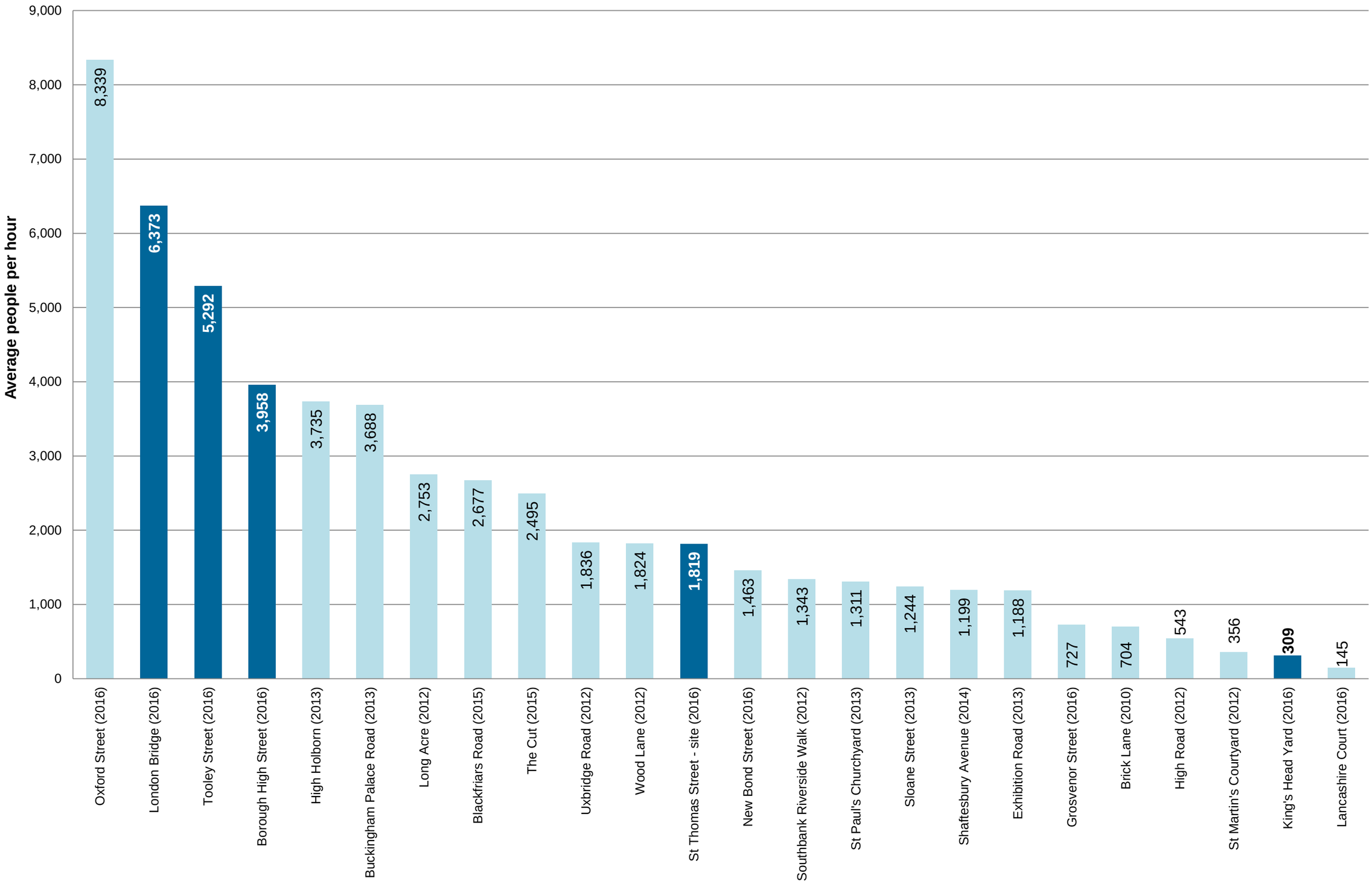

Footway closed during some of the survey time periods

**Pedestrian movement**
People per hour

- 2000 and above
- 1000 – 2000
- 500 – 1000
- 250 – 500
- 100 – 250
- 0 – 100

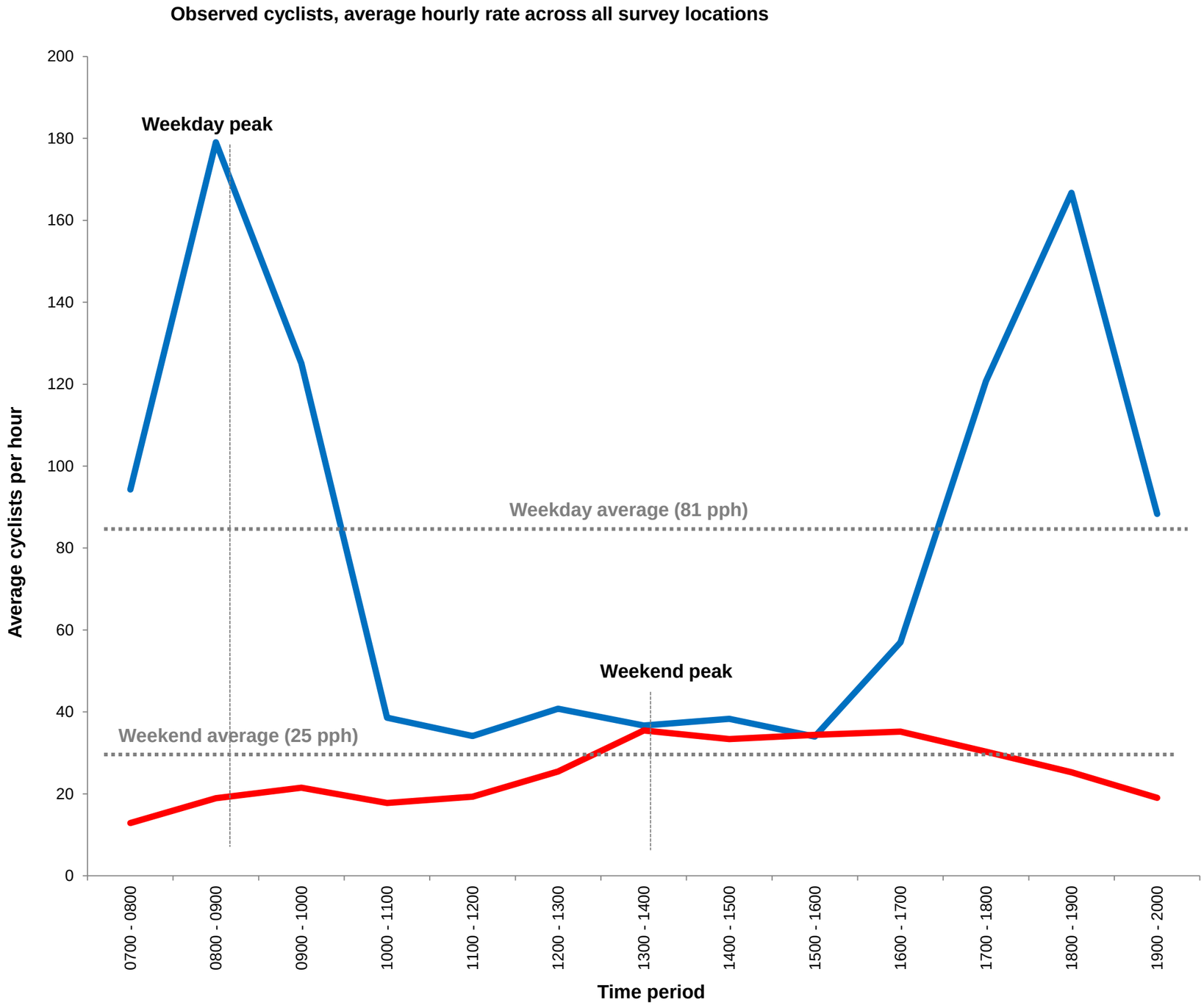
Project site

# Pedestrian movement patterns London streets comparison All day average movement




Space Syntax Limited © 2018

# Cyclist movement patterns Distribution across the day Weekday and weekend

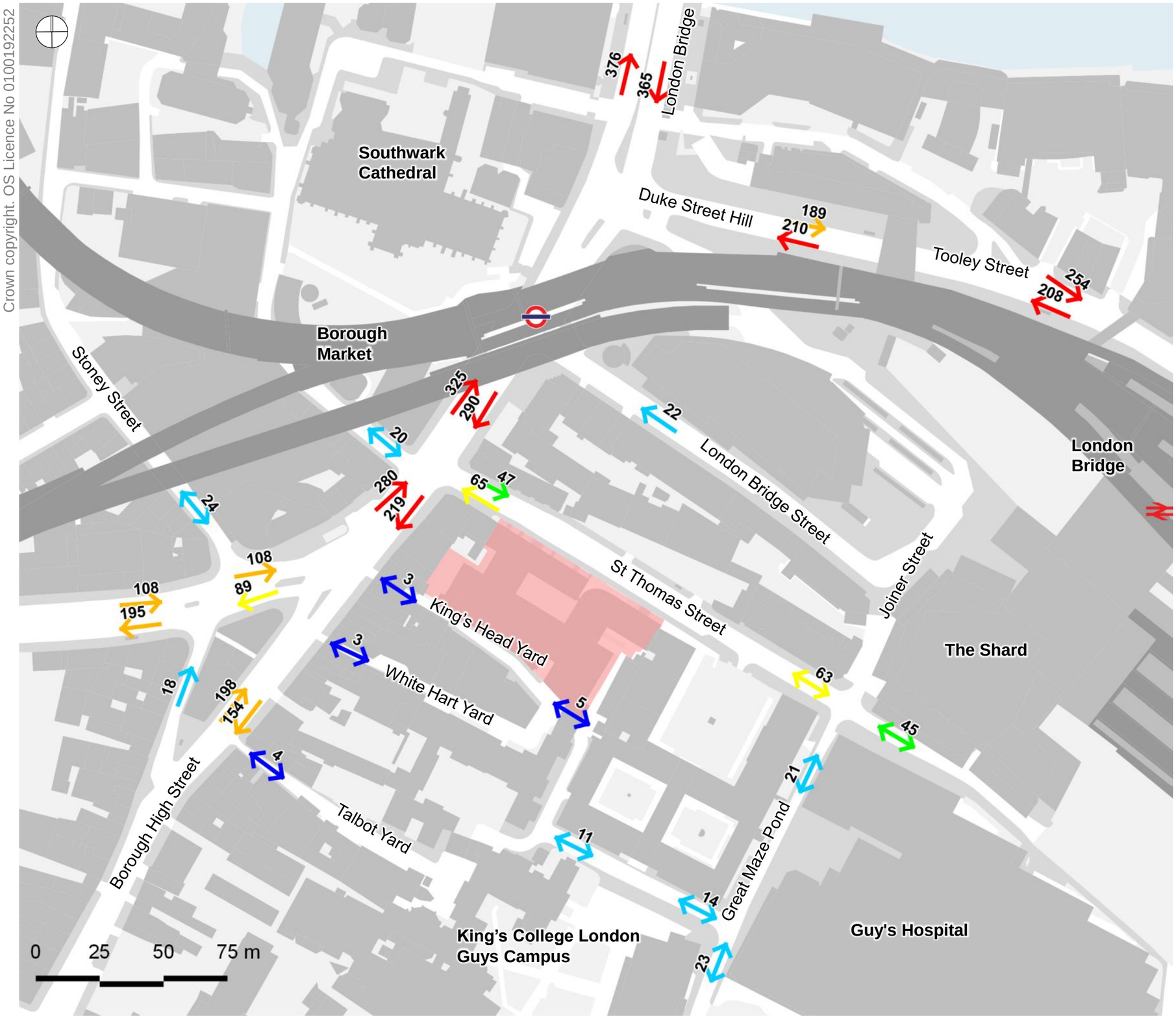



Cycling activity largely follows a commuting pattern. During the weekday, the observed cyclist movement in the area shows a “U” shape pattern with the highest peak in the morning between 08:00 and 09:00.

Weekend cyclist movement levels were markedly low.

# Cyclist movement patterns Weekday All day average

Crown copyright. OS Licence No 0100192252




Cyclists use the primary route network, along London Bridge, Borough High Street and Tooley Street.

**Cyclist movement**
Cyclists per hour

- 200 and above
- 100 – 200
- 50 – 100
- 25 – 50
- 10 – 25
- 0 – 10

Project site

Space Syntax Limited © 2018

# Appendix 2

## Glossary and Methodology Urban Form and Function

# Glossary

**Land use patterns and urban character**
The location and distribution of ground floor land uses and building entrances (or frontages). These elements affect the character of the public realm, the perceived pedestrian comfort, safety, attractiveness and conviviality, and therefore the movement potential of a street.

**Transport attraction**
The degree to which public and private transport systems impact an area.  These is related to ease of pedestrian access to/from key transport nodes in the area as well as passenger volume.

**Multiple regression analysis**
Regression is a statistical correlation analysis that is used to fit models to data. A multiple regression is used to predict the value of a single dependent variable based on the value of two or more independent variables.

**Multivariable pedestrian movement model**
Statistical correlation analysis (multiple regression, see above) between the observed pedestrian movement and two or more independent variables, for example spatial accessibility and land use patterns. The model explains the relationship between urban form and pedestrian movement patterns. In this model, urban form is defined by three components:  spatial layout attraction, land use attraction and transport attraction.

**R-Square ($R^2$) value**
$R^2$ is the percentage of the variability in the outcome explained by the model.

**t-Ratio**
The values of t-ratio show the significance of each variable in the model.

# Methodology Urban Form and Function

**Urban Form**

**1. Spatial accessibility analysis**

Spatial accessibility analysis measures key properties of the urban network which can then be linked to the movement potential of an area.

Both the urban grain and structure of a place contribute to its accessibility, which can be defined as the ability and degree of ease that people have when moving around in their environment.

Space Syntax analysis methods take into account standard route choice strategies and preferences of pedestrians and cyclists, and are able to robustly simulate pedestrian journeys.

The spatial accessibility model is based on a unique representation of publicly accessible streets and paths.

The resulting pattern of intersecting lines is then analysed using Space Syntax software. The software transforms the street pattern into a network graph by disaggregating the line network at the intersections to form a segment network. Each line is considered as a node and the links between nodes become intersections.

The cost between two line segments – how easy it is to move between them – is measured using the 'shortest' path between the pair which is then weighted by three key cost relations: metric (least length), topological (fewest turns) and angular (least angle change).

Spatial accessibility values can then be calculated from the spatial accessibility map by first selecting a line, then calculating how many other lines must be used wholly or in part to reach every other line in the whole spatial accessibility map (Figure 1). When this calculation is made for each line in the map it turns out that some lines require fewer changes of direction than others in order to cover the rest of the spatial accessibility map.

The 'spatial accessibility value' assigned to each line reflects the complexity of routes from that line to all the others within the system. This complexity influences movement in two ways.

First, lines with higher values are more easily accessible than segregated ones because they can be reached by simpler routes from other lines – thus they receive a high degree of 'to' movement.

Second, more accessible lines are more likely to be selected as part of a route between other pairs of lines: that is, they will attract more 'through' movement.

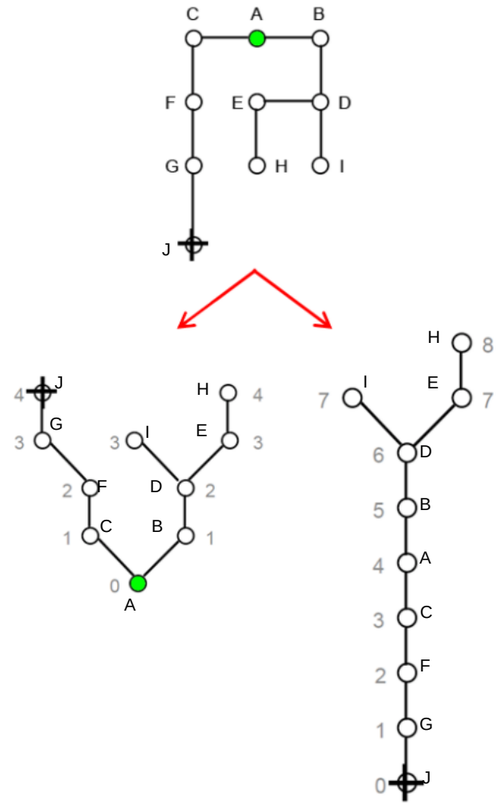



**Figure 1** Each segment in the spatial model is translated into a node. Above are graphs of the same layout seen from two different segment lines (nodes).

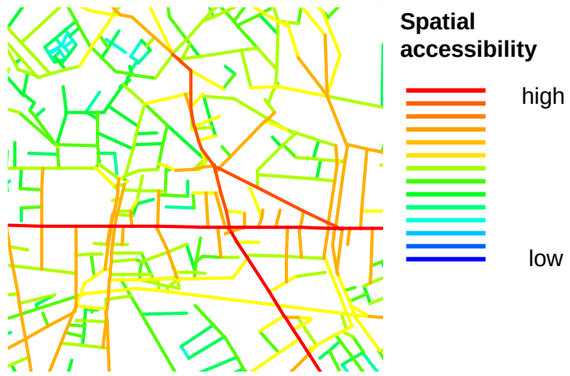



**Figure 2** Example of a processed Space Syntax model. Accessibility values assigned to each segment and represented by their colour.

# Methodology Urban Form and Function

**Urban Form (continued)**

**1. Spatial accessibility analysis (continued)**

**Key feature 1: analysis of 'angular movement'**

Key to the success of this approach is the discovery that movement in buildings and cities often follows a 'least angle' path between origins and destinations. In other words, many people minimise the angular deviation from their origin to their destination, even if this means they sometimes take a slightly longer route.

**Key feature 2: evaluation of multi-scale activity**

A second key aspect is the multi-scale analysis of spatial layouts is that it allows short and long-distance journeys to be simultaneously evaluated. This analysis shows how different parts of the same network can be used both for short and long-distance journeys. Land use analysis shows that these multi-scale places are typically successful commercial locations, thus demonstrating the importance of careful spatial layout design in creating multi-scale opportunities for shops to trade to more than one scale of movement.

**Key feature 3: integration of spatial layout, land use & transport factors**

The simultaneous analysis of spatial layout, land use and transport factors (distance and volume of passengers) is a third key factor in the uniqueness and success of Space Syntax models. By demonstrating the fundamental role of space in determining land use potentials, then showing how the specific location of individual land use attractors and transport attractors exploits these potentials, Space Syntax models make it possible to integrate the three essential aspects of planning and design: spatial, land use and transport (please see diagram on p. 7).

**2. Land use patterns and urban character survey**

A ground floor land use and entrances survey was conducted in the immediate context of the site (September 2016). The survey was based on a combination of site visits, photographic surveys and desktop data analysis.

**3. Walking distances from the station and distance decay**

The street network was used to measure walking distances from the station. Metric distance was calculated and converted into walking time, where 400m are covered in 5 minutes (based on a conservative walking speed of 1.33m/s).

The distance decay (Dd) from the station was calculated for each segment of the spatial network with the following formula: Dd = entry&exit volume / distance from station.

**Urban Function**

**4. Pedestrian movement survey**

A camera-based pedestrian and cyclist movement survey was carried out at 49 key locations around the site on Thursday 15th September and Saturday 17th September 2016 between 07:00 and 20:00. Bi-directional, 10minute pedestrian counts were sampled at each location at half hour intervals and the results transformed into average hourly rates, in accordance to TfL's Pedestrian Comfort Level Guidance[1].

London Bridge Station was under redevelopment during the surveys and the new southern exit was not open.

**5. Pedestrian route survey**

Individual route choices of passengers exiting the station on the eastern pavement of Borough High Street were recorded on Thursday 20th October 2016 from 08:00 to 10:00 and from 12:00 to 14:00.

**Note**

[1] Transport for London (TfL), 2010. Pedestrian Comfort Level Guidance, London

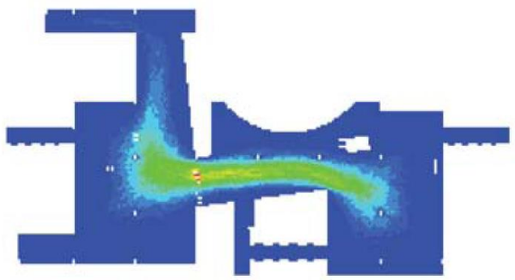
Space Syntax Limited © 2018

# Appendix 3

## Agent analysis methodology

# Agent analysis methodology

1 Standard agent simulation



Path overlap

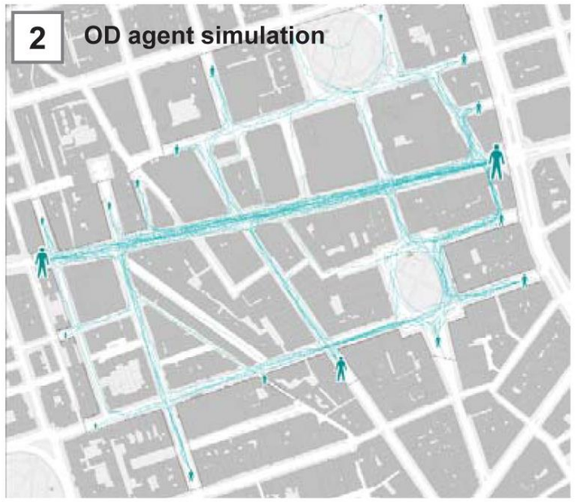
## Standard agent simulation

Our standard agent simulation model demonstrates likely movement patterns in a defined space, whether in a building or in the city, without impacts of any particular constraints or attractors. The model is mainly used to highlight the potential of the space layout of the space in subject.

The agents are programmed to move on the basis of the following rules.

- The agents navigate through the space on the basis of what they can see at each point in space.
- The agents decide the direction of their next steps at every several steps.
- The visibility is limited to 170 degree to the front, emulating ordinal human behaviour.

2 OD agent simulation



Agent numbers

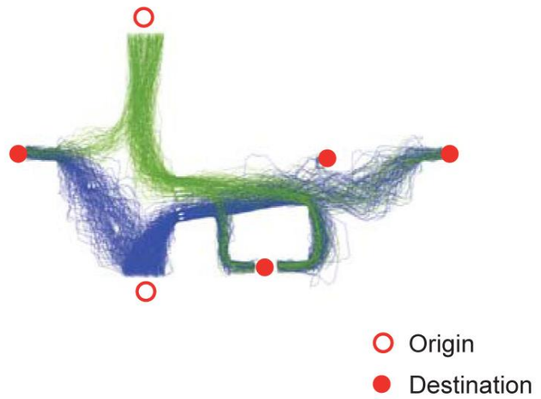
## Origins and destinations programmed agent simulation [OD agent]

There is another type of agent simulation model, in which agents can be programmed to move between certain points in a defined space. The model can be used to identify preferred routes under certain scenarios.

In addition to the rules for the standard agent simulation, there are additional rules for the OD agents as follows.

- The agents are assigned to the origins and the destinations according to the ratio programmed prior to the analysis.
- Once the agents are in the system, they choose the route that is easiest to navigate through as long as that route takes them nearer to their destination.

3 Agent paths (OD agent simulation)




## Agent paths

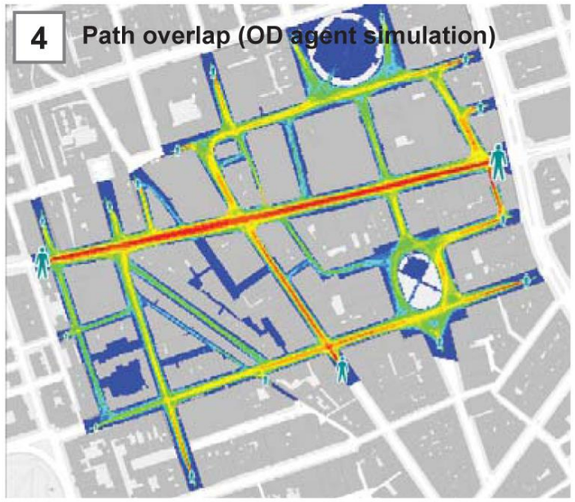
The results of either type of agent simulation can be visualised in two different ways: agent paths (image 3) and path overlap (image 4).

The lines in the image above represents paths of individual agents entering from the points that are indicated by dots. This type of presentation is useful to analyse different routes taken by individual agents.

As seen above, subsets of paths can be isolated to identify issues, which are specific to journeys involving a certain origin or destination or certain routes.

Level of Service can also be calculated using the agent paths data to evaluate the level of safety and comfort at selected points.

4 Path overlap (OD agent simulation)



Path overlap

## Path overlap

The image above demonstrates an overlap of agent paths.

The analysis represents the density of movement according to the number of times an agent ‘steps’ on a specific point. The warmer colours represent higher density of path overlap.

The path overlap can illustrate the density of agent movement clearly. It represents a hierarchy of the space from users’ perspectives.

Space Syntax Limited © 2018

# Appendix 4

## TfL Pedestrian Comfort Level on Footways

# TfL Pedestrian Comfort Level on Footways Ranges

Comfortable

## PCL A — COMFORTABLE FOR ALL AREAS

A+ < 3ppmm
< 3% Restricted Movement

A 3 to 5 ppmm
13% Restricted Movement

A- 6 to 8 ppmm
22% Restricted Movement

The pedestrian environment is very comfortable at PCL A+ to A- with plenty of space for people to walk at the speed and the route that they choose.

## PCL B — B+ RECOMMENDED MINIMUM FOR ALL AREAS

B+ 9 to 11ppmm
31% Restricted Movement

B 12 to 14ppmm
41% Restricted Movement

B- 15 to 17 ppmm
50% Restricted Movement

**PCL B+ is the recommended level of comfort for all area types.** This level provides enough space for normal walking speed and some choice in routes taken.
At PCL B and PCL B- normal walking speed is still possible but conflicts are becoming more frequent and, in retail areas, people start to consider avoiding the area.

Transport for London, 2010. Pedestrian Comfort Guidance for London, p.13

# TfL Pedestrian Comfort Level on Footways Ranges

PCL C — INCREASINGLY UNCOMFORTABLE

C+ 18 to 20ppmm
59% Restricted Movement

C 21 to 23 ppmm
69% Restricted Movement

C- 24 to 26 ppmm
78% Restricted Movement

The pedestrian environment is becoming increasingly uncomfortable, with the majority of people experiencing conflict or closeness with other pedestrians and bi-directional movement becoming difficult.

Uncomfortable

PCL D or E — VERY UNCOMFORTABLE

D 27 to 35ppmm
100% Restricted Movement

E >35 ppmm
100% Restricted Movement

At PCL D walking speeds are restricted and reduced and there are difficulties in bypassing slower pedestrians or moving in reverse flows.

At PCL E people have very little personal space and speed and movement is very restricted. Extreme difficulties are experienced if moving in reverse flows.

Transport for London, 2010. Pedestrian Comfort Guidance for Lo

# Appendix 5

**Detailed data:**

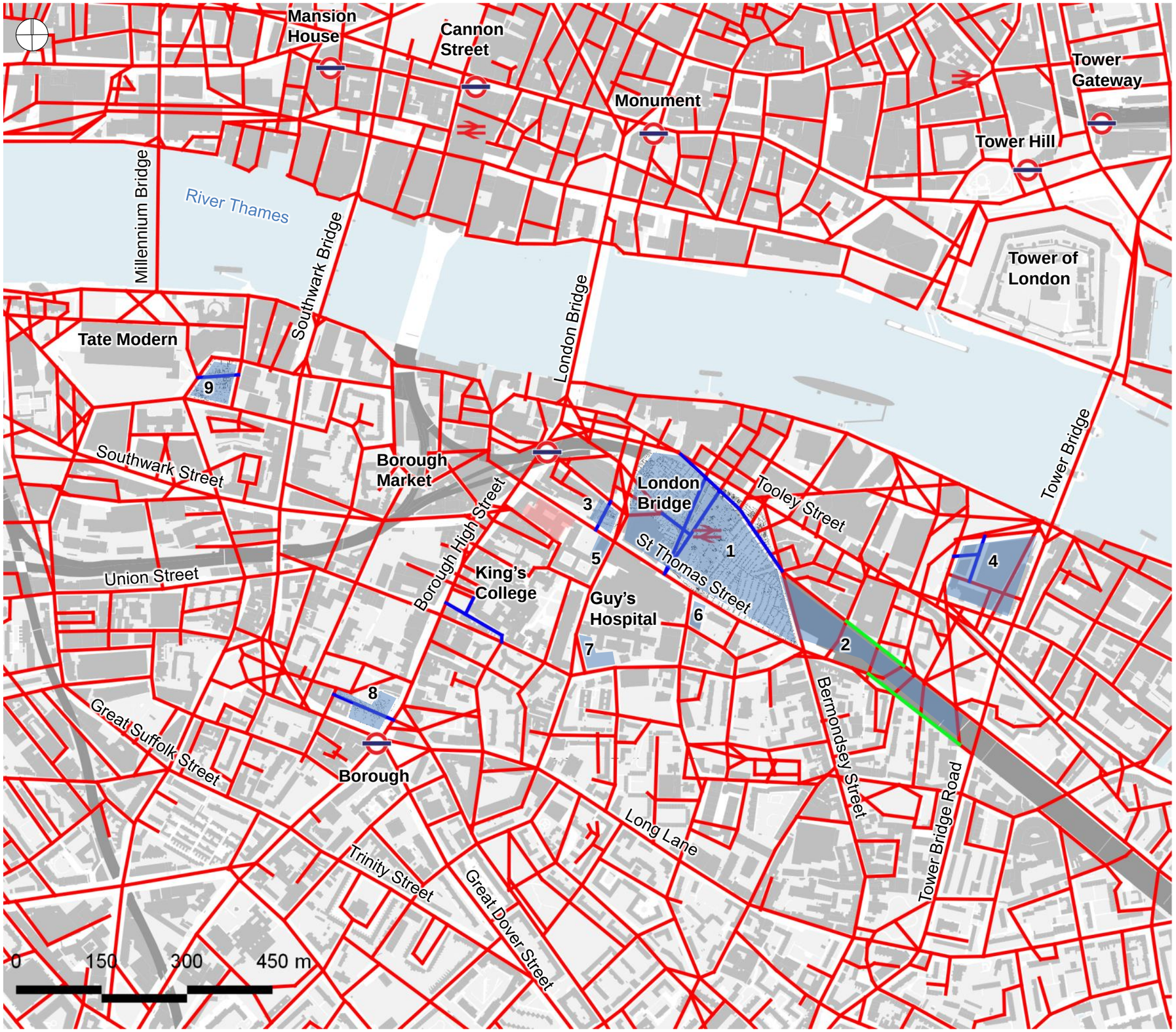
**Spatial layout attraction-Future baseline scenario**

**Transport attraction - Existing and Future transport growth**

**Land use attraction - NCC trip generation and mode split**

# Spatial layout attraction Future baseline scenario Spatial layout changes

Crown copyright. OS Licence No 0100192252




The future baseline model will include a selected number of planned developments which propose changes to the street network connectivity. These include:

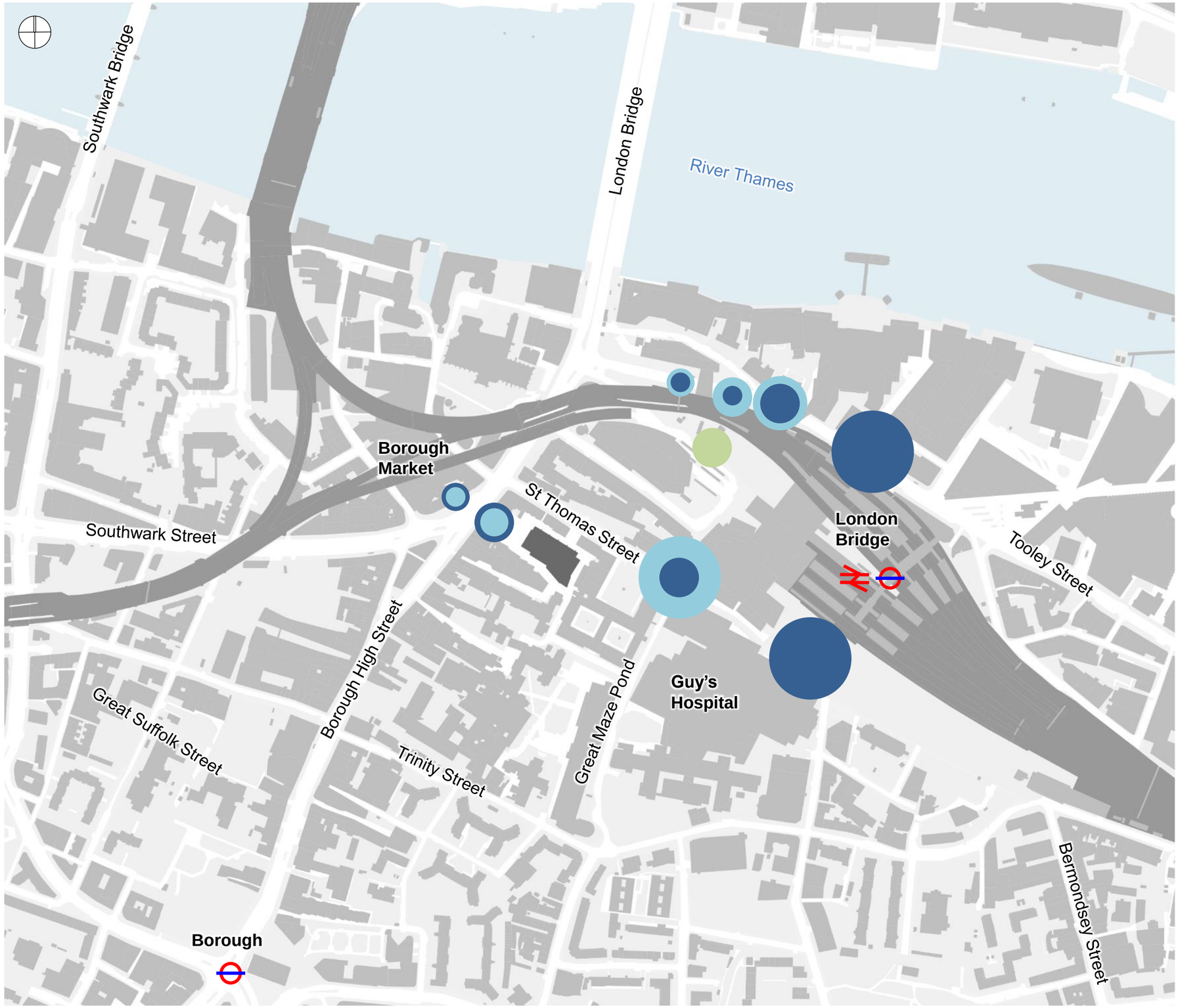
1. London Bridge
2. Low Line
3. Fielden House apartments
4. 1 Tower Bridge apartments
5. KCL Science Gallery
6. The Quill apartments
7. Guy's Cancer Centre
8. Brandon House
9. 185 Park Street

Other future developments can be added upon discussion and agreement with the team.

- Existing spatial network
- Future baseline spatial network
- Long term scenario spatial network
- Underground
- Railway station
- Project site

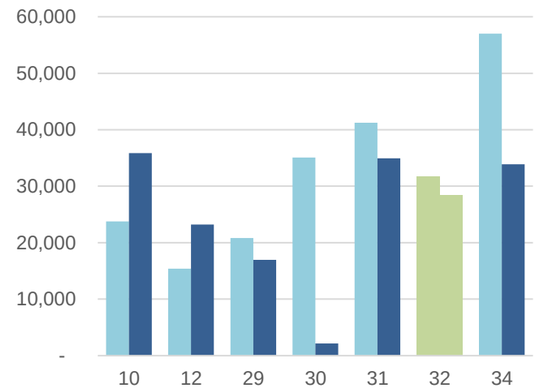
NACh 1200

# Transport attraction Existing and Future transport growth Comparison




There is an increase of movement at the exits along Borough Highs Street, in close proximity to the site. However, the opening of two new exits of London Bridge station to the east reduces movement at the other exits.

Predicted numbers based on TfL's commuter forecast for 2031. TfL's prediction based on RODS 2016 and Railplan 2031 combined Standard Forecasting approach.




**Pedestrian daily footfall difference in existing station exits**

- 15,000 – 20,000
- 20,000 – 30,000
- 30,000 – 40,000
- 40,000 – 50,000
- 50,000 – above

- 2016
- 2031
- No significant change

Space Syntax Limited © 2018

# Transport attraction Network Rail London Bridge Station application

Crown copyright. OS Licence No 0100192252

Network Rail Observed movement 2010[1]

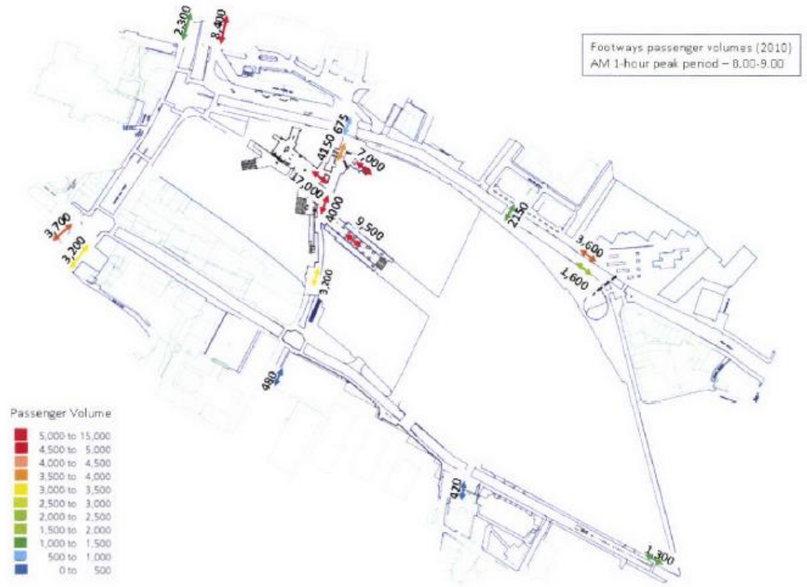
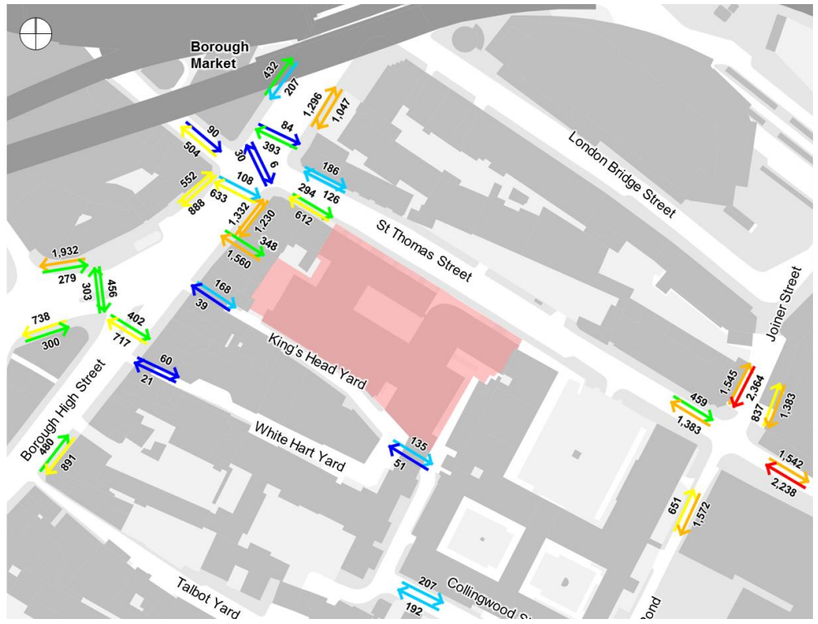



Figure 13: Peak hour magnitude of flows - Street level (8:00-9:00)

Space Syntax AM Peak baseline movement data 2016[2]




The Space Syntax forecast has used the observed movement data from the baseline (2016) as well as the NR data on the London Bridge entrance distribution. The passenger forecasts in the NR submission were used to inform the increase in transport capacity for the 2031 scenario, however, the NR approach to the distribution of movement into the context is based on a number of assumptions which now appear to have been superseded, particularly in terms of how people are distributed into the street network as shown in the Space Syntax movement survey.

As shown in the diagram from the existing (Space Syntax 2016 baseline), movement is higher towards the eastern sections of St Thomas Street (east of Great Maze Pond/London Bridge Street, towards Bermondsey) with less movement at the western section of St Thomas St.

This condition is likely to grow as a result of opening of the new station concourse. This shift of movement to the eastern entrance along St Thomas Street is already assumed in the NR model. Recent site visits seem to confirm this, at least from a qualitative point of view.

The distribution of movement between the north and south pavements of St Thomas is also a result of using the existing distribution.

[1]Appendix 10 Pedestrian modelling of local streetscape and crossings, Network Rail Infrastructure Investment Thameslink Programme, June 2011

[2] Space Syntax survey data, September 2016

# Transport attraction Network Rail London Bridge Station application

Crown copyright. OS Licence No 0100192252

NR Forecast 2031[1]

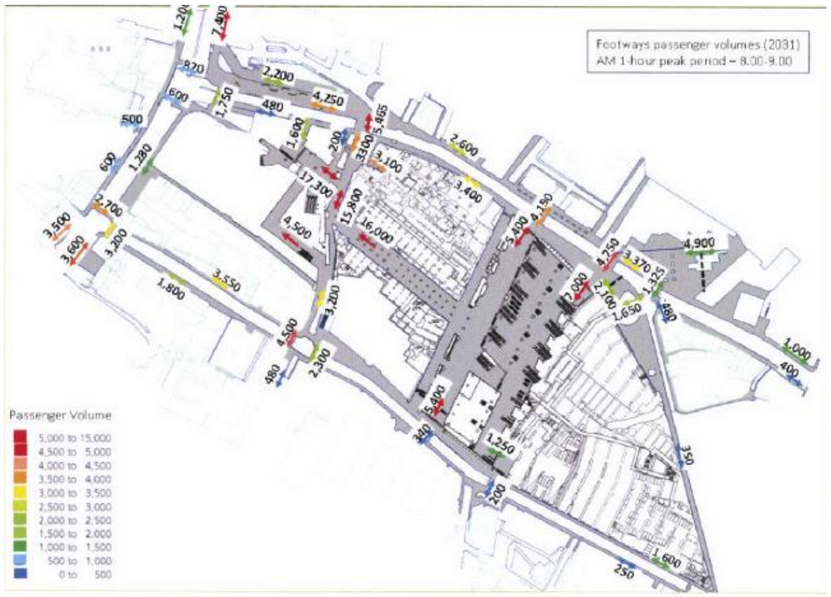



Figure 17: Peak hour magnitude of flows

Space Syntax AM Peak forecast

[1]Appendix 10 Pedestrian modelling of local streetscape and crossings, Network Rail Infrastructure Investment Thameslink Programme, June 2011

# Land use attraction New City Court trip generation and modal split

| Time | In | % | Out | % |
|---|---|---|---|---|
| 07:00-07:30 | 32 | 0% | 15 | 0% |
| 07:30-08:00 | 127 | 2% | 17 | 0% |
| 08:00-08:30 | 460 | 6% | 29 | 0% |
| **08:30-09:00** | **718** | **10%** | **29** | **0%** |
| **09:00-09:30** | **742** | **10%** | **58** | **1%** |
| 09:30-10:00 | 691 | 9% | 85 | 1% |
| 10:00-10:30 | 336 | 5% | 168 | 2% |
| 10:30-11:00 | 214 | 3% | 178 | 3% |
| 11:00-11:30 | 192 | 3% | 231 | 3% |
| 11:30-12:00 | 202 | 3% | 304 | 4% |
| 12:00-12:30 | 256 | 3% | 326 | 5% |
| 12:30-13:00 | 380 | 5% | 669 | 10% |
| 13:00-13:30 | 664 | 9% | 611 | 9% |
| 13:30-14:00 | 450 | 6% | 341 | 5% |
| 14:00-14:30 | 343 | 5% | 270 | 4% |
| 14:30-15:00 | 406 | 6% | 192 | 3% |
| 15:00-15:30 | 350 | 5% | 299 | 4% |
| 15:30-16:00 | 273 | 4% | 270 | 4% |
| 16:00-16:30 | 114 | 2% | 438 | 6% |
| 16:30-17:00 | 73 | 1% | 368 | 5% |
| 17:00-17:30 | 80 | 1% | 716 | 10% |
| 17:30-18:00 | 66 | 1% | 608 | 9% |
| 18:00-18:30 | 56 | 1% | 419 | 6% |
| 18:30-19:00 | 95 | 1% | 200 | 3% |
| **Total** | **7,321** | **-** | **6,842** | **-** |

**Trip Generation and Arrival/Departure Profile[1]**

| Mode | | Mode Split % |
|---|---|---|
| Sustainable | Underground | 28.20% |
| | Train | 48.40% |
| | Bus | 10.20% |
| | Bicycle | 5.60% |
| | On foot | 5.10% |
| **Sub-total** | | **97.50%** |
| Unsustainable | Car | 0.00% |
| | Taxi | 0.20% |
| | Motorcycle | 1.50% |
| | Passenger in a car | 0.40% |
| | Other | 0.30% |
| **Sub-total** | | **2.50%** |
| **Grand Total** | | **100.00%** |

**5.6% Cycle Modal Split[1]**

| Mode | Adjusted Mode Split (25% Cycle Mode) |
|---|---|
| Underground | 21.90% |
| Train | 37.60% |
| Bus | 7.90% |
| Bicycle | 25.00% |
| On foot | 5.10% |
| Car | 0.00% |
| Taxi | 0.20% |
| Motorcycle | 1.50% |
| Passenger in a car | 0.40% |
| Other | 0.30% |
| **Total** | **100%** |

**25% Cycle Modal Split[1]**

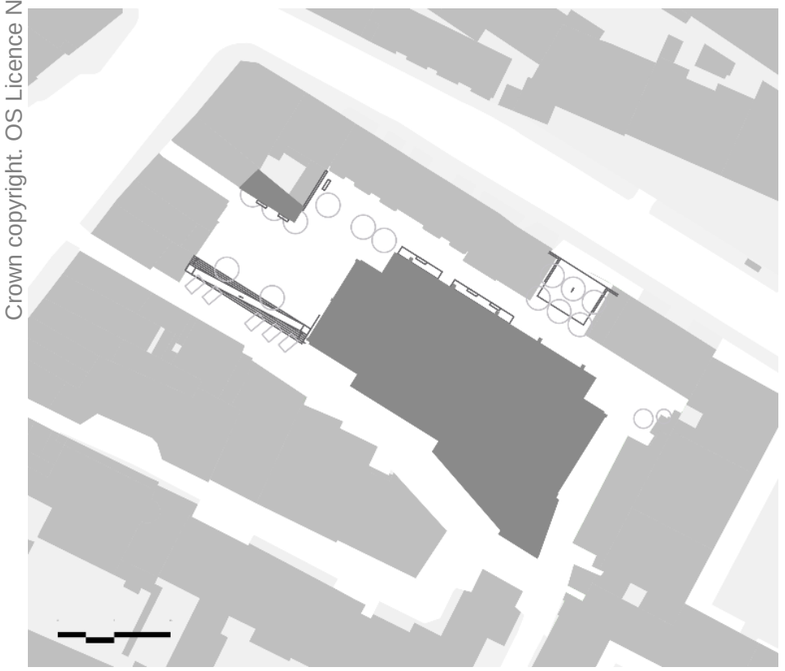
**[1] Note**
Trip generation and modal split provided by TPP.

# Appendix 6

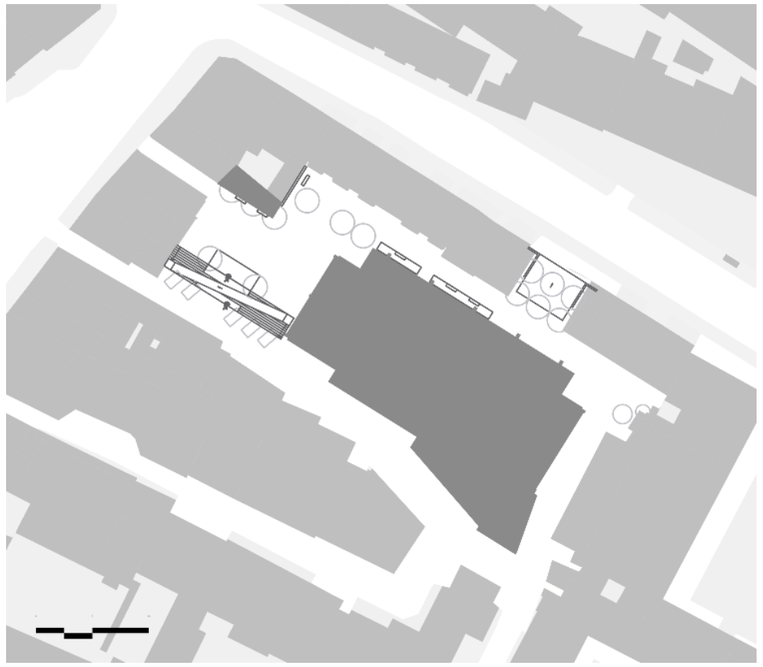
## Landscape assessment: Option testing

# Landscape assessment Option testing

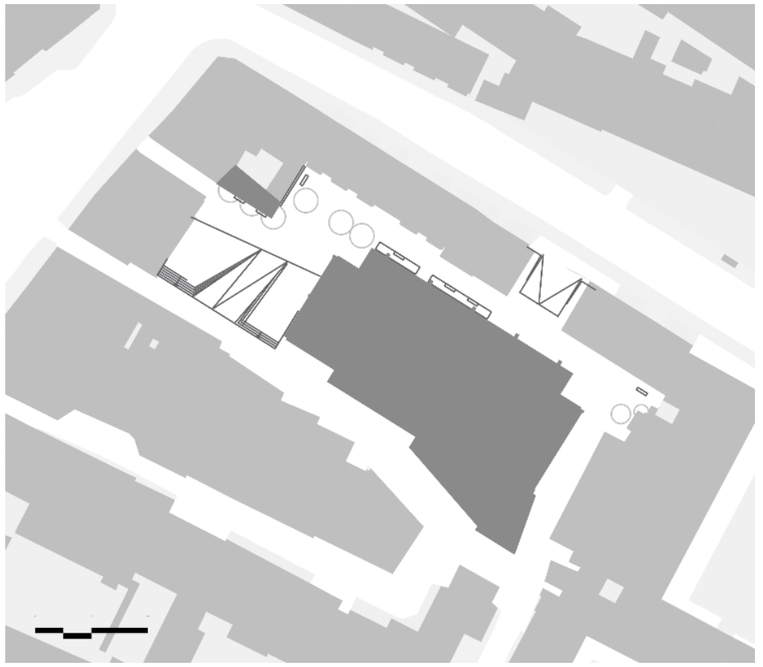
Crown copyright. OS Licence No 0100192252



Option 1



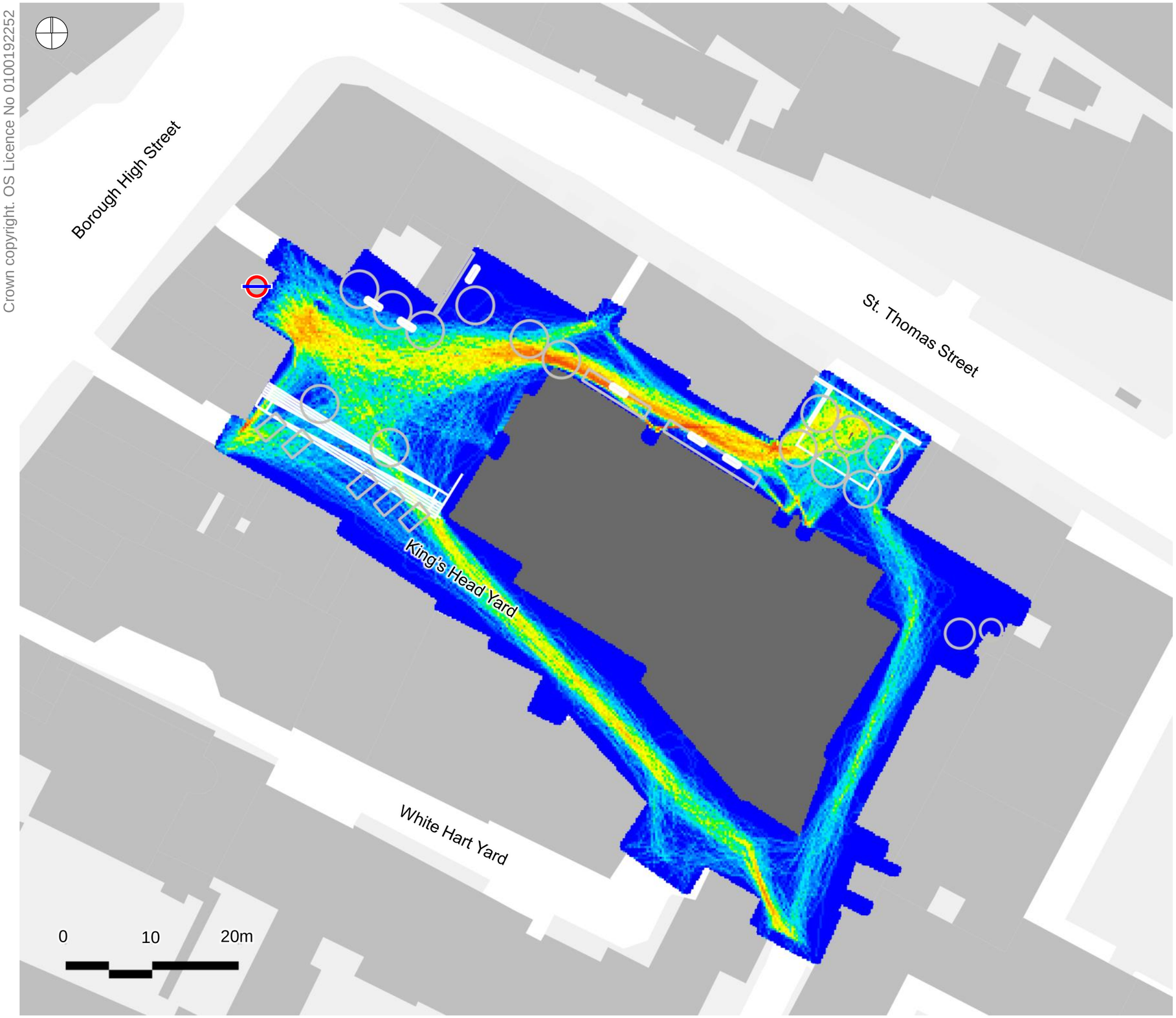
Option 2

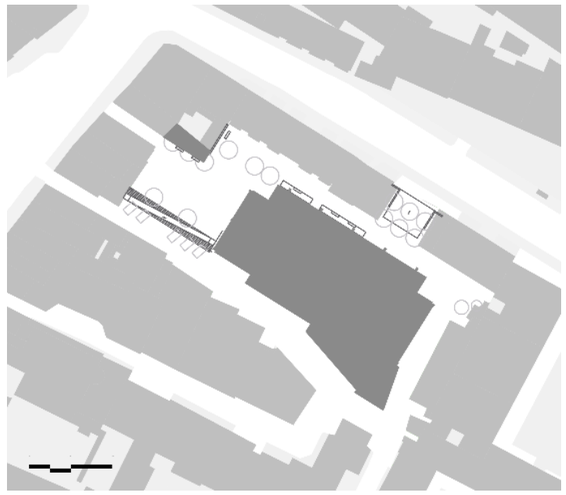


Option 3

# Landscape assessment Design and desire lines AM peak Option 1

Crown copyright. OS Licence No 0100192252



Trees

Level difference

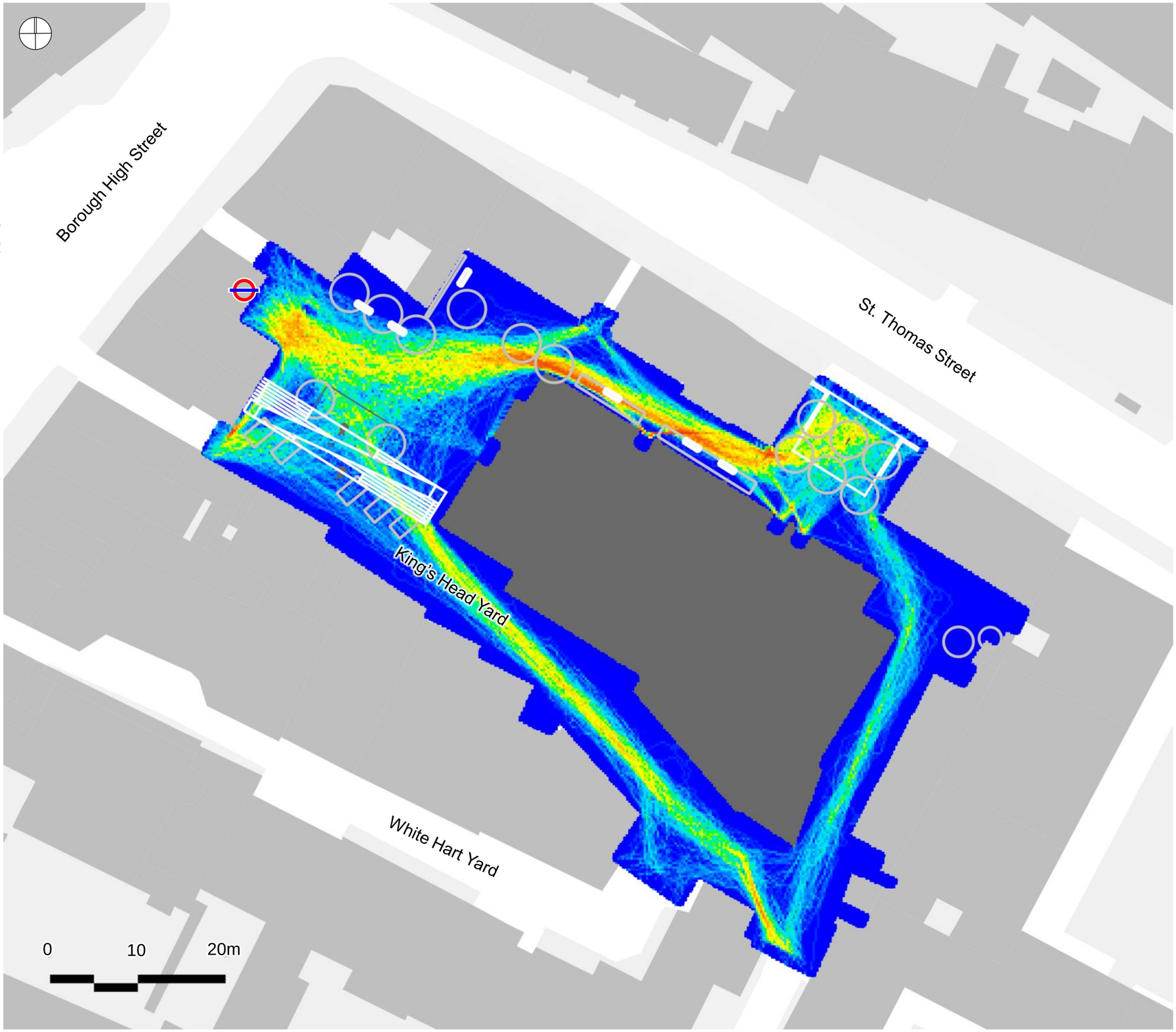
Benches

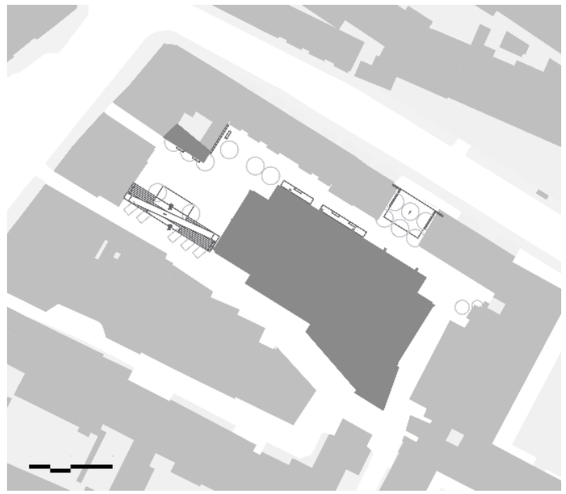
**Path overlap**

low high

# Landscape assessment Design and desire lines AM peak Option 2

Crown copyright. OS Licence No 0100192252



Trees

Level difference

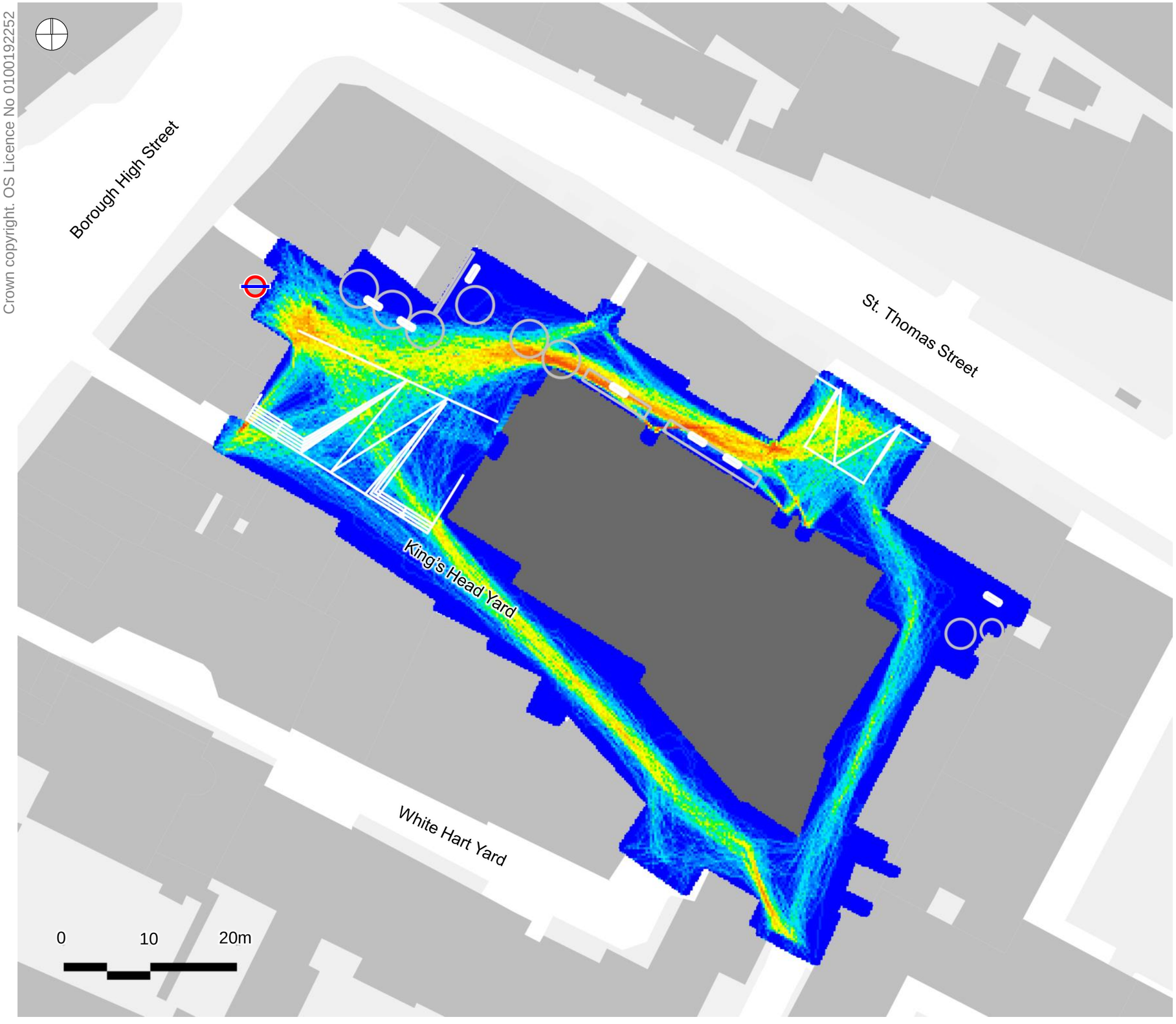
Benches

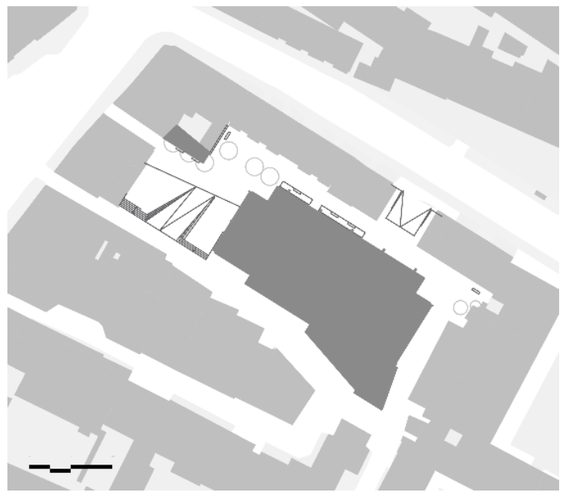
**Path overlap**

low high

# Landscape assessment Design and desire lines AM peak Option 3

Crown copyright. OS Licence No 0100192252



Trees

Level difference

Benches

**Path overlap**

low high

Space Syntax Limited © 2018