
# Thameslink Programme Evaluation:

# Baseline Report

Department for Transport

March 2018

# Quality information

AECOM ref. no.: 60518666

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March 2018

Final Report to DfT

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Department for Transport

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# Executive Summary

In September 2016 the Department for Transport (DfT) commissioned this study to undertake a baseline assessment of the Thameslink Programme. The evaluation of the Thameslink Programme forms part of the DfT's Monitoring and Evaluation Programme intended to provide evidence of the effectiveness of the Department's major programmes in achieving their anticipated outcomes. Establishing a comprehensive baseline and analysis of benefits delivered to date was the first activity for the Thameslink Programme to support any subsequent ex-post evaluation. The scope of this study is limited to a review of transport benefits for Thameslink passengers.

**Thameslink Programme**
Thameslink services first started operation in the late 1980s, introducing cross-London rail services with the re-opening of the Snow Hill Tunnel between Blackfriars and Farringdon. In the 1990s proposals were developed to enhance capacity on the Thameslink network. These proposals were further developed in the following decade as passenger demand and crowding levels grew, in order to address capacity and junction bottlenecks restricting the frequency of service that could be operated. These proposals were drawn together to become the Thameslink Programme – a series of infrastructure and rolling stock investment to deliver more capacity and better connections for passengers across London and the south east. The stated primary objectives of the Thameslink Programme are to:

- Reduce overcrowding on Thameslink and other London commuter services;
- Reduce overcrowding on the Underground;
- Reduce the need for interchange between mainline and Underground train services;
- Provide for the introduction of new cross-London services, so improving public transport accessibility in South East England including access to areas of expected demand growth such as the London Bridge area, Docklands, the land adjacent to King's Cross/St. Pancras International stations and London's airports; and
- Facilitate the dispersal of passengers from St. Pancras station.

To achieve these objectives the Thameslink Programme has been structured into the following phases: Key Outputs (KO) 0 and 1 with implementation between 2009 and 2011; and Key Output 2 between 2013 and 2019. Within these, the following interventions are to be delivered:

- Changes and upgrades to infrastructure, including upgrades to track and signalling to enable longer trains, increase capacity and relieve junction bottlenecks (KO1 and KO2) and redevelopment of Farringdon, Blackfriars (KO1) and London Bridge stations (KO2);
- Procurement of 115 new Class 700 trains (1140 carriages) and two new maintenance depots at Hornsey and Three Bridges (KO2); and
- Delivery of a new high capacity timetable for running passenger services by the Thameslink Southern and Great Northern franchise operator (KO2).

**Thameslink Benefits**
The forecast benefits of the Thameslink Programme have been grouped into the following areas for ease of assessment:

- Service improvements;
- Station improvements;
- Rolling stock ambience; and
- Service reliability.

Each of these is reported in turn within this Baseline Report, providing the basis for the ongoing monitoring of benefit realisation. The focus of this report has been twofold: first, to present an analysis of the Key Output 0 and 1 benefits, realised between the baseline of 2008 and 2012; and secondly, to present a comprehensive baseline (2012) for Key Output 2 to support any follow-up ex-post evaluation. It should be noted that the majority of Thameslink Programme benefits were forecast to be realised following the delivery of Key Output 2, scheduled for 2019.

From December 2018, Thameslink passengers will also be able to interchange at Farringdon and Abbey Wood with Elizabeth Line (Crossrail) services east-west across London.

**Key Output 0 and 1 Benefits**

### Service Improvements (Chapter 3)

Service improvement benefits include all elements of end-to-end journey time (platform wait, in-vehicle and egress), interchanges and on-train crowding.

### Platform wait time

In terms of platform wait time, the increase in train frequency through the core (St. Pancras International, Farringdon, City Thameslink and Blackfriars stations), from 8 to up to15 train paths per hour, implemented in 2009, has reduced average wait times in the AM peak period. The main impact of the Key Output 0 and 1 timetable changes has been to provide an increase in service frequency to stations south of Farringdon from the Bedford Mainline and improved connectivity from the south with the joining up of Southeastern and Thameslink services to run through the core. Furthermore, for Sevenoaks services the main impact of the timetable change was to provide connectivity to the core north of Blackfriars, and hence provide interchange rather than platform wait time benefits.

This increase in service frequency resulted in a small but statistically significant increase in passenger satisfaction with service frequency, as measured in the National Rail Passenger Survey (NRPS) combining results from both the spring and autumn surveys in each calendar year, from 75% saying that the frequency was ‘good’ or ‘very good’ in 2008 to 78% saying this in 2012. This level of improvement in passenger satisfaction was similar to that recorded for c2c services, which are used in this study as a comparator for Key Outputs 0 and 1, to put the trends for Thameslink in context[1].

### In-vehicle time

The impacts of Key Outputs 0 and 1 on in-vehicle journey times were expected to be minimal, and a comparison of 2008 and 2012 timetables confirms this assumption. However, the joining up of Thameslink and Southeastern services through the core will have provided increased connectivity for certain travellers. In the NRPS in 2012 (spring and autumn surveys combined), about 82% of passengers of both Thameslink and Southeastern said that they thought the length of their journey was ‘good’ or very good’. These levels were not significantly different from those recorded in 2008 whereas there was a small but significant increase in the satisfaction levels for the comparator services, c2c, in the same period.

### Interchange time

Satisfaction with train connections, as measured by the NRPS, improved significantly among Thameslink and Southeastern passengers between 2008 and 2012. However, significant

[1] One comparator has been used in the report, and this is discussed in more detail in chapter 3 (section 3.2) and chapter 7. Comparators help demonstrate what may have happened in the absence of the Thameslink Programme, and thus allow measurement of the Programme’s impact. Potential comparators are selected on the basis of having relatively stable service provision (such as rolling stock, service frequency, network served, and infrastructure provision). However, Thameslink does not lend itself well to other comparators given its geographical coverage, uniqueness in providing through-London rail services, interaction with multiple operators etc. In addition, there are few non-Thameslink operators and services which have had or are planned to have no changes in their own rolling stock, infrastructure etc. The choice and applicability of comparators should be revisited as part of the ex-post evaluation, and take into account other factors, such as background population and employment growth in the areas served.

improvements were also recorded for the comparator service, c2c. It is not therefore possible to determine a net benefit generated by the Thameslink Programme, although Key Output 0 and 1 investment is considered likely to have contributed to improved satisfaction levels.

### On-train crowding

The capacity of the Thameslink network has increased during Key Outputs 0 and 1 through the provision of increased frequencies in the peak periods, longer 12-car trains and new rolling stock. The overall increase in Thameslink capacity has been greater than the growth in demand between 2008 and 2012. This was a better outcome than for the comparator, where demand increased by more than capacity. These changes resulted in on-train crowding on Thameslink services to or through Elephant & Castle and Blackfriars reducing from 10.8% in 2008 to 4.6% in 2012, as measured by PiXC (passengers in excess of capacity) in the AM peak period (when crowding levels are generally highest); the comparable c2c values showed an increase in crowding from 2.7% to 4.6%. This suggests a positive impact of the Thameslink programme on crowding levels in Key Outputs 0 and 1 in the AM peak period.

Furthermore, there is no evidence for the closure of the Moorgate branch line in 2009 resulting in a notable impact on demand on the Farringdon to Barbican section of the Circle, Hammersmith & City and Metropolitan Underground lines.

### Station Improvements (Chapter 4)

Farringdon and London Blackfriars stations recorded low levels of passenger satisfaction in the NRPS in 2008 compared with Thameslink network comparators (London Bridge and City Thameslink) and an external comparator (Fenchurch Street). Significant increases in satisfaction were recorded in 2012 at both stations in relation to the upkeep of station buildings and the quality of the overall station environment. Furthermore, significant increases in satisfaction were recorded at Farringdon for the provision of information on trains and platforms, overall facilities and the provision of ticket buying facilities. Although significant increases in passenger satisfaction were also recorded by c2c for facilities, ticket buying facilities and the overall environment, the changes recorded for the two Thameslink stations were far higher. The Thameslink Programme of investment has clearly contributed to these improvements at both Farringdon and London Blackfriars. It can also be assumed that the improvements in access and egress routes, and the general flow of passengers within the station, will have contributed to reducing congestion within London Blackfriars station.

### Rolling Stock Ambience (Chapter 5)

The main rolling stock ambience benefits are forecast to be realised during Key Output 2, following the implementation of new Class 700 trains across the Thameslink network. However, the introduction of 23 Class 377 trains during Key Output 1, although not procured as part of the core Thameslink Programme, has contributed to significant improvements in passenger satisfaction with rolling stock. The Class 377s were also augmented by three leased Southern 377s which replaced older 319s.

Significant increases in passenger satisfaction were recorded between 2008 and 2012 in the NRPS for Thameslink services across a range of rolling stock attributes: ease of boarding/alighting, ability to sit/stand, upkeep of trains and seating comfort. This trend in satisfaction levels was similar to that for the comparator service, c2c. However, as with station improvements, Thameslink had a significantly lower 2008 baseline than c2c and increased by substantially more across most metrics.

### Service Reliability (Chapter 6)

The level of service reliability/punctuality on the Thameslink network, as measured by the Public Performance Measure (PPM), remained fairly constant between 2008 and 2012 despite the increased operational complexity of running more trains through the core. There was a short term reduction in reliability during the period of Thameslink Programme works in

2009/2010, but this had no lasting impact on service performance. This is compared to an improvement in reliability for c2c services, achieved from a higher 2008 baseline. It could be hypothesised that much of the Key Output 0 and 1 works would negatively impact reliability. However, data on performance and passenger satisfaction showed no evidence of any lasting disbenefit.

**Key Output 2 Benefits**

This study has collated a comprehensive 2012 baseline for Key Output 2, for use in any future ex-post evaluation of the Programme. This covers all of the above benefit areas: service improvements; station improvements; rolling stock ambience; and service reliability. In addition to the analysis of a range of available secondary data sets, a new bespoke survey of passengers using the four Thameslink core stations (Farringdon, City Thameslink, Blackfriars and St. Pancras International) was undertaken in March 2017. This survey was designed to provide additional data on the extent of interchanging within central London and the detailed trip patterns of station users.

The work undertaken as part of this commission has also established processed data sets to support the ongoing monitoring of benefit realisation during the remaining period of Key Output 2 implementation.


# Introduction

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# 1. Introduction

## 1.1 Overview

1.1.1 In September 2016 the Department for Transport (DfT) commissioned this study to undertake a baseline evaluation of the Thameslink Programme. The evaluation forms part of the DfT's Monitoring and Evaluation Programme[2] intended to provide evidence of the effectiveness of the department's major programmes in achieving their anticipated outcomes. Lessons learned will inform the future development of ongoing programmes and projects, and the options appraisal and planning for new initiatives.

1.1.2 The scope of this commission for the Thameslink Programme included the collation of Programme baseline data for 2008, the initial ex-post impact evaluation of Thameslink Programme investment made between 2009 and 2011, and the collation/collection of baseline data to assess investment (to be) delivered between 2013 and the end of the programme. The specific objectives of the commission were to:

- Develop an evaluation approach for the Thameslink Programme which can be utilised in subsequent post-opening evaluations, including methods for measuring programme impacts;
- Collect and present comprehensive baseline measures to enable an evaluation of the impacts of the Thameslink Programme post completion of the programme;
- Provide initial analysis of the investments delivered to the end of 2011; and
- Ensure that all relevant baseline data are securely captured, documented and stored with DfT so that it can be used for post-opening evaluations and interim benefits monitoring and reporting.

1.1.3 This document is the Baseline Report for the Thameslink Programme, covering the initial evaluation of benefits up to 2012 and presenting the baseline for the future assessment of benefits after 2012. This chapter presents a brief overview of the evaluation methodology being adopted, before summarising the contents of this Baseline Report.

[2] DfT (2017) *DfT Monitoring and Evaluation Programme: 2016 Update* (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/590519/monitoring-and-evaluation-programme-2016.pdf)

## 1.2 Methodology

1.2.1 The evaluation methodology for the Thameslink Programme has three key elements, each of which is summarised in the proceeding sections:

- Baseline time periods;
- Evaluation approach; and
- The attribution of observed benefits.

**Baseline Time Periods**

1.2.2 A central consideration for the evaluation was establishing suitable baseline periods against which to assess investment benefits. The Thameslink Programme of investment has been delivered in phases, outlined in more detail in Chapter 2:

- Key Outputs 0 and 1, running from 2009 to 2011; and
- Key Output 2, running from 2013 to 2019.

1.2.3 A Thameslink Programme baseline of 2008 has been defined, representing a period prior to any programme related investment. The initial ex-post evaluation of Key Outputs 0 and 1 benefits has been undertaken using 2012 as the one year ex-post period. The suitable baseline year for Key Output 2 investment is also 2012, prior to the start of the main rebuilding works being undertaken at London Bridge. In future, this can be used to compare observed outturn benefits realised within one year of Programme implementation. **Table 1** provides a summary of these key evaluation periods.

**Table 1 Baseline and Evaluation Milestones**

| Key Output | Baseline | One year ex-post evaluation |
|---|---|---|
| 0 & 1 | 2008 | 2012 |
| 2 | 2012 | 2020/21 |

## Evaluation Approach

1.2.4 The overarching evaluation approach to be adopted on the Thameslink Programme is a Theory of Change, which has been used to articulate the mechanisms through which the Programme is expected to deliver defined benefits. Theory of Change is an evaluation approach identified in both the HM Treasury Green Book[3] (on approaches to appraisal) and is explored in depth by the HM Treasury Magenta Book[4] (guidance on evaluation design). The overarching rationale for the Thameslink programme investment is set out in the following paragraph, with the corresponding Theory of Change outlined in **Table 2**.

1.2.5 The Thameslink network allows for travel into, through and out of London from neighbouring economic centres. Capacity on the network is currently constrained by the existing infrastructure in central London. Enhancing capacity through infrastructure works, provision of new, higher-capacity trains and increased service frequencies will enable more passengers to travel on the network, open up new direct journey possibilities and subsequently relieve pressure on the London Underground network.

**Table 2 Outline Theory of Change for the Thameslink Programme**

| | Aspect |
|---|---|
| **Strategic Case** | Providing additional capacity to meet increasing demand, particularly in the peaks. |
| **Inputs** | Total investment in the programme. |
| **Activities** | Infrastructure (e.g. track and station improvements such as London Bridge rebuild), technical (e.g. signalling), procurement (e.g. new rolling stock) and franchise (e.g. new timetable and selection of routes). |
| **Outputs** | Improved stations, extended platforms to support longer trains, improved railway signalling and systems, power supply upgrades, new higher capacity trains, timetable changes offering new journey options, enhanced peak-period frequencies. |
| **Outcomes (benefits)** | Service improvements – shorter platform wait times, reduced journey times, less need to interchange, less on-train crowding.<br>Station improvements – more pleasant stations, enhanced facilities, and reduced passenger congestion.<br>Rolling stock ambience – enhanced quality, increased capacity.<br>Service reliability – a combination of upgraded or new infrastructure, rolling stock and technology driving improved reliability and punctuality.<br>Connectivity – increased range of travel options due to revised service patterns and routing. |
| **Impacts** | Improved passenger experience and satisfaction.<br>A stronger economy because the labour force have better access to employment opportunities. |
| **Disbenefits** | Disruption caused by infrastructure works. |

[3] HMT (2013) Green Book, appraisal and evaluation in central government, available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf
[4] HMT (2011) Magenta Book: Guidance for evaluations, available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220542/magenta_book_combined.pdf

1.2.6 This Theory of Change will be assessed and evaluated in each of the two ex-post periods of 2012 and 2019/20. The scope of analysis undertaken in each evaluation period will be determined by the stage of Programme implementation and anticipated timescales for benefit realisation.

**Attribution of Observed Benefits**

1.2.7 A key challenge with the evaluation is how to attribute observed changes in benefit measures to the Thameslink Programme or other contextual factors. This is fundamental to determining the net benefit of the Programme compared to the counterfactual scenario. The principle of a counterfactual is that it can attempt to demonstrate what may have happened in the absence of the Programme and thus allow measurement of the Programme's impact. However, in the case of the Thameslink Programme, there are no suitable alternative networks that could offer a robust programme-wide counterfactual. The main reason for this is that the Thameslink network serves a very large area and benefits are anticipated to be spread by interconnecting services. Furthermore, London is materially unlike any other city in the UK with a more developed transport network and there are other major infrastructure schemes, such as Crossrail, taking place at the same time as the Thameslink Programme.

1.2.8 However, it has been possible to identify sets of comparators for specific elements of the Thameslink Programme e.g. station improvements and new rolling stock. This allows comparisons of changes in key benefits for the Thameslink Programme and external routes/stations, to understand the influence of wider contextual factors i.e. those that will have influenced both sets of comparators, versus specific Thameslink Programme impacts. There are still limitations in finding suitable comparators and the analysis of individual benefits presented in Chapters 3 to 6 of this report identifies where suitable comparators exist, and any limitations where relevant.

1.2.9 The economic downturn from 2008 to broadly 2010/11 and subsequent recovery also need to be taken into account in the attribution of benefits in the ex-post evaluation. For the ex-post evaluation, the use of both comparators and trend data will help identify such impacts.

## 1.3 Data and Evidence

1.3.1 Central to the evaluation of the Thameslink Programme are the data sources available to assess the anticipated outcomes or benefits. For each of the main categories of benefits (service improvements, stations improvements, rolling stock ambience, and service reliability) data have been identified for assessing baseline and ex-post periods.

1.3.2 Given this study commenced in late 2016 after both the Programme and Key Output 2 baselines (2008 and 2012 respectively), the study has focused on existing data sources where possible. It has also identified whether these data sources will be available in the ex-post period for Key Output 2 (assumed to be 2019) or whether there could be potential consistency issues in how the data are collected or processed over time.

1.3.3 In addition, new surveys were designed and undertaken in March 2017 to help inform the Key Output 2 baseline and address gaps in the evidence available from existing data (e.g. journey information for passengers currently using any of the four central London Thameslink core stations between St. Pancras International and Blackfriars).

1.3.4 The key data sources informing the evaluation of benefits are described in each of the relevant benefit chapters in this report.

## 1.4 Structure of Baseline Report

1.4.1 This remainder of this report consists of the following chapters:

- **Chapter 2: Thameslink Programme overview**, summarising the main interventions as part of Key Outputs 0, 1 and 2;
- **Chapter 3: Service improvement benefits**, including the initial analysis of journey time, platform wait time, interchange time and on-train crowding benefits;
- **Chapter 4: Station improvement benefits**, including investment at Blackfriars, Farringdon and London Bridge;
- **Chapter 5: Rolling stock ambience benefits**, focusing on the introduction of new Class 700 rolling stock during Key Output 2;
- **Chapter 6: Service reliability benefits**, focusing on train performance (reliability and punctuality) following infrastructure and rolling stock improvements and new timetables; and
- **Chapter 7: Next steps**.


# The Thameslink Programme

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# 2. The Thameslink Programme

## 2.1 Introduction

2.1.1 This chapter presents an overview of the Thameslink Programme, beginning with a summary of the rationale and objectives behind the Programme and its phased roll out (known as Key Outputs 0, 1 and 2) before providing a summary of the main investment in:

- Service improvements;
- Station improvements;
- Track and infrastructure investment; and
- Rolling stock improvements.

## 2.2 Background and Objectives

2.2.1 Thameslink services first started operation in the late 1980s, introducing cross-London rail services with the re-opening of the Snow Hill Tunnel between Blackfriars and Farringdon. In the 1990s proposals were developed to enhance capacity on the Thameslink network. These proposals were further developed in the following decade as passenger demand and crowding levels grew, in order to address capacity constraints such as the maximum 8 carriage (8-car) length trains possible on the route, and junction bottlenecks restricting the frequency of service that could be operated. These proposals were drawn together to become the Thameslink Programme.

2.2.2 Approval for the Thameslink Programme was announced by the then Secretary of State for the Department for Transport in the 2007 White Paper *Delivering a Sustainable Railway* as part of an overarching strategy to enable growth and prioritise investment in additional rail capacity. The Thameslink Programme was identified as one of the key priorities, given current and forecast levels of demand and capacity constraints. It was recognised that on the Thameslink network capacity could only be increased by a major upgrade. The 2007 White Paper stated:

"*The Thameslink Programme will enhance the frequency and capacity of services that operate north–south through central London. It will provide a step change in capacity by allowing 12-carriage operations and 24 trains per hour in both directions through the centre of London. The enhanced Thameslink network will serve a greater number of stations north and south of London and will provide significant congestion relief (both on national rail and London Underground) while providing capacity for growth in future. The Programme provides significant economic benefits to London and the wider South East.*"[5]

2.2.3 The concept of the Thameslink Programme was to operate more mainline trains through central London by extending the Thameslink network and reducing the number of trains terminating in London and by introducing the capability to run 12-car rolling stock (previously restricted to 8-car maximum) and up to 24 trains per hour (tph) through the Thameslink core at the busiest times. The Thameslink core consists of the following four stations: St. Pancras International, Farringdon, City Thameslink and Blackfriars.

[5] Chapter 5 *Delivering a Sustainable Railway* White Paper (DfT, 2007)

2.2.4 The stated primary objectives of the Thameslink Programme were to[6]:

- Reduce overcrowding on Thameslink and other London commuter services;
- Reduce overcrowding on the Underground;
- Reduce the need for interchange between mainline and underground train services;
- Provide for the introduction of new cross-London services, so improving public transport accessibility in South East England, including access to areas of expected demand growth such as the London Bridge area, Docklands, the land adjacent to King's Cross/St. Pancras International stations and London's airports; and
- Facilitate the dispersal of passengers from St. Pancras station.

2.2.5 This would be achieved by:

- Major infrastructure works to provide platforms to accommodate longer trains and the removal of key capacity bottlenecks;
- The procurement of new rolling stock; and
- Changes to existing, and letting of new, railway franchises to accommodate the revised Thameslink services.

2.2.6 **Figure 1** shows the current Thameslink network (not every station is shown on the map), extending from Bedford in the north; to the Wimbledon Loop (Tooting – Mitcham Eastfields via Wimbledon and Sutton) and Brighton in the south; and Sevenoaks in the south east.

2.2.7 **Figure 2** shows the latest proposed Thameslink network (not every station is shown on the map) from 2018/2019. It also shows Crossrail (the Elizabeth line)[7], given that Crossrail services will commence operation between Paddington and Abbey Wood in December 2018, providing direct interchange with Thameslink services at Farringdon and Abbey Wood. **Figure 2** shows Thameslink services being extended to cover a wider area, to also include routes up to Peterborough and Cambridge; Horsham in the south; and Ashford and Rainham in the south east. Further mapping showing detailed services are provided in **Appendix B**.

[6] DfT (2008) *Thameslink Rolling Stock Project Summary and Overview*
[7] Further information can be found on the Crossrail website www.crossrail.co.uk.

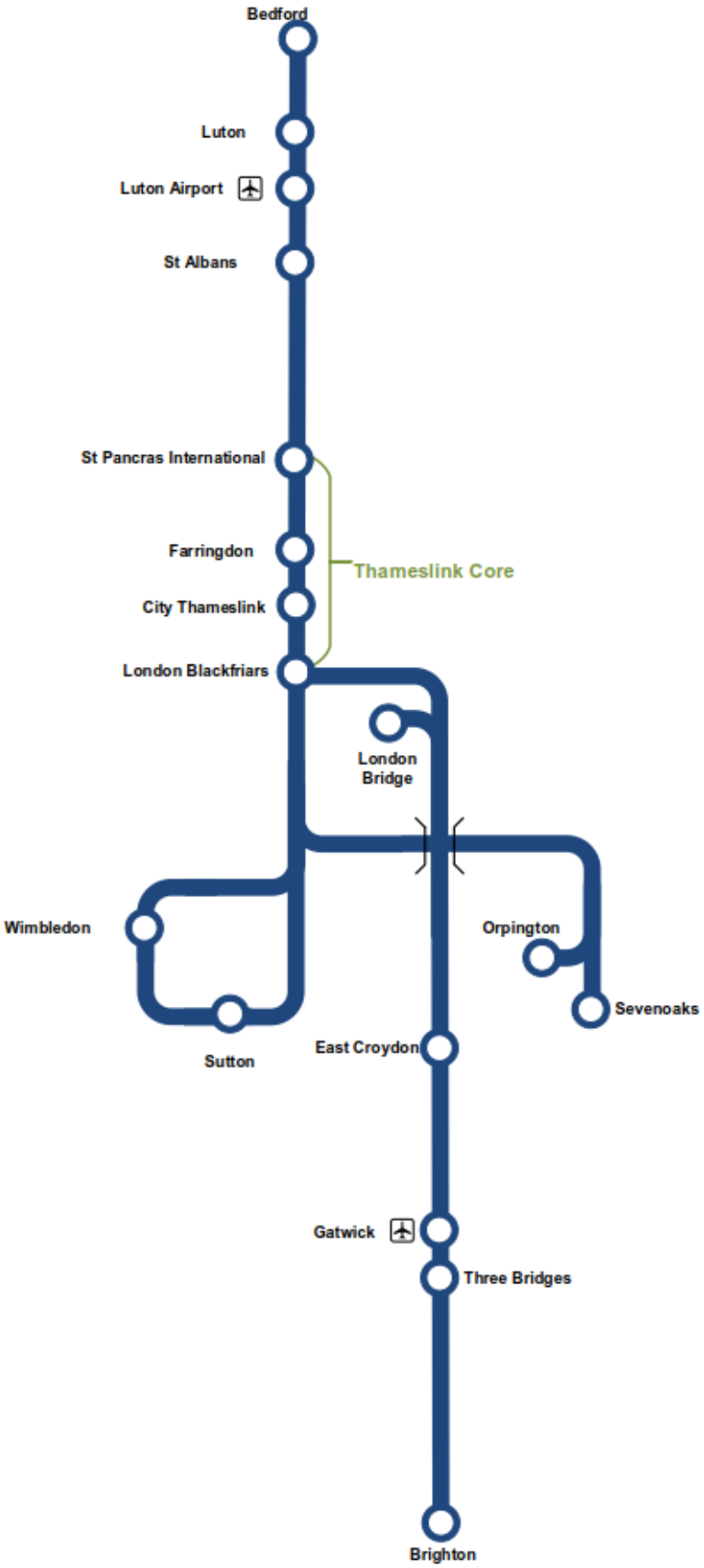


**Figure 1 Thameslink Route Map (2017) (not all stations shown) to illustrate the geographic scope of the Thameslink network prior to completion of the Thameslink Programme** *(see Appendix B Figure B1 for a more detailed map)*

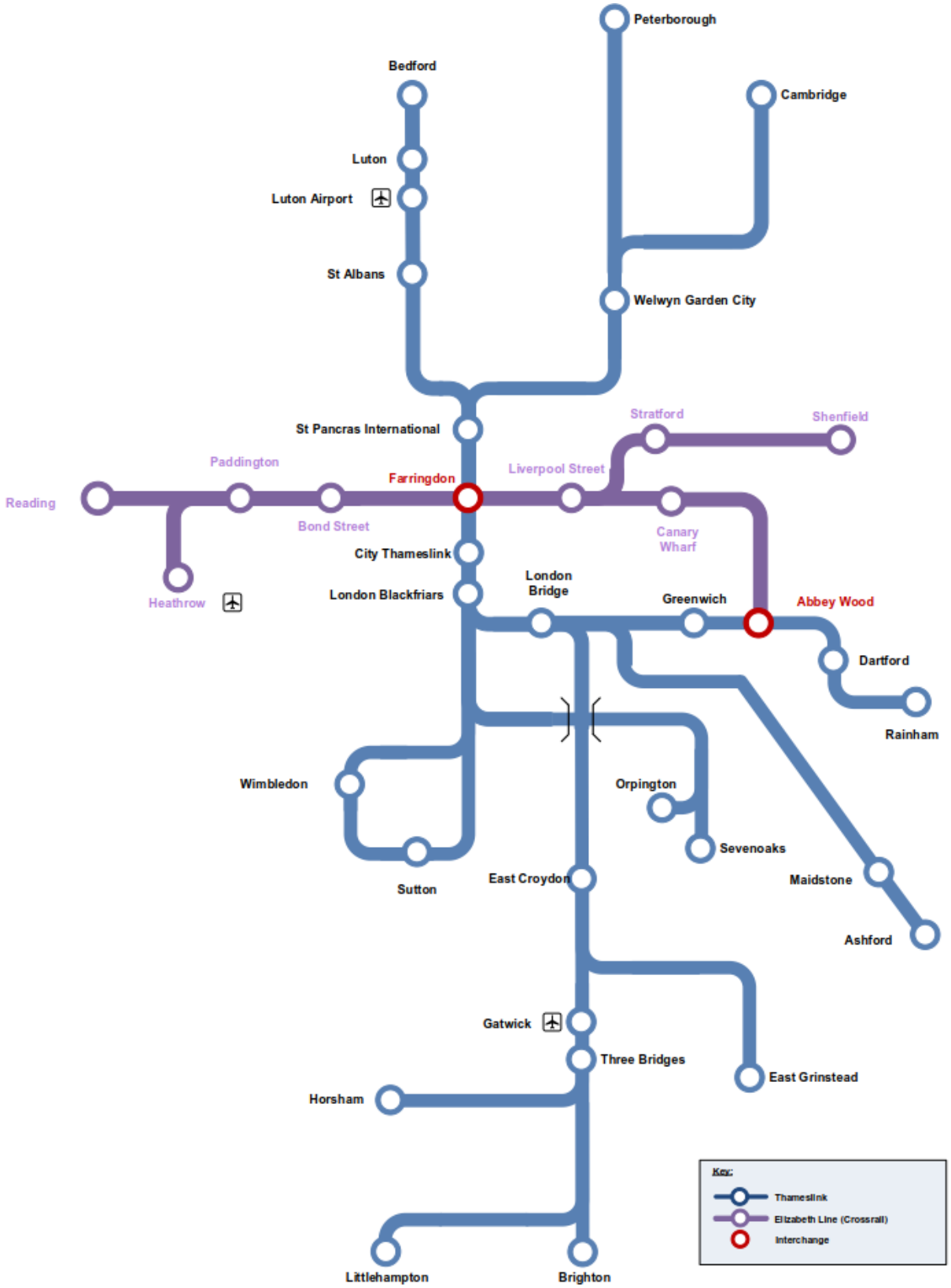


**Figure 2 Proposed Thameslink Route Map (2018/2019) (not all stations shown) to illustrate the geographic scope of the Thameslink network post completion of the Thameslink Programme, showing key interfaces with Crossrail from 2018** *(see Appendix B Figure B2 for a more detailed map)*

## 2.3 Phased Roll Out of the Programme – Key Outputs 0, 1 and 2

2.3.1 The Thameslink Programme was structured to deliver a phased roll out:

- Key Outputs 0 and 1:
  - Key Output 0 introduced service changes to allow Key Output 1 works to take place[8] and enabled an increase from 8 to up to 15 train paths per hour through the core.
  - Key Output 1 delivered the infrastructure changes to allow 12-car trains to run on the network by December 2011.
- Key Output 2:
  - This will allow up to 24 tph in the peak through the core by December 2019, with new rolling stock, and expand the Thameslink network by operating new cross-London Thameslink services from parts of the Great Northern, Southern and Southeastern networks.

[8] It should be noted that before Key Output 0, the old King's Cross Thameslink station was closed in December 2007, replaced by the new Thameslink platforms as part of St. Pancras International station. Eurostar services moved from London Waterloo to St. Pancras International at the end of 2007.

2.3.2 **Table 3** summarises the main interventions by Key Output phase.

**Table 3 Delivery of the Thameslink Programme by Key Output**

| Phases | Key interventions |
|---|---|
| **Key Output 0** | Closure of the Moorgate branch meant Southeastern and Thameslink paths were joined up and services were jointly operated to run through the core, linking the Midland Mainline to Sevenoaks in January 2009 (as well as some other peak services in Kent, for example Rochester and Ashford, where previously these Southeastern services terminated at Blackfriars). |
| | Permanent closure of the Moorgate branch of the Thameslink route (between Farringdon and Moorgate via Barbican) allowed for the extension of platforms at Farringdon to allow 12-car operation, which blocked the junction to the Moorgate branch, hence its closure in March 2009. With Thameslink services to Barbican and Moorgate no longer possible this will have impacted passengers accessing Barbican and Moorgate, but increased the frequency of services through the rest of the Thameslink core. |
| | Timetable updated in March 2009 to be able to operate up to 15 train paths per hour in the peak periods through the core in each direction. |
| | Blackfriars Underground station closed in March 2009 (re-opened in February 2012) for major redevelopment to increase capacity, including a larger ticket hall, refurbished platforms and step-free access. |
| **Key Output 1** | 12-car platforms opened at Farringdon, Blackfriars and stations between Mill Hill Broadway and Bedford, and 12-car trains introduced between Bedford and Brighton in December 2011. |
| | Redevelopment of Farringdon and Blackfriars rail stations completed in December 2011 (Blackfriars Underground station re-opened in February 2012). Station improvements including new entrance at West Hampstead Thameslink opened 2011. |
| | Track and signalling upgraded between West Hampstead and St. Pancras International; construction of an additional pair of tracks on the western approaches to London Bridge station alongside the existing rail bridge over Borough Market (Borough Viaduct in passenger service in January 2016). |
| **Key Output 2** | London Bridge station re-build commenced in May 2013, beginning with works on the terminating platforms, which were substantially completed by January 2015. |
| | Work on the through platforms at London Bridge commenced in January 2015, and was completed in January 2018. Thameslink cross-London services on diversion away from London Bridge (from January 2015, to be reintroduced in 2018); Southeastern Charing Cross services ran through and did not stop at London Bridge (January 2015 – August 2016); Southeastern Cannon Street services ran through and did not stop at London Bridge (August 2016 – January 2018). |
| | New Class 700 rolling stock began gradual introduction into service on the Thameslink network in 2016.Two new depots built at Three Bridges (completed 2015) and Hornsey (2016) to maintain and stable the new Class 700 trains. |
| | Two thirds of new concourse opened at London Bridge August 2016, with new entrances and gatelines. Some new retail units opened during 2016. Station redevelopment will be completed in 2018. |
| | The completion of the Bermondsey Dive Under during 2017 allows the Thameslink lines to cross over the Kent lines on their approach to London Bridge station, facilitating an increase in the number of trains that can pass through London Bridge in 2018. |
| | New timetable with new cross-London Thameslink services introduced from May 2018. These will include a number of Great Northern services that currently terminate at King's Cross. The majority of the new cross-London Thameslink services will still start in May 2018, with 18 tph in the peak through the core, 20 tph from December 2018, 22 tph from May 2019 and 24 tph in the peak from December 2019. |
| | Automatic Train Operation (ATO) will be implemented to support delivery of up to 24 tph in the peak periods through the core in each direction, with the European Train Control System (ETCS) providing the signalling to support ATO. A Traffic Management System will also be used to support the high frequency timetable and will help plan and re-plan train movements in real time. |

## 2.4 Service Improvements

2.4.1 Overall the Thameslink Programme will deliver more capacity through a combination of longer trains and more peak time services. New rolling stock, infrastructure upgrades, and Automatic Train Operation (ATO) will enable frequency improvements to up to 24 tph at peak times in each direction from December 2019 through the core. The European Train Control System (ETCS) is one method to allowing ATO and is the proposed supporting signalling in this scenario. This enhanced service frequency will be largely enabled by Thameslink taking over a number of Great Northern, Southern and Southeastern services, which will be able to run through central London for the first time.

2.4.2 From May 2018, Thameslink services will provide new journey opportunities and better connections on an expanded network including better connections to airports and international rail services from St. Pancras International. Passengers from Cambridge and Peterborough will have direct rail access to the core, London Bridge and Gatwick for the first time, and passengers from Sussex, Surrey and Kent will be able to access the Great Northern and East Coast routes.

2.4.3 As indicated when comparing **Figure 1** and **Figure 2** set out earlier in the chapter (and the more detailed maps in **Appendix B**), the Thameslink Programme will result in Thameslink services being extended to cover a wider area, to also include routes up to Peterborough and Cambridge; Horsham in the south; and Ashford and Rainham in the south east. As such, the direct benefits of the Thameslink Programme will impact current Thameslink and Great Northern routes, a large number of current Southern routes and some Southeastern routes. This will also contribute to reducing crowding on the Underground as Thameslink takes more services through the core providing access to the City without needing to interchange onto the Underground and provide an alternative route between London Bridge and King's Cross St. Pancras to the Northern Line.

2.4.4 There will also be indirect impacts from the Thameslink Programme where the introduction of new cross-London Thameslink services may provide crowding relief on existing Southern and Southeastern services into London Victoria, Charing Cross, Waterloo East and Cannon Street.

2.4.5 As well as providing increased connectivity and bringing a number of services through the core for the first time, more Thameslink services will be able to stop at London Bridge during the peaks.

2.4.6 The increased capacity will enable Thameslink to deliver trains every 2.5 minutes on average at the busiest times in each direction through the core, and relieve crowding on the Underground, especially the Northern line between London Bridge and King's Cross and the Victoria line between Finsbury Park/King's Cross and Victoria.

## 2.5 Station Improvements

2.5.1 A key focus of investment in the Thameslink Programme has been, and will be, on improving the facilities and track/platform arrangements at strategic stations, including Blackfriars, Farringdon and London Bridge. Each is considered in turn below.

**Blackfriars**

2.5.2 Blackfriars station has been completely rebuilt to provide passengers with longer 12-car trains (**Figure 3**), more frequent services and easier connections to the underground. Blackfriars station is the first to span the River Thames and has been designed with a solar roof to provide up to 50% of the station's energy. The works have included:

- Step-free access;
- A new entrance on the south side of the river Thames enabling access to the station from both sides of the river;
- Moving bay platforms from the east to the west side of the station which avoids the need for cross-London through services (Wimbledon Loop) to cross the path of terminating services; and
- Upgrades to the power supplies.

2.5.3 The works at Blackfriars station were largely completed in late 2011 (although the Underground station was not re-opened until February 2012).


**Figure 3 Class 700 train at Blackfriars, 2016**
*Source: DfT*

### Farringdon

2.5.4 Farringdon station has been expanded to handle the increase in Thameslink passengers and will become a major transport hub when Crossrail services commence in 2018 (**Figure 4**). The works have included:

- A new ticket hall dedicated to Thameslink and future Crossrail passengers;
- Extended Thameslink platforms for 12-car trains to use[9];
- A refurbished London Underground entrance;
- A new concourse on Turnmill Street linking onto a new footbridge and the refurbished original London Underground entrance;
- An extended roof to allow passengers to use the full length of the platforms;
- Five new lifts to make Farringdon step-free for the first time; and
- Upgraded power supplies.

2.5.5 The works at Farringdon were concluded in December 2011 and the new ticket hall was opened in 2012.

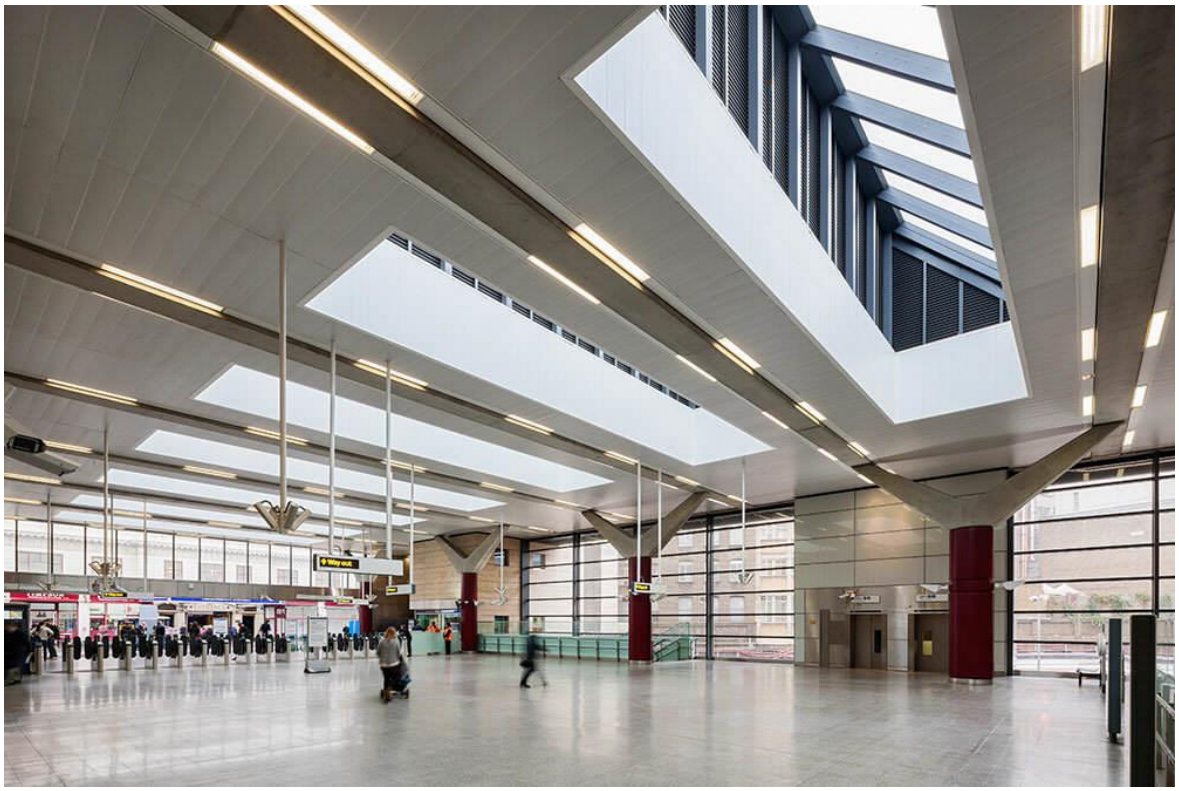

**Figure 4 New Farringdon concourse**
*Source: http://www.thameslinkprogramme.co.uk/improvements/farringdon-station*

[9] As set out in Table 3, this necessitated the closure of the Moorgate branch.

### London Bridge

2.5.6 A significant redevelopment of London Bridge station is currently underway to provide more rail capacity, relieve passenger congestion at the station and provide a much improved passenger environment at one of the country's busiest rail stations. The first phase of the new station concourse was completed in August 2016 (**Figure 5**) and the remaining concourse opened on schedule in January 2018. The station redevelopment is due to be completed in 2018.


**Figure 5 New London Bridge concourse (August 2016)**
*Source: DfT*

### Extended Platforms

2.5.7 Platforms have also been lengthened at a number of Thameslink stations on the Midland Mainline to enable 12-car operation:

- Bedford;
- Flitwick;
- Harlington;
- Leagrave;
- Luton;
- Luton Airport Parkway;
- Harpenden;
- St Albans;
- Radlett;
- Elstree & Borehamwood;
- Mill Hill Broadway;
- West Hampstead Thameslink;
- Farringdon; and
- Blackfriars.

## 2.6 Track and Infrastructure Investment

### London Bridge Track Re-alignment

2.6.1 A core part of the Thameslink Programme is investment to enhance and expand the rail network infrastructure. This includes the rebuilding of London Bridge station which was operating at peak capacity and realignment of the tracks in and around London Bridge and at Blackfriars so that trains do not have to slow down or stop at junctions to allow other services to pass.

2.6.2 Rebuilding London Bridge station includes changing the configuration of the station to increase the number of through platforms. Prior to the redevelopment, the station had 9 terminating platforms and 6 through platforms. There are now 6 terminating platforms and 9 through platforms. This segregates Cannon Street, Charing Cross and Thameslink services and enables more Thameslink services to operate through London Bridge, allowing up to 16 Thameslink tph to pass through the station and up to 24 tph through the core section between Blackfriars and St. Pancras International, in each direction in the peak periods.

2.6.3 As part of Key Output 1, a new viaduct was built over Borough Market and was brought into use in January 2016 (**Figure 6**). Before the viaduct was built, Southeastern services to and from Charing Cross shared a pair of tracks with Thameslink services. The viaduct has doubled the number of tracks heading west out of the station by creating dedicated tracks for Charing Cross and Thameslink services. This allows more train services to continue to and through London Bridge station.


**Figure 6 Borough Viaduct (aerial view and ground view)**
*Source: http://www.thameslinkprogramme.co.uk/improvements/borough-viaduct*

### Signalling

2.6.4 Investment is also being made in new signalling (European Train Control System) and Automatic Train Operation (ATO) in the core (St. Pancras International, Farringdon, City Thameslink and London Blackfriars), which will allow trains to operate at a Tube-like frequency i.e. every 2.5 minutes on average through the core from December 2019 in the peaks.

### Train Depots

2.6.5 Two new train depots have been built to maintain the new Thameslink Class 700 trains and are located at Hornsey in North London and Three Bridges depot, Crawley, West Sussex.

2.6.6 The Three Bridges Depot was completed in July 2015, followed by completion of the new facility at Hornsey in July 2016. Both depots are fully signalled and incorporate stabling and servicing facilities and key personnel safety features including a depot protection and emergency electrical isolation system. Both depots include an in-cab simulator to provide specialist driver training for the new Class 700 trains.

### Canal Tunnels

2.6.7 The Thameslink Programme is linking two new routes to the Thameslink network through a set of tunnels between the Thameslink route at St. Pancras International station and the East Coast Mainline near King's Cross, which will allow passengers to travel from Peterborough and Cambridge directly to Blackfriars and beyond.

2.6.8 The Canal Tunnels were built at the same time as the redevelopment of St. Pancras International station between 2004 and 2006, with the intention that they would be used to provide this essential link within the Thameslink Programme. Network Rail has installed track, power, signalling and safety systems to run passenger services through them from 2018. Connecting these services is a vital part of delivering capacity improvements in and around London. When the Thameslink Programme is completed, of the 24 trains per hour peak service which will travel through central London, up to 8 of these will travel via the Canal Tunnels.

## Bermondsey Dive Under

2.6.9 The Thameslink Programme is untangling the track on the approaches to London Bridge station to reduce the time trains wait for platforms to clear, and thereby cut delays. Fewer crossing movements on the approach to London Bridge should reduce the risk of delays and the knock-on impacts of disruption. To achieve this, new track and infrastructure has been added, including a major new section of railway called the Bermondsey Dive Under (**Figure 7**). The dive under, on the eastern approach to London Bridge station, will allow the Thameslink lines to cross the Kent lines unimpeded on their approach to London Bridge station. This will help increase the number of trains which can serve London Bridge.

2.6.10 The dive under is formed by a series of new structures constructed along the line of existing operational railway viaducts, reusing existing structures wherever possible to reduce disruption and waste. The first lines through the dive under opened during 2017 and the dive under will be in full use from 2018.

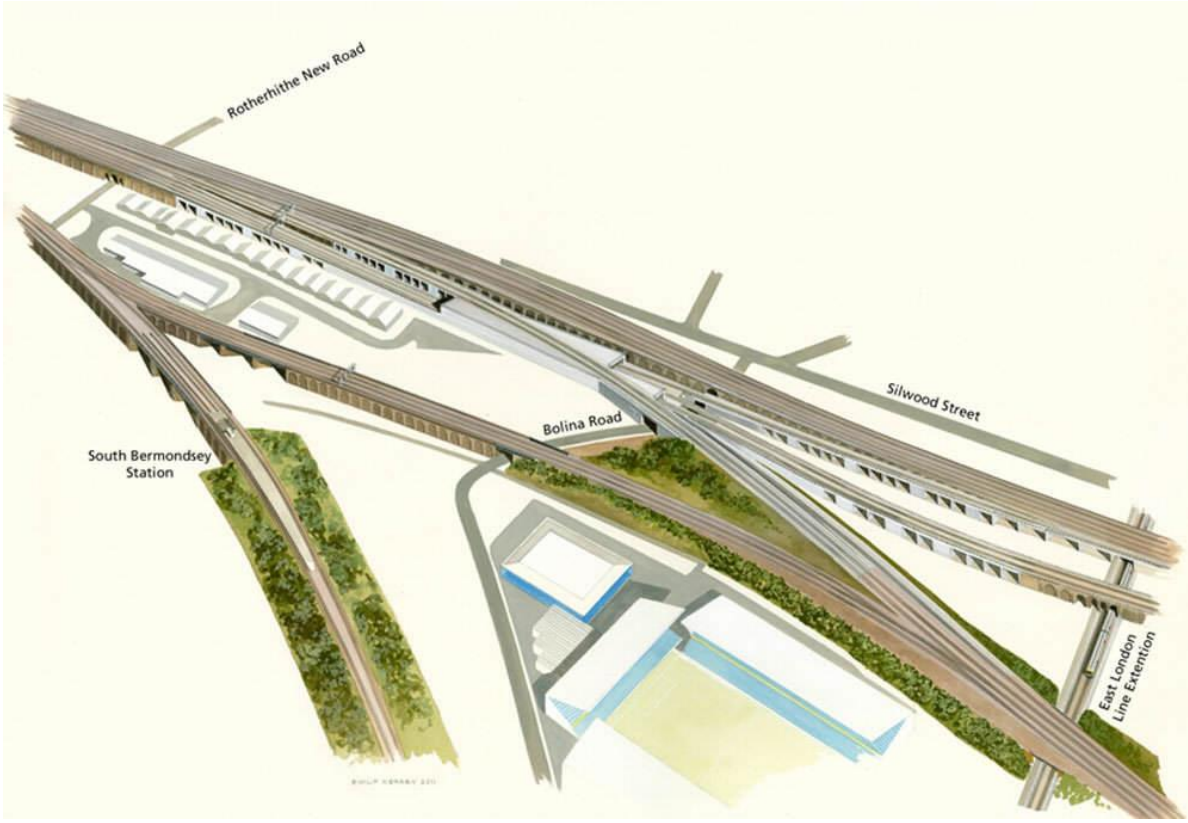


**Figure 7 Bermondsey Dive Under (artist's impression)**
*Source: http://www.thameslinkprogramme.co.uk/improvements/bermondsey-dive-under*

## 2.7 Rolling Stock Improvements

2.7.1 To support investment in infrastructure and stations, a significant element of the Thameslink Programme is investment in new rolling stock which together with the new Thameslink timetable will help provide additional capacity on Thameslink routes. The new fleet of 115 Class 700 trains began introduction in June 2016 (**Figure 8**)[10]. There will be a total of 1140 carriages in 12-car and 8-car configuration: 55 trains in 12-car fixed formation and 60 trains in 8-car fixed formation. A 12-car Class 700 train can carry around 1,700 passengers.


**Figure 8 Class 700 train (left) alongside a Class 319 train at St. Pancras International (October 2016)**
*Source: AECOM*

2.7.2 Designed for a mix of longer distance and metro type journeys, the Class 700 trains include:

- Wider doors and aisles to make getting on and off easier;
- Spacious walkways between carriages to make it easier to move through the train;
- Two-by-two seating to create more room;
- Luggage space;
- Adaptive climate-controlled air conditioning which adjusts to the number of passengers;
- Electronic screens showing which carriages have more space to sit or stand and real time information about the tube;

[10] The Class 377 rolling stock introduced in 2009 facilitated the enhanced service frequencies in Key Outputs 0 and 1 but was not procured as part of the core Thameslink Programme. The Class 319 rolling stock was introduced in the late 1980s.

- Fully accessible toilets for disabled passengers and those with pushchairs or needing baby changing facilities; and
- Spaces for full sized bikes in the off-peak; storage for fold-up bikes in the peak.

2.7.3 While standing room and capacity on the new trains is higher than existing rolling stock, the number of seats per carriage is lower than on the Class 377s. However, many of the Thameslink services have been or will be extended from 8-car to 12-car services. Overall, the Thameslink Programme will deliver a significant increase in peak time seats through a combination of longer trains and more services.

## 2.8 Summary

2.8.1 The Thameslink Programme is comprised of three main elements:

- Changes and upgrades to infrastructure, including upgrades to track and signalling to increase capacity and relieve junction bottlenecks and redevelopment of Farringdon, Blackfriars and London Bridge Stations;
- Procurement of 115 Class 700 trains (1140 carriages) with ATO (Automatic Train Operation)/ETCS (European Train Control System) technology ; and two new depots at Hornsey and Three Bridges; and
- Delivery of a new high capacity timetable for running passenger services by the Thameslink Southern and Great Northern (TSGN) franchise operator, with key milestones planned for May 2018 (18 tph through the core in the peak), December 2018 (20 tph), May 2019 (22 tph) and December 2019 (24 tph).

2.8.2 Central to the evaluation of the Thameslink Programme are the anticipated outcomes or benefits related to the Programme's key interventions. The following chapters of this report present a summary of the main anticipated benefits, grouped into the following categories:

- Service improvements (Chapter 3);
- Station improvements (Chapter 4);
- Rolling stock ambience (Chapter 5); and
- Service reliability (Chapter 6).

2.8.3 Each of these groups is presented in turn, identifying the key Thameslink Programme interventions that are anticipated to contribute to realising the benefits. The chapters that follow also include an assessment of each of the benefits, identifying data sources for their measurement and progress made in benefit realisation.


# Service Improvements

# 03

# 3. Service Improvements

## 3.1 Introduction

3.1.1 The service improvement element of the Thameslink Programme includes four defined benefits grouped into two areas:

- Journey time, consisting of:
  - Platform Wait Time;
  - In-vehicle Time;
  - Interchange Time; and
- On-train crowding.

3.1.2 Overall journey time consists of platform wait times, 'in-vehicle' time, and the number of interchanges to create a 'generalised journey time'. The Thameslink Programme will deliver reduced journey times primarily through reduced platform waiting times due to increased service frequencies. The improvements in 'in-vehicle' time are expected to be relatively modest for a given origin-destination journey on the current (pre-Thameslink Programme) Thameslink network in the baseline and ex-post periods.

3.1.3 The increased number of journeys through the core and the additional connectivity provided by the Thameslink Programme (for example bringing Great Northern services through the Thameslink core for the first time) will reduce the need for passengers to interchange with other trains or the Underground, although the expanded network will also provide additional interchange opportunities with a greater number of other services, including Crossrail (Elizabeth Line), international rail services and High Speed services from St. Pancras International.

3.1.4 This chapter summarises the key Thameslink Programme interventions within scope of journey time improvements and the data sources used to assess the impacts. An assessment of each of the components of journey time is then provided. The same information for on-train crowding is subsequently presented.

## 3.2 Journey Time Improvements

### Summary of service improvement interventions

3.2.1 **Table 4** summarises the key Thameslink Programme interventions expected to impact on platform wait time, in-vehicle time and interchanges in Key Outputs 0 and 1. Collectively these changes were hypothesised to have influenced journey times on both Thameslink and Southeastern services going through the core, although the overall impacts are likely to be small.

**Table 4 Thameslink Programme Key Output 0 and 1 interventions related to platform wait time, in-vehicle time and interchanges**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 0 & 1 | Mar 2009 | Southeastern and Thameslink services joined to run through the core. | Facilitated an enhanced connectivity between St Albans and Sevenoaks, bringing additional services through the Thameslink core and anticipated to generate interchange benefits. |
| 0 & 1 | Mar 2009 | Closure of Farringdon to Moorgate Branch (which had weekday peak period[11] services, approximately 12 trains in each of the morning (arriving at Moorgate) and evening (departing from Moorgate) peak periods. | With Thameslink services to Barbican and Moorgate no longer possible this will have impacted negatively on passengers accessing Barbican and Moorgate. This is anticipated to have impacted journey times and required additional interchange (with Underground). Conversely the transfer of these services to the core will have increased frequency through the core south of Farringdon, contributing to decreasing platform wait time for some passengers to/from locations south of Farringdon. |
| 0 & 1 | Mar 2009 | Increased frequency up to 15 train paths per hour from the previous 8 tph in the peak periods through the entire core in each direction using additional Class 377 trains (not procured as part of the core Thameslink Programme). | The additional rolling stock, together with the closure of the Moorgate branch (which in effect 'diverted' trains from the Moorgate branch to the rest of the core), facilitated an increase in service frequencies and connectivity through the core. These improvements will have contributed to decreasing platform wait time. |
| 0 & 1 | Dec 2011 | Blackfriars Station improvements largely complete with entrances and exits north and south of the River Thames.<br>Introduction of 12-car trains between Bedford and Brighton in December 2011 in the peak directions (following the lengthening of station platforms and lengthening some trains from 8-car). Upgraded track and signal technology. | The 12-car trains had higher capacity and are anticipated to have improved boarding and alighting times, thereby decreasing platform wait time and improving journey time reliability. |

[11] Peak periods refer to the three hour morning peak period (usually 7-10am for arrival into central London) and three hour evening peak period (usually 4-7pm for departure from central London). The peak hour or 'high' peak is usually but not always 8-9am within the morning peak period and 5-6pm within the evening peak period (the other hours within these peak periods are usually referred to as the shoulder peaks), but may vary depending on context and location. Where train frequencies are noted in this report (e.g. up to 24 tph in the peak periods) this does not imply that this frequency will be maintained for the duration of the entire three hour peak periods, as lower frequencies may be delivered in some or all of the shoulder peaks.

3.2.2 **Table 5** summarises the main service benefits anticipated to be realised during Key Output 2. As well as Thameslink and Southeastern services, Key Output 2 is anticipated to generate benefits on Great Northern and Southern, with a number of services from both transferring to Thameslink in 2018 and running through the core rather than terminating at London stations.

**Table 5 Thameslink Programme Key Output 2 interventions related to platform wait time, in-vehicle time and interchanges**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 2 | Jan 2018 | London Bridge station redevelopment works are largely complete. | Dedicated platforms will provide improved boarding and alighting and therefore reduce platform wait times. Southeastern services to Cannon Street resumed calling at London Bridge. |
| 2 | May 2018 | Thameslink services to the Brighton Mainline resume calling at London Bridge between Blackfriars and East Croydon by May 2018.<br>Increased train frequencies (up to 18 tph in the peak periods through the core in each direction) are scheduled from the May 2018 timetable change. | There will be improved connectivity and interchange opportunities for passengers and journey time and interchange benefits, particularly in the peaks.<br>The increased frequency through the core from May 2018 will provide improved journey time and interchange opportunities to/from Great Northern destinations to central London and south of London, and also interchange with Thameslink services on the Bedford Mainline. Southern and Southeastern routes transferred to Thameslink will provide additional connectivity through the core, including adding services on the Southeastern Kent Metro lines. All of these improvements will contribute to improved journey times. |
| 2 | Dec 2019 | Automatic Train Operation (ATO) in the core<br>Increased train frequencies of 24 tph through the core in the peak. | ATO in the core will be used to support operational training and the increased train frequencies of 24 tph through the core in each direction during the peak periods, enabled by the European Train Control System (ETCS). |

### *Key Data Sources*

3.2.3 As outlined in Chapter 1, for Key Outputs 0 and 1 the analysis focuses on reviewing change between 2008 and 2012. The service benefits resulting from Key Outputs 0 and 1 were anticipated to be small, with the main benefits being realised following Key Output 2. The analysis presented herein therefore provides only an overview of data trends for Key Outputs 0 and 1. The Key Output 2 baseline for 2012 is also presented.

3.2.4 There is no single data set available through which to assess all the various elements of journey time and therefore a combination of data is used to provide an overview of change for separate trip elements.

3.2.5 The changes in train journey times and train frequencies on defined Thameslink routes are presented, using timetable data. The journey time data were constructed as follows:

- To derive a measure of train in-vehicle times, the timetabled journey time data between selected origin and destination points have been used.
- Data were obtained on a station by station basis for commuter services[12] and subsequently collated into five London termini: King's Cross; St. Pancras International; Blackfriars; London Bridge; and Victoria. St. Pancras International was taken as the end point for Thameslink services which entered London from the north; whilst Blackfriars was taken as the end point for Thameslink services which entered London from the south.
- All services which passed through London Bridge on their way to Blackfriars are recorded as Blackfriars.
- The timetabled frequency of services on each selected route has also been reported.

3.2.6 The changes in overall journey times have not been assessed against any comparator routes, given that they are specific to the Thameslink Programme and present factual changes, as far as it is possible to measure or discern these, in overall journey times.

3.2.7 This is supported by the use of service reliability and punctuality data (using performance data[13]) to determine if anticipated frequency and in-vehicle journey time improvements have actually been successfully delivered. Service reliability has been measured through the Public Performance Measure (PPM)[14] and is presented for Thameslink and Southeastern services for Key Outputs 0 and 1, and baselined for Thameslink, Southeastern, Southern and Great Northern for Key Output 2.

[12] i.e. Thameslink, Great Northern, Southern and Gatwick Express, and Southeastern services only i.e. excludes East Midlands Trains, Virgin Trains East Coast, Hull Trains and Grand Central inter-city services.
[13] See **Chapter 6** for more details.
[14] See **Chapter 6** for more details, which also includes analysis of other performance metrics.

3.2.8 These data are supplemented by the consideration of changes in passenger satisfaction levels, using results from Transport Focus' National Rail Passenger Survey (NRPS). The NRPS data are collected twice a year by Transport Focus, in spring and autumn, across the rail network, achieving about 50,000 responses nationally per year. Unless specified otherwise, NRPS data presented in this report combine both spring and autumn waves to provide results for a given calendar year. Passengers' overall satisfaction with train services is collected from a representative sample of journeys, alongside satisfaction with thirty different aspects of service provision, including the station environment. Specifically, the following topics are analysed in relation to journey time:

- Frequency of trains on the route;
- Journey length (in time);
- Train reliability/punctuality;
- Delays experienced on the journey;
- Connections with other trains and other modes; and
- Overall satisfaction with the journey.

3.2.9 The NRPS results are presented for Thameslink and Southeastern services, as both were anticipated to be influenced by the Thameslink Programme investment in Key Outputs 0 and 1. The data presented here are at a Train Operating Company (TOC) level, and have not been disaggregated to look at only those stations or routes affected by the Programme nor by time period[15]. To aid the interpretation of benefits, data are also presented for c2c services as a comparator[16]; shown in grey cells within tables. c2c services were selected as a suitable comparator as service patterns and rolling stock had remained relatively stable during the period of Key Outputs 0 and 1, and is expected to have limited changes in service provision and rolling stock between 2012 and 2019, although there may be longer term changes. Its suitability as a comparator should be reviewed as part of the ex-post evaluation.

3.2.10 As outlined above, for Key Outputs 0 and 1 the main focus of the NRPS analysis is on the comparison between the 2008 baseline and 2012. Time series data are also presented for Thameslink and Southeastern services for the intervening years (2009, 2010 and 2011). However, it should be noted that the intervening year data are considered to reflect passengers' experience of disbenefits associated with:

- The closure of the Moorgate branch;
- Disruptions associated with the station developments at Farringdon and Blackfriars; and
- The temporary worsening of performance following the increased frequency of services through the core in 2009 and engineering work in this period.

[15] Consideration can be given to assessing the data at a more disaggregate level in the ex-post evaluation.
[16] Data were analysed for 2008 and 2012 only and therefore no interim year data for 2009, 2010 and 2011 are presented for c2c in this report, although such data are available.

3.2.11 Transport Focus weight the NRPS survey data to ensure it is representative of passenger journeys on each TOC, weighting to passenger numbers and the profile of these journeys (for example by journey purpose – commuter, business, leisure)[17]. The analysis presented herein has been undertaken on the weighted NRPS data. Where NRPS data are presented, all samples (i.e. the underlying unweighted survey data) consist of at least 100 unless otherwise stated. Furthermore, where changes between 2008 and 2012 are statistically significant the 2012 results are underlined[18] within tables.

3.2.12 All NRPS results are shown to the nearest whole percentage (i.e. 0 decimal places (dp)) in this report. Consequently, percentage point (pp) differences (calculated from the original unrounded percentages) may not quite match the difference between the rounded percentage.

3.2.13 The majority of data is presented at the Train Operating Company (TOC) level. This approach is considered proportionate to the Thameslink Programme investment. However, there are consequent limitations in identifying trends or benefits resulting from interventions made on specific sections/routes of the network or at individual stations. This is particularly the case for Southeastern, where services to Blackfriars made up 10% of Southeastern morning peak demand into London in 2008 and 2012 (excluding High Speed services to St. Pancras International).

3.2.14 Finally, changes in connectivity and the need to interchange are considered, using a bespoke survey commissioned as part of this baseline evaluation exercise[19]. There may also be improvements in terms of egress and access times (i.e. walk time between stations and ultimate origin and destination points) as a consequence of the Thameslink Programme. However, there are no baseline data available for these specific elements of end-to-end journey time and these are not assessed here.

[17] See NRPS Spring 2017 Main Report for more information on weighting.
[18] z-tests at the 95% confidence level.
[19] This survey was undertaken in March 2017. Further information is set out in **section 3.5**.

## 3.3 Platform wait time

3.3.1 Improved service frequency and enhanced performance/reliability are the two core factors expected to generate benefits in relation to platform wait time. Each of these is reported in turn, alongside the relevant passenger satisfaction data.

***Key Outputs 0 and 1 – analysis of benefits realisation to date***

3.3.2 Table 6 presents the train frequency information for key Thameslink services for 2008 and 2012. The data presented are the number of trains in the AM peak period (07:00 – 10:00), including all trains that arrived at the named central London station in this period.

3.3.3 Most stations have seen the number of trains remain relatively constant between 2008 and 2012. Although there was relatively little change in the overall frequency, the main impact was the increase in the frequency of services through the core. This will provide overall journey time benefits for those travelling southbound beyond Farringdon or northbound beyond Blackfriars.

3.3.4 For example, although there was no change between Sevenoaks and Blackfriars, the key benefit was to extend these services to destinations north of Blackfriars. Bedford to St. Pancras International saw the number of trains reduce by two, but there was an increase in frequency to destinations south of Farringdon (at the expense of Barbican and Moorgate with the permanent closure of the Moorgate branch). Sutton saw an increase of three trains to London Blackfriars. East Croydon to London Blackfriars saw no change.

**Table 6 Timetabled train frequency for selected routes served by Thameslink (2008 and 2012, trains in AM peak period 07:00 – 10:00)**

| Route | Operators | 2008 Baseline | 2012 Ex-post | Overall Change | Change through the core |
|---|---|---|---|---|---|
| St Albans to St. Pancras International | Thameslink | 34 (21 through the core and 13 to Moorgate) | 35 (all through the core) | +1 | +14 |
| Bedford to St. Pancras International | Thameslink | 21 (14 through the core and 7 to Moorgate) | 19 (all through the core) | -2 | +5 |
| West Hampstead to St. Pancras International | Thameslink | 18 (9 through the core and 9 to Moorgate) | 18 (all through the core) | 0 | +9 |
| Sevenoaks to London Blackfriars | Thameslink and Southeastern | 7 (2 terminate at City Thameslink and 5 terminate at Blackfriars) | 7 (all through the core) | 0 | +7 |
| Brighton to London Blackfriars | Thameslink | 9 (all through the core) | 9 (all through the core) | 0 | 0 |
| East Croydon to London Blackfriars | Thameslink | 9 (all through the core) | 9 (all through the core) | 0 | 0 |
| Sutton to London Blackfriars | Thameslink | 7 (all through the core) | 10 (all through the core) | +3 | +3 |

3.3.5 NRPS data were used to assess passenger satisfaction with the frequency of services (**Table 7**). **Figure 9** shows the trend data from 2008 through to 2012[20]. **Table 7** shows that Thameslink recorded a small but significant 3 percentage point (pp) increase in 'good' or 'very good' responses between 2008 and 2012. In the same period, there were also significant increases in these ratings for Southeastern (of 6pp) and for the comparator service c2c (shown in grey cells in the table, of 3pp), so the trend for Thameslink was not distinct. Although there was a temporary decline in satisfaction levels on Thameslink services from 2008 to 2010, as noted earlier this reflects the impact of the closure of the Moorgate branch and the disruption associated with the station developments at Farringdon and Blackfriars.

**Table 7 Key Outputs 0 and 1 NRPS passenger satisfaction with frequency of services (2008 and 2012, % good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 75% | 78% | +3pp |
| Southeastern | 71% | 76% | +6pp |
| *c2c* | *82%* | *85%* | *+3pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

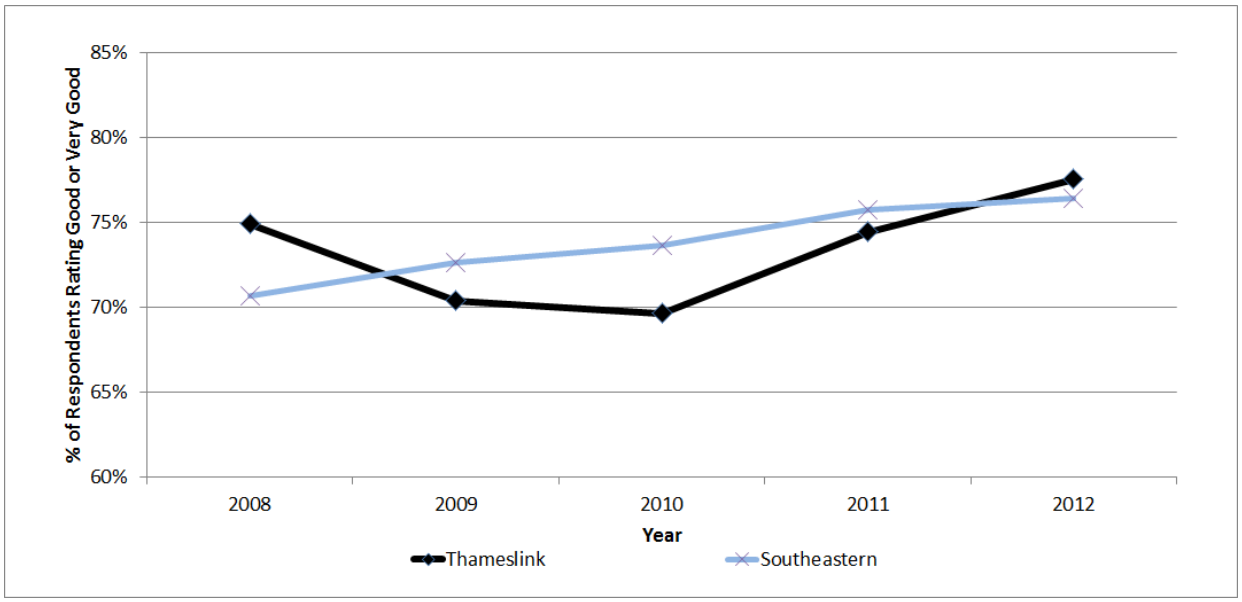


**Figure 9 Key Output 0 and 1 NRPS passenger satisfaction with train frequency (2008-2012)**

*Note: The y-axis does not start at 0.*

[20] As noted in paragraph 3.2.9, the NRPS data presented here are at all day TOC level.

3.3.6 In terms of service reliability/punctuality, **Table 8** shows the PPM moving annual average (MAA)[21] data for 2008/09 and 2012/13 for Thameslink and Southeastern[22]. This shows that the performance levels for these services were similar and did not change significantly between these two periods. There was a more noticeable dip in performance on Thameslink services in 2009/10 (**Figure 10**) during the temporary Thameslink Programme service disruptions, but overall there was a low level of fluctuation during the period, suggesting little impact on performance from the increase in frequency through the core. Further details on performance can be found in Chapter 6.

**Table 8 Key Outputs 0 and 1 PPM moving annual average 2008/09 – 2012/13**

| | 2008/09 Baseline) (Period 13) | 2012/13 Ex-post (Period 13) | Percentage Point (pp) Change |
|---|---|---|---|
| Thameslink | 89.1% | 88.4% | -0.7pp |
| Southeastern | 88.9% | 90.3% | +1.4pp |

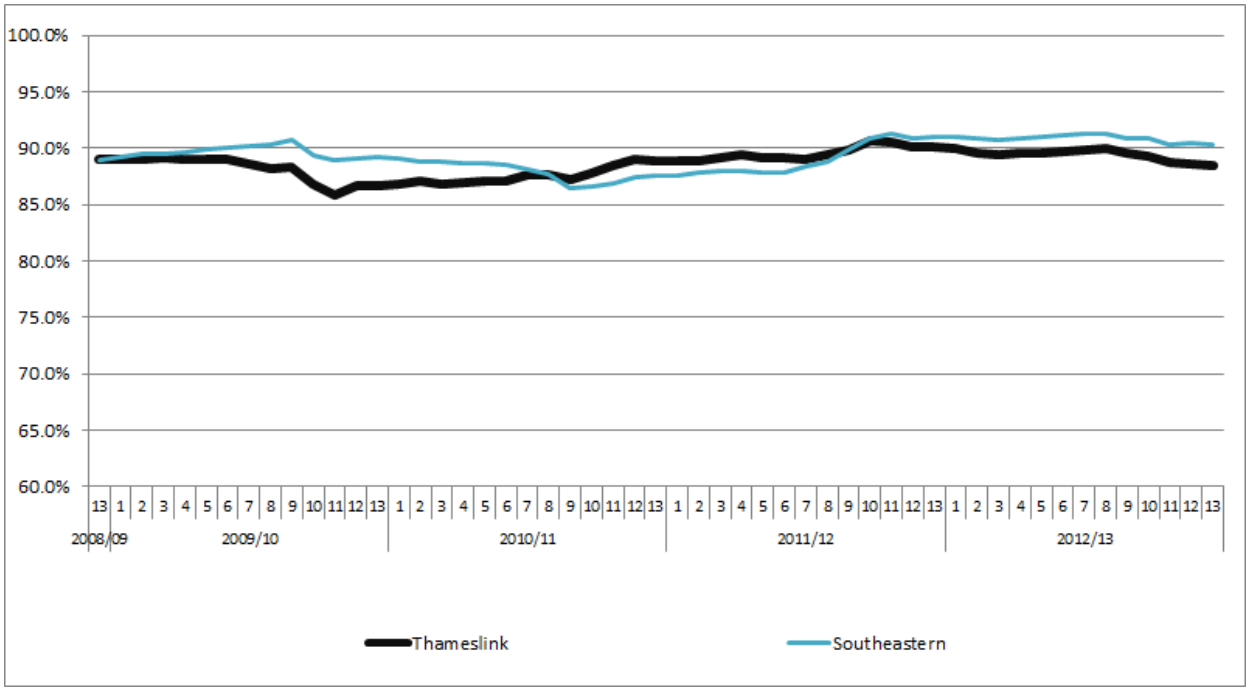


**Figure 10 PPM moving annual average 2008/09 – 2012/13**

*Note: The y-axis does not start at 0.*

[21] See **Chapter 6** for more details, in particular paragraph 6.1.9 onwards.
[22] The Southeastern data were for services via London Bridge.

3.3.7 NRPS data were also examined to assess passenger satisfaction with the punctuality/reliability of services. It was hypothesised that a change in service performance, particularly any increase in delays, could influence passengers' satisfaction with platform wait time. **Table 9** presents the 2008 baseline and 2012 ex-post data for passenger satisfaction with the punctuality/reliability of trains. There was no significant change on Thameslink services nor on the c2c comparator services. The only TOC reporting a significant change was Southeastern (+3pp).

**Table 9 Key Outputs 0 and 1 NRPS passenger satisfaction with the punctuality/reliability of trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 75% | 75% | 0pp |
| *Southeastern* | *79%* | *82%* | *+3pp* |
| *c2c* | *90%* | *94%* | *+4pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

3.3.8 The main impact of the Key Output 0 and 1 timetable changes was to provide an increase in frequency to stations south of Farringdon from the Bedford Mainline and improved connectivity from the south with the joining up of Southeastern and Thameslink services to run through the core. For Sevenoaks services the main impact of the timetable change was to provide connectivity to the core north of Blackfriars[23], and hence provide interchange rather than platform wait time benefits.

3.3.9 Overall, the level of satisfaction with the reliability/punctuality of Thameslink services remained relatively constant between 2008 and 2012; although there was an increase in services operating through the core. There was a significant increase in passenger satisfaction with service frequency from 2008 to 2012 on the Thameslink network, although this was matched by the level of change on the c2c comparator services. However, both Thameslink and Southeastern had lower baseline levels of satisfaction than c2c.

[23] There were 7 trains arriving at Blackfriars in the morning peak period in 2012, of which 1 terminated at Bedford, 1 at Luton, 2 at St. Albans, 1 at West Hampstead and 2 at Kentish Town.

### *Key Output 2 – baseline for future analysis*

3.3.10 The main Thameslink Programme benefits relating to platform wait times are anticipated to occur as a result of Key Output 2. **Table 10** presents the 2012 baseline data for timetabled frequency for selected Thameslink routes (trains that arrived at the named central London station in the morning peak period). This is not a comprehensive assessment of the timetable and frequency for every station, but a summary of key Thameslink stations on the Midland Mainline, Brighton Mainline, Wimbledon Loop, and Sevenoaks routes. These will need to be compared to frequencies following finalisation of the Thameslink Programme timetable in December 2019 and take into account whether changes in frequency are distributed across the entire three hour peak period or if there are differences in frequency between the 'high' peak and the 'shoulder' peaks (see footnote 11).

**Table 10 Key Output 2 timetabled train frequency for selected routes served by Thameslink (2012) (trains in AM peak period 07:00 – 10:00)**

| Route | Operators | 2012 Baseline Frequency (AM peak 07:00 – 10:00) |
|---|---|---|
| Bedford to St. Pancras International | Thameslink | 19 |
| St Albans to St. Pancras International | Thameslink | 35 |
| West Hampstead to St. Pancras International | Thameslink | 18 |
| Brighton to London Blackfriars | Thameslink | 9 (5 via Elephant & Castle) |
| East Croydon to London Blackfriars | Thameslink | 9 (5 via Elephant & Castle) |
| Sevenoaks to London Blackfriars[24] | Thameslink and Southeastern | 7 (all via Elephant & Castle) |
| Sutton to London Blackfriars | Thameslink | 10 (all via Elephant & Castle) |

[24] Sevenoaks to Blackfriars services via Beckenham Junction will return to Southeastern in 2018 and terminate in the Blackfriars bay platforms.

3.3.11 **Table 11** presents the 2012 frequency data for selected routes on which Thameslink will introduce services (these may be in addition to or instead of some or all existing services) from 2018. These do not currently offer direct services to the core[25] without interchanging to another train or mode. The Thameslink Programme will introduce services in addition to or instead of some or all those services, but diverting through the core.

**Table 11 Key Output 2 timetabled baseline data for frequency on selected routes which will include Thameslink services in addition to or instead of some or all existing services (2012)**

| Selected routes not currently served by Thameslink | 2012 Baseline Frequency (AM peak 07:00 – 10:00) |
|---|---|
| **Great Northern** | |
| Cambridge to King's Cross | 11 |
| Peterborough to King's Cross | 10 |
| Stevenage to King's Cross | 22 |
| **Southeastern** | |
| Dartford to London Bridge | 31 |
| Maidstone East to London Victoria | 8 |
| **Southern** | |
| East Grinstead to London Victoria | 5 |
| Horsham to London Victoria | 16 |

[25] There are limited direct Maidstone East services to Blackfriars via Elephant & Castle, about 3 trains per day. A large number of Great Northern services will be diverted to St. Pancras International from King's Cross. This will have minimal impact on those passengers who currently board/alight at King's Cross, given the proximity of King's Cross and St. Pancras International, and given there will still be services to King's Cross. The Programme will be beneficial to those who wish to travel *through* the core south of St. Pancras International.

3.3.12 **Table 12** shows the baseline performance measures for Key Output 2 for Thameslink, Great Northern, Southeastern[26] and Southern. PPM is similar between the train operating companies (TOCs)[27], ranging from 88.3% on Southern to 90.3% on Southeastern. Additional performance measures are set out in Chapter 7. There will be a change in services between these TOCs with implementation of the Thameslink Programme from 2018 (with some Great Northern, Southern and Southeastern services transferring to Thameslink), and more disaggregated performance data will need to be analysed in order to account for these changes and assess any changes in performance.

**Table 12 Key Output 2 PPM (moving annual average) 2012/13 baseline**

| | PPM MAA |
|---|---|
| Thameslink | 88.4% |
| Great Northern | 88.7% |
| Southeastern | 90.3% |
| Southern | 88.3% |

3.3.13 **Table 13** presents a summary of the 2012 baseline for NRPS data for Thameslink, Southeastern, Southern and Great Northern relating to questions of relevance to assessing platform wait times.

**Table 13 Key Output 2 NRPS baseline data (% good or very good) 2012 passenger satisfaction with frequency of services and with the punctuality/reliability of trains**

| | Thameslink | Southeastern | Southern | Great Northern |
|---|---|---|---|---|
| Frequency of trains on the route | 78% | 76% | 74% | 81% |
| Train punctuality/reliability | 75% | 82% | 77% | 83% |

[26] The Southeastern data were for services via London Bridge.
[27] With the award of the TSGN franchise in 2014, Thameslink, Great Northern and Southern are run by one operator. However, they are considered separately here.

## 3.4 In-Vehicle time

3.4.1 This section focuses on timetabled journey times on the Thameslink network; in effect, 'in-vehicle' times. These may not change significantly as a result of the Thameslink Programme, subject to final confirmation of the timetable to be introduced from 2018. However, they are provided for context as in-vehicle (timetabled) journey time makes up a significant proportion of end-to-end journey times; changes in timetabled times may therefore influence overall journey time benefits and passenger perceptions.

***Key Outputs 0 and 1 – analysis of benefits realisation to date***

3.4.2 **Table 14** presents average train journey time data for key routes in the Thameslink Programme for 2008 and 2012 (for trains arriving at the named central London station in the morning peak period); a negative change indicates that journey times have reduced. These routes have been selected to provide an overview of services to and from a range of locations, including data for services from St Albans and Sevenoaks which benefited from enhanced connectivity.

**Table 14 Timetabled journey times (minutes) for selected Thameslink routes (2008 and 2012, average in minutes arriving in the AM peak period 07:00 – 10:00)**

| | 2008 Baseline | 2012 Ex-post | Change (minutes) | % Change |
|---|---|---|---|---|
| | | | *–ve change shows an improvement in journey time by 2012* | |
| St Albans to St. Pancras International | 25.59 | 24.40 | -1.19 | -4.6% |
| Bedford to St. Pancras International | 58.14 | 55.63 | -2.51 | -4.3% |
| West Hampstead to St. Pancras International | 9.28 | 7.61 | -1.67 | -18.0% |
| Sevenoaks to London Blackfriars | 62.57 | 64.71 | +2.14 | +3.4% |
| Brighton to London Blackfriars | 79.33 | 81.33 | +2.00 | +2.5% |
| East Croydon to London Blackfriars | 24.67 | 25.89 | +1.22 | +5.0% |
| Sutton to London Blackfriars | 49.71 | 45.80 | -3.91 | -7.9% |

3.4.3 The route from St Albans to St. Pancras International saw a reduction in timetabled average journey time on Thameslink services of just over 1 minute (4.6%) between 2008 and 2012. Furthermore, all three Thameslink routes on the Bedford Mainline (St. Albans, Bedford and West Hampstead) had a reduction in timetabled journey times to London between 2008 and 2012. Conversely, for services from the south into London Bridge and Blackfriars there is a mixture of increases and decreases in journey times.

3.4.4 **Figure 11** provides a more detailed overview of train services between St Albans and St. Pancras International. This shows three different timed service groups: fast, semi-fast, and stopping. The fast services have journey times of between 16 and 22 minutes and represent the largest proportion of services leaving during the morning peak period from St. Albans. The journey times for fast services in May 2012 were lower than in May 2008. Indeed, within each group the scheduled journey times reduced between 2008 and 2012. Fast services in May 2008 generally had scheduled journey times between 20 and 22 minutes; whilst in May 2012 there are 11 trains scheduled as less than 20 minutes[28]. The semi-fast services, the smallest group, had scheduled journey times between 25 and 30 minutes. Once again, the services provided in May 2012 were scheduled to be faster than in May 2008. The last group, the all station stopping services, had trains with scheduled journey times between 32 and 36 minutes, and these were largely unchanged in 2012.

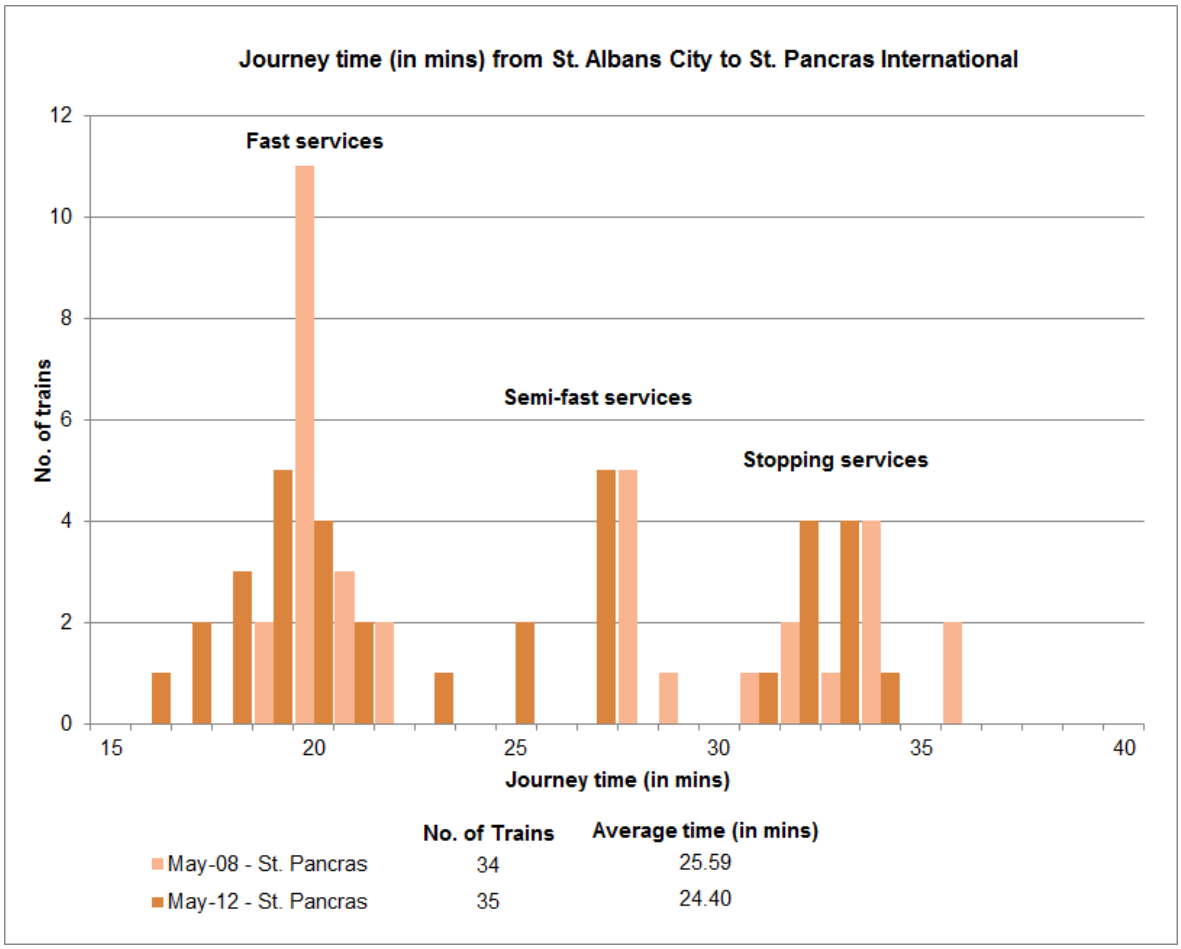


**Figure 11 Journey time (in mins) from St. Albans arriving at St. Pancras International in the AM peak period**

[28] This has an impact on crowding measures, as reflected in the Passengers in Excess of Capacity (PiXC) metric. PiXC shows the proportion of standard class passengers that are above the capacity on their service at its busiest point. Capacity includes all standard class seats, and also includes a standing allowance if passengers are standing for **20 minutes or less**. See **section 3.6** on on-train crowding for more details.

3.4.5 **Figure 12** shows the detailed journey times for services from Sevenoaks to Blackfriars (Thameslink). For passengers to Blackfriars, in particular those using the new station entrance on the south side of the River Thames from 2012 Southeastern fast and semi-fast services to London Bridge provide a possible alternative, and have been included in **Figure 12**. This highlights the difference in scheduled journey times for services to London Blackfriars and London Bridge from Sevenoaks. All services to London Bridge had journey times between 23 and 45 minutes, whereas the journey time to London Blackfriars was an hour or more. The average journey time to London Bridge remained the same, at around 30 minutes. Average journey time increased slightly to Blackfriars. The key benefit delivered by the Thameslink Programme in this regard was connectivity through the core rather than in-vehicle journey time.

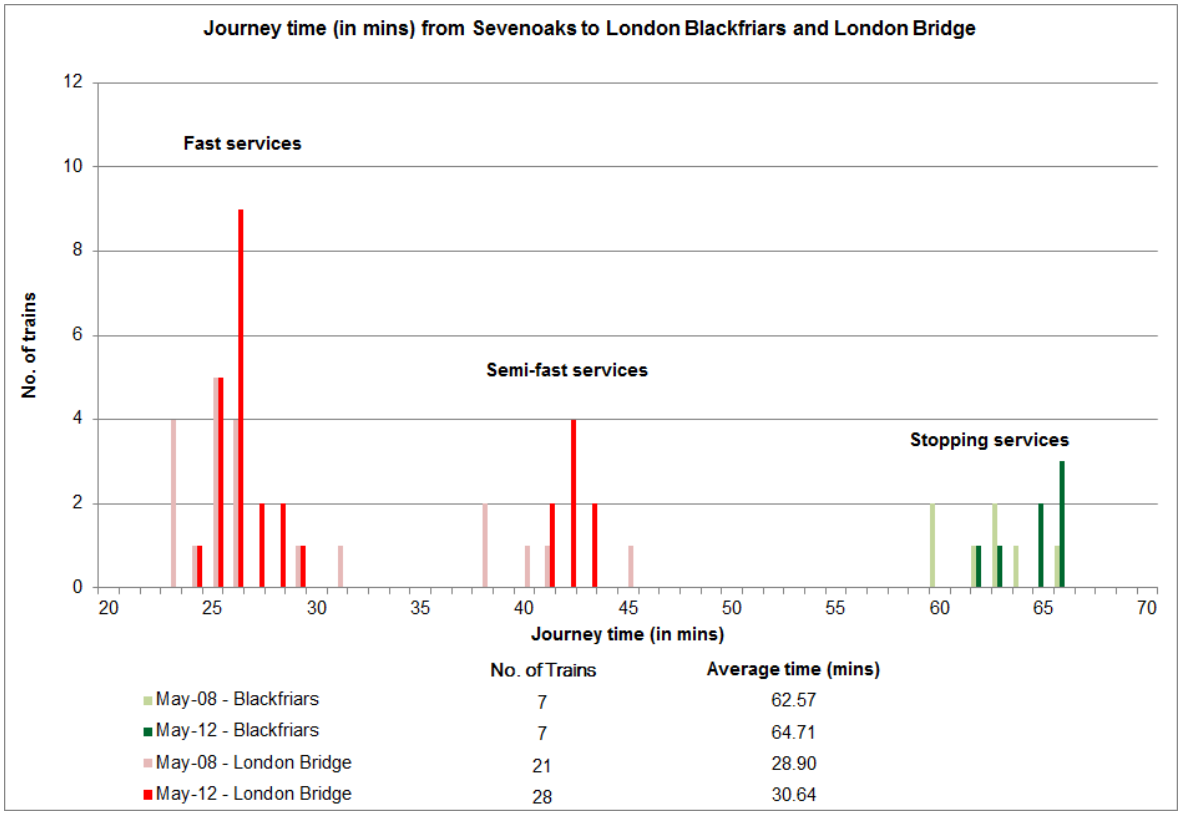


**Figure 12 Journey time (in mins) from Sevenoaks arriving at Blackfriars or London Bridge in the AM peak period**

3.4.6 **Table 15** presents data on passenger satisfaction with the length (in time) of journeys on their route. This shows that there were no significant changes between 2008 and 2012 on either Thameslink or Southeastern services[29]. Thameslink recorded a passenger satisfaction level of 82% in 2012, as did Southeastern. The lack of change in this measure for Thameslink contrasted with the trend for c2c services which experienced a small but significant increase in satisfaction with journey length in this period.

**Table 15 Key Outputs 0 and 1 NRPS passenger satisfaction with journey length (2008 and 2012, % good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 82% | 82% | 0pp |
| Southeastern | 81% | 82% | +2pp |
| *c2c* | *89%* | *92%* | *+3pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

3.4.7 **Figure 13** shows that there was a temporary reduction in Thameslink passenger satisfaction levels with journey length in 2009/10 (a reduction of around 4pp), in line with the previously described trend for satisfaction with train frequency, which may be a consequence of the temporary service disruptions.

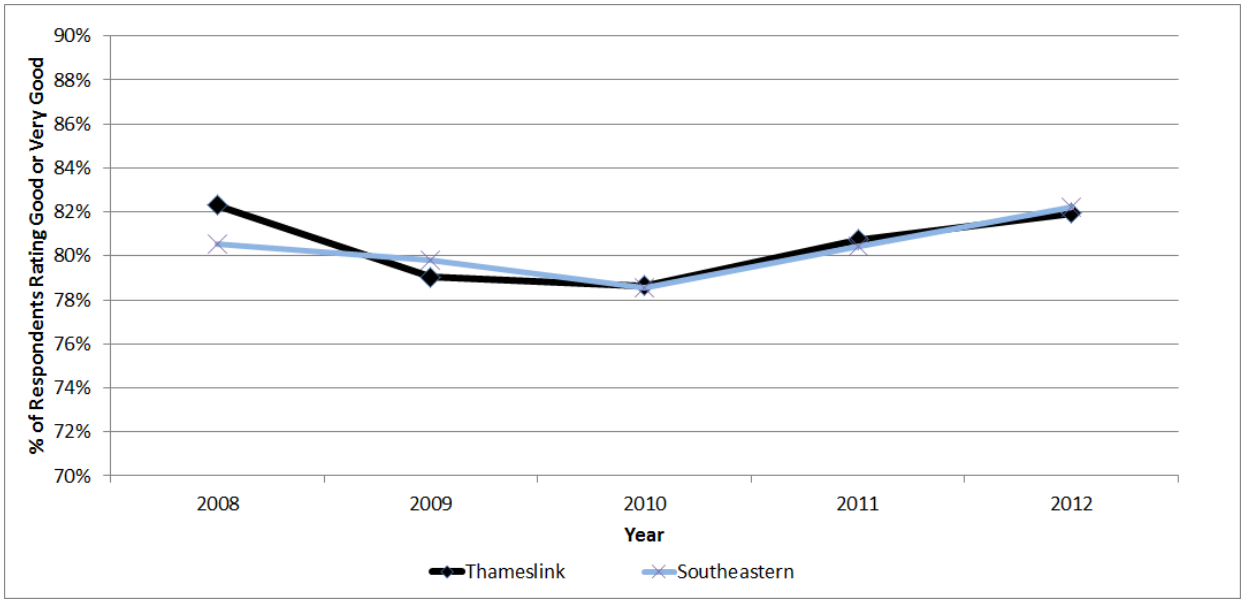


**Figure 13 Key Outputs 0 and 1 NRPS passenger satisfaction with the length of journey (2008-2012)**

*Note: The y-axis does not start at 0.*

3.4.8 Other factors which may have affected passengers' satisfaction with journey length, such as service performance levels (**Table 8**) and passengers' satisfaction with punctuality/reliability of services (**Table 9**) also showed no significant change in 2012 compared with 2008.

[29] As noted in paragraph 3.2.9, the NRPS data presented here are at all day TOC level.

### *Key Output 2 – baseline for future analysis*

3.4.9 As noted in section 3.2, the main Thameslink Programme benefits relating to journey times are anticipated to occur as a result of Key Output 2. In-vehicle times may not change significantly as a result of the Thameslink Programme, subject to final confirmation of the timetable to be introduced from 2018. However, they are provided for context as in-vehicle (timetabled) journey time makes up a significant proportion of end-to-end journey times. **Table 16** therefore presents the 2012 baseline data for timetabled journey length (time) for selected Thameslink routes (morning peak period arrival at the named central London station). Other non-Thameslink service journey times may be impacted by timetable changes as a result of the Thameslink Programme. This is not a comprehensive assessment of the timetable for every station, but a summary of key Thameslink stations on the Midland Mainline, Brighton Mainline, Wimbledon Loop, and Sevenoaks routes.

**Table 16 Key Output 2 timetabled baseline data for average journey length for selected routes served by Thameslink (2012) (trains arriving in the AM peak period 07:00 – 10:00)**

| | 2012 Baseline Journey Time (minutes) |
|---|---|
| St Albans to St. Pancras International | 24.4 |
| Bedford to St. Pancras International | 55.6 |
| West Hampstead to St. Pancras International | 7.6 |
| Sevenoaks to London Blackfriars | 64.7 |
| Brighton to London Blackfriars | 81.3 |
| East Croydon to London Blackfriars | 25.9 |
| Sutton to London Blackfriars | 45.8 |

3.4.10 **Table 17** presents the journey time and frequency data for those routes on which Thameslink will introduce services in 2018 and 2019. These do not currently offer direct services to the core[30] without interchanging to another train or mode. The Thameslink Programme will introduce services in addition to or instead of some or all those services, but diverting through the core.

**Table 17 Key Output 2 timetabled baseline data for average journey length on selected routes which will include Thameslink services (2012 unless stated otherwise) (trains arriving in the AM peak period 07:00 – 10:00)[31]**

| Selected routes not currently served by Thameslink | 2012 Baseline Journey Time (minutes) |
|---|---|
| **Great Northern** | |
| Cambridge to King's Cross | 69.2 |
| Cambridge to Gatwick (Average journey time 2017) | 141.7<br>*(Average of 2 interchanges by various routes)* |
| Cambridge to Brighton (Average journey time 2017) | 175.3<br>*(Average of 2 interchanges by various routes)* |
| Peterborough to King's Cross | 74.9 |
| Peterborough to Gatwick (Average journey time 2017) | 144.2<br>*(Average of 2 interchanges by various routes)* |
| Stevenage to King's Cross | 32.1 |
| **Southeastern** | |
| Dartford to London Bridge | 36.7 |
| Maidstone East to London Victoria | 67.4 |
| **Southern** | |
| East Grinstead to London Victoria | 57.8 |
| East Grinstead to St. Pancras International (Average journey time 2017) | 88.4<br>*(Average of 1 interchange by various routes)* |
| Horsham to London Victoria | 69.3 |

[30] See footnote 25.
[31] Due to the complexity of reviewing paper/pdf archived timetables to calculate journey times, route options and interchanges, where necessary May 2017 information has been provided based on electronic, online and searchable timetable information.

3.4.11 **Table 18** presents a summary of the 2012 baseline for NRPS data for Thameslink, Southeastern, Southern and Great Northern for questions relevant to in-vehicle times.

**Table 18 Key Output 2 NRPS baseline passenger satisfaction with journey length and train reliability/punctuality (% good or very good) (2012)**

| | Thameslink | Southeastern | Southern | Great Northern |
|---|---|---|---|---|
| Journey length (time) | 82% | 82% | 83% | 89% |
| Train reliability/punctuality | 75% | 82% | 77% | 83% |

## 3.5 Connectivity and interchange time

3.5.1 Key Outputs 0 and 1 were anticipated to generate some connectivity benefits for stations between St Albans through to Sevenoaks (served by Southeastern), facilitated by the redevelopment at Blackfriars and closure of the Moorgate branch. Key Output 2 is anticipated to generate greater connectivity benefits, in particular for new routes with direct services through the core (such as Great Northern services which currently terminate at King's Cross), reducing the need to interchange, or allowing interchange opportunities at new locations. Passengers may also benefit from better connections to airports, with more direct journey opportunities to Gatwick and Stansted airports.

3.5.2 However, the data available through which to monitor and evaluate interchange benefits are limited. NRPS includes a question on the satisfaction with connectivity to train services and a question on the satisfaction with connectivity to other modes. These questions provide information on passenger perceptions of connections, but not a quantitative measure of how many connections passengers have. NRPS provides no information on satisfaction for those for whom the need to make a connection has been removed, for example by providing direct services to and through the core.

3.5.3 To supplement NRPS for the Key Output 2 baseline, a bespoke survey was therefore commissioned as part of this baseline exercise, to collect data from train passengers at the four core central London stations:

- St. Pancras International;
- Farringdon;
- City Thameslink; and
- Blackfriars.

3.5.4 These surveys were undertaken in March 2017, between 15:30 and 19:30 at each station, and hence would typically have intercepted passengers' home-bound and return journeys. Survey questionnaires (see **Appendix C**) were handed out to passengers boarding trains in both directions, with the aim of capturing full journey origin-destination information for their afternoon/evening period journey. Counts were also undertaken of all passengers boarding trains during the survey period. A summary of the survey approach is provided in **Appendix D**.

3.5.5 There were 1,892 valid questionnaire returns from a total of 9,301 questionnaires handed out to passengers boarding Thameslink trains in the afternoon/evening survey period. A total of 45,080 passengers boarded Thameslink trains in the core during the survey period. All results have been weighted to the boarding counts unless stated otherwise, from the sample of 1,892.

3.5.6 To provide an overview of the coverage of survey respondents, preceding the analysis of interchanges, **Figure 14** shows the proportion of boarders by direction for each station. Sixty-seven percent of boarders at St. Pancras International went north, compared to 49% at Farringdon, 48% at City Thameslink and 55% at Blackfriars. Overall, 54% of boarders went north.

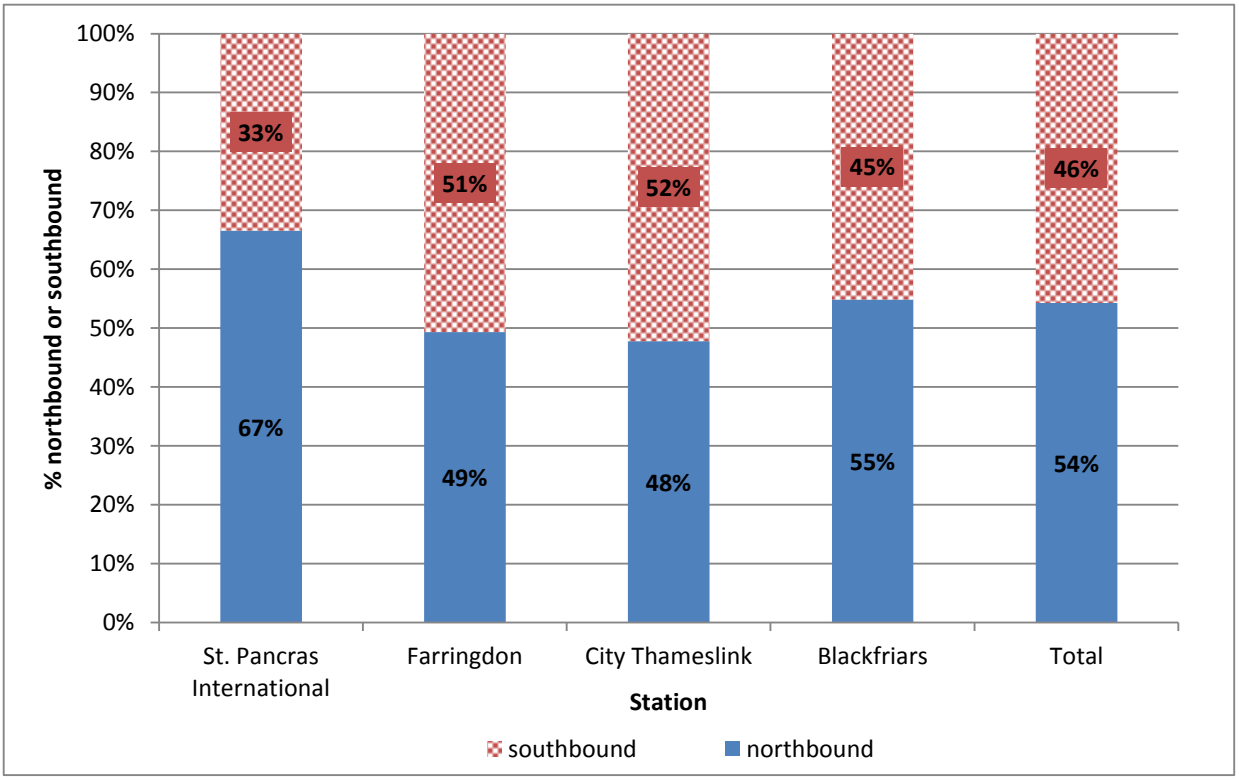


**Figure 14 Total passenger boardings by direction by station**

3.5.7 **Figure 15** shows the time distribution of boarders for the four stations combined, by half hour period. The busiest half hour northbound was 18:00-18:29, and southbound was 17:30-17:59. The busiest hour in both the northbound and southbound directions was 17:30-18:29, making up 40% of boarders over the survey period 15:30-19:30, and 46% of boarders over the evening peak period 16:00-18:59.

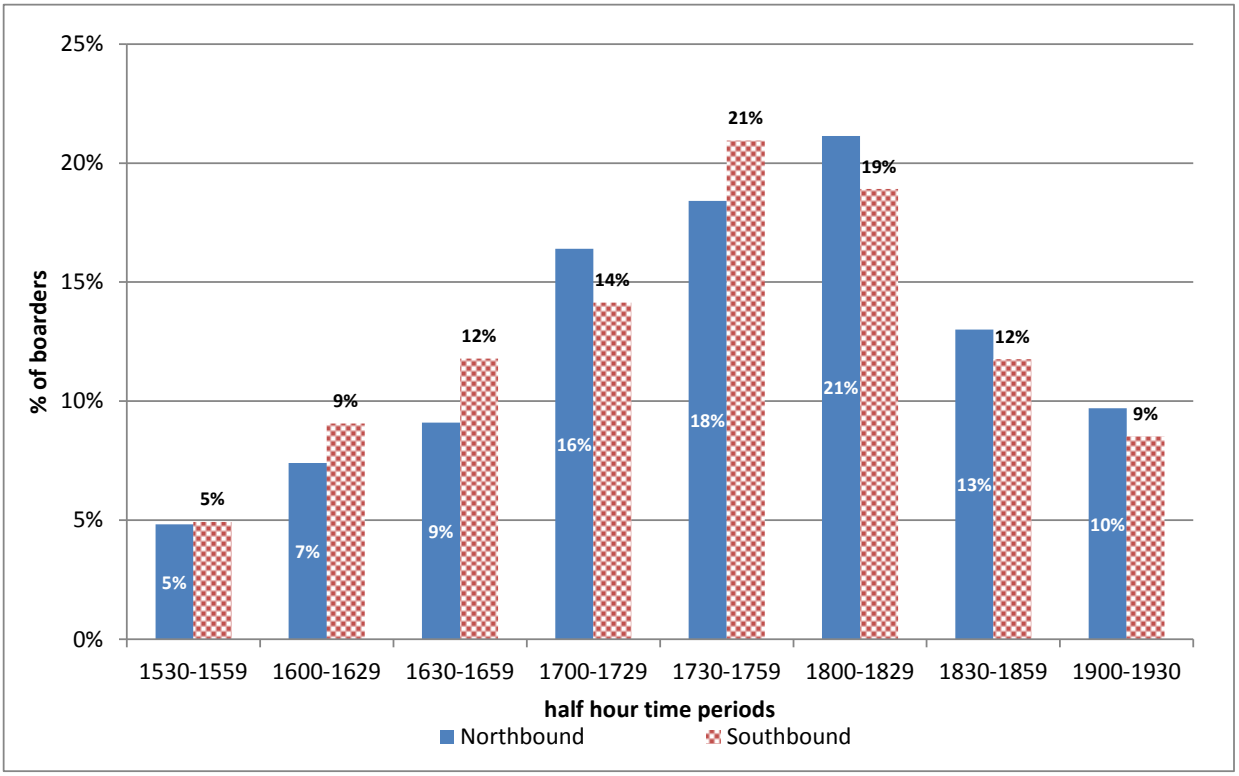


**Figure 15 Boarders by direction by half hour time periods**

### *Key Outputs 0 and 1 – analysis of benefits realisation to date*

3.5.8 **Table 19** presents a summary of the 2008 baseline and 2012 ex-post data for passenger satisfaction with train connections. Thameslink recorded a significant increase in satisfaction, from 72% in 2008 to 75% in 2012, compared to a significant increase of 10pp on c2c services from 75% in 2008. Southeastern also recorded a significant increase during this period of 4pp. So the trend of improving satisfaction with connectivity among Thameslink and Southeastern passengers was in keeping with that for c2c passengers. **Figure 16** shows that there were fluctuations in satisfaction with train connections between 2008 and 2012, but the percentage of respondents stating good or very good remained between 69% and 76% on Thameslink and Southeastern services.

**Table 19 Key Outputs 0 and 1 NRPS passenger satisfaction with train connections (2008 and 2012)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 72% | 75% | +4pp |
| Southeastern | 71% | 75% | +4pp |
| *c2c* | *75%* | *85%* | *+10pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

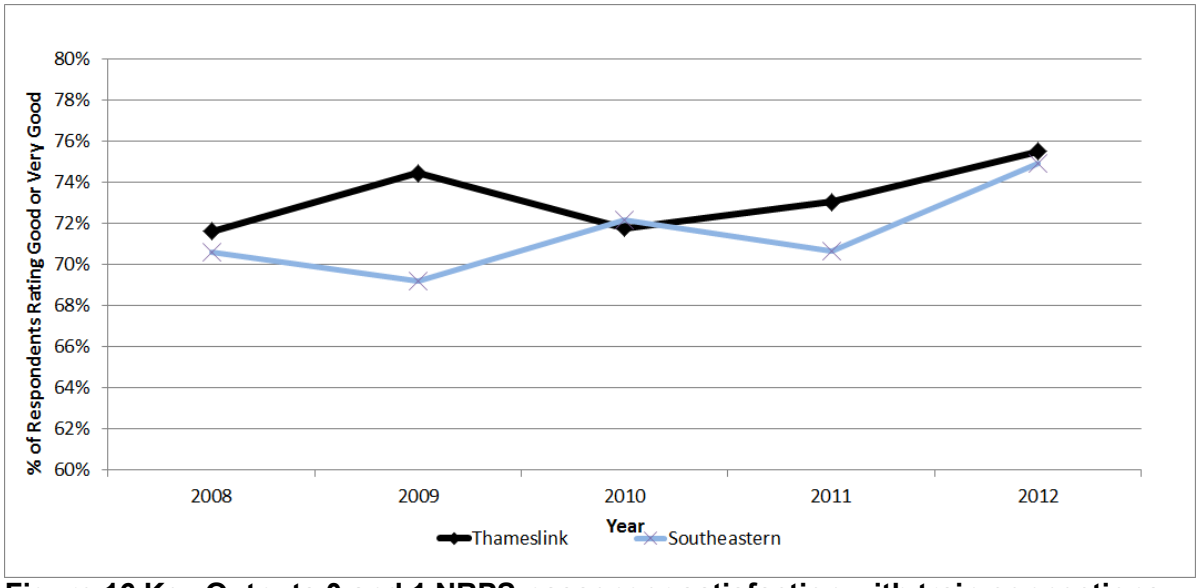


**Figure 16 Key Outputs 0 and 1 NRPS passenger satisfaction with train connections (2008-2012, % good or very good)**

*Note: The y-axis does not start at 0.*

3.5.9 **Table 20** presents the 2008 baseline and 2012 ex-post data for passenger satisfaction with connections to other modes of transport, including bus and underground. Thameslink recorded a significant 7pp increase to 78% in 2012, compared to a +6pp change for c2c services (also significant). There was no significant change recorded for Southeastern in the period, with satisfaction levels remaining at about 75%, as can be seen in **Figure 17**. The significant improvement in satisfaction with connections to other modes is likely to have been influenced by the enhanced facilities and integration at Farringdon and Blackfriars stations[32].

**Table 20 Key Outputs 0 and 1 NRPS passenger satisfaction with connections to other modes of transport (2008 and 2012)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 71% | 78% | +7pp |
| Southeastern | 75% | 75% | 0pp |
| *c2c* | *68%* | *74%* | *+6pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

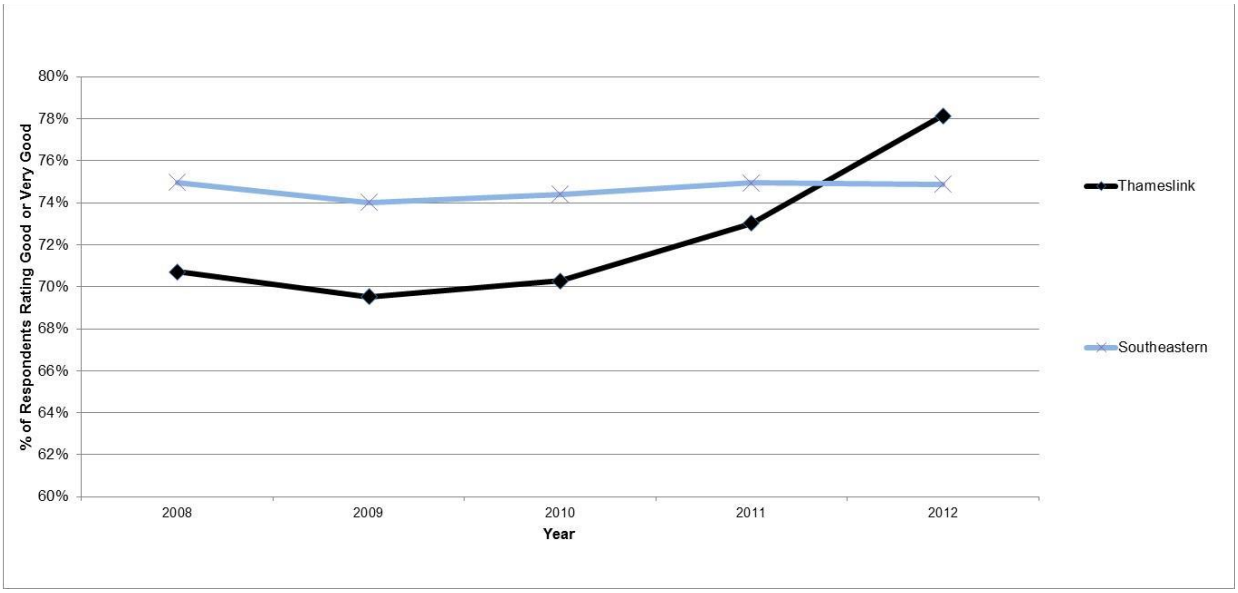


**Figure 17 Key Outputs 0 and 1 NRPS passenger satisfaction with connections to other modes of transport (2008-2012)**

*Note: The y-axis does not start at 0.*

[32] There were non-Thameslink Programme improvements that may have had an impact, although these were largely implemented by mid-2010 and did not have an immediate impact on Thameslink passenger satisfaction levels with connections, based on the trends shown in **Figure 17**. The new Northern Line ticket hall at King's Cross St. Pancras Underground station (to clarify, this was not part of the Thameslink Programme) was completed in late 2009 (with step free access to most Underground lines completed by mid-2010). Oyster pay as you go roll out to all national rail stations in Greater London, including those on the Thameslink network, was largely completed in early 2010.

### *Key Output 2 – baseline for future analysis*

3.5.10 As noted earlier, Key Output 2 is anticipated to generate more significant benefits in terms of connectivity, both reducing the need for passengers to interchange (thereby generating journey time benefits) and also offering greater interconnectivity between services. This section presents key baseline data for the subsequent evaluation of interchange benefits, consisting of the NRPS 2012 data and results from bespoke surveys undertaken in 2017.

3.5.11 **Table 21** presents the 2012 baseline for NRPS questions relating to connectivity with train services and other transport modes. It can be seen that Thameslink passengers' satisfaction with connectivity is broadly similar to that of passengers of other services.

**Table 21 Key Output 2 NRPS baseline passenger satisfaction with connectivity (2012, % good or very good)**

| | Thameslink | Southeastern | Southern | Great Northern |
|---|---|---|---|---|
| Connectivity with other train services | 75% | 75% | 77% | 80% |
| Connectivity to other modes of transport | 78% | 75% | 76% | 77% |

**3.5.12** The baseline survey undertaken in March 2017 was designed to provide greater insight into the travel patterns, and particularly interchanges, of passengers using stations that make up the Thameslink core in advance of new routes joining the Thameslink network from 2018. This assists in addressing a gap in other available data sets covering the central London area. An overview of key baseline data is presented herein, focusing on the following areas:

- Origin and destination stations, to provide an overview of the Thameslink services' catchment areas at both ends of surveyed trips;
- Origin and destination pairs, to consider key trip patterns for comparison with the ex-post survey following improvements in connectivity;
- Interchange propensity, considering both interchanges made by respondents before they reached the core Thameslink survey station, and interchanges made after they left the survey station; and
- Access/egress modes, to consider interchanges prior to entering the rail or Underground networks.

3.5.13 This will inform the ex-post evaluation and provide a baseline from which to understand changes to the origin and destination of Thameslink passengers as a result of the Thameslink Programme.

## Origin and destination stations

3.5.14 An analysis was undertaken of the origin and destination station for trips, defined as the first and last station used on the trip being made at the time of survey. In terms of the origin station, **Figure 18** shows that 76% of journeys started at one of the four survey stations in the core. Of the remaining 24% of journeys, 22% started at a station that included London Underground (LUL) and/or Docklands Light Railway (DLR) services, and only 2% of trips started at another rail station (mainly national rail, but also London Overground and TfL Rail).

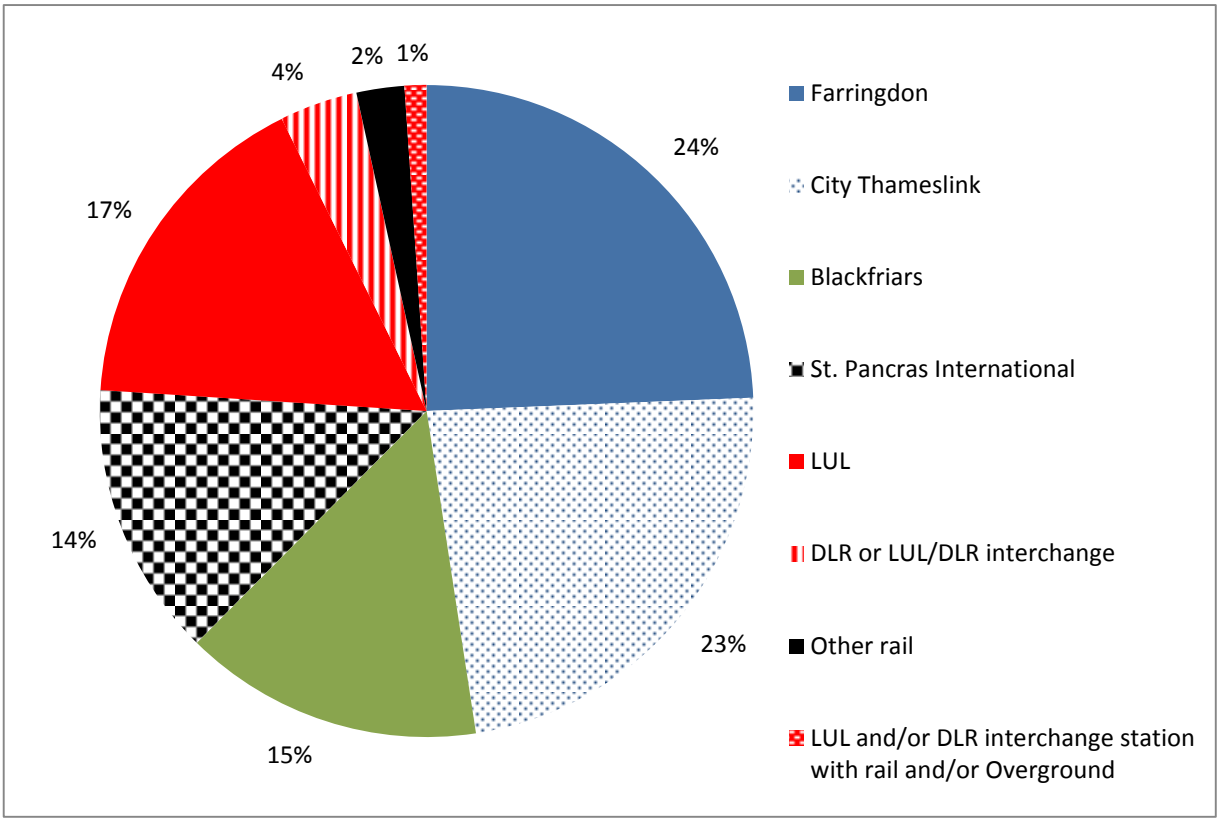


**Figure 18 Origin stations by mode**

3.5.15 The above analysis shows that 24% of surveyed trips did not start at the survey stations and therefore included at least one interchange. **Table 22** shows a breakdown of the proportion of surveyed trips originating from specific stations; it shows the four core survey stations in blue cells and the top 15 origin stations outside the core.

3.5.16 Those trips not originating from one of the four survey stations started predominantly at London Underground stations. The top five non-core origin stations (Liverpool Street, Oxford Circus, St. James's Park, Canary Wharf and Victoria) accounted for 25% of trips starting outside the core. It is worth noting that Liverpool Street and Canary Wharf will both be served by Crossrail from 2018; Moorgate is likely to have an interchange with Crossrail at Liverpool Street; and Oxford Circus will be relatively close to the Crossrail stations at Bond Street and Tottenham Court Road.

**Table 22 Top origin stations for afternoon/evening journeys**

| Station | Percentage of total trips | Percentage of total trips excluding journeys starting in the core |
|---|---|---|
| Farringdon (Core) | 24.4% | |
| City Thameslink (Core) | 23.2% | |
| Blackfriars (Core) | 14.8% | |
| St. Pancras International (Core) | 13.6% | |
| Liverpool Street (LUL) | 1.6% | 6.6% |
| Oxford Circus (LUL) | 1.2% | 4.8% |
| St. James's Park (LUL) | 1.2% | 4.8% |
| Canary Wharf (LUL/DLR) | 1.1% | 4.7% |
| Victoria (LUL) | 1.1% | 4.4% |
| Westminster (LUL) | 1.0% | 4.0% |
| Monument (LUL/DLR) | 0.9% | 3.8% |
| Tower Hill (LUL/DLR) | 0.9% | 3.8% |
| Moorgate (LUL) | 0.8% | 3.4% |
| Cannon Street (LUL) | 0.7% | 3.1% |
| Euston Square (LUL) | 0.7% | 3.0% |
| Embankment (LUL) | 0.7% | 2.8% |
| Green Park (LUL) | 0.6% | 2.7% |
| Great Portland Street (LUL) | 0.6% | 2.3% |
| South Kensington (LUL) | 0.5% | 2.1% |

3.5.17 **Figure 19** shows that 93% of destinations on the afternoon/evening journey were to locations on other parts of the Thameslink network (49% north of the core, 43% south of the core, and 1% within the core). This includes stations with services provided by other operators, such as Southern and Southeastern. Five percent of destinations were to other rail stations (including London Overground). There was a small number of passengers that started and ended their journey in the core (0.6%, mainly boarding St. Pancras International to go southbound or Blackfriars to go northbound).

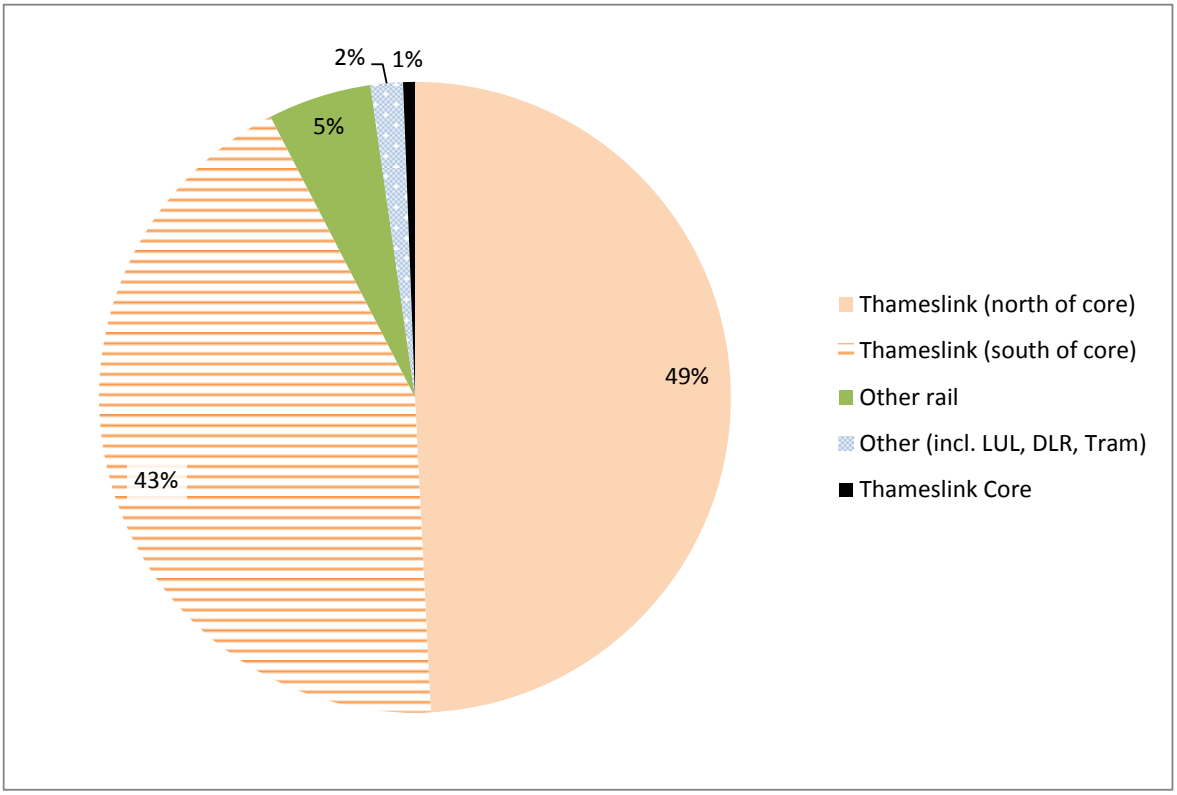


**Figure 19 Destination stations by mode**

3.5.18 **Table 23** shows the top destination stations for the afternoon/evening journey, indicating whether the stations are north of the Thameslink core (TLN) or south (TLS). It can be seen that St Albans City and Harpenden were the key destination stations in the afternoon/evening. Indeed, the five neighbouring stations of Harpenden, St Albans City, Radlett, Elstree & Borehamwood and Mill Hill Broadway all feature in the top 15 destinations from the core, making up almost a third (32%) of surveyed trips. The top fifteen destination stations made up 54% of surveyed trips, with 43% to stations north of the core and 11% south of the core. However, this distribution does not take into account the demand to destinations outside the top 15 destinations, and across all stations there was a more balanced split in demand going north and south of the core (see **Figure 14**).

3.5.19 The survey recorded destinations at all 15 Thameslink stations to the north of the core, and to 59 stations on the Thameslink network south of the core; this included 7 stations with a limited Thameslink service on the Kent line between and including West Dulwich – Beckenham Junction, and Petts Wood and Orpington.

**Table 23 Top destination stations for afternoon/evening journeys**

| Station | Percentage of total trips |
|---|---|
| St Albans City (TLN) | 15.8% |
| Harpenden (TLN) | 9.2% |
| Elstree & Borehamwood (TLN) | 3.6% |
| Flitwick (TLN) | 3.6% |
| Streatham (TLS) | 2.7% |
| Herne Hill (TLS) | 2.3% |
| Tulse Hill (TLS) | 2.3% |
| Mill Hill Broadway (TLN) | 1.9% |
| Bedford (TLN) | 1.9% |
| Sutton (TLS) | 1.9% |
| East Croydon (TLS) | 1.9% |
| Leagrave (TLN) | 1.9% |
| Radlett (TLN) | 1.8% |
| Kentish Town (TLN) | 1.8% |
| Luton (TLN) | 1.8% |

**3.5.20** The distribution of origin and destination stations should be recorded in the ex-post period to asses any changes that could be attributed to the enhanced connectivity generated by the Thameslink Programme.

### Key origin-destination flows

3.5.21 To further understand the baseline patterns of trips to/from/through the core, an analysis was undertaken of the origin and destination pairs for trips, defined as the first and last station used on the trip being made at the time of survey.

3.5.22 **Table 24** shows the top 15 origin and destination (OD) pairs, which accounted for 22% of total surveyed trips. These OD pairs all had origins at one of the four survey stations in the core. Northbound destinations from the core were predominant, in particular flows to St. Albans and Harpenden, as expected given **Table 22**. There was only one OD pair that started at Blackfriars (Blackfriars – St. Albans City) in the top 15 flows.

**Table 24 Top 15 origin-destination flows**

| Origin | Destination | Percentage of total trips |
|---|---|---|
| Farringdon | St Albans City (TLN) | 3.0% |
| St. Pancras International | St Albans City (TLN) | 2.8% |
| City Thameslink | St Albans City (TLN) | 2.2% |
| Farringdon | Harpenden (TLN) | 2.0% |
| City Thameslink | Harpenden (TLN) | 1.9% |
| Blackfriars | St Albans City (TLN) | 1.7% |
| St. Pancras International | Harpenden (TLN) | 1.5% |
| Farringdon | Kentish Town (TLN) | 1.0% |
| City Thameslink | Elstree & Borehamwood (TLN) | 0.9% |
| Farringdon | Streatham (TLS) | 0.9% |
| City Thameslink | Sutton (TLS) | 0.9% |
| City Thameslink | Flitwick (TLN) | 0.9% |
| Farringdon | Flitwick (TLN) | 0.9% |
| City Thameslink | East Croydon (TLS) | 0.8% |
| Farringdon | Luton (TLN) | 0.8% |

## Interchanging

3.5.23 The survey provided a range of data on baseline levels of interchanging. The data presented herein focus, first, on the level of interchange occurring between respondents' origin stations and the four survey stations i.e. considering the 24% of trips that did not originate at one of the four core stations. The analysis subsequently considers the level of interchanging occurring in trips once respondents left the four survey stations, prior to reaching their final destination.

3.5.24 **Table 25** shows the number of interchanges made by respondents on their journey to the survey station in the core. Three quarters of respondents started their journey at one of the four survey stations i.e. no interchange took place to reach the core station. This varied from 58% at St. Pancras International to 97% at City Thameslink.

3.5.25 In total, 19% of respondents first interchanged at the survey station. However, this ranged from 2% at City Thameslink, 15% at Farringdon, 30% at St. Pancras International through to 31% at Blackfriars. Few respondents made more than one interchange to travel to the core in the afternoon/evening peak (the proportions doing this ranging between 2.3% at Farringdon and 12.4% at St. Pancras International).

**Table 25 Interchanges to the survey station**

| Number of interchanges | St. Pancras International | Farringdon | City Thameslink | Blackfriars | Overall |
|---|---|---|---|---|---|
| 0 (i.e. started journey at the survey station) | 58.0% | 82.9% | 97.3% | 60.6% | 75.2% |
| 1 (i.e. first interchange was at the survey station) | 29.6% | 14.8% | 1.5% | 30.9% | 18.9% |
| 2 (2nd interchange was at the survey station) | 9.8% | 2.1% | 0.9% | 7.1% | 4.8% |
| 3 (3rd interchange was at the survey station) | 2.6% | 0.2% | 0.3% | 1.4% | 1.1% |

3.5.26 **Table 26** summarises the top ten origin stations of trips for respondents who interchanged before reaching, or at, one of the four survey stations (these are not the stations at which they interchanged as they are provided in Table 29). The list of origin stations for passengers who made one or more interchanges (the left side of the table) identifies the same non-core stations as shown in **Table 22**. The right side of the table lists origin stations for respondents who made only one interchange at the survey station (i.e. they travelled direct from their origin station to the survey station). Liverpool Street, Oxford Circus and St. James's Park were the three most common origin stations among respondents who made an interchange before the survey station.

**Table 26 Interchanges to survey station from top ten origin stations**

| Top ten stations: 1 or more interchanges | % of total trips | Top ten stations: 1 interchange [*at* survey station] | % of total trips |
|---|---|---|---|
| Liverpool Street | 6.4 | Liverpool Street | 6.0 |
| Oxford Circus | 4.7 | St. James's Park | 4.6 |
| St. James's Park | 4.7 | Oxford Circus | 4.2 |
| Canary Wharf | 4.5 | Westminster | 3.7 |
| Victoria | 4.3 | Monument | 3.7 |
| Westminster | 3.9 | Tower Hill | 3.7 |
| Monument | 3.7 | Victoria | 3.5 |
| Tower Hill | 3.7 | Moorgate | 3.0 |
| Moorgate | 3.3 | Cannon Street | 3.0 |
| Cannon Street | 3.0 | Embankment | 2.7 |
| **Sample size** | **478** | | **478** |

3.5.27 **Table 27** shows the number of interchanges made by respondents on their journey *from* the survey station. There were far fewer interchanges from the survey stations, with 87.0% not making any interchanges later in their journey, with little variation between the core stations (ranging from 82.9% at Blackfriars to 92.5% at St. Pancras International). Only 1.6% made more than one interchange after leaving the four survey stations.

**Table 27 Interchanges from the survey station**

| Number of interchanges | St. Pancras International | Farringdon | City Thameslink | Blackfriars | Overall |
|---|---|---|---|---|---|
| 0 | 92.5% | 86.8% | 86.1% | 82.9% | 87.0% |
| 1 | 6.5% | 12.3% | 12.4% | 14.0% | 11.4% |
| 2 | 1.0% | 0.8% | 1.2% | 2.6% | 1.4% |
| 3 | 0.0% | 0.1% | 0.3% | 0.4% | 0.2% |

3.5.28 **Table 28** summarises the top ten destination stations of trips where respondents interchanged after leaving one of the four survey stations. The left side of the table lists the top ten destination stations to which respondents made one or more interchanges from the survey station, and the right side of the table includes those for respondents who interchanged only once. This includes stations to which it is possible to travel direct from the survey stations (e.g. St. Albans City), although it is possible to interchange between fast, semi-fast and slow services.

**Table 28 Interchanges to travel to the top ten destination stations from the survey stations**

| Top ten stations: 1 or more interchanges | % of total trips | Top ten stations: 1 interchange [*after* survey station] | % of total trips |
|---|---|---|---|
| St Albans City | 4.9 | Beckenham Junction | 4.7% |
| Beckenham Junction | 4.7 | St Albans City | 4.5% |
| Bickley | 3.8 | Bickley | 3.8% |
| Harpenden | 3.6 | Harpenden | 3.6% |
| Kent House | 3.5 | Kent House | 3.5% |
| East Finchley | 3.4 | Penge East | 3.1% |
| Penge East | 3.1 | East Finchley | 2.5% |
| Welwyn Garden City | 2.3 | Shortlands | 2.1% |
| Shortlands | 2.1 | Preston Park | 2.0% |
| Preston Park | 2.0 | Belmont | 1.5% |
| **Sample size** | **223** | | **223** |

### Interchange stations

3.5.29 **Table 29** and **Table 30** show the key stations that respondents interchanged at overall, for those who interchanged one or more times to the survey station; or one or more times from the survey station respectively. King's Cross was the most common interchange station, mainly due to interchange between King's Cross (both national rail and underground stations) and St. Pancras International, although there were also a small number of trips from King's Cross to Farringdon. Overall however, these were only a small proportion of the total trips in the survey.

**Table 29 Top 10 Overall Interchanges (To Survey Station)**

| Interchange | Percentage of total trips |
|---|---|
| King's Cross | 1.7% |
| Southwark | 0.7% |
| Bank | 0.6% |
| Liverpool Street | 0.3% |
| Green Park | 0.3% |
| Victoria London | 0.2% |
| Euston | 0.2% |
| Tower Hill | 0.2% |
| Moorgate | 0.2% |
| Vauxhall | 0.2% |

**Table 30 Top 10 Overall Interchanges (From Survey Station)**

| Interchange | Percentage of total trips |
|---|---|
| St. Pancras International | 1.9% |
| King's Cross | 1.8% |
| Herne Hill | 1.7% |
| East Croydon | 1.3% |
| Kentish Town | 0.7% |
| St Albans City | 0.6% |
| Sutton | 0.6% |
| Bromley South | 0.5% |
| Redhill | 0.4% |
| Blackfriars | 0.3% |

### Access and Egress Modes

3.5.30 To consider the level of interchange between rail and other modes, the survey analysis included the review of access and egress modes. **Table 31** shows the access modes for the start of the journey by survey station (respondents were able to select more than one access mode). It should be noted that the data are for access to the first station where they started their journey, which was not necessarily the survey station. Walking was the dominant access mode at over 90% for all stations, and for trips surveyed at Farringdon and Blackfriars it accounted for around 96%. Buses were used by 9% of those surveyed at City Thameslink and by 5% of those surveyed at St. Pancras International but by only around 1% for the other two stations.

3.5.31 Other access modes made up only a small proportion. Cycling share was highest at St. Pancras International (2.6%), as was use of taxi/private hire vehicle (1.0%) and use of a car (either driving or dropped off) at 2.4%.

**Table 31 Top Access Mode (% of total trips)**

| | St. Pancras International | Farringdon | City Thameslink | Blackfriars | Overall |
|---|---|---|---|---|---|
| Walked | 90.0% | 96.7% | 90.4% | 95.7% | 93.4% |
| Bus | 4.7% | 1.1% | 9.3% | 1.1% | 3.9% |
| Cycled | 2.6% | 1.1% | 1.2% | 1.1% | 1.5% |
| Car/Van drove | 0.7% | 0.2% | 0.2% | 0.5% | 0.4% |
| Car/Van dropped off | 1.7% | 0.2% | 0.0% | 0.5% | 0.6% |
| Taxi/private hire | 1.0% | 0.2% | 0.0% | 0.5% | 0.4% |
| Other | 0.1% | 0.9% | 0.0% | 0.5% | 0.4% |
| Motorcycle | 0.0% | 0.3% | 0.0% | 0.0% | 0.1% |

3.5.32 **Table 32** shows the egress mode from the final station to final destination (in most cases home). Two-thirds of trips included walking. In addition, 21% went by car (14% drove and 7% got a lift) and 10% used the bus to reach their end destination. Compared to access mode, a higher proportion cycled (5%) or used a taxi/private hire vehicle (1.3%) to egress from their final station.

**Table 32 Top Egress Mode (% of total trips)**

| | St. Pancras International | Farringdon | City Thameslink | Blackfriars | Overall |
|---|---|---|---|---|---|
| Walked | 65.4 | 69.3 | 62.5 | 68.0 | 66.5 |
| Car/Van drove | 14.9 | 11.3 | 16.4 | 14.8 | 14.2 |
| Bus | 9.3 | 10.7 | 10.6 | 8.4 | 9.8 |
| Car/Van Lift | 6.6 | 5.8 | 10.0 | 6.1 | 7.1 |
| Cycled | 5.7 | 4.8 | 4.3 | 4.0 | 4.7 |
| Taxi/private hire | 2.5 | 0.9 | 0.7 | 1.3 | 1.3 |
| Other | 0.6 | 0.6 | 1.9 | 0.9 | 1.0 |
| Motorcycle | 0.3 | 1.3 | 0.3 | 1.0 | 0.8 |
| Air | 0.2 | 0.0 | 0.0 | 0.8 | 0.2 |

3.5.33 The March 2017 survey shows that for the majority of passengers, the core station was the first station in their afternoon/evening journey. In most cases they walked to the station. However, a notable proportion (24%) started at another station to travel to the core, using mainly London Underground (17%), in particular those travelling to St. Pancras International and Blackfriars. However, very few passengers interchanged more than once either to or from the core.

3.5.34 As part of the ex-post evaluation, the survey should be repeated. However, the ex-post assessment will need to take into account that there will be services going through the core for the first time in 2018 from parts of the current Great Northern, Southern and Southeastern networks. These trips have not been surveyed in the 2017 baseline. However, there is an opportunity to collect information from passengers on how or whether their origins/destinations or their routeing have changed in the immediate ex-post period.

3.5.35 Surveys in the immediate ex-post period and the 5 year ex-post period will provide an indication of the extent to which the Thameslink Programme has provided direct connectivity and interchange benefits. This will need to be contextualised against background changes in trip patterns (ultimate origins and destinations), through suitable comparators or assessing changes in trip patterns on current Thameslink services going through the core.

3.5.36 Consideration should also be given to extending the survey to include on-board surveys of those going through the core, who may not be represented in the surveys of boarders at core stations.

## 3.6 On-train crowding

**Summary of On-Train Crowding interventions**

3.6.1 One of the main objectives of the Thameslink Programme is to reduce overcrowding on Thameslink and other commuter services; and reduce overcrowding on London Underground (LUL) services by reducing the need to interchange between mainline services using LUL stations and connections. This will be achieved through the provision of more frequent higher capacity trains. The impacts on on-train crowding are expected to be greatest in Key Output 2.

3.6.2 In Key Outputs 0 and 1, on-train crowding was addressed through the provision of additional train capacity in a number of locations (**Table 33**). Within the core, additional Class 377 trains were introduced in 2009, which facilitated an increased frequency through the core, covering the fast train services operating between Bedford/Luton and Brighton/Sevenoaks.

3.6.3 The introduction of 12-car Class 377 trains between Bedford and Brighton in 2011 in the peak directions provided additional capacity. The impacts of Key Outputs 0 and 1 will therefore have affected both Thameslink and Southeastern services operating between Bedford/Luton and Brighton/Sevenoaks, and Thameslink services between Bedford and Brighton.

**Table 33 Key Thameslink Programme Key Output 0 and 1 interventions related to on-train crowding**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 0 & 1 | Jun 2009 | Increased frequency up to 15 trains paths per hour through the core in the peak periods (using additional Class 377 rolling stock). | The additional Class 377 rolling stock was required to facilitate enhanced service frequencies and connectivity through the core. These improvements were anticipated to decrease on-train crowding. |
| 0 & 1 | Dec 2011 | Introduction of 12-car trains between Bedford and Brighton and 12-car platforms opened in Farringdon, Blackfriars and stations between Mill Hill Broadway and Bedford. | The new rolling stock and the lengthening of station platforms were anticipated to increase service capacity and thereby contribute to decreasing on-train crowding. |

3.6.4 In Key Output 2, increased train frequency and additional capacity through new Class 700 rolling stock will be the key contributory factors to addressing crowding on the Thameslink network (**Table 34**). By bringing more services through the core from a wider number of destinations on the rail network there is anticipated to be a decrease in demand to interchange to London Underground services. Where Thameslink shares or will share routes with Southern[33] and Southeastern[34] services, the Thameslink Programme will increase capacity with the introduction of Class 700 rolling stock and some passengers may transfer to Thameslink services to access the core, decreasing crowding on Southern and Southeastern services into London Bridge and Victoria.

**Table 34 Key Thameslink Programme Key Output 2 interventions related to on-train crowding**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 2 | Jun 2016 | New Class 700 trains (60 8-car trains and 55 12-car trains) began gradual introduction into service in June 2016. | The new rolling stock has wider doorways, more standing and circulation space, and is more accessible than previous rolling stock. Overall the Thameslink Programme will deliver more capacity through a combination of longer trains and more peak time services. These factors are anticipated to increase service capacity and thereby decrease on-train crowding. |
| 2 | May 2018 | Increased train frequencies (up to 18 tph in the peak periods through the core in each direction), scheduled from the May 2018 timetable change with new cross-London Thameslink services. | The increase in service frequency in the core will increase service capacity and contribute to decreasing on-train crowding. |
| 2 | Dec 2019 | ETCS and ATO in the core.<br>Increased train frequencies of up to 24 tph through the core in the peak. | ETCS and ATO are required in order to support operational training and to run trains through the core at 24 tph during peak periods. Improved frequencies are anticipated to decrease on-train crowding. |
| 2 | Dec 2019 | Increased train frequencies of up to 24 tph through the core in the peak periods. | The increase in service frequency in the core will increase service capacity and contribute to decreasing on-train crowding. The majority of new cross-London Thameslink services will start in May 2018, with 18 tph in the peak, 20 tph from December 2018, 22 tph from May 2019 and 24 tph by December 2019. |

[33] e.g. East Grinstead Southern services to Victoria. The GTR 2018 Timetable Consultation (15 September – 08 December 2016) proposed introducing two Thameslink trains per hour (in the peak periods only) to/from East Grinstead (via London Bridge), on top of the existing Southern train service from East Grinstead to Victoria.

[34] e.g. Rainham Southeastern services to Cannon Street. The GTR 2018 Timetable Consultation (15 September – 08 December 2016) proposed introducing two Thameslink trains per hour to/from Rainham.

### *Key Data Sources*

3.6.5 Crowding can be assessed by looking at three main data sources:

- DfT passenger count and train capacity data can be used to assess peak period demand, capacity and crowding;
- NRPS data can be used to assess passenger satisfaction with crowding; and
- Transport for London (TfL) Rolling Origin Destination Survey (RODS) data can be used to calculate demand on London Underground lines.

3.6.6 DfT passenger count and train capacity data provide the main source of information to measure on-train crowding on the rail network. The data are collected every spring and autumn. The latter is the main data set going back over the longest period, and with a greater number of counts in a given survey period, therefore providing greater confidence in the data.

3.6.7 Passengers in Excess of Capacity (PiXC) is the main metric used by DfT to assess crowding levels on a typical autumn weekday in the peak periods[35]. PiXC shows the proportion of standard class passengers that are above the capacity on their train service at its busiest point (this is known as the *critical load* point for that service – each train service on a given route may reach its most crowded level at a different point on the route)[36]. Capacity includes all standard class seats, and also includes a standing allowance if passengers are standing for 20 minutes or less[37]. PiXC is generally higher in the morning peak period, and therefore AM peak period data are presented here.

3.6.8 PiXC data were available for both Key Outputs 0 and 1 and for Key Output 2. Both the capacity and the demand data to calculate the PiXC metric have been obtained and can therefore be analysed to determine the key drivers behind any changes in PiXC.

3.6.9 In addition, capacity and demand data are also available as *cordon load* point data. Whilst PiXC provides information on the crowding on a service at its busiest point (critical load point), cordon load data provide capacity and demand information at fixed key points (stations) in city centres, usually but not always the major rail termini. For London, the stations are chosen as being the entry point to Travelcard Zone 1 (as a proxy for 'Central London'), although specific services may be more crowded at other points on the route. Key cordon points of relevance to the Thameslink Programme include: Old Street; King's Cross; St. Pancras International; Victoria; Elephant & Castle; and London Bridge.

[35] Three hour peak periods (07:00 – 09:59 for the AM peak period; and 16:00 – 18:59 for the evening peak period).
[36] The numbers in excess of capacity on each service are added together and shown as a percentage of the total number of standard class passengers on all peak services (DfT (2017) *Rail passenger numbers and crowding on weekdays in major cities in England and Wales: 2016*). Therefore, even if only one service is over capacity and all other services are under capacity, the passengers in excess of capacity on that one service will be shown as a proportion of total passengers to calculate PiXC. Therefore, PiXC can be influenced by the distribution of passengers across services in the peak period. This has not been assessed here.
[37] Crowding is measured by comparing the standard class critical load with the standard class capacity of the service. The standard class capacity includes the number of standard class seats on the service and may include an allowance for standing room. No allowance for standing is made on a service when the time between stations before (AM) or after (PM) the critical load point is more than 20 minutes, but it is allowed when it is 20 minutes or less. A limitation with this approach is that this may not reflect the amount of time for which passengers have actually been standing, since it is not possible to directly record this. The 20 minute threshold used also means that small changes to timetables can push services from one side of the threshold to another, which will then have implications for their PiXC measures. (DfT (2017) *Rail passenger numbers and crowding statistics: Notes and definitions*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633284/rail-passenger-crowding-notes-definitions.pdf).

3.6.10 NRPS data allow comparison with DfT passenger count and capacity data, providing a measure of passenger satisfaction with crowding, through a question on the ability to stand or sit on the train. The data provide additional contextual information on crowding. However, passenger satisfaction may be influenced by other factors, such as train reliability/punctuality, and represents a cross-section of passengers at the level of a given train operating company (and not just morning peak passengers).

3.6.11 RODS data can be used to calculate demand between each station on each Underground line in both directions. This provides an annual average weekday peak period estimate of passenger volume in both directions. It can therefore be used to assess any changes in passenger numbers on key sections of the Underground network likely to be impacted by the Thameslink Programme, as well as on sections not impacted by the Programme to provide a comparison against general changes in demand. As demand is generally higher in the morning peak period, AM peak period data are presented here. However, RODS does not provide a direct measure of crowding as it does not include any measure of capacity on the Underground.

3.6.12 RODS data have been obtained from 2008 to 2012 for this commission. RODS is available for later years, but TfL will replace it after 2017 with a new data set called NUMBAT, details of which have not yet been confirmed. It will be necessary to assess the consistency between RODS and subsequent data sources when returning to this work for the ex-post evaluation of Key Output 2.

### *Key Outputs 0 and 1 – analysis of benefits realisation to date*

3.6.13 This section sets out the data relating to on-train crowding for both the baseline (2008) and ex-post (2012) periods for Key Outputs 0 and 1. The impacts of Key Outputs 0 and 1 will affect Thameslink and Southeastern services operating between Bedford/Luton and Brighton/Sevenoaks and Thameslink services between Bedford and Brighton. The majority of these services went northbound in the morning peak through **Elephant & Castle** (Thameslink and Southeastern services), for which PiXC data are available, and go southbound in the morning peak through **St. Pancras International** (Thameslink services), for which PiXC data are also available. There are few suitable comparators available for Thameslink and Southeastern services, given changes in rolling stock or frequency on most other train operating companies. However, there were limited changes in train frequencies, rolling stock capacity and class of rolling stock on c2c services into Fenchurch Street, so these have been presented herein as a comparator.

3.6.14 **Table 35** summarises the PiXC results for on-train crowding and changes in demand and capacity[38] levels for the AM peak period of 7:00 – 10:00. Results are shown for Thameslink northbound and southbound, Southeastern northbound (as this was also impacted) and c2c westbound (as a comparator). **Table 35** shows that crowding levels decreased on Thameslink services from 10.8% to 4.6% between 2008 and 2012 on services northbound to or through Elephant & Castle in the morning peak, and decreased from 4.0% to 1.2% southbound to or through St. Pancras International. Demand increased less than capacity over this period, demonstrating a positive impact from the increase in capacity in the AM peak period. In comparison, crowding on c2c services, which were not affected by the Thameslink Programme and where there was no significant alternative investment in capacity or rolling stock, increased from 2.7% in 2008 to 4.6% in 2012. However, there was a much larger increase in demand over this period (10.4%) than for other services, with the smallest increase in capacity (2.5%).

**Table 35 Key Outputs 0 and 1 on-train crowding AM peak period autumn 2008 and 2012 (PiXC)**

| | | 2008 Baseline | 2012 Ex-post | Demand change 2008-12 | Capacity change 2008-12 |
|---|---|---|---|---|---|
| Thameslink northbound | Thameslink services to or through Elephant & Castle/Blackfriars | 10.8% | 4.6% | +3.6% | +6.2% |
| Thameslink southbound | Thameslink services to or through St. Pancras International | 4.0% | 1.2% | +2.4% | +3.7% |
| Southeastern northbound | Southeastern services to or through Elephant & Castle/Blackfriars | 4.5% | 5.0% | +5.7% | +4.0% |
| *Fenchurch Street (westbound)* | *c2c services to Fenchurch Street* | *2.7%* | *4.6%* | *+10.4%* | *+2.5%* |

[38] See paragraph 3.6.7 for information on definitions.

3.6.15 **Figure 20** shows crowding levels between 2008 and 2012. It also illustrates the degree of overlap between Thameslink and Southeastern services to or through Elephant & Castle. With the closure of Blackfriars (eastern side) bay platforms in 2009, the former Southeastern services which used these were joined up with Thameslink services, and jointly operated by both operators. There may have been some crossover of demand from Thameslink to Southeastern on a small number of specific train services in 2009, where the timetable and the extension of Southeastern services beyond the core allowed some passengers to switch to Southeastern services at Herne Hill, Loughborough Junction and Elephant & Castle. Southeastern's High Speed services started in 2009, terminating at St. Pancras International which may have had an impact on some passenger journeys and numbers.

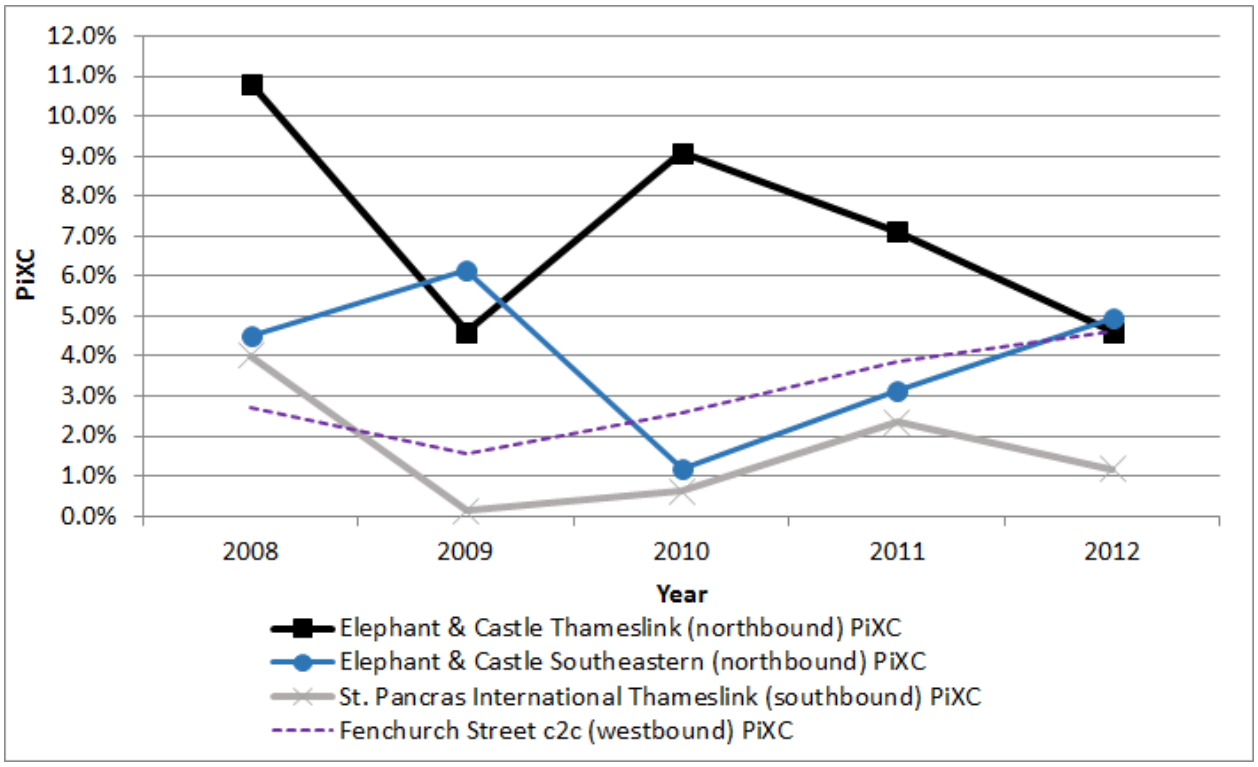


**Figure 20 Key Outputs 0 and 1 on-train crowding AM peak period autumn 2008 to 2012 (PiXC)**

3.6.16 **Table 36** shows the number of trains operated by each TOC to or through Elephant & Castle in autumn each year. Frequency on Thameslink dropped from 15 trains in the AM peak period in 2008 to 14 in 2009, before increasing to 16 from 2010; but remained constant on Southeastern at 18. However, the key change in 2012 was the introduction of 12-car trains between Bedford and Brighton, with 12-car platforms opened in Farringdon, Blackfriars and stations between Mill Hill Broadway and Bedford. There was a 3.6% increase in capacity from 2010 to 2012 for the same number of trains on Thameslink over the AM peak period. Conversely on Southeastern there was a smaller 0.5% increase over the same period.

**Table 36 Number of Thameslink and Southeastern Trains to or through Elephant & Castle 2008-2012 in the AM Peak Period**

| Year | Number of Thameslink Trains | Number of Southeastern Trains | Total Number of Trains |
|---|---|---|---|
| 2008 | 15 | 18 | 33 |
| 2009 | 14 | 18 | 32 |
| 2010 | 16 | 18 | 34 |
| 2011 | 16 | 18 | 34 |
| 2012 | 16 | 18 | 34 |

3.6.17 To provide context to the above analysis of PiXC crowding percentages, the levels of AM peak period demand and capacity between 2008 and 2012 were investigated to assess the extent to which change in demand, capacity or both drove changes in year-on-year crowding levels. This analysis considers total demand and capacity for the routes above across the AM peak period, at the cordon points rather than the busiest point of services as reported by PiXC data.

3.6.18 As shown in **Figure 21**, there was some variability in passenger volumes between 2008 and 2012. For all services including the c2c comparator, demand decreased from 2008 to 2009 (2010 for northbound Southeastern services to/through Elephant & Castle). Demand on northbound Thameslink and Southeastern services increased from 2010 to 2012, with 2012 passenger volumes being slightly higher than in 2008. However, on southbound Thameslink services to/through St. Pancras International, demand increased to 2011 before decreasing in 2012, again to levels slightly higher than in 2008. In contrast, c2c services showed a larger and more sustained increase in demand from 2009 than the other services, which is reflected in the PiXC data on crowding.

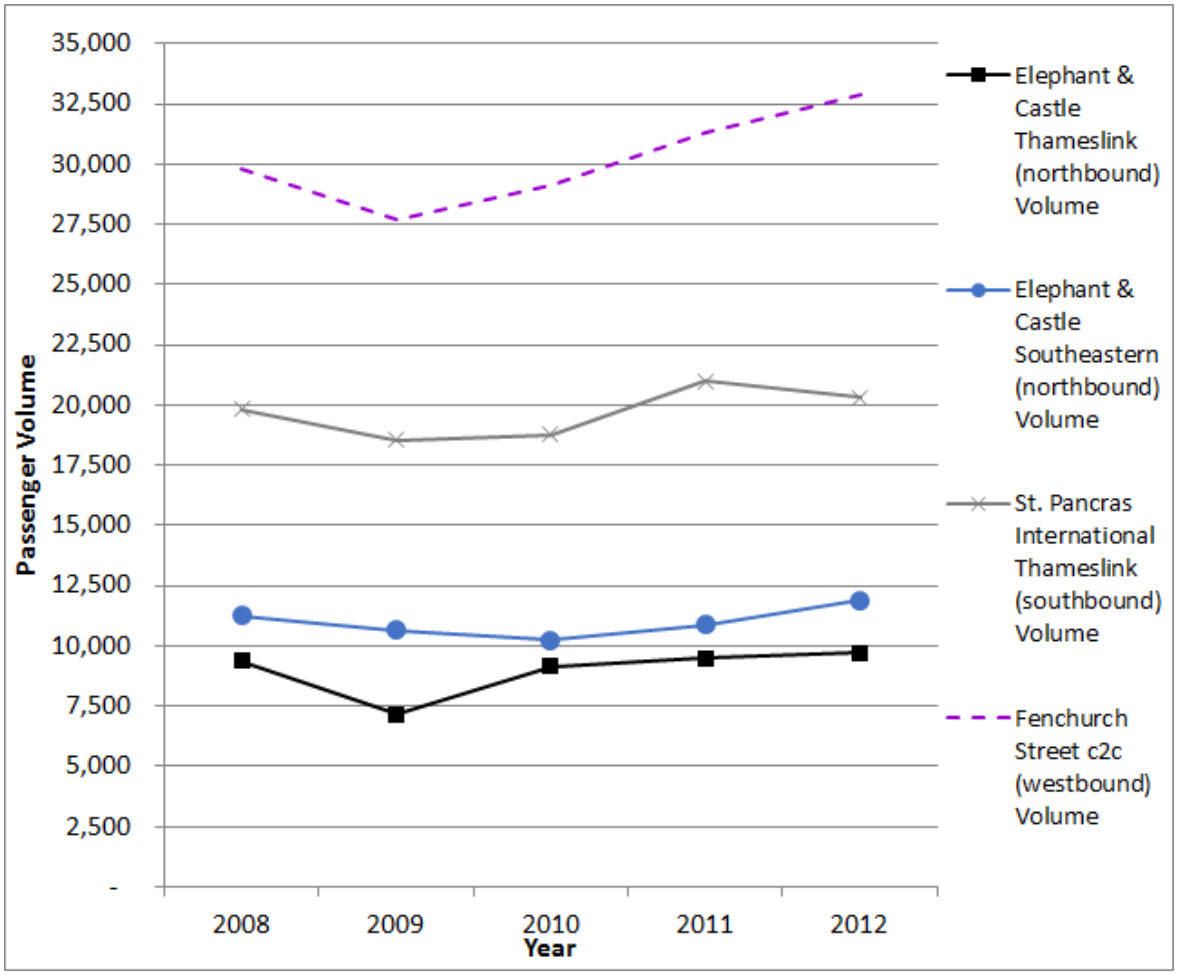


**Figure 21 Key Outputs 0 and 1 demand AM peak period autumn 2008 to 2012 – Passenger Volume**

3.6.19 **Figure 22** shows capacity levels between 2008 and 2012, which for all services were higher than demand levels across the whole AM peak period. Furthermore, in contrast to changes in demand, the levels of capacity were generally more constant; this would be expected as capacity is determined by the level of service provided and is not influenced by external factors. Although capacity levels were higher than demand levels for all services over the morning peak period as a whole, this hides the extent to which certain services within the peak period might be over capacity (critical load points), which in turn contributes to crowding levels as measured by PiXC.

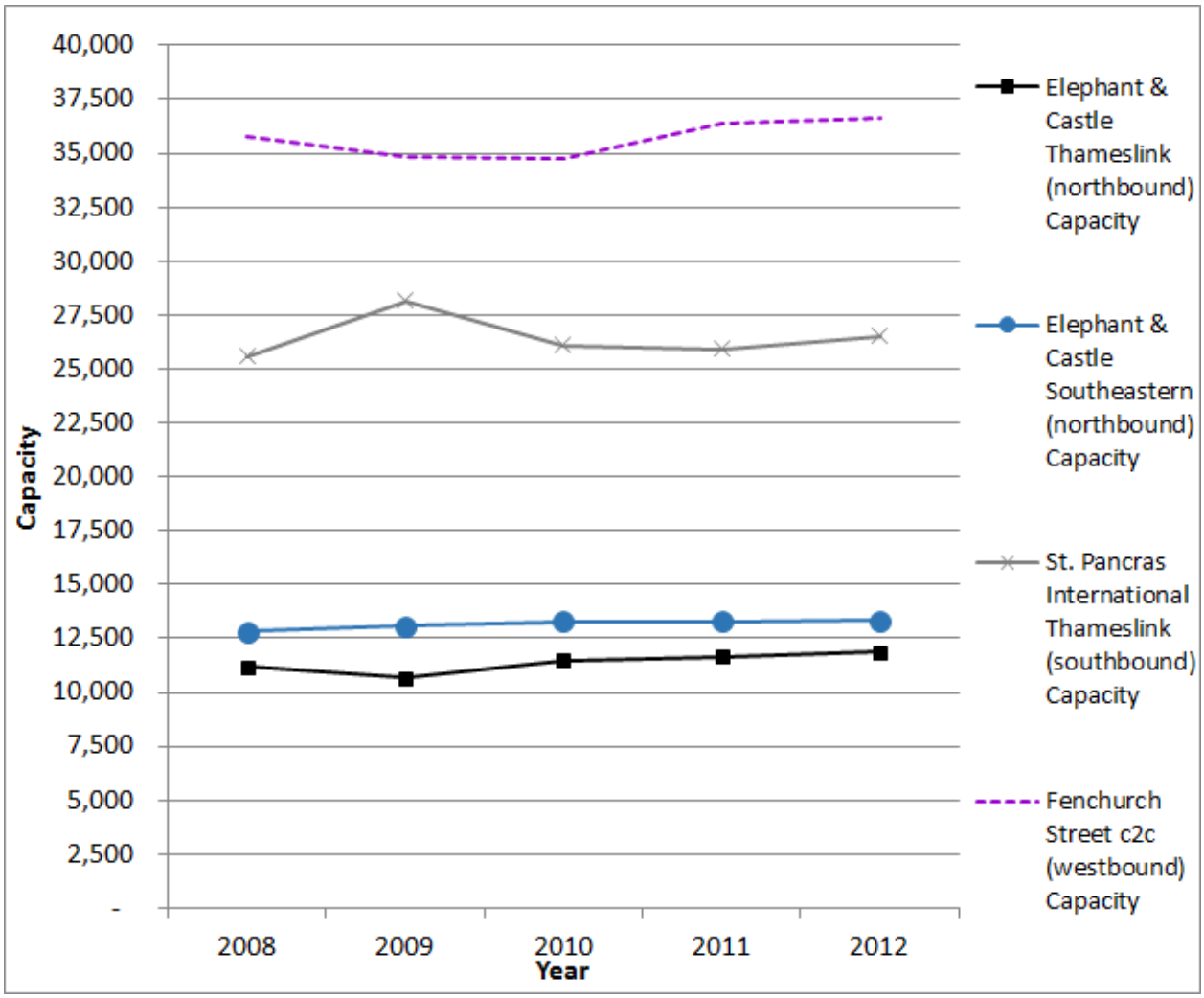


**Figure 22 Key Outputs 0 and 1 capacity AM peak period autumn 2008 to 2012 – Train Capacity**

3.6.20 **Table 37** presents the 2008 baseline and 2012 ex-post data for passenger satisfaction with the level of room available for passengers to sit or stand on board trains and **Figure 23** presents the trend data for the above question between 2008 and 2012. Thameslink and Southeastern recorded significant improvements in passenger satisfaction with the room available to sit or stand between 2008 and 2012. Thameslink's ratings improved by 4pp to 62% and Southeastern's ratings improved by 9pp to 64%. However, satisfaction levels for c2c, the comparator, also improved in this period (by 3pp to 65%), so the trends for Thameslink and Southeastern were not distinctive. It should be noted that the NRPS data will reflect the Thameslink and Southeastern services as a whole, including those not affected by capacity enhancements or service changes in the AM peak period. The data therefore provide an indication of overall passenger satisfaction with room available to sit or stand, although this measure will in general be heavily influenced by peak time conditions when crowding levels are generally highest.

**Table 37 Key Outputs 0 and 1 NRPS passenger satisfaction with the room available to sit or stand on board trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 59% | 62% | +4pp |
| Southeastern | 55% | 64% | +9pp |
| *c2c* | *61%* | *65%* | *+3pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

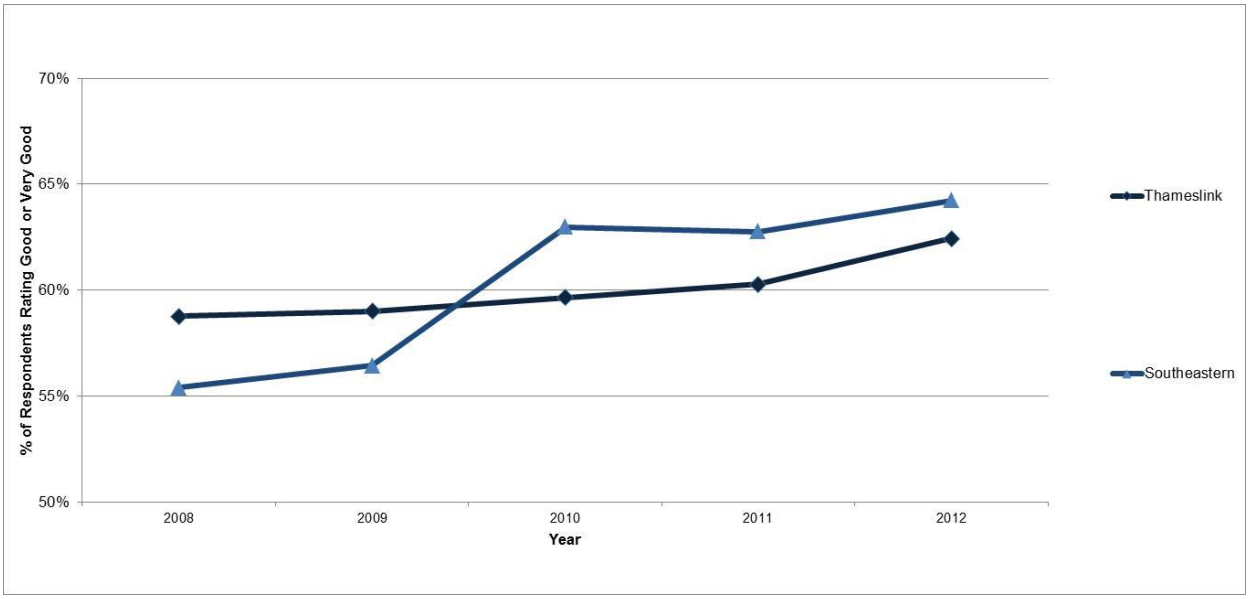


**Figure 23 Key Outputs 0 and 1 NRPS passenger satisfaction with the room available to sit or stand on board trains (2008-2012)**

*Note: The y-axis does not start at 0.*

3.6.21 The final element of Key Output 0 and 1 analysis considered the change in demand on London Underground services. The closure of the Moorgate branch in 2009 is hypothesised to have increased demand on London Underground services between Farringdon and Moorgate (Circle/Hammersmith & City and Metropolitan lines) and the Northern line between King's Cross and Moorgate. This can be examined by looking at

demand on London Underground between Farringdon and Barbican (eastbound in the morning peak) and between King's Cross and Angel (southbound in the morning peak).

3.6.22 It is difficult to find a suitable comparator given changes on other Underground lines (e.g. new rolling stock, interchanges with Thameslink services or interchanges with other national rail services where there have been changes in frequency or rolling stock[39]) and which also serve the City. However, there was little additional investment on the Circle line at Tower Hill, which also provides a potential interchange with c2c at Fenchurch Street (the rail comparator), and therefore this has been chosen as a suitable comparator.

3.6.23 **Table 38** summarises levels of demand on the above sections of the Underground. **Figure 24** to **Figure 26** help contextualise the data by providing demand in 2008 and 2012 for each station to station movement along each of the relevant Underground lines. The marker points on the charts have been enlarged to highlight the key station to station movements that could be impacted by the Thameslink Programme e.g. Farringdon to Barbican in **Figure 24**.

3.6.24 The closure of the Moorgate branch was expected to result in a small increase in demand on the Farringdon to Moorgate Underground section, and a smaller increase in demand on the King's Cross to Angel Underground section (providing an alternative although less convenient route to Moorgate for those previously using Thameslink services into Moorgate). However, this is not reflected in the numbers. There was a decrease in demand from Farringdon to Barbican of 8.0% from 30,674 in 2008 to 28,226 in 2012 (about a 2.1% annual decrease). On the Circle and District line comparator, chosen on the basis it was not affected by the Thameslink Programme or other significant non-Thameslink changes, there was also a decrease in demand of 8.0% from 28,097 in 2008 to 25,840 in 2012.There was also little change in demand between King's Cross and Angel (a 0.6% increase from 29,982 in 2008).

**Table 38 Key Outputs 0 and 1 London Underground AM peak demand 2008 and 2012 (RODS)**

| | | 2008 Baseline | 2012 Ex-post | % change |
|---|---|---|---|---|
| Circle, Hammersmith & City and Metropolitan lines | Farringdon – Barbican (eastbound (EB) in morning peak) | 30,674 | 28,226 | -8.0% |
| Northern line | King's Cross - Angel (southbound (SB) in morning peak) | 29,982 | 30,174 | +0.6% |
| *Circle and District lines* | *Tower Hill to Monument (westbound (WB) in morning peak)* | *28,087* | *25,840* | *-8.0%* |

[39] There may also have been local increases in population or employment and changes to local bus networks, which have not been identified as part of this work.

3.6.25 **Figure 24** confirms that the Moorgate branch closure on the Circle, Hammersmith & City and Metropolitan Lines between Farringdon and Moorgate did not increase demand, with demand actually lower in 2012 than in 2008 between Farringdon and Liverpool Street. Although there was little change in demand between King's Cross and Angel, from **Figure 25** it can be seen that there was a decline in southbound demand to Moorgate and Bank.

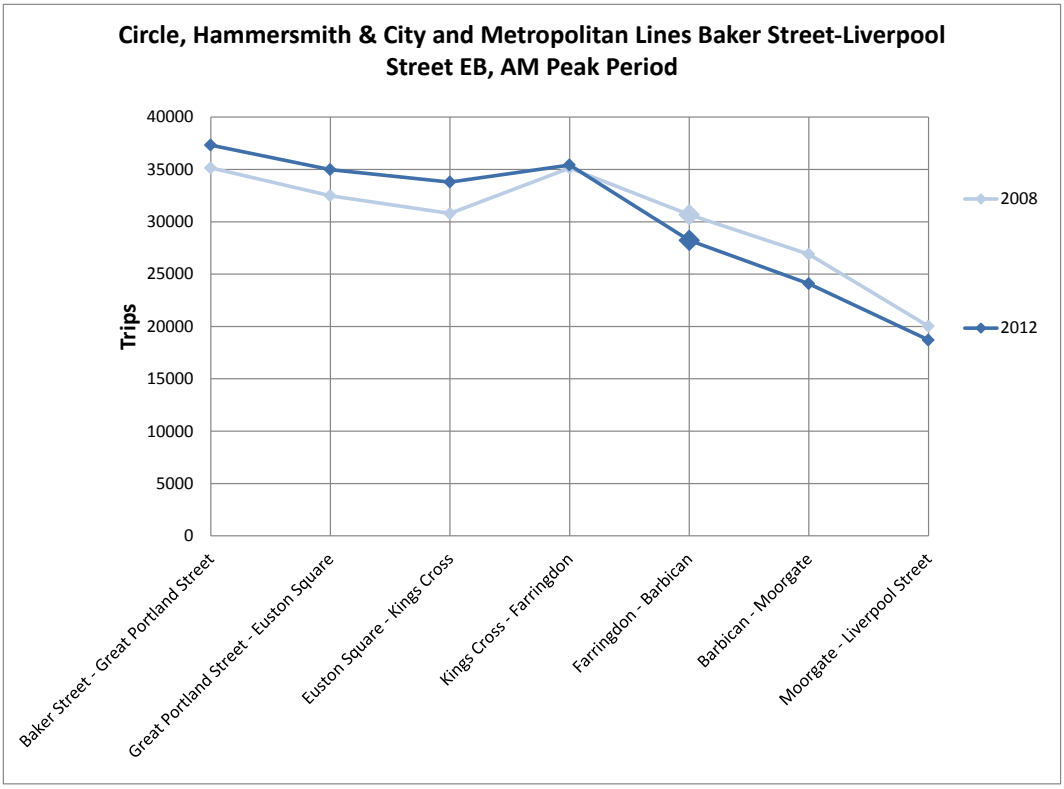


**Figure 24 Circle, Hammersmith & City and Metropolitan Lines Baker Street – Liverpool Street eastbound, AM peak period demand 2008 and 2012**

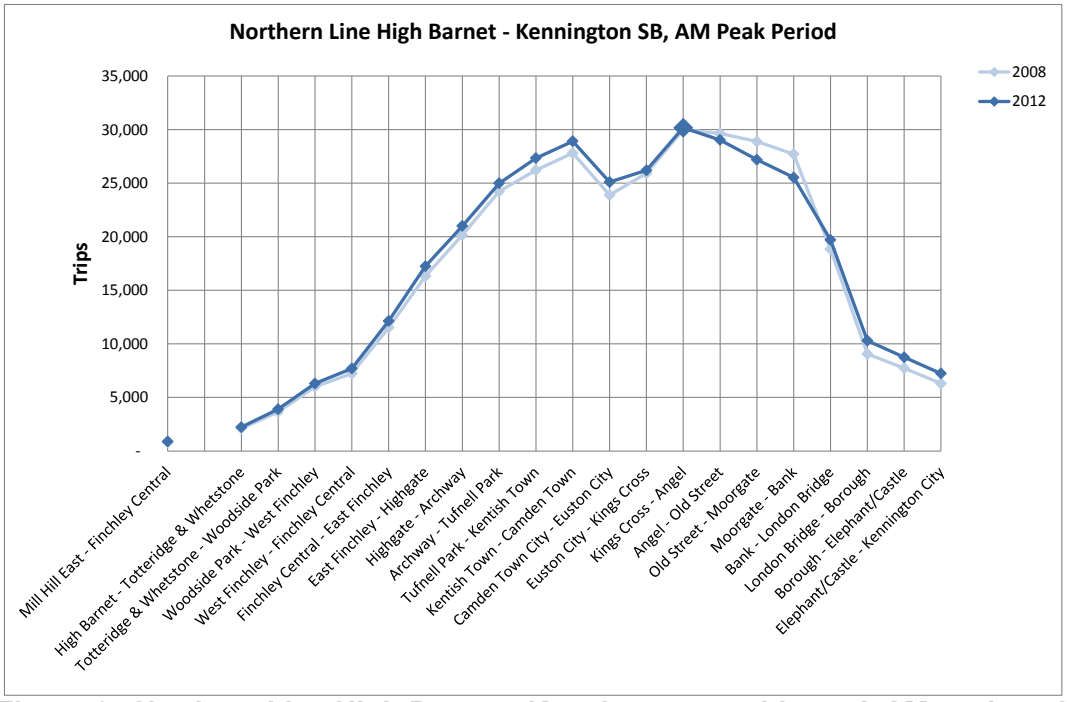


**Figure 25 Northern Line High Barnet - Kennington southbound, AM peak period demand 2008 and 2012**

3.6.26 **Figure 26** shows that demand on the comparator route was lower in 2012 than in 2008 between Tower Hill and Monument.

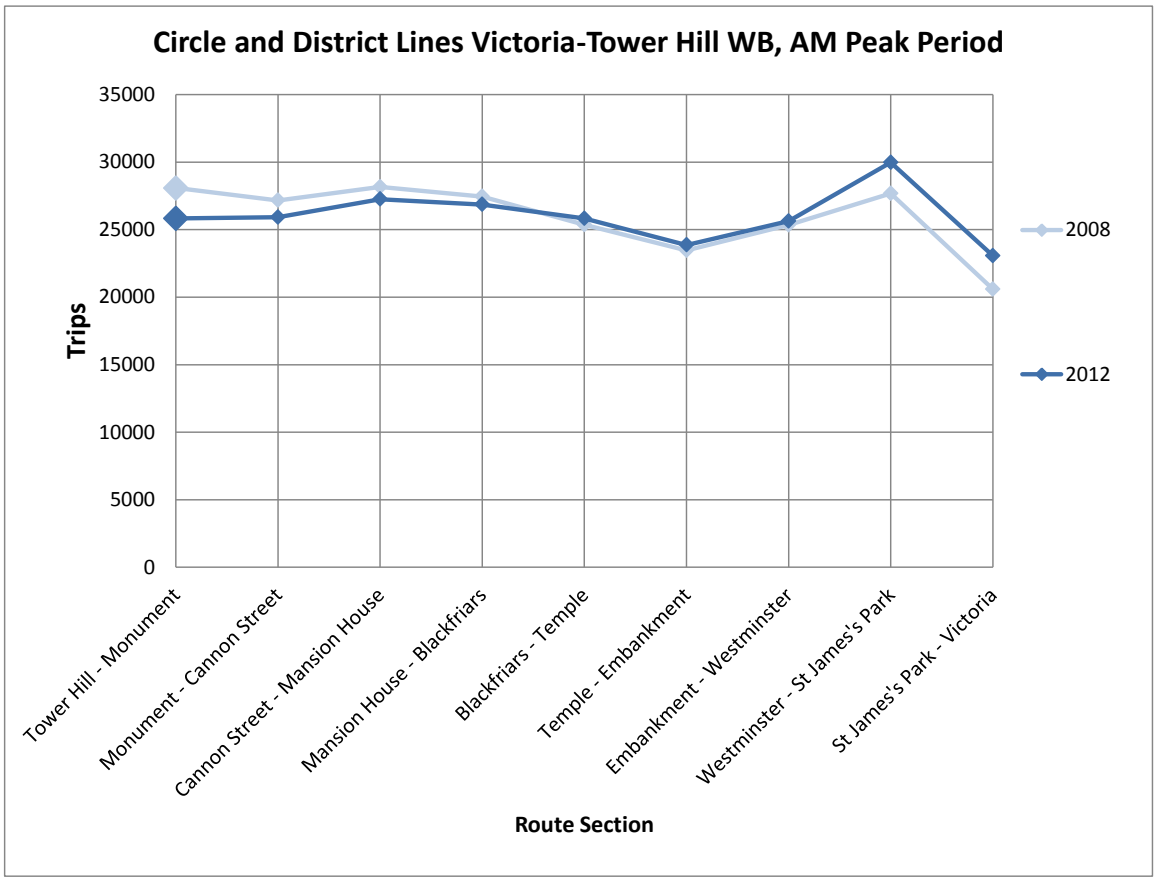


**Figure 26 Circle and District Lines Tower Hill – Victoria westbound, AM peak period demand 2008 and 2012**

3.6.27 The analysis of Key Outputs 0 and 1 has shown that overall morning peak period capacity was greater than demand on Thameslink and Southeastern services. However, Thameslink had high crowding levels on northbound services to Elephant & Castle in 2008 (as measured by the PiXC metric, at 10.8%). There were improvements in on-train crowding levels in the morning peak periods on Thameslink services southbound to or through St. Pancras International and northbound to or through Elephant & Castle, with capacity increases greater than the increases in demand. However, although the increase in capacity was greater than the increase in demand on Southeastern services northbound to or through Elephant & Castle, crowding levels still increased, suggesting a greater proportion of passengers using a more limited number of services (i.e. passengers less distributed across the available capacity in the morning peak period) or an increase in passengers standing for over 20 minutes.

3.6.28 Passenger satisfaction levels with the room available to sit or stand on board trains increased for Thameslink, Southeastern and the c2c comparator; although the data can only be taken as indicative as they will also reflect services not directly impacted by Key Outputs 0 and 1.

3.6.29 The closure of the Moorgate branch was hypothesised to have increased demand for Underground services between Farringdon or King's Cross and Moorgate, but no such impact was detected based on the RODS data.

### *Key Output 2 – baseline for future analysis*

3.6.30 The Key Output 2 baseline data are shown for Thameslink and other impacted routes where relevant, and also for comparator routes. c2c services into Fenchurch Street have been selected as a comparator given these will have the most limited changes in service provision and rolling stock between 2012 and 2019 (although there may be longer term changes beyond 2019). However, the suitability of c2c services as a comparator will need to be reviewed as part of the ex-post evaluation to confirm any changes in capacity and to review the magnitude of any changes in demand on these routes.

3.6.31 **Table 39** summarises crowding using the PiXC metric, as well as setting out capacity (comprising standard class seats and a standing allowance for passengers standing 20 minutes or less) and demand. A larger number of data points are included for Key Output 2, reflecting the anticipated coverage of benefits. The data show that in the 2012 baseline, crowding levels varied from 0.0% at London Bridge (Thameslink Brighton Mainline) to 5.7% at both London Bridge (Southern) and Victoria (Southern). It should be noted that the 0% Thameslink service via London Bridge is because there is a very small number of services on this route in the morning peak period, which run at the very start and end of the period, so are relatively lightly loaded compared to the high peak services via Elephant & Castle. The data show that AM peak period capacity is greater than the total demand. There is still crowding on some services, as demand is not spread evenly over the available capacity.

**Table 39 Key Output 2 on-train crowding autumn 2012 – PiXC, capacity and demand AM peak period**

| | | 2012 Baseline PiXC | 2012 Baseline Capacity | 2012 Baseline Demand |
|---|---|---|---|---|
| Thameslink northbound | to or through Elephant & Castle/Blackfriars | 4.6% | 11,872 | 9,715 |
| Southeastern northbound | to or through Elephant & Castle/Blackfriars | 5.0% | 13,334 | 11,892 |
| Great Northern southbound | to King's Cross | 0.6% | 21,855 | 14,659 |
| Thameslink Brighton Mainline northbound | to or through London Bridge[40] | 0.0% | 2,675 | 1,821 |
| Southeastern northbound | to or through London Bridge | 1.6% | 118,668 | 91,852 |
| Southern northbound | to or through London Bridge | 5.7% | 56,790 | 43,367 |
| Great Northern southbound | to or through Old Street | 2.5% | 19,840 | 15,447 |
| Thameslink southbound | to or through St. Pancras International | 1.2% | 26,499 | 20,314 |
| Southeastern High Speed northbound | to St. Pancras International | 1.8% | 12,976 | 7,438 |
| Southern northbound | to Victoria | 5.7% | 63,466 | 51,568 |
| Southeastern northbound | to Victoria | 3.0% | 27,190 | 20,875 |
| *c2c westbound* | *To Fenchurch Street* | *4.6%* | *36,652* | *32,872* |

3.6.32 **Table 40** shows that the 2012 baseline for passenger satisfaction with being able to stand or sit varied from 60% on Great Northern to 66% on Southern (excluding Gatwick Express).

**Table 40 Key Output 2 passenger perceptions of on-train crowding 2012 – % sufficient room to stand or sit on train (NRPS)**

| | 2012 Baseline |
|---|---|
| Thameslink | 62% |
| Great Northern | 60% |
| Southeastern | 64% |
| Southern | 66% |
| *c2c* | *65%* |

[40] Thameslink Brighton Mainline services northbound to or through London Bridge in the AM peak period had negligible or no crowding. This is because the only Thameslink trains that ran that route were at the periphery of the peak period and off peak or inter peak (there were no gaps for most of the peak in the Southeastern services to allow Thameslink trains to cross the Southeastern Mainline between the Brighton Mainline and Thameslink core). Most peak trains from the Brighton Mainline ran via Elephant & Castle with the crowding forming part of the Thameslink services northbound to or through Elephant & Castle data.

3.6.33 **Table 41** summarises the baseline demand for Key Output 2 on parts of the Underground network likely to be impacted by the Thameslink Programme; **Figure 27** to **Figure 35** set these out within the context of demand on the rest of the relevant Underground line for each station to station movement[41] (the marker points on the charts have again been enlarged to highlight the key station to station movements that could be impacted by the Thameslink Programme).

3.6.34 The locations in **Table 41** were selected on the basis that they provide interchange locations with Thameslink or may be impacted by the Thameslink Programme e.g. crowding relief of the Northern and Victoria lines as the Thameslink Programme delivers direct services to and through the core from a range of destinations for the first time.

**Table 41 Key Output 2 London Underground AM peak period demand 2012 (RODS)**

| Underground Line(s) | Route(s) | 2012 Baseline |
|---|---|---|
| Northern line | King's Cross to London Bridge (all station-to-station links both directions) | See **Figure 27** and **Figure 28** |
| Circle, Hammersmith & City and Metropolitan lines | King's Cross to Euston Square (westbound (WB) in morning peak) | 24,668 |
| Circle, Hammersmith & City and Metropolitan lines | King's Cross-Farringdon (eastbound (EB) in morning peak)<br>Farringdon -Barbican (EB in morning peak) | 18,766<br>25,114 |
| Circle and District lines | Mansion House-Blackfriars (WB in the morning peak)<br>Blackfriars -Temple (WB in the morning peak) | 26,861<br>25,829 |
| Circle and District lines | Temple-Blackfriars (EB in the morning peak)<br>Blackfriars-Mansion House (EB in the morning peak) | 26,966<br>22,908 |
| Circle and District lines | Victoria to St James's Park (EB in the morning peak) | 42,385 |
| Bakerloo line | Elephant & Castle to Lambeth North (northbound (NB) in morning peak) | 4,841 |
| Victoria line | Victoria to Green Park (NB in morning peak) | 56,064 |
| Victoria line | Finsbury Park to Highbury & Islington (southbound (SB) in morning peak) | 48,704 |
| Victoria line | King's Cross to Euston (SB in morning peak) | 54,236 |

3.6.35 Given the anticipated outcomes of the Thameslink Programme and Crossrail, the scope of impacts and other investment, it is difficult to find a suitable Underground comparator. It is recommended that each Underground line is analysed individually as part of the ex-post analysis, and therefore no comparator line data are presented here. Some Thameslink demand will also interchange with Crossrail (e.g. at Farringdon to head westbound toward Tottenham Court Road and eastbound toward Liverpool Street) providing an alternative to current Underground lines.

[41] Morning peak period data have been presented here, as demand tends to be higher.

3.6.36 **Figure 27** (northbound) and **Figure 28** (southbound) show AM peak period demand on the Northern line between High Barnet and Kennington. By introducing direct services through the core from a range of destinations on the Great Northern, Southern, and Southeastern networks the Thameslink Programme may reduce demand for the Northern line between London Bridge and King's Cross[42] (in both directions).

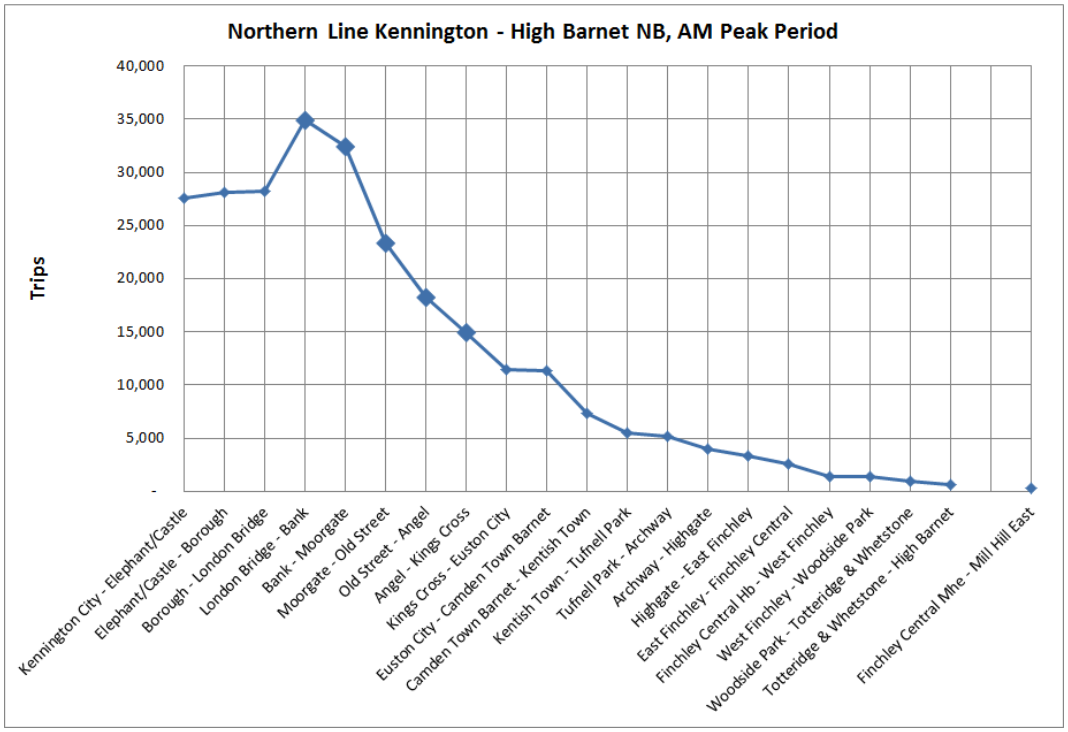


**Figure 27 Northern Line Kennington – High Barnet northbound, AM peak period demand 2012**

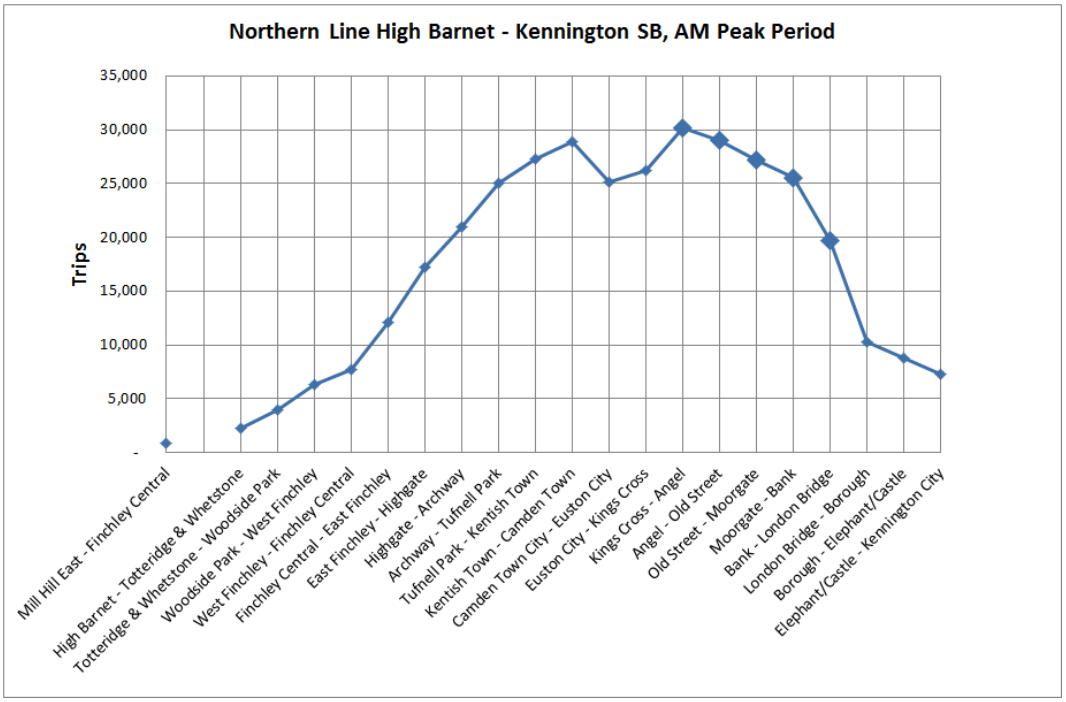


**Figure 28 Northern Line High Barnet – Kennington southbound, AM peak period demand 2012**

[42] In both directions, as Thameslink will provide an enhanced route between these stations and an alternative route to the City.

3.6.37 **Figure 29** (westbound) and **Figure 30** (eastbound) show AM peak period demand on the Circle, Hammersmith & City and Metropolitan lines between Liverpool Street and Baker Street. By introducing more and higher capacity services to the core the Thameslink Programme may increase demand both westbound toward Baker Street and eastbound toward Liverpool Street in the AM peak period.

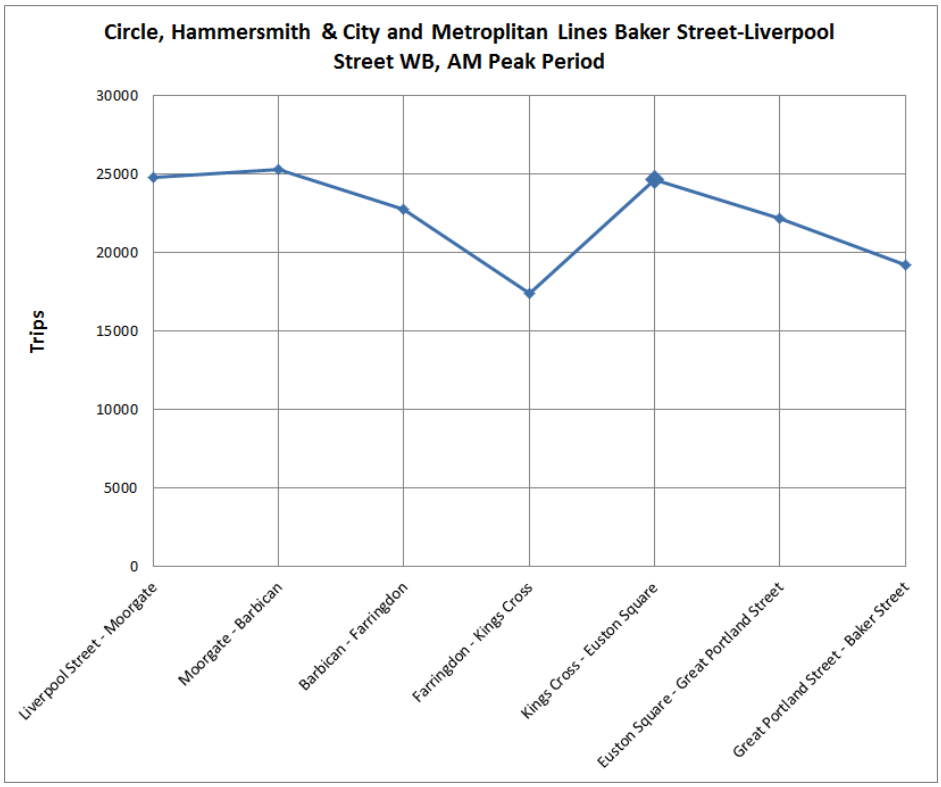


**Figure 29 Circle, Hammersmith & City and Metropolitan Lines Liverpool Street – Baker Street westbound, AM peak period demand 2012**

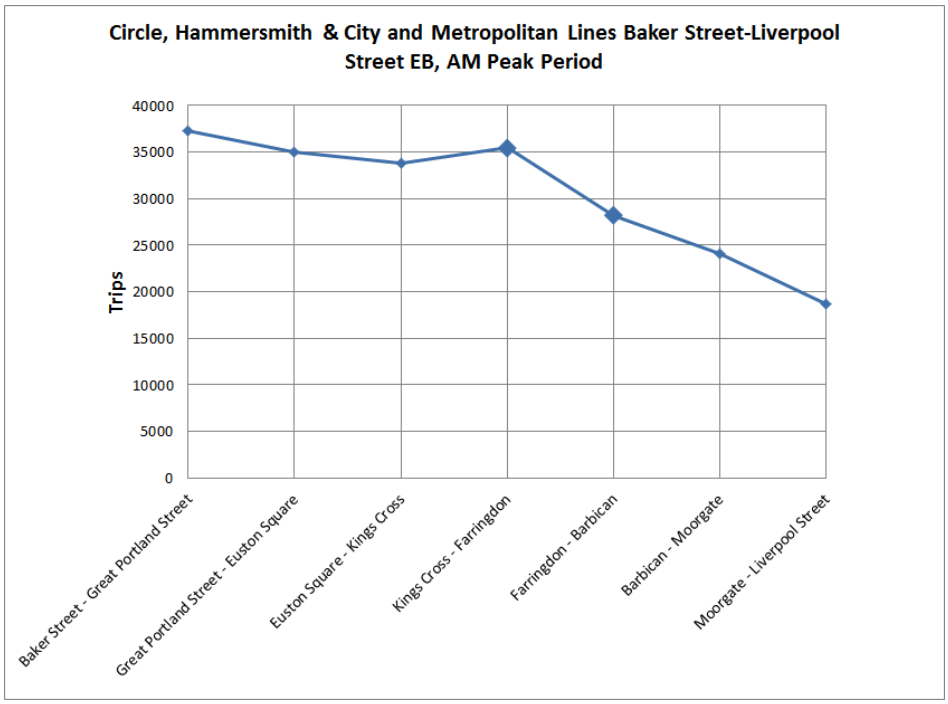


**Figure 30 Circle, Hammersmith & City and Metropolitan Lines Baker Street – Liverpool Street eastbound, AM peak period demand 2012**

3.6.38 **Figure 31** (westbound) and **Figure 32** (eastbound) show demand on the Circle and District lines between Tower Hill and Victoria. By introducing more and higher capacity services the Thameslink Programme may increase demand to/from Blackfriars Underground station. By introducing more and higher capacity services to the core from destinations in the south currently terminating at Victoria, the Thameslink Programme may reduce demand on the Circle and District lines eastbound from Victoria[43].

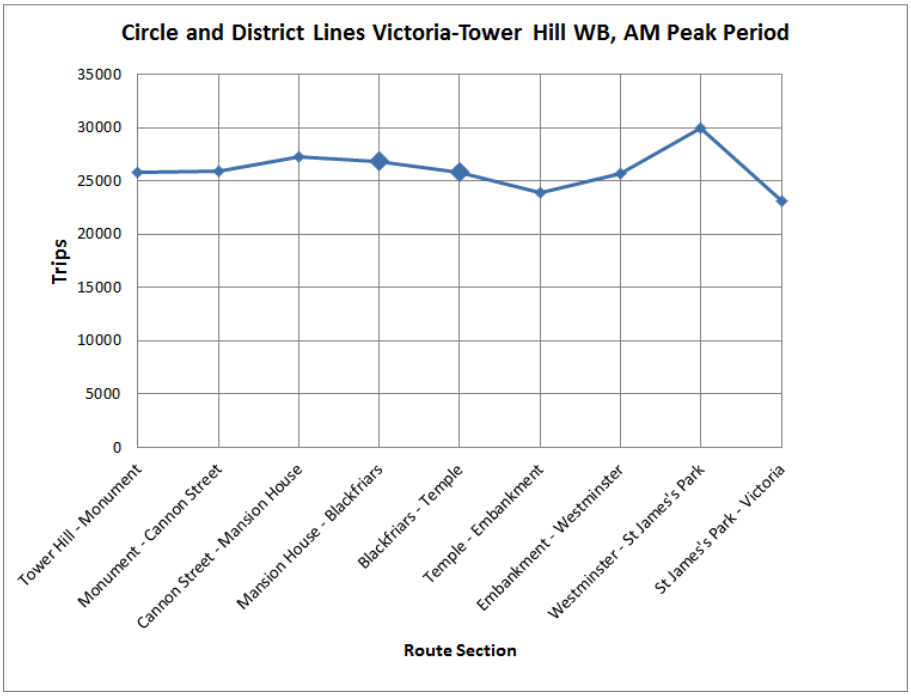


**Figure 31 Circle and District Lines Tower Hill – Victoria westbound, AM peak period demand 2012**

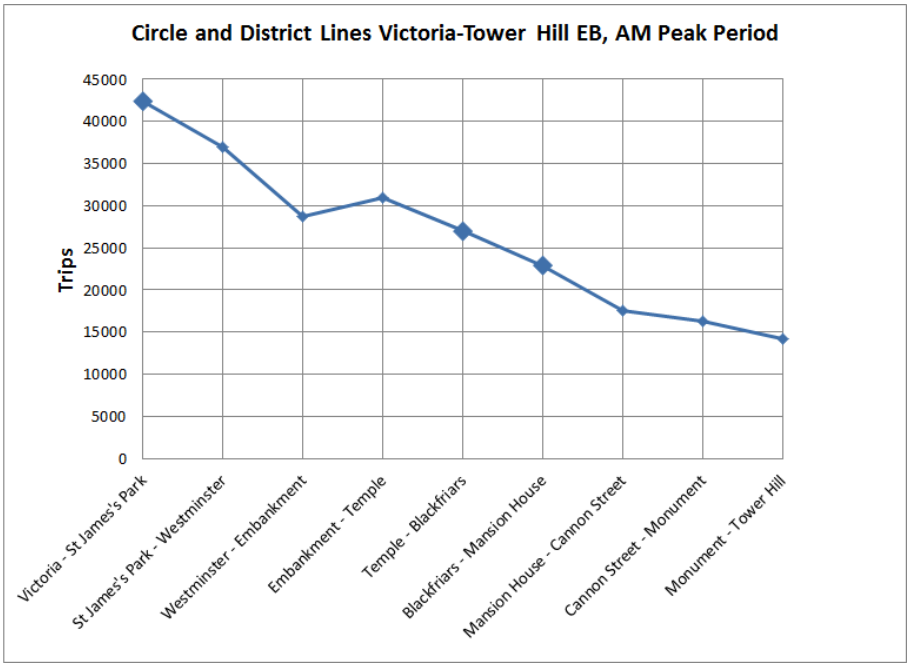


**Figure 32 Circle and District Lines Victoria – Tower Hill eastbound, AM peak period demand 2012**

[43] As some Southeastern passengers may be diverted away from Charing Cross and Cannon Street to Blackfriars, there may also be a reduction in demand eastbound on the Circle and District lines from Embankment (which is a short walk from Charing Cross rail station) and westbound from Cannon Street in the AM peak period.

3.6.39 **Figure 33** (northbound) shows AM peak period demand on the Bakerloo lines between Elephant & Castle and Harrow & Wealdstone. By introducing more and higher capacity services to the core via Elephant & Castle the Thameslink Programme may increase demand on the Bakerloo line northbound from Elephant & Castle in the morning peak period.

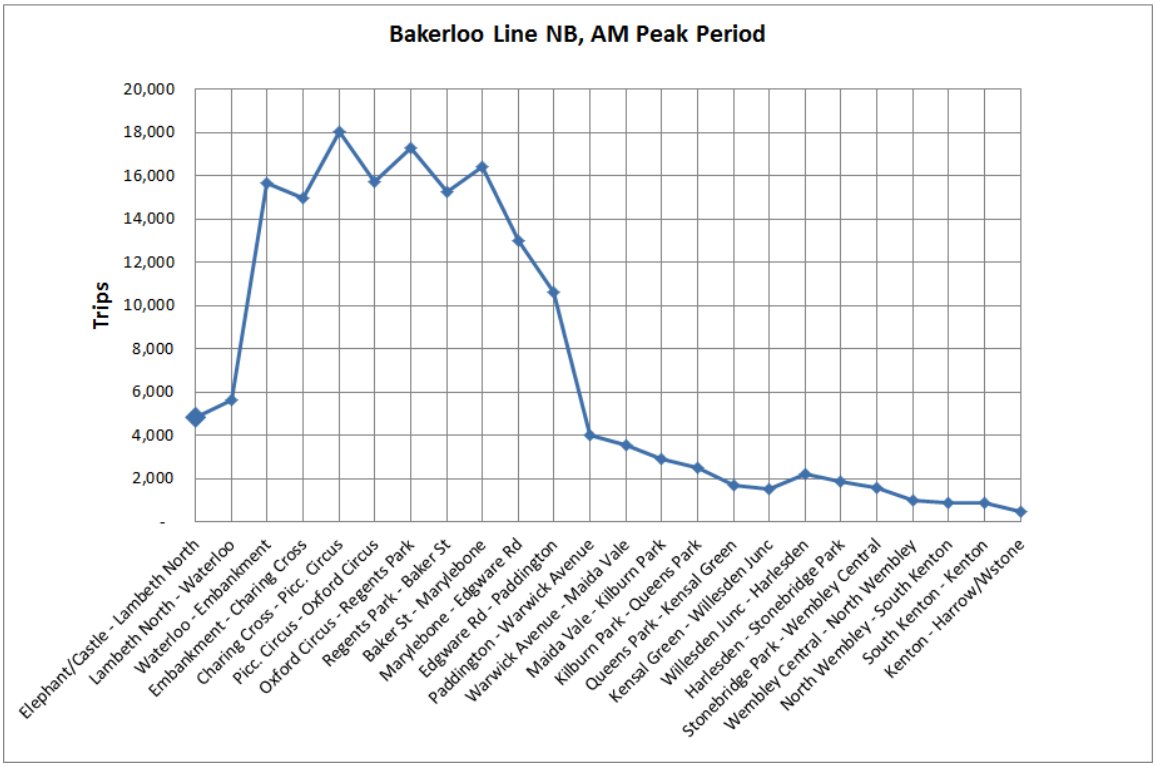


**Figure 33 Bakerloo Line Elephant & Castle – Harrow & Wealdstone northbound, AM peak period demand 2012**

3.6.40 **Figure 34** (northbound) and **Figure 35** (southbound) show AM peak period demand on the Victoria line between Brixton and Walthamstow Central. By introducing direct services through the core from a range of destinations on the Great Northern, Southern, and Southeastern networks the Thameslink Programme may reduce demand for the Victoria line northbound from Victoria and southbound from King's Cross in the morning peak period. It may also reduce demand southbound from Finsbury Park as Great Northern services are diverted through the core.

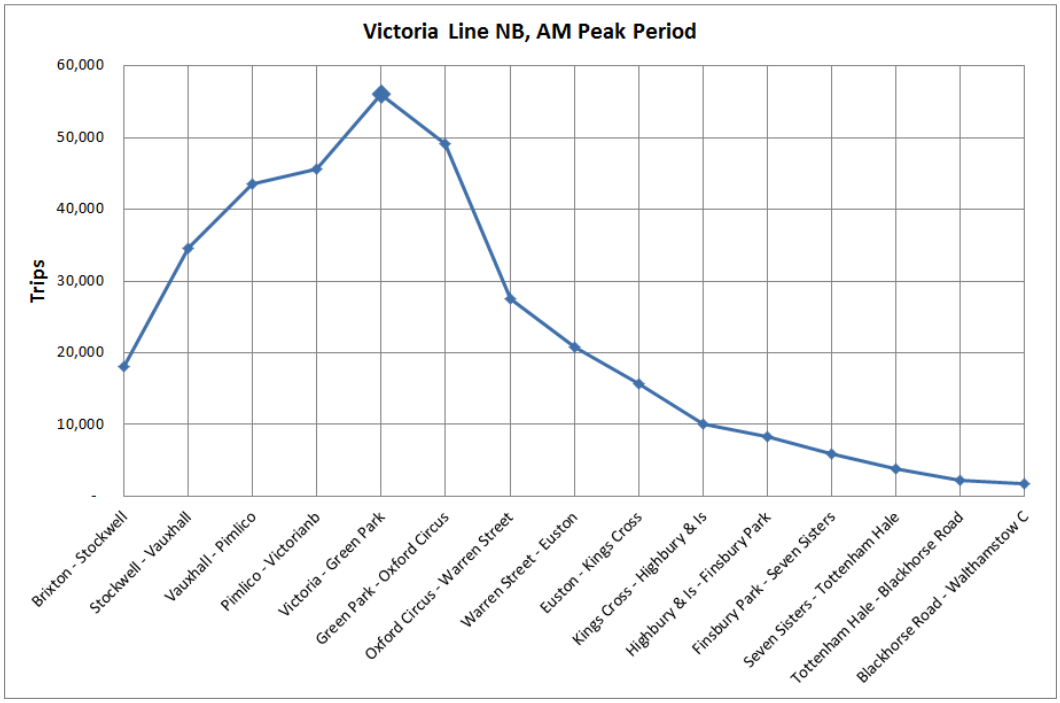


**Figure 34 Victoria Line Brixton – Walthamstow Central northbound, AM peak period demand 2012**

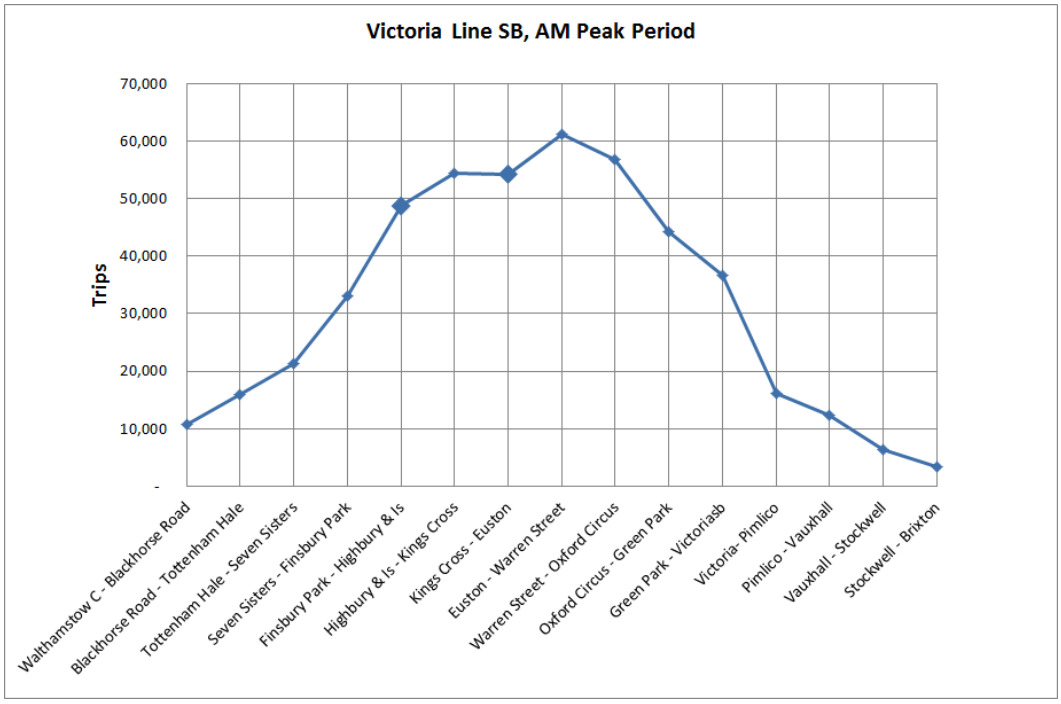


**Figure 35 Victoria Line Walthamstow Central – Brixton southbound, AM peak period 2012**

3.6.41 Demand should be analysed between each Underground station in the ex-post period to compare to the 2012 baseline as set out in the preceding analysis, potentially looking at trend data from 2012 to identify any background changes or impacts from the implementation of the Programme. As TfL are discontinuing use of RODS data from 2017, it will be necessary to assess the consistency between RODS and subsequent data sources in the ex-post evaluation (see paragraph 3.6.12). It will also be necessary to take into account the potential impact of Crossrail, which will provide additional capacity and abstraction of demand from existing Underground routes.


# Station Improvements

# 04

# 4. Station Improvements

## 4.1 Introduction

4.1.1 The Thameslink Programme includes investment in selected stations, including platform extensions at a number of locations to operate 12-car trains. In addition, investment occurred at key central London stations to generate specific benefits in terms of:

- Blackfriars and Farringdon facility improvements, including decongestion benefits at Blackfriars through enhanced passenger routing and station design; and
- London Bridge:
  - Construction impacts (a disbenefit);
  - London Bridge decongestion; and
  - London Bridge facilities.

## 4.2 Blackfriars and Farringdon Improvements

**Summary of Blackfriars and Farringdon interventions**

4.2.1 As set out in chapter 2, a key focus of investment in the Thameslink Programme in Key Output 0 and 1 was the improvement of facilities and track/platform arrangements at Blackfriars and Farringdon. Both stations were made fully accessible and transformed with lengthened and extended platforms; enlarged concourses and new ticket halls; and improved information provision, ticket buying facilities and lighting.

4.2.2 A central element of the Programme at Blackfriars station was the opening of a new entrance to the southern side of the station. Prior to this, all passengers were required to exit to the north, to access destinations both north and south of the River Thames. The station was also rebuilt to facilitate longer trains and more frequent services, easier connections to the underground and step-free access to both banks of the Thames. Improvements also included a new shared Underground and National Rail ticket hall and a solar roof.

4.2.3 The works also included moving the bay platforms from the east of the station to the west, the widening of gate lines, enhanced platform accessibility and improved pedestrian circulation throughout the station. The underground station was closed from March 2009 to February 2012, which may have moderated potential increases in demand compared to other stations. In addition, the rail station was closed for 8 weeks between mid-November 2010 and mid-January 2011 when major works were being undertaken on the mainline station. The new southern entrance opened at the end of 2011.

4.2.4 The works at Farringdon were concluded in December 2011, and included a new dedicated Thameslink (and Crossrail) ticket hall, a new concourse onto Turnmill Street, extended platforms with roof coverage, a refurbished Underground entrance and new lifts. The new ticket hall was opened in 2012.

4.2.5 **Table 42** summarises the key Thameslink Programme Key Output 0 and 1 interventions expected to impact on station decongestion and facilities.

**Table 42 Thameslink Programme Key Output 0 and 1 interventions related to station improvements**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 0 & 1 | Dec 2011 | New entrance opened at Blackfriars Station (southern side), widened gatelines and platforms, enhanced platform accessibility. The station was rebuilt to facilitate longer trains (12-car platforms) and more frequent services, easier connections to the underground and step-free access to both banks of the Thames. Improvements also included a new shared Underground and National Rail ticket hall. The works at Blackfriars station were largely completed in late 2011 (although the Underground station was not re-opened until February 2012). Improved lighting and information provision. | Prior to this, all passengers were required to exit to the north, to access destinations both north and south of the River Thames. The works providing enhanced platform and station accessibility will have contributed to improved pedestrian circulation throughout the station. This will have contributed to reducing passenger congestion at Blackfriars. The investment in the ticket hall, platforms and access will have contributed to providing enhanced facilities at Blackfriars. |
| 0 & 1 | Dec 2011 | New entrance opened at Farringdon Station and station works substantially complete. The works included a new dedicated Thameslink (and Crossrail) ticket hall, a new concourse onto Turnmill Street (opened early 2011), extended and widened platforms (12-car platforms) with roof coverage, a refurbished Underground entrance and new lifts. The new ticket hall was opened in late 2011, but the refurbished Underground ticket hall in early 2012. Improved lighting and information provision. | The works providing enhanced platform and station accessibility will have contributed to improved pedestrian circulation throughout the station. The investment in the ticket hall, platforms and access will have contributed to providing enhanced facilities at Farringdon. Ticket office and machines introduced in addition to the LUL ticket office, providing the full array of rail ticket types (which were not available from the LUL ticket office). |

## Key Data Sources

4.2.6 The main source of data through which to consider station-related benefits is the NRPS. The benefits associated with these improvements are likely to be experienced only by passengers using the specific stations. As such it is feasible to use other Thameslink stations where no works have taken place as comparators; this helps to control for factors such as service performance or rolling stock provision which may influence passengers' overall satisfaction levels.

4.2.7 The NRPS data for Farringdon and London Blackfriars are therefore presented alongside that for City Thameslink and London Bridge[44]; these stations were selected on the basis of available station level data and the lack of investment in station facilities between 2008 and 2011. Fenchurch Street is also used as a non-Thameslink comparator for the same reasons. There are a range of NRPS questions relating specifically to the quality of facilities at stations, which can be split into two groups:

- **Core Questions used to determine benefit realisation:**
  - Services and facilities at the station: an overarching question that has direct relevance to the Thameslink Programme investment at both Blackfriars and Farringdon;
  - Ticket buying facilities: of relevance to both Blackfriars and Farringdon given the changes in ticket halls;
  - Provision of information about train times and platforms: of relevance to both Blackfriars and Farringdon given the changes in ticket halls and associated provision of information; and
  - Upkeep of station buildings: enhancements to the general station environment are likely to influence passenger perceptions of buildings, which they may interpret to relate to the whole station area. The rebuild of Blackfriars and significant works at Farringdon would both be expected to influence responses to this question.
- **Overarching NRPS questions:**
  - Overall satisfaction with the station environment.

4.2.8 The above core questions are those that relate directly to the Thameslink Programme investment at the two stations, and as such would be expected to change post Key Output 0 and 1 implementation. The NRPS question relating to overall station environment is also presented as context to the above data.

4.2.9 The NRPS data are presented herein at the individual station level. For London Blackfriars, London Bridge and City Thameslink the sample sizes were sufficiently large to permit this. However, it should be noted that the sample sizes for Farringdon were very low in some years; these are highlighted where applicable.

4.2.10 There is no direct or single measurement of congestion levels at Blackfriars station. Available data have therefore been used to generate an indication of the levels of demand/use of the station and thereby the potential change in congestion experienced.

[44] Work to rebuild London Bridge station commenced as part of Key Output 2 and therefore will not have impacted on the data presented herein.

4.2.11 The Office of Rail and Road (ORR) station usage data have been used to provide information on demand to/from Blackfriars station. The ORR data are derived largely from ticket sales and passenger survey data by financial year (for a 12-month period from April to March)[45]. The data set is available for 2007/08 through to 2012/13. The ORR data therefore provide context on underlying trends in demand for understanding changes in passenger perceptions regarding the station as captured by the NRPS data.

4.2.12 ORR data are also presented for Fenchurch Street station as a comparator. This has been selected on the basis that it is a terminus station and, more importantly, that little intervention has occurred at the station or on the c2c network e.g. the rolling stock has remained largely unchanged since the 2008 baseline.

***Key Outputs 0 and 1 – analysis of benefits realisation to date***

4.2.13 This section sets out the results of the benefit measures for both the baseline (2008) and ex-post (2012) periods for Key Outputs 0 and 1. **Table 43** presents the level of passenger satisfaction (% rating good or very good) with facilities and services at selected stations[46].

4.2.14 Farringdon station had a very low baseline at just 10% good or very good responses. This increased by 20pp to 30% in 2012. Although this is a significant change, caution should be taken when interpreting these results due to the low sample sizes. There was no significant change in passenger satisfaction with services and facilities at London Blackfriars, increasing by 2pp from 38% to 40%. In comparison, satisfaction at Fenchurch Street was higher in 2008 (62%) than Farringdon and Blackfriars and increased significantly by 8pp to 70% in 2012. There were no significant changes at either City Thameslink or London Bridge.

**Table 43 Key Outputs 0 and 1 NRPS passenger satisfaction with facilities and services at stations 2008 and 2012 (% good or very good)**

| | | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|---|
| London Blackfriars | Thameslink | 38% | 40% | +2pp |
| Farringdon | Thameslink | 10% | 30% | +20pp |
| *City Thameslink* | *Thameslink* | *45%* | *48%* | *+4pp* |
| *London Bridge* | *Thameslink* | *42%* | *40%* | *-2pp* |
| *London Fenchurch Street* | *c2c* | *62%* | *70%* | *+8pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

[45] Caveats regarding use and interpretation of ORR data are set out in the annual ORR method reports on estimates of station usage (http://orr.gov.uk/statistics/published-stats/station-usage-estimates). In particular note that for central London/Travelcard Zone 1 rail stations, only total demand at a group of stations is known based on ticket sales, requiring disaggregation based on survey data, mainly the London Area Travel Surveys (LATS) from 2001. The ORR 2008/09 and 2009/10 reports noted that for Thameslink stations in central London, figures were adjusted to give a better estimate of station usage compared to previous estimates by reviewing the original ticket sales to the individual central London Thameslink stations. The 2010/11 report noted that a previous adjustment factor, affecting predominantly Farringdon and Elephant & Castle stations in London, was removed, resulting in an increase in flows to/from Farringdon and a reduction to/from Elephant & Castle.

[46] Sample sizes under 100 were as follows: Farringdon (2012) – 65; City Thameslink (2008) – 87.

4.2.15 **Figure 36** presents the trend data from 2008 to 2012 for the Thameslink stations[47]. This provides additional insight into the trends in passenger satisfaction, particularly at Blackfriars in 2009 and 2010 where good and very good responses fell to below 20% from nearly 40% in 2008, before increasing again to almost 40% in 2011. This is likely to have been a consequence of the Thameslink Programme works undertaken in 2009/2010. However, the 2011/2012 satisfaction levels were comparable with the 2008 baseline at just under 40%, indicating that there was no evidence of a net improvement in satisfaction with facilities and services resulting from the investment at Blackfriars.

4.2.16 Farringdon remained relatively stable during this period at approximately 10% before increasing substantially in 2012 to 30%. However, the sample size for 2009 (35 responses), 2010 (42), 2011 (49) and 2012 (65) were very low. There was therefore inconclusive evidence (due to small sample sizes) that passenger satisfaction with station facilities improved for Farringdon following its redevelopment.

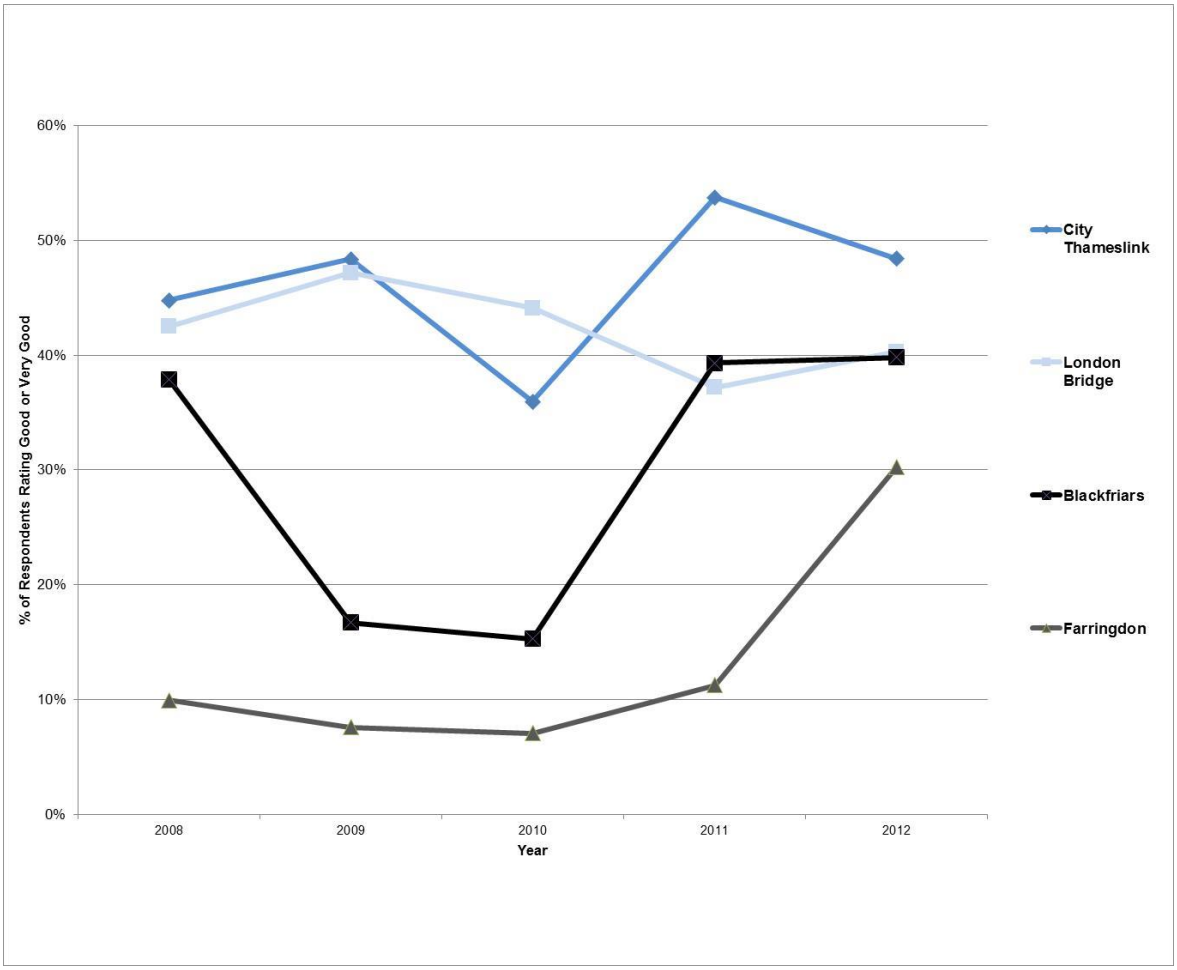


**Figure 36 Key Outputs 0 and 1 NRPS passenger satisfaction with facilities and services at stations 2008 to 2012 (% good or very good)**

[47] Sample sizes under 100 were as follows: Farringdon (2009) – 35, (2010) – 42, (2011) – 49, (2012) – 65; City Thameslink (2008) – 87, (2009) – 68, (2010) – 96.

4.2.17 **Table 44** presents the level of passenger satisfaction with ticket buying facilities at stations[48]. It should be noted that the sample sizes reported for both Farringdon and Blackfriars were very low for this question in both survey years, and therefore care should be taken when interpreting the data. The proportions of passengers giving good or very good ratings for ticket buying facilities at Blackfriars were 61% in 2008 and 70% in 2012, which were comparable levels in the light of the low sample sizes. Farringdon station had the lowest baseline at 30% good or very good responses in 2008. However, this had increased significantly by 37pp by 2012 to 67%, which was a comparable level to Blackfriars. The new ticket hall is considered likely to have contributed to this change, which was a similar level to Farringdon. In the same period there were no significant changes in satisfaction levels for this attribute at City Thameslink or London Bridge. It should be noted that the interim ticket office was installed at London Bridge in 2012 and a number of ticket vending machines were moved as part of the Thameslink Programme works at the station. Satisfaction levels at the comparator station of Fenchurch Street recorded a significant increase of 7pp during this period to 80% which was +10pp higher than the levels for Blackfriars and Farringdon.

**Table 44 Key Outputs 0 and 1 NRPS passenger satisfaction with ticket buying facilities at stations 2008 and 2012 (% good or very good)**

| | | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|---|
| Blackfriars | Thameslink | 61% | 70% | +9pp |
| Farringdon | Thameslink | 30% | 67% | +37pp |
| *City Thameslink* | *Thameslink* | *79%* | *67%* | *-12pp* |
| *London Bridge* | *Thameslink* | *48%* | *50%* | *+2pp* |
| *London Fenchurch Street* | *c2c* | *74%* | *80%* | *+7pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

[48] Sample sizes were below 100 in both 2008 and 2012 for Blackfriars, Farringdon and City Thameslink.

4.2.18 **Figure 37** presents the trend data from 2008 to 2012 for the same stations[49]. This highlights that passenger satisfaction with ticket buying facilities at Farringdon fluctuated in this period before rising significantly in 2012. The fluctuations in these results may reflect the very low sample achieved in the interim years: 16 in 2009; 23 in 2010; and 25 in 2011. No firm conclusions can therefore be drawn from the data. London Blackfriars showed a temporary decline in passenger satisfaction in 2009 and 2010 during the period of works, although the sample sizes for interim years were again low; 67 in 2009, 65 in 2010 and 72 in 2011.

4.2.19 There was therefore some evidence that satisfaction with ticket buying facilities increased at Farringdon following its redevelopment while there was little change in ratings for the other stations, but care needs to be taken in interpreting findings based on small sample sizes.

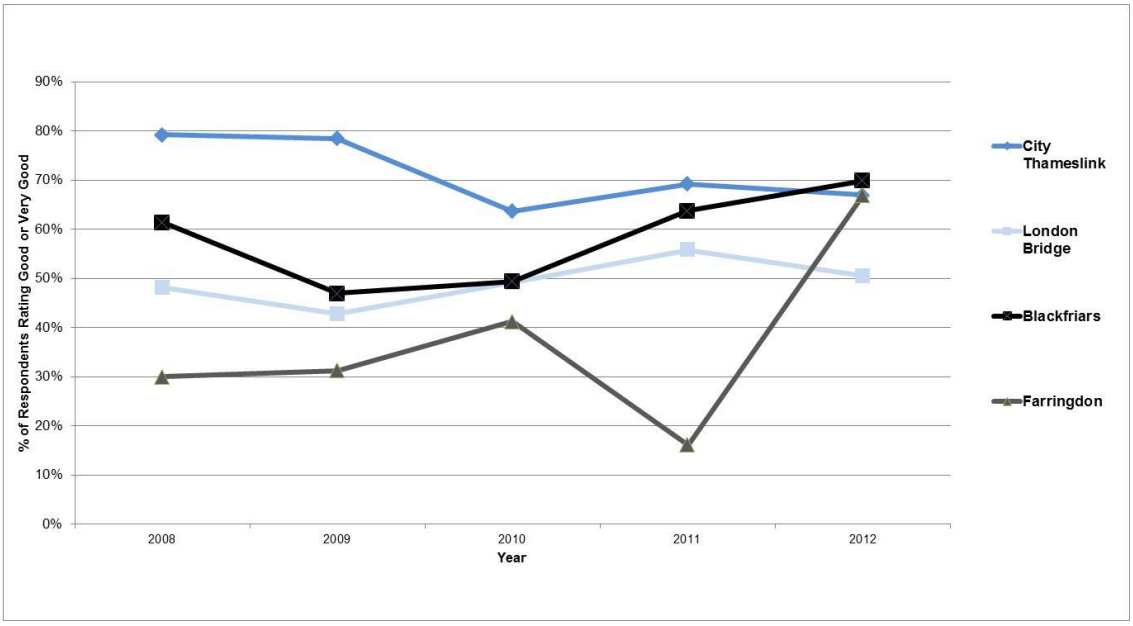


**Figure 37 Key Outputs 0 and 1 NRPS passenger satisfaction with ticket buying facilities at stations 2008 to 2012 (% good or very good)**

[49] Sample sizes were below 100 in all years for Farringdon, City Thameslink and Blackfriars.

4.2.20 **Table 45** presents the level of passenger satisfaction with the provision of information about train times and platforms at stations. Some improvement in these ratings might be expected for Blackfriars and Farringdon due to the station improvements in 2011. Blackfriars and Farringdon had comparable 2008 baseline positions of 63% and 66% respectively, which were lower than City Thameslink and London Bridge. Satisfaction levels at Farringdon increased significantly to 84% in 2012, a change of +21pp, which may reflect the station improvements. The level of change observed at London Blackfriars was lower at just +2pp, with a 2012 ex-post value of 68%. In comparison, there was no significant change in satisfaction levels at the comparator station, Fenchurch Street, or at London Bridge. However, satisfaction with information at City Thameslink did improve in this period.

**Table 45 Key Outputs 0 and 1 NRPS passenger satisfaction with the provision of information on train times/platforms at stations 2008 and 2012 (% good or very good)**

| | | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|---|
| London Blackfriars | Thameslink | 66% | 68% | +2pp |
| Farringdon | Thameslink | 63% | 84% | +21pp |
| *City Thameslink* | *Thameslink* | *74%* | *86%* | *+11pp* |
| *London Bridge* | *Thameslink* | *74%* | *71%* | *-2pp* |
| *London Fenchurch Street* | *c2c* | *86%* | *91%* | *+5pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

4.2.21 **Figure 38** presents the trend data from 2008 to 2012 for the same stations[50]. This shows that passenger satisfaction with the provision of information on train times/platforms increased significantly at Farringdon following its redevelopment while no change was seen at Blackfriars and trends at other stations were variable, increasing at City Thameslink but not at London Bridge.

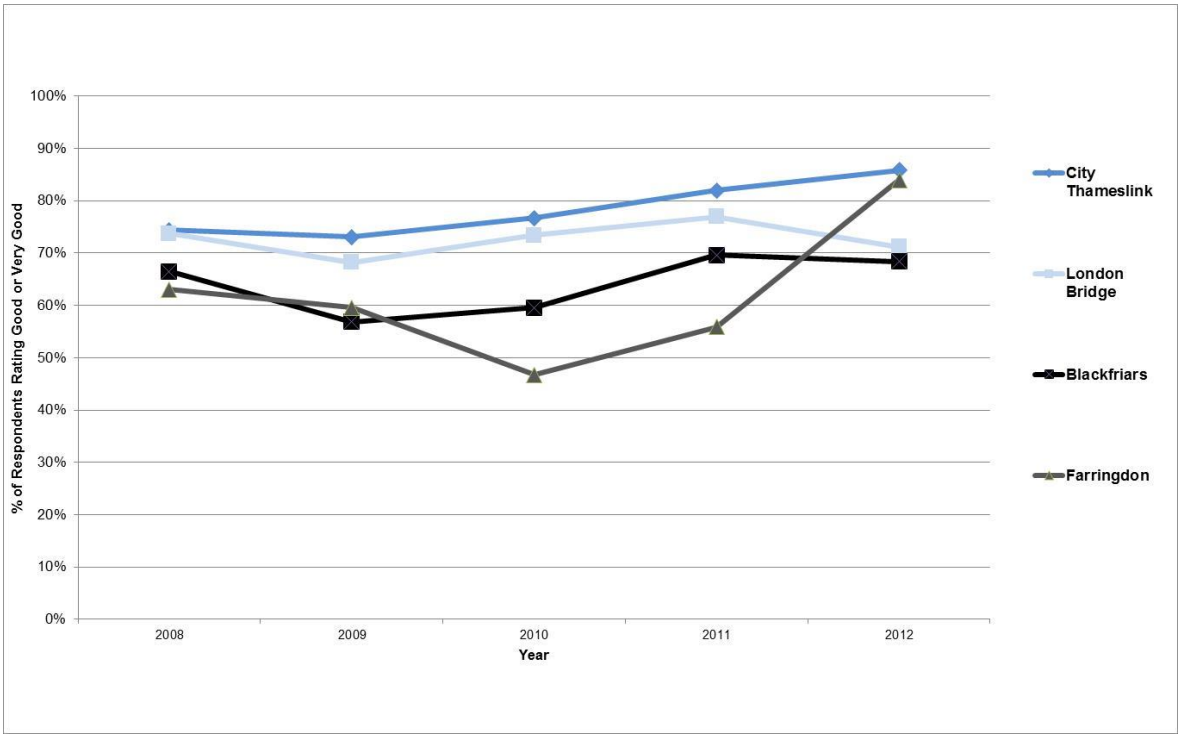


**Figure 38 Key Outputs 0 and 1 NRPS passenger satisfaction with the provision of information on train times/platforms at stations 2008 to 2012 (% good or very good)**

[50] Sample sizes under 100 were as follows: Farringdon (2009) – 51, (2010) – 55, (2011) – 81; City Thameslink (2009) – 88.

4.2.22 **Table 46** presents the level of passenger satisfaction with the upkeep and repair of station buildings. Both Farringdon and Blackfriars stations received investment, with the latter being rebuilt during the Key Output 0 and 1 period. Both stations recorded significant increases in passenger satisfaction between 2008 and 2012 while there was no significant change in satisfaction levels at City Thameslink or Fenchurch Street stations or at London Bridge which was about to be rebuilt.

4.2.23 Passenger satisfaction with the upkeep and repair of Farringdon increased from 39% in 2008 to 86% in 2012, a change of 48pp. The level of change in satisfaction for London Blackfriars was lower but still substantial at +28pp, with a 2012 ex-post value of 71%. The Thameslink Programme of investment in the facilities and general appearance of these stations is considered likely to have contributed to a general improvement in the perception of station buildings. In comparison, there was no significant change in satisfaction at Fenchurch Street, although it should be noted that this had a baseline nearly 40pp higher than both London Blackfriars and Farringdon.

**Table 46 Key Outputs 0 and 1 NRPS passenger satisfaction with the upkeep and repair of station buildings 2008 and 2012 (% good or very good)**

| | | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|---|
| London Blackfriars | Thameslink | 43% | 71% | +28pp |
| Farringdon | Thameslink | 39% | 86% | +48pp |
| *City Thameslink* | *Thameslink* | *78%* | *75%* | *-3pp* |
| *London Bridge* | *Thameslink* | *47%* | *50%* | *+3pp* |
| *London Fenchurch Street* | *c2c* | *82%* | *84%* | *+3pp* |

4.2.24 **Figure 39** presents the trend data from 2008 to 2012 for the same stations[51]. This highlights that passenger satisfaction with the upkeep and repair of Farringdon decreased marginally between 2008 and 2011, before increasing substantially in 2012 following the completion of Thameslink Programme works. Similarly, London Blackfriars saw passenger satisfaction with station upkeep and repair decline in 2009 and 2010, during the period of works, before increasing in 2011 and 2012.

4.2.25 In summary, despite the initial reductions in satisfaction both Blackfriars and Farringdon stations reported significant improvements between 2008 and 2012. This suggests that the Thameslink Programme contributed to an improved level of passenger satisfaction with station buildings at both stations.

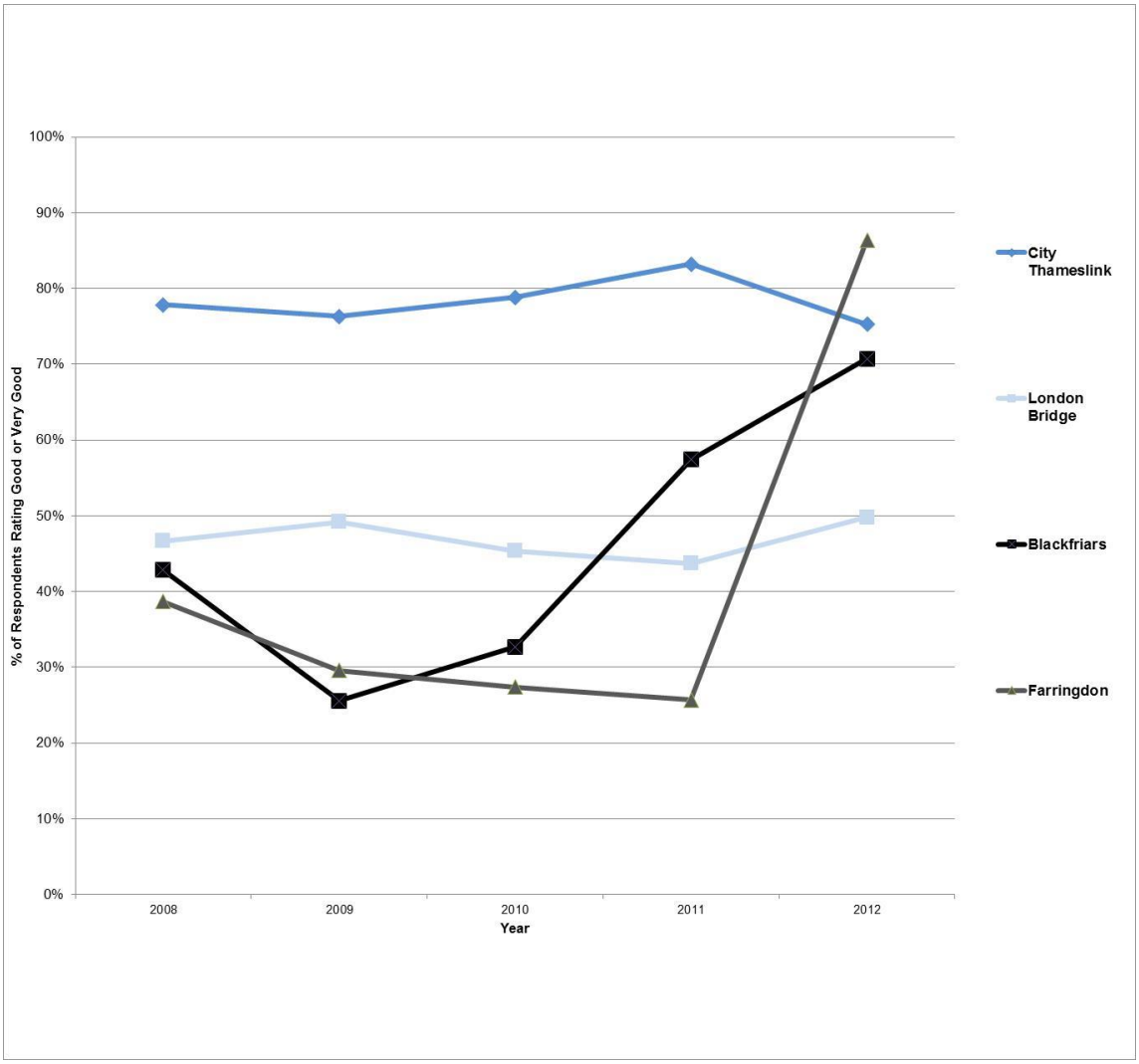


**Figure 39 Key Outputs 0 and 1 NRPS passenger satisfaction with the upkeep and repair of station buildings 2008 to 2012 (% good or very good)**

[51] Sample sizes under 100 were as follows: Farringdon (2009) – 51, (2010) – 51, (2011) – 79; City Thameslink (2009) – 87.

4.2.26 The final NRPS question relates to the overall satisfaction with the station environment (**Table 47**). Farringdon recorded a significant increase in passenger satisfaction from 39% in 2008 to 81% in 2012, a change of 42pp. The level of change observed at London Blackfriars was lower, but still significant, at +23pp with a 2012 ex-post value of 75%. In contrast, there were no significant changes in satisfaction levels with the station environments at City Thameslink or London Bridge. There was also a significant increase in satisfaction at the comparator station of Fenchurch Street, although much lower at only +5pp. Whereas in 2008 passenger satisfaction with the station environment at Farringdon and Blackfriars was substantially lower than for Fenchurch Street, in 2012 levels were comparable for Farringdon and only slightly lower for Blackfriars. It can again be concluded that the Thameslink Programme of investment has contributed to enhanced passenger satisfaction with both Farringdon and Blackfriars stations.

**Table 47 Key Outputs 0 and 1 NRPS passenger satisfaction with the overall station environment 2008 and 2012 (% good or very good)**

| | | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|---|
| London Blackfriars | Thameslink | 51% | 75% | +23pp |
| Farringdon | Thameslink | 39% | 81% | +42pp |
| *City Thameslink* | *Thameslink* | *65%* | *73%* | *+9pp* |
| *London Bridge* | *Thameslink* | *52%* | *51%* | *-1pp* |
| *London Fenchurch Street* | *c2c* | *78%* | *82%* | *+5pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

4.2.27 **Figure 40** presents the trend data from 2008 to 2012 for the same stations[52]. This provides further insight and shows that passenger satisfaction with the station environment at Blackfriars declined markedly in 2009 and 2010, before increasing in 2011 (to a similar level to 2008) and 2012. This trend can be assumed to reflect the three year closure of the underground station (March 2009 to February 2012) and disruption associated with works rebuilding the mainline station. Furthermore, the recorded improvement in 2011 and 2012 reflects the completion of the rebuilding and appreciation of the new facilities at the station. However, it is not possible to determine the contribution of the new southern entrance, and assumed decongestion benefits thereby generated, to the improved satisfaction levels.

4.2.28 The same pattern is observed for Farringdon, with satisfaction reducing during the period of implementation before increasing in 2012. It can again be concluded that the Thameslink Programme of investment has contributed to enhanced passenger satisfaction with both Farringdon and Blackfriars stations.

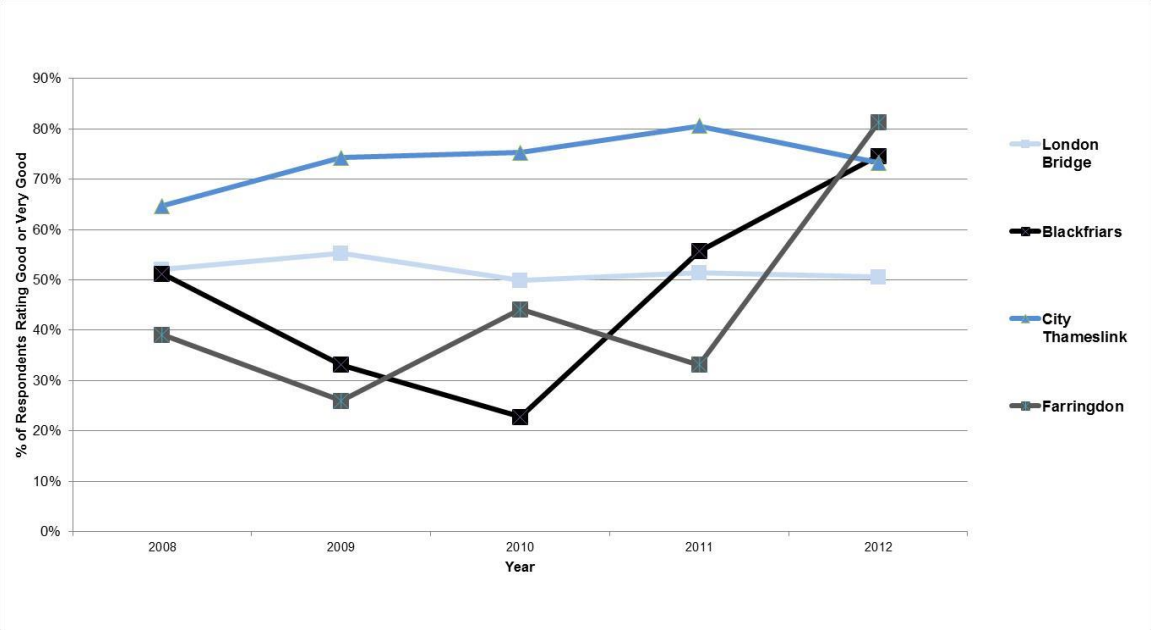


**Figure 40 Key Outputs 0 and 1 NRPS passenger satisfaction with the overall station environment 2008 to 2012 (% good or very good)**

[52] Sample sizes under 100 were as follows: Farringdon (2009) – 53, (2010) – 56, (2011) – 85; City Thameslink (2009) – 90.

4.2.29 **Figure 41** presents a summary of the NRPS results for Farringdon station for the 2008 baseline and 2012 ex-post periods for Key Outputs 0 and 1, also showing the percentage point change. The highest percentage point changes were recorded for satisfaction with the upkeep of station buildings and the overall station environment, reflecting a general improvement in the perception of the station. The significant changes in satisfaction between 2008 and 2012 reflect the level of Thameslink Programme investment at Farringdon and the redevelopment works.

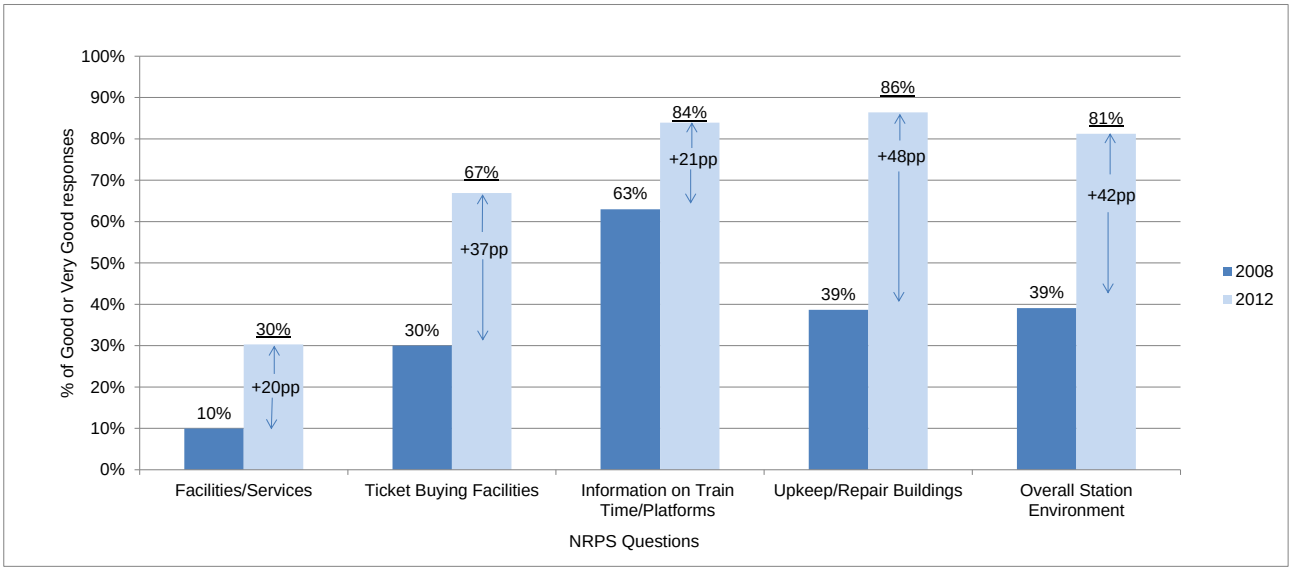


**Figure 41 Key Outputs 0 and 1 NRPS passenger satisfaction with Farringdon station 2008 to 2012 (% good or very good)**

4.2.30 **Figure 42** presents a summary of the NRPS results for London Blackfriars station for the 2008 baseline and 2012 ex-post periods for Key Outputs 0 and 1, again showing the percentage point change. As for Farringdon, substantial improvements in satisfaction were observed for upkeep and repair and the station environment following the rebuilding of the station.

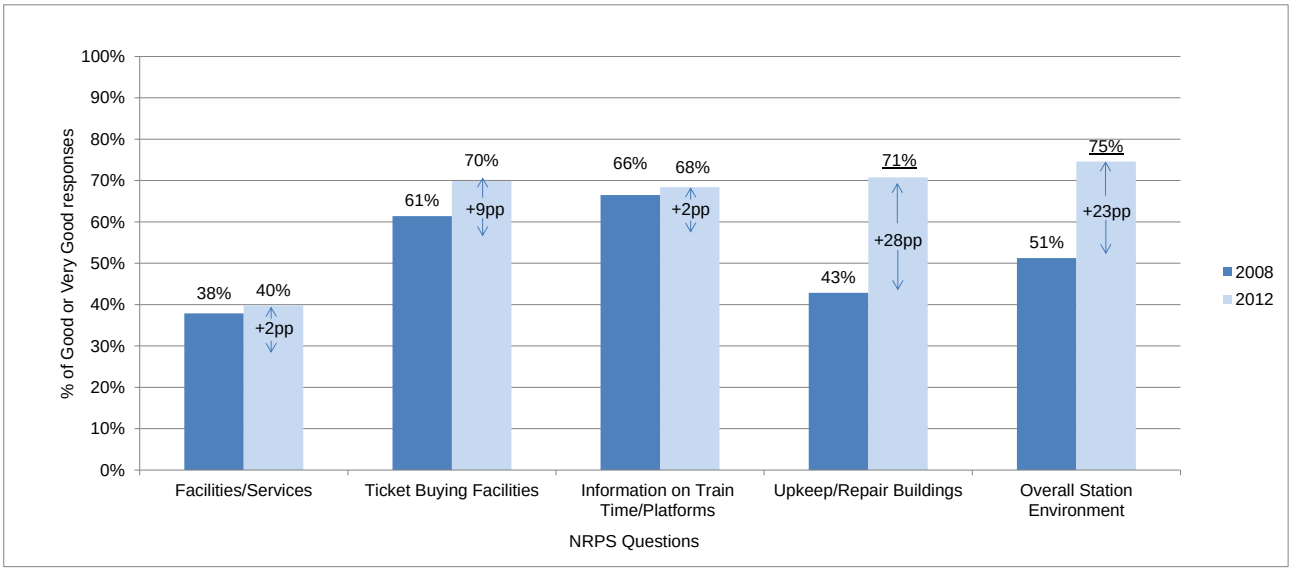


**Figure 42 Key Outputs 0 and 1 NRPS passenger satisfaction with Blackfriars station 2008 to 2012 (% good or very good)**

4.2.31 **Table 48** shows the ORR station usage data for 2008/09 and 2012/13 (the data are available by financial year) which provide contextual information for considering pressures on the achievement of planned decongestion benefits at Blackfriars (note that decongestion benefits cannot be measured directly). The table also includes data for two adjacent central London stations within the Thameslink network for comparative purposes: City Thameslink and London Bridge. Fenchurch Street is again presented as an external comparator.

4.2.32 The ORR data show that the number of passengers using London Blackfriars changed only slightly (+0.5%) through the Key Output 0 and 1 evaluation period while numbers for City Thameslink, London Bridge and Fenchurch Street increased by between 4.7% and 7.4%. With improvements made to access/egress routes and the general movement of passengers through the station, it can be assumed that congestion levels reduced as a result of the Thameslink Programme works, although this cannot be directly evidenced.

**Table 48 ORR station usage data for selected stations (2008/09 and 2012/13)**

| ORR Passengers (Millions) | | 2008/09 Baseline | 2012/13 Ex-post | % change |
|---|---|---|---|---|
| London Blackfriars | Thameslink | 12.96 | 13.02 | +0.5% |
| *City Thameslink* | *Thameslink* | *5.29* | *5.54* | *+4.7%* |
| *London Bridge* | *Thameslink* | *49.70* | *53.35* | *+7.3%* |
| *London Fenchurch Street* | *c2c* | *15.68* | *16.84* | *+7.4%* |

4.2.33 **Figure 43** shows the ORR station usage data for each year between 2008/09 and 2012/13 for London Blackfriars and each of the aforementioned comparator stations. This shows that passenger numbers at London Blackfriars remained fairly constant between 2008/09 and 2012/13 which was similar to the trend for City Thameslink and Fenchurch Street but different from London Bridge which saw passenger numbers rise steadily after 2009/10. All stations recorded a small reduction in demand between 2008/9 and 2009/10, suggesting the influence of background economic conditions on travel demand. Overall, there is no evidence that the works at London Blackfriars in late 2010/early 2011 impacted on demand at the station. However this, and the closure of the underground station, may have limited the growth in passenger numbers in this period.

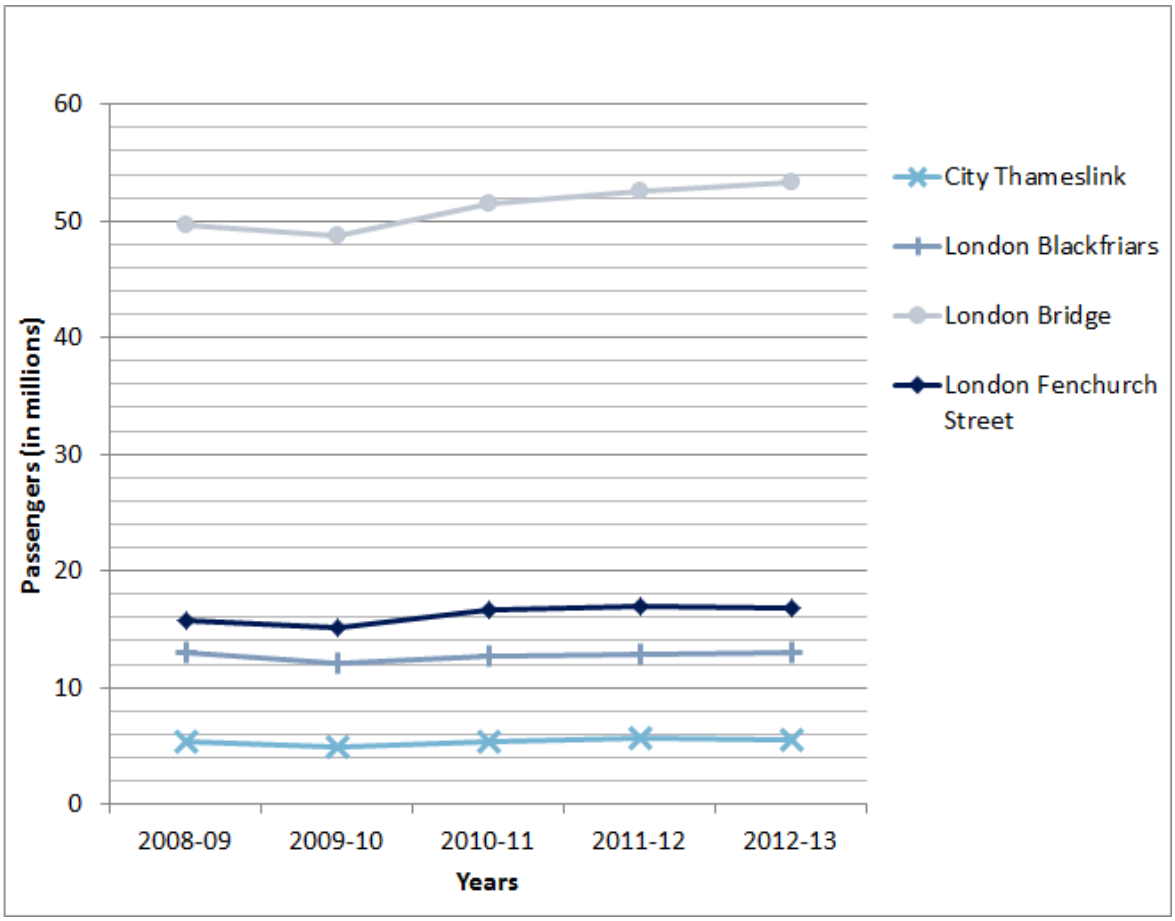


**Figure 43 ORR station usage data 2008/09 to 2012/13 for selected stations**

## 4.3 London Bridge

4.3.1 Within the station improvement benefit area there are three benefits that relate directly and solely to London Bridge station, to be realised during Key Output 2:

- Construction impacts;
- Decongestion benefits; and
- Improved facilities at the station.

**Summary of London Bridge Interventions**

4.3.2 During the London Bridge rebuild, Thameslink, Southern and Southeastern services have been disrupted. This is hypothesised to lead to longer journeys, fewer interchange opportunities, some performance issues and longer walking routes through the station. Conversely, there may be some benefits for passengers on services no longer stopping at London Bridge e.g. decreased crowding on some services.

4.3.3 Similarly to the forecast decongestion benefits at Blackfriars as part of Key Outputs 0 and 1, investment as part of Key Output 2 at London Bridge was anticipated to generate decongestion benefits. The Thameslink Programme includes the significant redevelopment of London Bridge station, relieving passenger congestion and providing a much improved passenger environment. The works include changing the configuration of the station to increase the number of through platforms. Prior to the redevelopment, the station had 9 terminating platforms and 6 through platforms. From 2018, there are 6 terminating platforms and 9 through platforms. This will enable more Thameslink services to operate through London Bridge and improve performance providing more reliable journeys for passengers. These works will therefore provide direct access to the Thameslink core for new services and routes, including some parts of the Southern network, which may decrease the need to interchange and hence result in decongestion at London Bridge; however, improved connectivity and services to London Bridge could increase interchange for some trips.

4.3.4 Finally, the redevelopment of London Bridge station includes the enhancement of facilities.

4.3.5 **Table 49** presents a summary of the Key Output 2 interventions.

**Table 49 Thameslink Programme Key Output 2 interventions related to station improvements**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 2 | May 2013 | London Bridge works on terminating platforms commences. Closure of platforms 14-16 in May 2013 and a small number of services removed or retimed, as work commenced to re-model London Bridge and change from 9 terminating and 6 through platforms to 9 through platforms and 6 terminating platforms. | Terminating platforms were the first to be redeveloped and reopened in stages, with all terminating platforms redeveloped by the end of 2014. New terminating platforms (platforms 10 to 15), were opened January 2015 and used by Southern services. These works were anticipated to generate construction disbenefits. |
| 2 | Jan 2015 | Thameslink services on diversion away from London Bridge. Thameslink services diverted via Elephant & Castle and stopping at London Bridge until 2018 to facilitate rebuilding the station. | When Thameslink services resume in 2018, they will use new platforms 4 and 5. Potential decrease in passengers using or interchanging at station during service changes and construction disbenefits. |
| 2 | Jan 2015 | Charing Cross services run through London Bridge. Southeastern Charing Cross services running through and not stopping at London Bridge from Jan. 2015 – Aug 2016 to facilitate rebuilding the station. From August 2016 services use new platforms 7 to 9, and platform 6 from August 2017. | Potential decrease in passengers using or interchanging at station due to service changes. Temporary walking routes. These works were anticipated to contribute to construction disbenefits.<br>As part of plans to improve reliability and capacity through London Bridge, Southeastern services on the Greenwich line to Charing Cross and Waterloo East were permanently diverted to and from Cannon Street. |
| 2 | Aug 2016 | Cannon Street services run through London Bridge. Southeastern Cannon Street services running through and not stopping at London Bridge Aug 2016 - Jan 2018 to facilitate rebuilding the station. | Potential decrease in passengers using or interchanging at station due to service changes. Temporary walking routes. These works were anticipated to contribute to construction disbenefits.<br>From January 2018 services are using new platforms 1 to 3. |
| 2 | Aug 2016 | Part opening of new concourse, new gatelines, new entrance on St Thomas Street, new platforms 7-9, cafes and improved facilities at London Bridge. | Opening of two thirds of the new concourse, including platforms 7-9. |
| 2 | Jan 2018 | London Bridge station redevelopment works are largely complete. New concourse, with step free access to all platforms; new entrance on Tooley Street; nine ‘through’ platforms and six terminating platforms complete; cafes and station facilities open progressively through 2018. | These works are anticipated to generate decongestion and improved facilities benefits. |

## Key Data Sources

4.3.6 The evaluation of disbenefits experienced during the Thameslink Programme implementation will use a combination of data sources. ORR station usage data will be used to establish the context, to see how many passengers are using the station. This will determine the gross change in people using the station during the period of disruption. Blackfriars and City Thameslink have been used as within-Programme comparators and two external comparators are reported: Liverpool Street and Fenchurch Street. Liverpool Street was selected on the basis of its similarity to London Bridge in terms of baseline passenger numbers. In the case of Fenchurch Street this is because no works are proposed during the Key Output 2 period.

4.3.7 It is important to note that London Bridge acts as both a major terminating station (similar to Liverpool Street and Fenchurch Street) and a through station (similar to stations in the Thameslink core), as well as providing interchange with other rail services and with the Underground. This makes the selection of comparators difficult.

4.3.8 RODS[53] data can be used to calculate demand on the Northern and Jubilee lines to provide an indication of the number of passengers interchanging at London Bridge. This will only be indicative but substantial changes could indicate reductions in interchange and thereby pedestrian movements within the station. The 2012 baseline data are presented for each of these data sets. The 2013 to 2019 data will need to be analysed as part of the Key Output 2 ex-post evaluation, to consider the impacts (an assumed reduction of passenger numbers during construction) of Thameslink Programme works on passengers using the station.

4.3.9 To consider the impacts of works on the level of passenger satisfaction at London Bridge, NRPS questions have been used. It should be noted that a constraint of this approach is that the survey will only determine satisfaction levels of passengers still using London Bridge during the works and at the time of the ex-post NRPS survey. It will therefore not pick up the views of passengers no longer able to use the station, who are most likely to experience disbenefits. The following questions have been used:

- Overall satisfaction with the station environment;
- Satisfaction with specific elements of the station e.g. facilities; and
- Satisfaction with service reliability and overall satisfaction with their trip.

[53] See Chapter 0 for more information on RODS data.

### London Bridge Construction Impacts

***Key Output 2 – baseline for future analysis***

4.3.10 **Table 50** shows the 2012/13 baseline passenger numbers derived from the ORR data for London Bridge and comparators and **Figure 44** presents trend data from 2008/09 to 2012/13. London Bridge and Liverpool Street have experienced very similar patterns of passenger numbers, with a decline between 2008/09 and 2009/10, before an increase through to 2012/13. The two Thameslink comparator stations, London Blackfriars and City Thameslink, and the external comparator Fenchurch Street all have lower absolute passenger levels and saw a small increase over the period.

**Table 50 ORR station usage data for selected stations (2012/13)**

| ORR Passengers (Millions) | | 2012/13 Baseline |
|---|---|---|
| London Bridge | Thameslink | 53.35 |
| London Blackfriars | Thameslink | 13.02 |
| City Thameslink | Thameslink | 5.54 |
| *London Fenchurch Street* | *c2c* | *16.84* |
| *Liverpool Street* | *Great Anglia* | *58.45* |

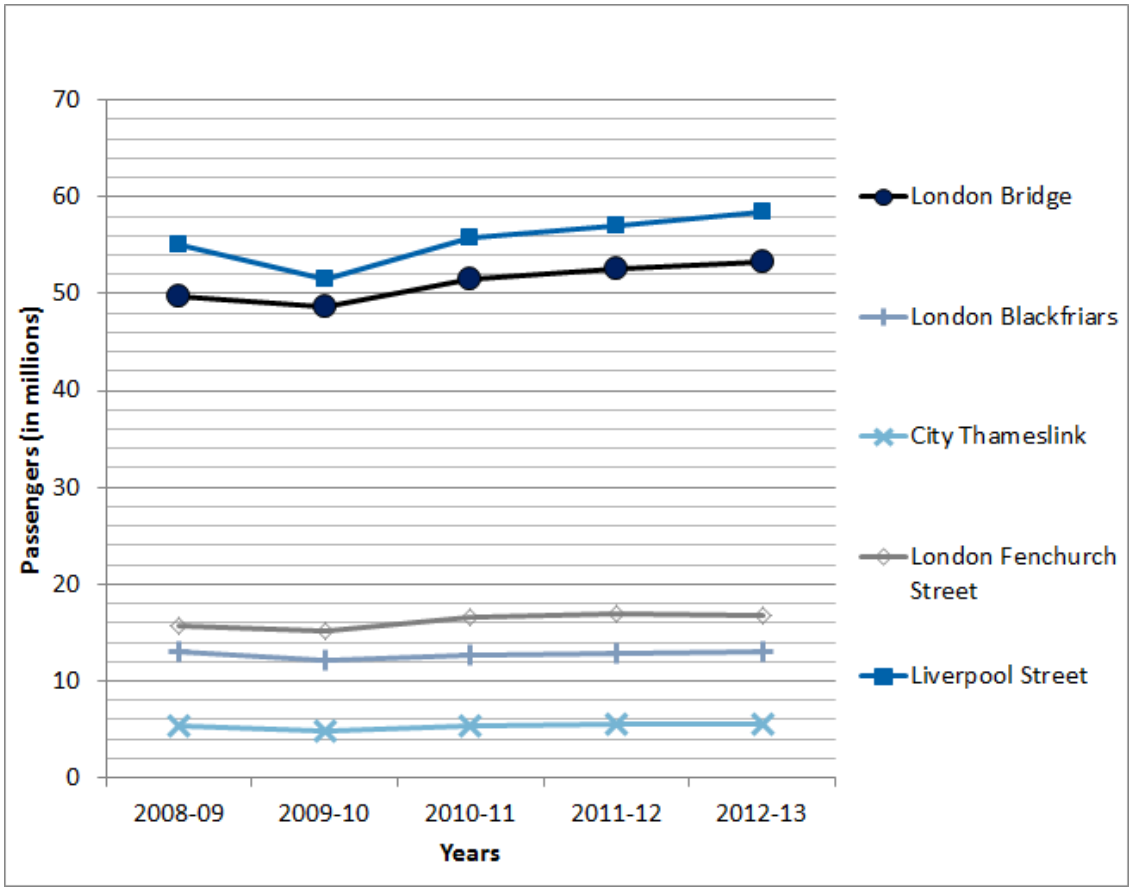


**Figure 44 ORR station usage data 2008/09 to 2012/13 for selected stations**

4.3.11 **Table 51** presents the RODS data for trips on the Jubilee and Northern lines made to and from London Bridge in the AM peak period[54]. On the Jubilee Line, there were 41,735 trips eastbound from Southwark to London Bridge, increasing slightly to 42,506 eastbound from London Bridge to Bermondsey (with key stations further eastbound from Bermondsey including Canary Wharf and Stratford), indicating more passengers boarded at London Bridge than alighted in the AM peak period eastbound. This was also the case in the westbound direction, with 40,120 trips from Bermondsey to London Bridge, increasing to 44,805 from London Bridge to Southwark (with key stations further westbound from Southwark including Waterloo, Westminster, Bond Street and Baker Street).

4.3.12 On the Northern Line, there were 19,699 trips southbound from Bank to London Bridge and 10,304 southbound from London Bridge to Borough (with key stations further southbound from Borough including Elephant & Castle and Clapham North), indicating that notably more passengers alighted at London Bridge than boarded in the AM peak period southbound. This pattern is reversed in the northbound direction and there was much greater demand. There were 28,183 trips northbound from Borough to London Bridge, increasing to 34,887 northbound from London Bridge to Bank (with key stations further northbound from Bank including Moorgate, Old Street and King's Cross St. Pancras), showing that more passengers boarded at London Bridge than alighted in the AM peak period northbound.

**Table 51 RODS trips for London Underground lines interchanging at London Bridge (2012 AM peak period)**

| RODS Trips | | 2012 Baseline |
|---|---|---|
| Southwark to London Bridge (eastbound) | Jubilee Line | 41,735 |
| London Bridge to Bermondsey (eastbound) | Jubilee Line | 42,506 |
| Bermondsey to London Bridge (westbound) | Jubilee Line | 40,120 |
| London Bridge to Southwark (westbound) | Jubilee Line | 44,805 |
| Bank to London Bridge (southbound) | Northern Line | 19,699 |
| London Bridge to Borough (southbound) | Northern Line | 10,304 |
| Borough to London Bridge (northbound) | Northern Line | 28,183 |
| London Bridge to Bank (northbound) | Northern Line | 34,887 |

[54] Demand and crowding are generally greater in the AM peak for most Underground and rail lines, and hence AM peak period data are presented here.

4.3.13 **Figure 45** and **Figure 46** present the same sections of the Jubilee and Northern lines respectively for the period 2008 to 2012 to provide context to the above 2012 baseline. **Figure 45** shows that the number of trips on the Jubilee line to and from London Bridge has increased since 2008, ranging from 4.7% growth on the eastbound section from London Bridge to Bermondsey, to 45% on the westbound section from Bermondsey to London Bridge.

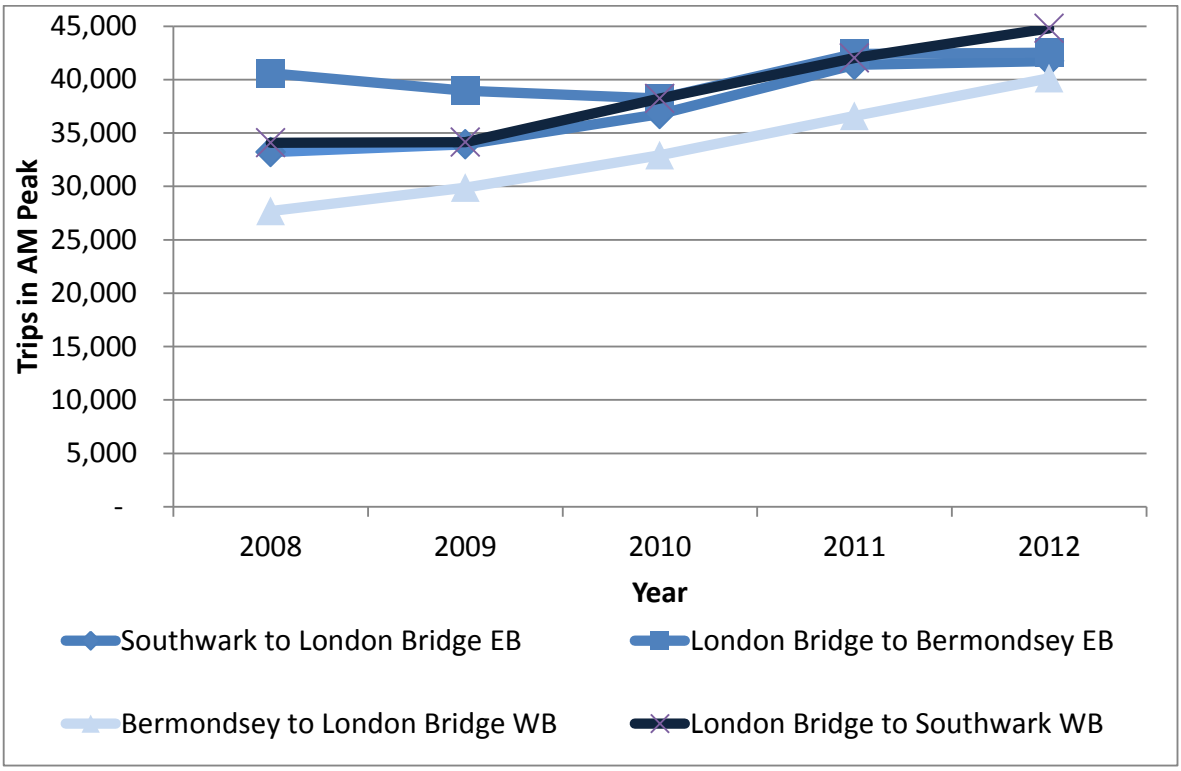


**Figure 45 RODS data Jubilee line to/from London Bridge AM peak period (2008 – 2012)**

**4.3.14** **Figure 46** shows that the number of trips on the Northern Line to and from London Bridge have increased less substantially since 2008, ranging from 0.3% on the northbound section from Borough to London Bridge, to 13.8% on the northbound section from London Bridge to Bank.

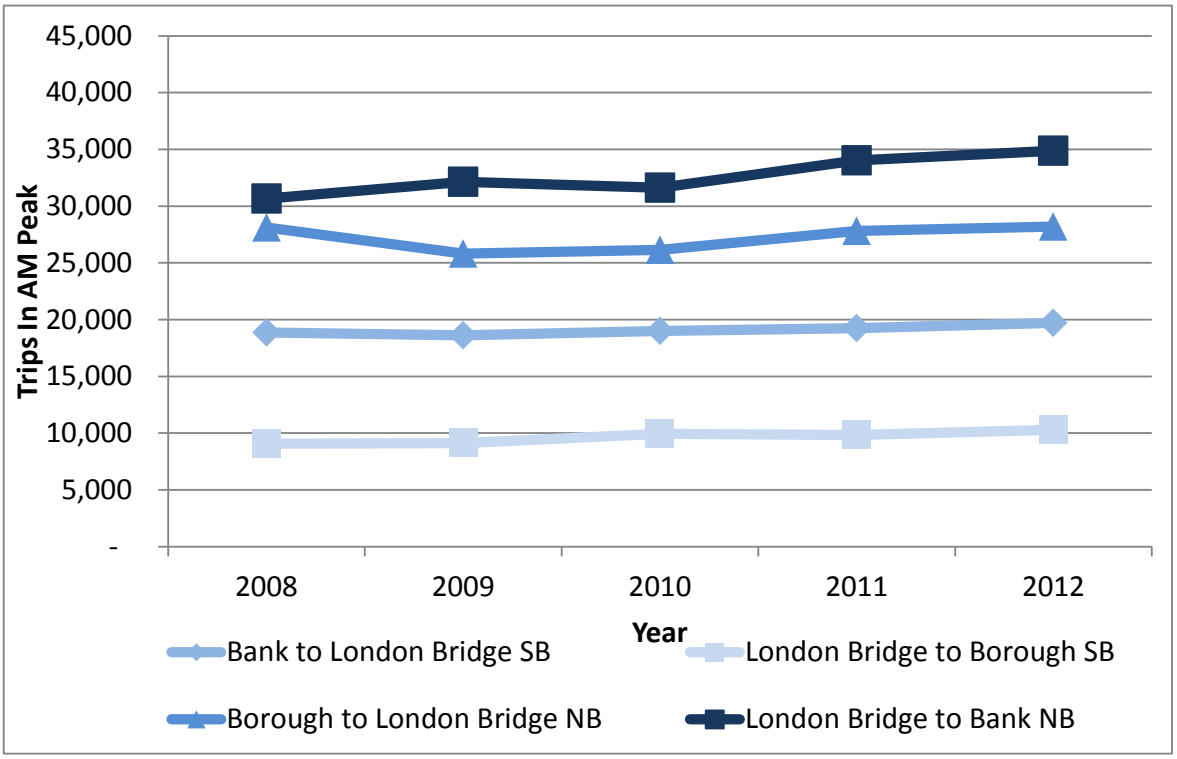


**Figure 46 RODS data Northern line to/from London Bridge AM peak period (2008 – 2012)**

4.3.15 **Table 52** presents the 2012 NRPS results for London Bridge, City Thameslink and London Blackfriars for passenger satisfaction with the station environment. Data for Fenchurch Street and Liverpool Street are also provided as external comparators. Satisfaction levels at London Bridge were lower in 2012 than the other stations.

**Table 52 Key Output 2 NRPS baseline passenger satisfaction with the station environment 2012 (% good or very good)**

| | | 2012 Baseline |
|---|---|---|
| London Bridge | Thameslink | 51% |
| *London Blackfriars* | *Thameslink* | *75%* |
| *City Thameslink* | *Thameslink* | *73%* |
| *London Fenchurch Street* | *c2c* | *82%* |
| *Liverpool Street* | *Greater Anglia* | *78%* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

4.3.16 **Table 53** presents the 2012 baseline NRPS data on satisfaction with a range of station facilities that could be influenced by the construction impacts of the Thameslink Programme[55].

**Table 53 Key Output 2 NRPS baseline passenger satisfaction with London Bridge station 2012 (% good or very good)**

| | London Bridge | London Blackfriars | City Thameslink | Fenchurch Street | Liverpool Street |
|---|---|---|---|---|---|
| Facilities and services at stations | 40% | 40% | 48% | 70% | 70% |
| Ticket buying facilities | 50% | 70% | 67% | 80% | 79% |
| Provision of information on train times/platforms | 71% | 68% | 86% | 91% | 84% |
| Upkeep and repair of buildings | 50% | 71% | 75% | 84% | 80% |
| Provision of shelters | 57% | 75% | 93% | 82% | 77% |
| Availability of seating | 24% | 45% | 40% | 58% | 24% |
| Overall station | 67% | 82% | 81% | 91% | 85% |

[55] There were sample sizes under 100 for both Blackfriars and City Thameslink for NRPS questions on Ticket buying facilities, Provision of shelters, and Availability of seating.

### London Bridge Decongestion

***Key Output 2 – baseline for future analysis***

4.3.17 The data required to assess the decongestion benefits associated with London Bridge are largely the same as those required to assess the impacts of the construction works at London Bridge. These data can therefore be found in the following tables and figures presented in the previous section:

- **Table 50** and **Figure 44** showing passenger numbers using the ORR data;
- **Table 51**, **Figure 45** and **Figure 46** showing demand (RODS data) on the Jubilee and Northern lines to and from London Bridge; and
- **Table 52** showing NRPS passenger satisfaction with the station environment; and
- **Table 53** showing NRPS passenger satisfaction with specific features of the station.

### London Bridge Facilities

***Key Output 2***

4.3.18 A range of NRPS questions can be used to baseline passenger satisfaction with facilities at London Bridge. As context, the 2008 to 2012 data showed no significant changes for any of the questions. **Table 52** and **Table 53** again show the relevant baseline data to be used in assessing changes in satisfaction with facilities.


# Rolling Stock Ambience

# 05

# 5. Rolling Stock Ambience

## 5.1 Introduction

**Summary of rolling stock Interventions**

5.1.1 Key Outputs 0 and 1 included some rolling stock changes on the Thameslink network, particularly through the delivery in 2009 of 23 class 377 trains, and lengthening to 12-car trains in December 2011. However, these were not procured as part of the core Thameslink Programme. The Thameslink Programme includes new rolling stock as part of Key Output 2 (**Table 54**), through the delivery of Class 700 rolling stock across the Thameslink network. Data for passenger satisfaction from 2008 to 2012 (Key Output 0 and 1) are presented herein as context to the baseline for Key Output 2.

**Table 54 Key Thameslink Programme Key Output 2 interventions related to rolling stock ambience**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 0 & 1 | Dec 2011 | Introduction of 12-car Class 377 rolling stock between Bedford and Brighton | Although not procured through the Thameslink Programme, the new rolling stock enabled 12-car services to operate on the route.<br>A secondary impact of this new rolling stock could be on passenger satisfaction with trains. |
| 2 | Jun 2016 | New Class 700 trains (60 8-car trains and 55 12-car trains) began gradual introduction into service in June 2016.<br>New Class 700 trains began rolling out on Brighton Thameslink services in June 2016; on the Wimbledon loop and Southeastern from November 2016; all Thameslink services operated by Class 700 trains from September 2017.<br>New Class 700 trains began gradual introduction into service from late 2017 on Southern and some Great Northern routes that are planned to become part of the Thameslink network from May 2018. | A major change to rolling stock provision (which will also allow the gradual release of the Class 387s to residual Great Northern services and the Class 377s (introduced to Thameslink in 2009) to Southern).<br>Rolling stock has wider doorways (improving boarding and alighting), more standing and circulation space (including walkways between carriages to make it easier to move through the train), two-by-two seating to create more room, electronic signs showing which carriages have more space to sit or stand, adaptive climate-controlled air conditioning, screens with real time service information including London Underground, and fully accessible toilets.<br>The new rolling stock is anticipated to improve passenger satisfaction. |

## Key Data Sources

5.1.2 The main source of data is the NRPS, which has questions on satisfaction with trains. Data are presented for Thameslink and also for c2c services as a comparator, selected on the basis that its services have seen/will see limited changes in rolling stock during the Thameslink Programme period[56]. The NRPS data cover the following questions:

- Overall satisfaction with trains (only available from 2012);
- Upkeep of trains;
- Information provision during trip;
- Room to sit and stand on trains;
- Comfort of seating on trains; and
- Ease of boarding/alighting trains.

5.1.3 In addition, it is important to consider the context within which the NRPS responses were received. Data on train crowding, demand and performance have also therefore been presented in other sections of the report, as these could influence passenger satisfaction levels.

[56] Selecting comparators for rolling stock benefits is extremely complex as changes have and will continue to occur across the majority of operators and routes. c2c has had a largely stable fleet between since 2008 with some reconfiguration of train interiors in 2015 (from 3+2 seating to 2+2 and additional standing capacity) and 6 new trains (24 carriages) in 2016. There will be 64 new carriages introduced in 2019.

***Key Outputs 0 and 1 – analysis of benefits realisation to date***

5.1.4 Although there were some rolling stock changes on the Thameslink network during Key Outputs 0 and 1 (the delivery in 2009 of 23 class 377 trains, and the lengthening to 12-car trains in December 2011) these were not procured as part of the core Thameslink Programme. However, the introduction of Class 377 rolling stock between Bedford and Brighton enabled 12-car services to operate on this route as part of the Thameslink Programme (see **Table 4**). A secondary impact of this new rolling stock could be on passenger satisfaction with trains. The results presented in this section for Key Outputs 0 and 1 therefore provide context to the baseline for the rolling stock improvements in Key Output 2 and do not constitute findings about the Thameslink Programme.

5.1.5 **Table 55** presents the 2008 baseline and 2012 ex-post data for passenger satisfaction with the upkeep of trains. Thameslink and c2c both recorded significant improvements between 2008 and 2012. It should be noted that the Thameslink baseline of 52% was significantly lower than for c2c, and the level of change was higher (+10pp). This suggests that the rolling stock that was introduced in 2009 was well-received.

**Table 55 Key Outputs 0 and 1 NRPS passenger satisfaction with the upkeep of trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 52% | 61% | +10pp |
| *c2c* | *87%* | *91%* | *+4pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

5.1.6 **Table 56** presents the data for passenger satisfaction with the provision of information on board trains. Once again, Thameslink had a lower 2008 baseline of 41% good or very good ratings. This increased significantly by 7pp by 2012, compared to a significant increase of 8pp for c2c. So there was a moderate improvement in satisfaction with the provision of information on Thameslink trains in this period but further improvement would need to occur in Key Output 2 to bring satisfaction levels into line with c2c.

**Table 56 Key Outputs 0 and 1 NRPS passenger satisfaction with the provision of information on board trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 41% | 47% | +7pp |
| *c2c* | *73%* | *81%* | *+8pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

5.1.7 **Table 37** presents the data for satisfaction with the level of room available for passengers to sit or stand on board trains. Thameslink (+4pp) recorded a small but significant improvement in passenger satisfaction through to 2012, as did c2c (+3pp).

**Table 57 Key Outputs 0 and 1 NRPS passenger satisfaction with the room available to sit or stand on board trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 59% | 62% | +4pp |
| *c2c* | *61%* | *65%* | *+3pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

5.1.8 **Table 58** presents the data for satisfaction with the comfort of seating on board trains. Once again, Thameslink (+9pp) recorded a significant improvement in passenger satisfaction, as did c2c (+3pp). However, the comfort ratings for Thameslink remained appreciably lower than c2c in 2012.

**Table 58 Key Outputs 0 and 1 NRPS passenger satisfaction with the comfort of seating on board trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 53% | 62% | +9pp |
| *c2c* | *78%* | *81%* | *+3pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

5.1.9 **Table 59** presents the data for satisfaction with the ease of boarding and alighting trains. Thameslink (+5pp) recorded a significant improvement in passenger satisfaction with this attribute in this period, as did c2c (+3pp).

**Table 59 Key Outputs 0 and 1 NRPS passenger satisfaction with the ease of boarding and alighting trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 71% | 76% | +5pp |
| *c2c* | *83%* | *86%* | *+3pp* |

*Note: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*

5.1.10 **Figure 47** presents the trend data for the above questions for Thameslink between 2008 and 2012. This shows some improvements between 2008 and 2009 and then further improvements in most questions between 2011 and 2012. Overall, Thameslink passengers' satisfaction with aspects of rolling stock improved somewhat in this period which is likely to reflect the introduction of some new rolling stock (which was not part of the core Thameslink Programme).

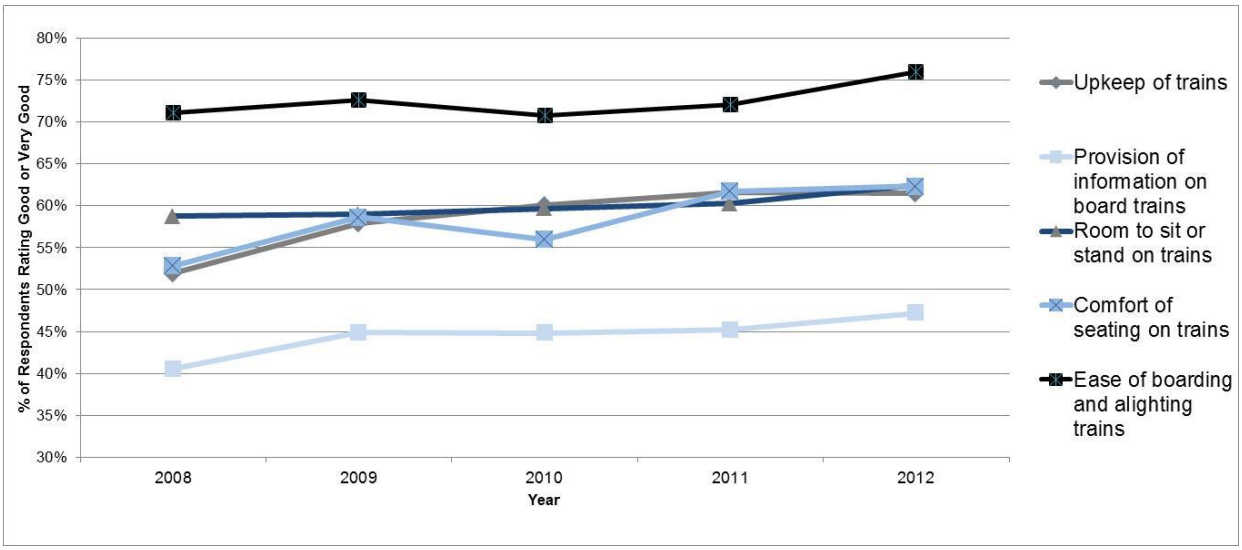


**Figure 47 Key Outputs 0 and 1 NRPS passenger satisfaction with rolling stock (2008-2012)**

*Note: The y-axis does not start at 0.*

### *Key Output 2 – baseline for future analysis*

5.1.11 **Table 60** presents the 2012 baseline for Key Output 2 rolling stock ambience. As has been observed earlier in this chapter, most passenger satisfaction measures for rolling stock in 2012 are lower for Thameslink than for comparator services. So there is scope for improvement with the further rolling stock changes in Key Output 2.

5.1.12 It should be noted that in the 2018 timetable change a number of Great Northern services will transfer to Thameslink (and run through the Thameslink core) with the residual Great Northern services continuing to terminate at Moorgate and King's Cross. A broadly similar number of Southern and Southeastern services will transfer to Thameslink (including Southern routes to Littlehampton, Horsham and East Grinstead and Southeastern services to Rainham and Ashford). There was also a gradual release (rolling stock cascade) of Thameslink Class 387s to residual Great Northern services. Class 377s will cascade out of Thameslink as part of the industry fleet cascade plans. This will need to be taken into account in the analysis when examining trends in the ex-post period using NRPS data.

**Table 60 Key Output 2 NRPS baseline passenger satisfaction with rolling stock 2012 (% good or very good)**

| | Thameslink | Great Northern | Southeastern | Southern | c2c |
|---|---|---|---|---|---|
| Overall satisfaction with trains | 73% | 74% | 80% | 80% | 92% |
| Upkeep of trains | 61% | 60% | 73% | 69% | 91% |
| Information provision during trip | 47% | 53% | 69% | 73% | 81% |
| Room to sit and stand on trains | 62% | 60% | 64% | 66% | 65% |
| Comfort of seating on trains | 62% | 60% | 69% | 69% | 81% |
| Ease of boarding/alighting trains | 76% | 76% | 80% | 76% | 86% |

# Service Reliability

06

# 6. Service Reliability

## 6.1 Introduction

**Summary of service reliability interventions**

6.1.1 One of the intended benefits of the Thameslink Programme is more reliable journeys[57], which will also contribute to many of the other defined benefits, particularly in-vehicle time, but also platform wait time and crowding. It will also contribute to passenger satisfaction levels, with passenger perception of reliability/punctuality one of the key drivers of overall satisfaction levels[58].

6.1.2 These investments will affect performance by introducing new higher capacity rolling stock[59]; updated infrastructure (which may be more reliable and will be optimised for the new higher capacity rolling stock and increased frequencies); and the new timetable (higher frequency services will reduce dwell times in stations, but may also result in decreased resilience[60]).

6.1.3 There were forecast to be limited positive impacts of Key Outputs 0 and 1 on service reliability (**Table 61**), and data are presented herein as context to the Key Output 2 baseline.

**Table 61 Thameslink Programme Key Outputs 0 and 1 interventions related to service reliability**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 0 & 1 | 2009 | Increased frequency up to 15 train paths per hour through the core in the peak periods (using additional Class 377 rolling stock, which was not procured as part of the Thameslink Programme). | The additional Class 377 rolling stock facilitated an increase in service frequencies and connectivity through the core. Improved frequencies may have decreased alighting/boarding and dwell times but could also have increased the impact of any delays. This will be assessed as part of the evaluation of service reliability. |
| 0 & 1 | 2011 | Introduction of 12-car trains between Bedford and Brighton. | The new 12-car Class 377 rolling stock was introduced alongside infrastructure upgrades, including upgrades to the track and signalling between West Hampstead and St. Pancras International. These are expected to have had a positive impact on service reliability. |

[57] Thameslink Programme website, as at 20th March 2017, which listed key benefits of the Programme as improved connections, more reliable journeys, better stations and new trains (http://www.thameslinkprogramme.co.uk/benefits-of-the-programme).
[58] National Rail Passenger Survey (2013) *Detailed Technical Survey Overview Autumn 2013 (Wave 29)*.
[59] New rolling stock may be more reliable than older rolling stock. Increased rolling stock capacity may decrease platform dwell times by reducing the time for passengers to alight and board the train.
[60] For example by decreasing the intervals between trains and by joining previously 'self-contained' train services. Increased intervals and reducing the interaction between services with dedicated routes reduces the spread of delays from incidents, ultimately making it easier to recover from disruption and subsequent delays.

6.1.4 The main impacts on performance and passenger satisfaction are expected in Key Output 2 (**Table 62**). Key Output 2 delivers new rolling stock (Class 700s) which allows faster boarding and alighting, shorter dwell times and more reliable rolling stock. The European Train Control System (ETCS) and Automatic Train Operation (ATO) will help deliver up to 24tph through the core in the peak periods in each direction. The works in the London Bridge area also include the construction of a new grade-separated junction at Bermondsey (the Bermondsey Dive Under) which will separate the Southeastern Kent lines from Thameslink and Southern to relive the bottleneck on the approach to London Bridge. The works at London Bridge will directly impact Thameslink, Southern and Southeastern; the platform reconstruction and reconfiguring of the tracks to provide nine through platforms and six terminating platforms are intended to allow more Thameslink trains to call at London Bridge and to reduce the delays associated with trains queuing to get through the station.

6.1.5 However, the increase in train frequency and expanded Thameslink network will increase interaction between trains on the wider rail network. A delay in the core will therefore impact more services across a wider area than would have been the case pre-Thameslink Programme. Thameslink services will interact with trains on the East Coast Mainline for the first time in 2018, as a large proportion of Great Northern services will transfer to Thameslink and go through the core. The residual Great Northern services will continue to terminate at Moorgate and King's Cross.

6.1.6 Thameslink services will also continue to interact with Southern and Southeastern and Gatwick Express services, and both GTR and Network Rail are examining timetable options that include consideration of performance, operational readiness and resilience. It has been assumed that the GTR timetable from the 2016 Consultation[61] will be in place in 2018.

6.1.7 Performance data are presented here for Thameslink, Great Northern, Southeastern and Southern. It is recognised that in 2018 there will also be interaction with East Midlands Trains on the Midland Mainline and Virgin Trains East Coast on the East Coast Mainline as well as open access operators such as Grand Central and Hull Trains. There will also be interaction with London Overground services. Overall performance for these various operators is also affected by train operations and infrastructure provision over a wider geographical area. They are therefore not presented here[62].

6.1.8 There is no suitable comparator against which to assess changes in performance on the Thameslink network, given the complex nature of the network and interaction with other operators (including freight). Performance on other operators with relatively stable infrastructure and rolling stock provision from 2012 (such as c2c) are likely to be the most suitable[63], and could be used to provide contextual information on external factors affecting performance, such as weather conditions for example.

[61] GTR 2018 Timetable Consultation (consultation 15 September – 08 December 2016).
[62] It is possible to examine performance at a more detailed level for these operators to identify the key drivers behind performance and any observed changes. This would require a more detailed interrogation of performance data.
[63] c2c had much higher performance levels than Thameslink, Great Northern, Southeastern and Southern (at about 95% or higher from the end of 2012/13).

**Table 62 Thameslink Programme Key Output 2 interventions related to service reliability**

| Key Output | Date | Intervention/Change | Relevance to Thameslink Programme Evaluation |
|---|---|---|---|
| 2 | Jun 2016 | New Class 700 trains (60 8-car trains and 55 12-car trains) began gradual introduction into service in Jun 2016. | A major change to rolling stock provision (which will also allow the gradual release of the Class 387s to Great Northern and the Class 377s (introduced to in 2009) to Southern). New rolling stock expected to have a positive impact on service reliability. |
| 2 | Jan 2018 | Bermondsey Dive Under complete | The dive under, on the eastern approach to London Bridge station, will allow the Thameslink lines to cross over the Kent lines on their approach to London Bridge station. This will help increase the number of trains that can pass through London Bridge and travel north on the Thameslink route, reduce the time trains wait for platforms to clear and cut delays to Thameslink, Southern and Southeastern services. These changes are expected to have a positive impact on service reliability. The first line of the Bermondsey Dive Under came into use in January 2017. |
| 2 | Jan 2018 | London Bridge station redevelopment works largely complete by January 2018. | The redevelopment works at London Bridge commenced in 2013 (beginning with the closure of platforms 14 to 16 for redevelopment). By January 2018 the works were substantially complete and new platforms operational. Southeastern services to/from Cannon Street resumed calling at London Bridge from January 2018. Thameslink cross-London services will begin to resume calling at London Bridge during 2018. |
| 2 | May 2018 | Increased train frequencies (up to 18 tph through the core in the peak periods in each direction), scheduled from the May 2018 timetable change. | Increased frequency through the core of 18 tph in the peaks from May 2018, 20 tph from December 2018, 22 tph from May 2019 and 24 tph in the peak from December 2019. |
| 2 | Dec 2019 | ATO and ETCS in the core. | ETCS and ATO are required in order to support operational training and to run trains through the core at 22 and 24 tph in the peak to ensure performance is not impacted. |

### *Key Data Sources*

6.1.9 The analysis of rail performance measures is a very complex field. Performance is measured principally using Network Rail's TRUST system, collecting information on the movement of train services and comparing these to the timetable. Incidents are allocated to cause codes and responsible manager codes in accordance with the rail industry's Delay Attribution Guide, which allows the type of incident causing the delay to be identified and responsibility to be attributed (e.g. to a specific TOC or Network Rail). There are a number of different industry measures for tracking performance including:

- Public Performance Measure ('PPM') - the proportion of trains in a four week period arriving at their destination within 5 minutes of their scheduled arrival time for commuter and inter-urban services, or within 10 minutes for long-distance services (a higher percentage indicates better performance). These can be calculated as a moving annual average (MAA) to track performance or compare a similar set of periods in one year to another[64];
- 'Right Time' - the proportion of trains arriving at their terminating station early or within 59 seconds of schedule (this can also be shown as a MAA) (a higher percentage indicates better performance); and
- Cancellations and Significant Lateness (CaSL) (this can also be shown as a MAA) (a higher percentage indicates *worse* performance) - the proportion of trains:
  - which are cancelled in part (i.e. skip some scheduled stops on route to reach their destination earlier, do not complete their entire scheduled journey, or where the originating station is changed);
  - which are cancelled in full; or
  - which arrive at their final destination 30 or more minutes later than the time shown in the public timetable.

[64] The data analysed for the purposes of this evaluation were available on a rolling four-weekly basis from Financial Year 2008/09 (there are 13 four weekly periods in each Financial Year, commencing in April of each year)

6.1.10 Performance tends to vary over the year, and is generally worse in the autumn and winter months, and as such average performance levels over 13 periods using the MAA are presented herein. The causes of and responsibility for delay can be assessed at a more detailed level to understand the drivers behind changes in performance. This level of analysis has not been undertaken as part of this baseline commission.

6.1.11 This analysis has been extended to Southeastern, Southern and Great Northern, given they operate or will operate services across Thameslink routes. It should be noted however that Great Northern services were not affected by Key Outputs 0 and 1, although will be heavily impacted by Key Output 2. Great Northern performance is nevertheless presented in the Key Output 0 and 1 analysis as context for Key Output 2.

6.1.12 There is no suitable comparator against which to assess changes in performance or passenger perceptions of performance on the Thameslink network, given the complex nature of the network and interaction with other operators (including freight). However, performance can be influenced by common external factors such as the weather. We have therefore included c2c as a comparator in the analysis, to provide context. c2c had relatively stable infrastructure and rolling stock provision between 2008 and 2012, and is not expected to have any significant changes by 2019.

6.1.13 At the time of writing, Network Rail and GTR were discussing the development of bespoke performance measures for the Thameslink core. This will need to be taken into account in the ex-post period once the relevant performance metric(s) have been defined and agreed. It is expected that the metric(s) will be able to make use of existing data collected on performance and as such it should be possible, if that is the case, to calculate any metric(s) back to a 2012 baseline.

6.1.14 The NRPS includes a question on passenger satisfaction with reliability and punctuality, and analysis of this data is also presented here. Research by Transport Focus has demonstrated that satisfaction with reliability and punctuality is the single biggest driver of overall passenger satisfaction, with multivariate analysis of services nationally indicating that about 40% of the variation in overall passenger satisfaction is explained by the rating on punctuality/reliability[65].

[65] The most recent survey indicated 36% (The National Rail Passenger Survey Autumn 2017 Main Report).

### *Key Outputs 0 and 1 – analysis of benefits realisation to date*

6.1.15 There were forecast to be limited positive impacts of Key Outputs 0 and 1 on service reliability (see Table 61), and data are presented herein as context to the Key Output 2 baseline. Given the interaction between Thameslink, Southeastern and Southern, as well as Great Northern with the implementation of Key Output 2, data are presented for all four services, as well as for c2c as a comparator.

6.1.16 **Table 63** shows the PPM moving annual average data for 2008/09 and 2012/13 for the above mentioned operators, whilst **Figure 48** shows the data by period between 2008/09 and 2012/13. The 2008 baseline position was similar for Thameslink, Southeastern and Southern, ranging from 88.9% to 89.7%. This is compared to 93.7% for Great Northern and 95.2% for c2c.

6.1.17 Overall, there was very little change between 2008/09 and 2012/13 on Thameslink, Southeastern and Southern services, with no more than a +/- 1.4pp change. This is compared to a decline of 5pp on Great Northern and a 2.4pp increase for c2c.

**Table 63 PPM moving annual average 2008/09 – 2012/13**

| | 2008/09 Baseline) (Period 13) | 2012/13 Ex-post (Period 13) | Percentage Point (pp) Change |
|---|---|---|---|
| Thameslink | 89.1% | 88.4% | -0.7pp |
| Southeastern | 88.9% | 90.3% | +1.4pp |
| Southern | 89.7% | 88.3% | -1.4pp |
| Great Northern | 93.7% | 88.7% | -5.0pp |
| *c2c* | *95.2%* | *97.6%* | *+2.4pp* |

*Note: Great Northern was not impacted by Key Outputs 0 and 1, but will be impacted by Key Output 2.*

6.1.18 From **Figure 48** it can be seen that performance on Thameslink was relatively similar in 2012/13 to that in 2008/09, but with a temporary worsening in performance in 2009/10, although by less than 5pp[66]. The overall trend was similar on Southeastern and Southern, which also showed little change; better than the trend for Great Northern which worsened from 2008/09 to 2012/13, from better performance than Thameslink in 2008/09 to a similar level of performance in 2012/13; and worse than the trend for c2c which improved. The Thameslink results do demonstrate some variation in performance during the delivery of Key Outputs 0 and 1. There was a drop in performance in 2009/10 which may have reflected a combination of factors, including the disruption caused by the late delivery of the Class 377s and knock on impacts on driver training, an overtime ban, and the through running of Southeastern Blackfriars and Thameslink Moorgate services through the core.

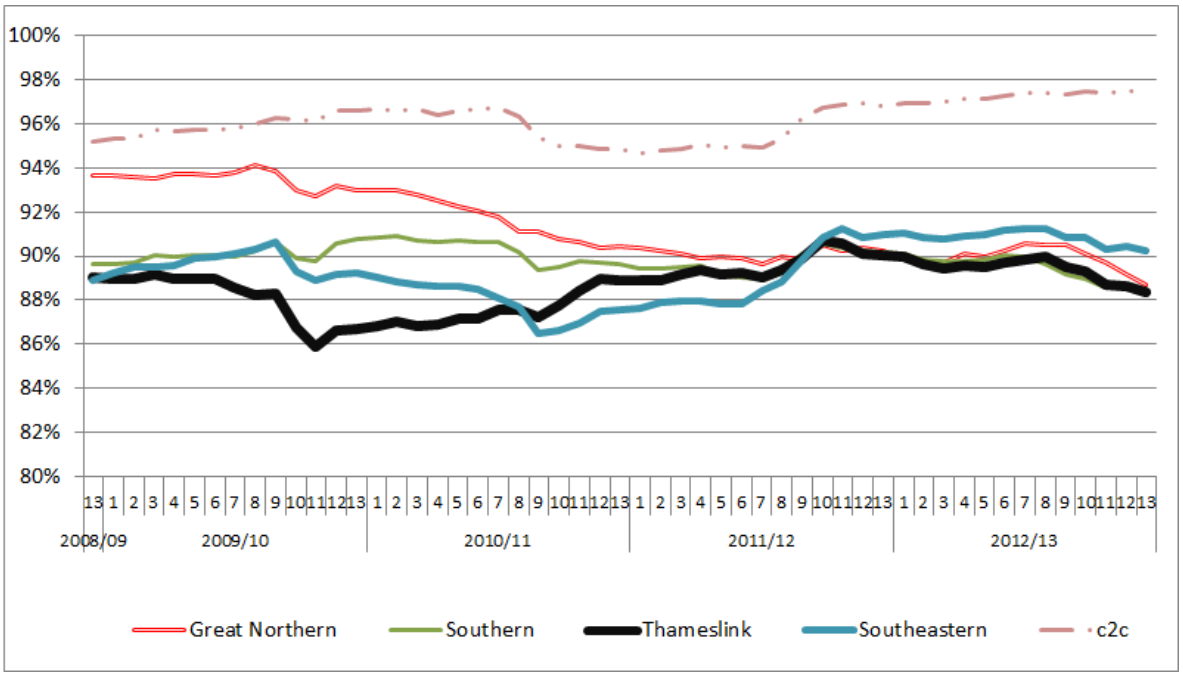


**Figure 48 PPM moving annual average by Period, from Period 13 2008/09 to Period 13 2012/13**

*Note: The y-axis does not start at 0.*

[66] Winter weather (2009/10 and 2010/11), the engineering works at Blackfriars and Farringdon, the initial impacts from a new timetable that introduced up to 15 train paths per hour in the peaks from March 2009, and the introduction of Class 377/5 units in 2009/10 may have contributed to a worsening of performance, but a detailed performance assessment has not been undertaken to assess this.

6.1.19 Further analysis was undertaken to identify variations in PPM on the Thameslink Bedford/Brighton route in the morning peak period, as this was directly affected by the Key Output 0 and 1 investment. The analysis also considered how performance varied across the peak period (**Figure 49**).

6.1.20 This showed trends in performance similar to the overall Thameslink Programme between 2008/09 and 2012/13. The best performance was in the first hour of the AM Peak (07:00 – 07:59) and the worst was in the last (09:00 – 09:59). Otherwise performance in each hour of the AM peak period reflected the overall trend, with average performance in March 2013 similar to performance in March 2008.

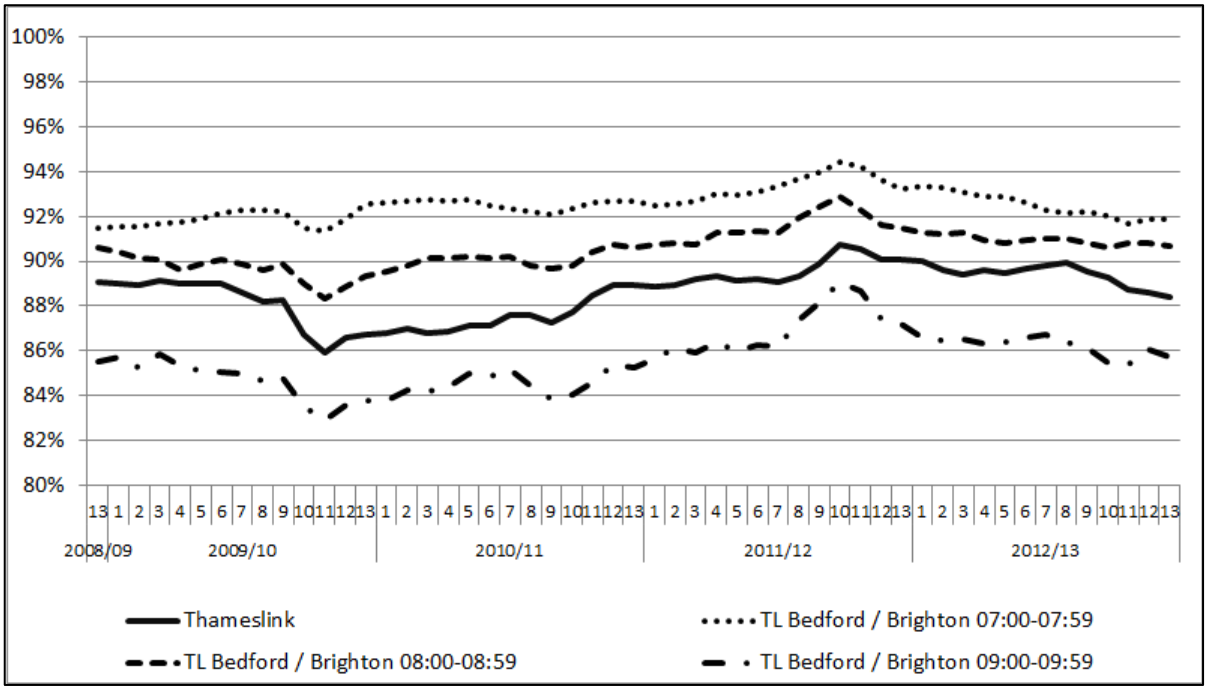


**Figure 49 PPM moving annual average by Period, from Period 13 2008/09 to Period 13 2012/13, on Thameslink services and on Thameslink Bedford/Brighton morning peak services**

*Note: The y-axis does not start at 0.*

6.1.21 Additional analysis was carried out to identify changes in CaSL and Right Time, which are shown in **Figure 50** and **Figure 51** respectively. **Figure 50** shows that throughout 2008/09 – 2012/13 Thameslink had higher levels of cancelled trains or significant lateness than Great Northern, Southern, Southeastern or c2c. There was an increased rate of cancelled trains or significant lateness in 2009/10, peaking in the winter of 2009/10[67], at 5.9%, before recovering to remain generally between 3.5% and 4.5%. CaSL was slightly higher (worse) at the end 2012/13 to the end of 2008/09.

6.1.22 The trend in Thameslink's CaSL measure in this period was different from that for the other services. Whereas Thameslink's CaSL average had a substantial peak in 2009/10, the averages for the other services were relatively stable aside from a smaller peak in 2011.

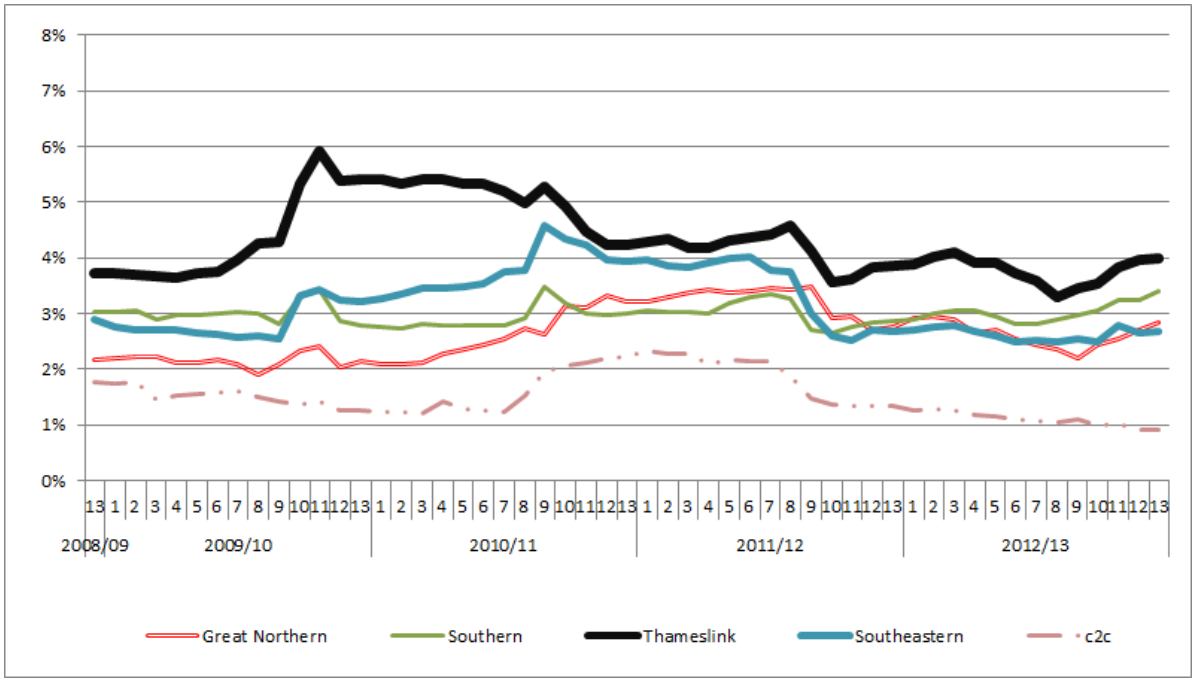


**Figure 50 CaSL moving annual average 2008/09 – 2012/13**

[67] See footnote 66.

6.1.23 **Figure 51** shows Thameslink Right Time performance remained at about 70% for most of 2009 and 2010, before rising steadily in 2011 to peak at about 76%, and then decreasing by a small amount to 73% by March (Period 13) 2013.

6.1.24 The trend for Thameslink's Right Time performance was broadly similar to those for c2c and Southeastern which also improved slightly over the period (at a higher level of performance in the case of c2c and a lower level in the case of Southeastern). Thameslink's trend was more positive than that for Southern, which showed little change, and Great Northern, which saw its performance worsen steadily from better performance than Thameslink in 2008/09 to worse performance in 2012/13.

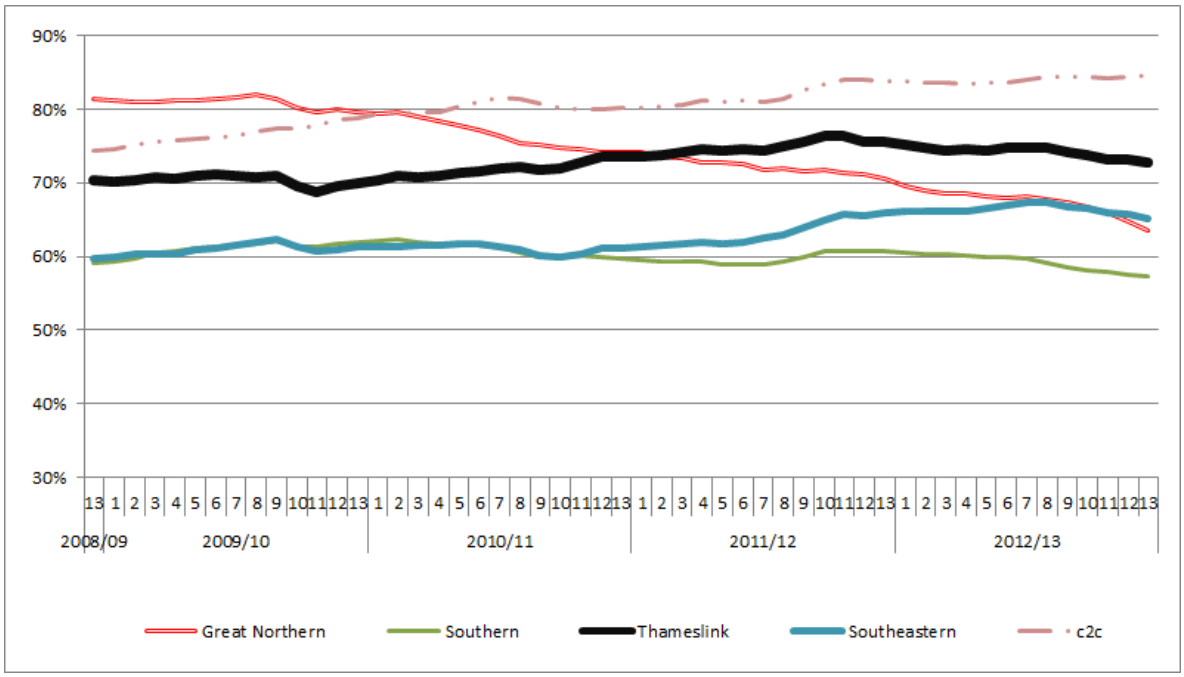


**Figure 51 Right Time moving annual average 2008/09 – 2012/13**

*Note: The y-axis does not start at 0.*

6.1.25 NRPS data were examined to assess passenger satisfaction with performance (**Table 64**). There was no significant change on Thameslink services nor on either of the main comparators of Great Northern and c2c. The only service reporting a significant change was Southeastern (+3pp). This generally reflects the performance data summarised in **Table 63**[68].

**Table 64 Key Outputs 0 and 1 NRPS passenger satisfaction with the punctuality/reliability of trains 2008 and 2012 (% good or very good)**

| | 2008 Baseline | 2012 Ex-post | Percentage Point Change |
|---|---|---|---|
| Thameslink | 75% | 75% | 0pp |
| Southeastern | 79% | 82% | +3pp |
| Southern | 78% | 77% | -2pp |
| Great Northern | 84% | 83% | -1pp |
| *c2c* | *90%* | *94%* | *+4pp* |

*Note 1: The percentage point change may not match, as all numbers in the table have been rounded to 0 dp.*
*Note 2: Great Northern was not impacted by Key Outputs 0 and 1, but will be impacted by Key Output 2.*

[68] The NRPS will differ from performance measures because it is a snapshot in time (surveys twice a year in spring and autumn), and will not reflect annual average performance levels, but those at the time of the survey; and measures of performance may not reflect how passengers perceive reliability and punctuality.

6.1.26 **Figure 52** presents the trend data for passenger satisfaction with punctuality/reliability between 2008 and 2012. Overall the level of satisfaction with Thameslink services was similar in 2008 and 2012. However, satisfaction with Thameslink on this measure declined between 2008 and 2010[69] to below 70% (the low in 2010 was 66%) before increasing again in 2011 and marginally in 2012. This pattern is comparable with fluctuations in PPM and CaSL data during the period. The satisfaction scores for punctuality/reliability for Great Northern, Southeastern and Southern showed relatively little fluctuation and remained at higher levels than Thameslink throughout the period.

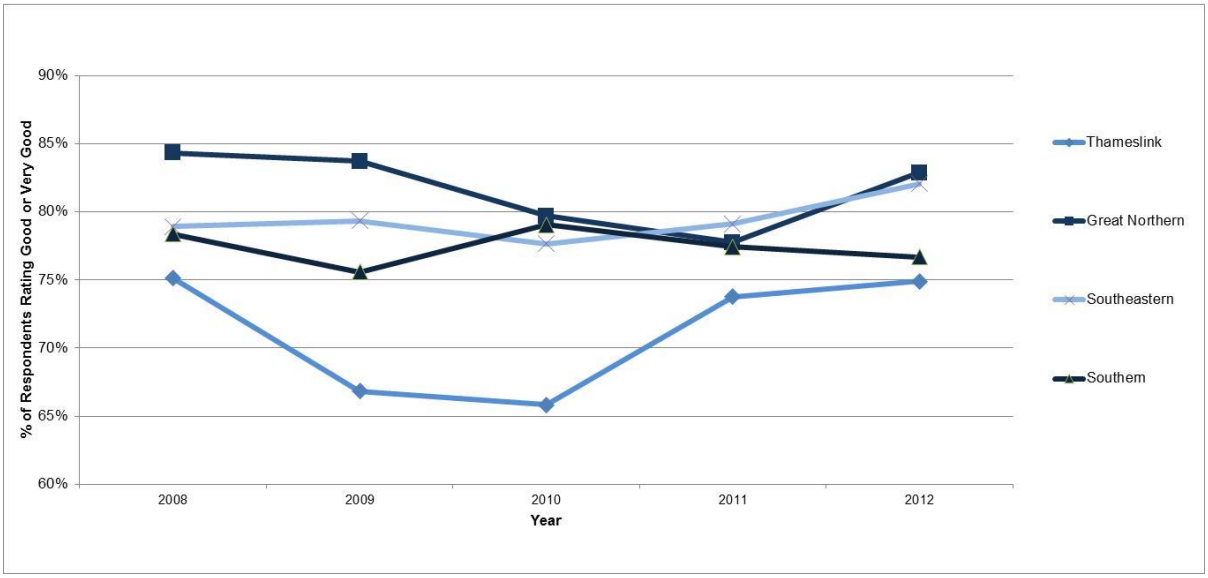


**Figure 52 Key Outputs 0 and 1 NRPS passenger satisfaction with the punctuality/reliability of trains (2008 to 2012)**

*Note: The y-axis does not start at 0.*

[69] See footnote 66 and pa. 6.1.18.

6.1.27 **Figure 53** shows that in 2008 Thameslink had a higher proportion of passengers experiencing delays on their journey (27%) than the other three services. This measure worsened noticeably in 2009 to almost 35%, before declining significantly to 21% by 2012, which was closer to the levels of the other three services[70]. However, it should be noted that this is a self-reported measure of passenger delay for the journey they were making when surveyed by the NRPS, rather than a measure of actual trains delayed.

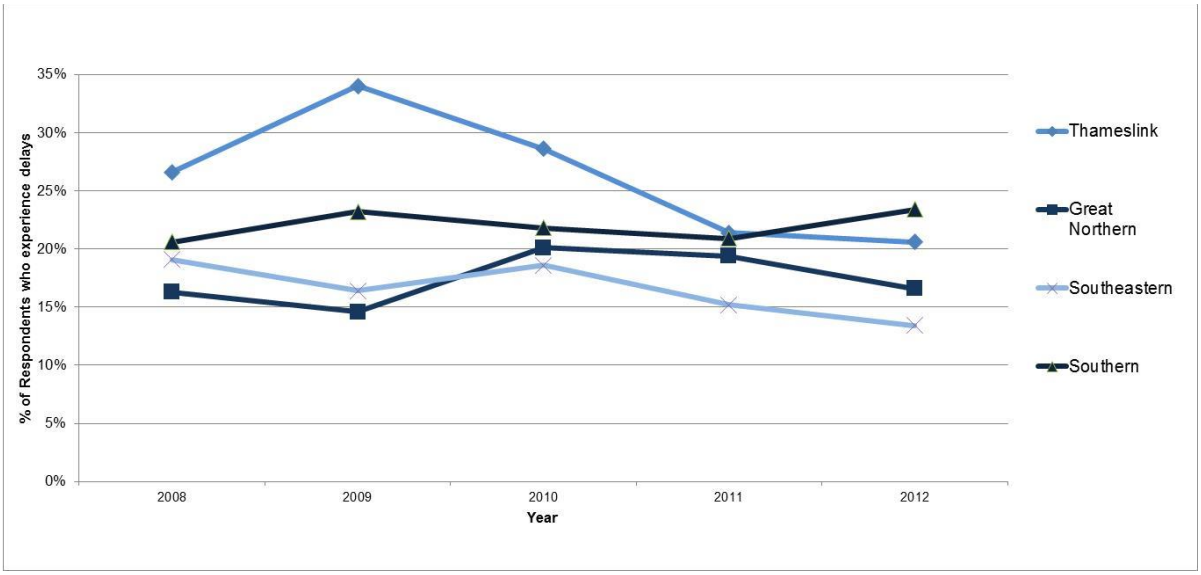


**Figure 53 Key Outputs 0 and 1 % of passengers experiencing delays on their journey (2008 to 2012) (NRPS)**

6.1.28 In summary, this chapter has looked at changes in performance and passenger satisfaction with performance. Overall there was little change in the performance of the Thameslink network between 2008 and 2012, considering the PPM moving annual average, CaSL and Right Time data. Although some measures worsened temporarily in 2009 and 2010, performance levels subsequently returned to levels that were comparable with the 2008 baseline. There were more pronounced reductions in passengers' satisfaction with Thameslink service reliability/punctuality in 2009 and 2010, influenced by the service disruptions on Thameslink at that time.

[70] See footnote 66 and pa. 6.1.18.

***Key Output 2 – baseline for future analysis***

6.1.29 Baseline performance data for Key Output 2 are presented here for Thameslink, Great Northern, Southeastern and Southern services. The proposed Thameslink network from 2018 will consist of current Thameslink services and some Great Northern, Southeastern and Southern services which will transfer to Thameslink and run through the core.

6.1.30 **Table 65** shows the Key Output 2 baseline performance measures. PPM MAA was 88.4% for Thameslink in 2012/13, relatively similar to the other TOCs (ranging from 88.3% on Southern to 90.3% on Southeastern). Thameslink had the highest proportion of CaSL at 4.0% (compared to 2.7% to 3.4% on the other TOCs), but the highest Right Time MAA at 72.7% (compared to 57.3% to 65.1% on the other TOCs).

**Table 65 Key Output 2 baseline performance measures (moving annual average) 2012/13**

| | PPM MAA | CaSL MAA | Right Time MAA |
|---|---|---|---|
| Thameslink | 88.4% | 4.0% | 72.7% |
| Great Northern | 88.7% | 2.8% | 63.5% |
| Southeastern | 90.3% | 2.7% | 65.1% |
| Southern | 88.3% | 3.4% | 57.3% |

6.1.31 **Table 66** presents the 2012 baseline for the level of passenger satisfaction with train reliability/punctuality, and whether passengers experienced delays on their journey.

**Table 66 Key Output 2 NRPS baseline passenger satisfaction with the reliability/punctuality of trains and whether passengers experienced delays (% good or very good)**

| | Reliability/punctuality | Experienced delays |
|---|---|---|
| Thameslink | 75% | 21% |
| Great Northern | 83% | 17% |
| Southeastern | 82% | 13% |
| Southern | 77% | 23% |

6.1.32 The gradual roll out of new rolling stock, infrastructure and technology upgrades (in particular to and from London Bridge and implementation of ETCS and ATO in the core) are likely to have a positive impact on performance in the longer term. Performance should therefore be assessed on a continual basis to identify trends and impacts from the implementation and gradual roll out of the Programme and the impact of the new timetable and increased frequency through the core. This will need to go beyond analysis of the industry-standard performance metrics to encompass the new metric (or metrics) being developed Network Rail and GTR to assess performance in the core.


# Next Steps

# 07

# 7. Next Steps

## 7.1 Ex-post evaluation milestones and monitoring

7.1.1 As outlined in Chapter 1, this baseline evaluation focuses on the initial phases of the Thameslink Programme (Key Outputs 0 and 1 and 2008 – 2012). This is intended to provide a foundation for the ex-post evaluation of the final phase of the Programme, Key Output 2. As part of this commission AECOM was asked to recommend suitable data for ex-post evaluation and recommendations are included here. However, it will be for the DfT to determine next steps for monitoring and evaluation work streams taking into account these recommendations alongside wider contextual factors and programme developments.

7.1.2 The Key Output 2 and overarching Thameslink Programme ex-post period will extend beyond 2020, as set out in **Table 67**, to assess benefits realised up to five years post implementation; currently assumed to be 2024. The data set out in this report, with the exception of the bespoke survey undertaken in March 2017 and noting there may be consistency issues in how certain data are collected and processed over time, allow for annual monitoring of benefits throughout this period.

**Table 67 Baseline and Currently Assumed Evaluation Periods**

| Key Output | Baseline | 1 year Ex-post evaluation | 5 year Ex-post evaluation |
|---|---|---|---|
| 2 | 2012 | 2020/21 | 2024/25 |

7.1.3 It is recommended that the ex-post evaluation includes an assessment of trends from 2012 through to the five year ex-post assessment to provide context to the full evaluation and to monitor benefits realisation against the schedule of outputs delivered by the Thameslink Programme. This will allow the evaluation to identify any changes in the context for the research – for example external factors that may influence the realisation of outcomes and benefits from the Thameslink Programme.

## 7.2 Thameslink Programme

7.2.1 An important early task of the ex-post evaluation will be to review and update the definition and timing of different elements of the Thameslink Programme, based on its actual delivery and implementation. This is especially relevant if aspects of delivery have materially changed from that set out in Chapter 2.

7.2.2 At the time of writing, the 2018 Thameslink timetable which will affect the geographical extent of the Thameslink network and the benefits from the Thameslink Programme, is under development. The assessment presented herein has been based on the network set out in the GTR 2018 Timetable Consultation. The map of future Thameslink services from the consultation is included in this report at Appendix B, Figure B2.

## 7.3 Data collation

7.3.1 The baseline study has included the assessment of the viability of using different existing data sets to evaluate the Thameslink Programme, and identified gaps and issues in using the data for the ex-post evaluation. Data collation should be ongoing through 2018 and 2019 leading into the year one ex-post assessment, assumed to be in 2019/20.

7.3.2 This section summarises the main issues around the data sets used in the baseline evaluation and sets out recommendations, where possible, for how to address these in the ex-post evaluation.

**Rolling Origin Destination Survey (RODS) (TfL)**

7.3.3 RODS data can be used to assess changes in passenger numbers on key sections of the Underground network likely to be impacted by the Thameslink Programme. RODS data have been obtained from 2008 to 2012 for this evaluation. RODS data are available for later years, but TfL are considering alternatives after 2017, which may involve use of their Oyster Clicks Model to allocate journeys within the London Travelcard area to individual stations in London.

7.3.4 If RODS data are discontinued after 2017, it will be necessary to assess the consistency between RODS and alternative sources to inform the ex-post evaluation of Key Output 2. This will require discussion with TfL and assessment of the impact of the change in methodology to determine demand on the Underground.

**ORR station usage data**

7.3.5 The ORR data are derived largely from ticket sales and passenger survey data by financial year (for a 12-month period from April to March). There have been several changes to methodology to estimate station usage from 2008/09.

7.3.6 For central London/Travelcard Zone 1 rail stations, only total demand at a group of stations is known based on ticket sales, requiring disaggregation based on survey data, mainly the London Area Travel Surveys (LATS) from 2001. The ORR 2008/09 and 2009/10 reports noted that for Thameslink stations in central London, figures were adjusted to give a better estimate of station usage compared to previous estimates by reviewing the original ticket sales to the individual central London Thameslink stations. The 2010/11 report noted that a previous adjustment factor, affecting predominantly Farringdon and Elephant & Castle stations in London, was removed, resulting in an increase in flows to/from Farringdon and a reduction to/from Elephant & Castle.

7.3.7 More recently, there have been changes to the methodology that have had a significant effect on the estimate of demand at stations in London since 2015/16. The most significant change has been to use TfL's Oyster Clicks Model to allocate journeys made wholly within the London Travelcard area to individual London stations, whereas previously journeys were allocated using data from the 2001 London Area Travelcard Survey (LATS).

7.3.8 The changes in method mean that direct comparisons between entries, exits and interchanges for 2015-16 and previous years are not valid. An estimate of the effect of the methodology change has been included in the ORR data set to help users identify where the methodology change affects results.

7.3.9 This impact will need to be assessed as part of the ex-post evaluation, as the implication is that it will not be possible to compare ex-post data with the 2012 baseline using the ORR data.

**National Rail Passenger Survey (NRPS)**

7.3.10 NRPS data are collected every spring and autumn. The ex-post assessment will need to review and take into account any changes in methodology or sample size.

7.3.11 There have been some recent methodological changes, including changes to the questionnaire, that were implemented in the Spring 2017 wave. Some of the newly-worded questions may not be comparable to the questions from previous NRPS waves. Of particular relevance for this study are questions used to measure passenger satisfaction with crowding and the overall station environment.

7.3.12 Further work will be required at the ex-post stage to investigate these changes, and any made subsequently, to understand any data consistency implications for analysis.

**On-train crowding**

7.3.13 DfT passenger count and train capacity data can be used to assess peak period demand, capacity and crowding. The data are collected every spring and autumn, with the latter providing a greater number of counts in a given survey period and going back over a greater number of years, providing greater confidence in the data.

7.3.14 Passengers in Excess of Capacity (PiXC) is the main metric used by DfT to assess crowding levels on a typical autumn day in the peak periods. PiXC takes into account standing room for passengers, but only where the time between stations is 20 minutes or less.

7.3.15 A limitation with this approach is that this may not reflect the amount of time for which passengers have actually been standing, since it is not possible to directly record this. The 20 minute threshold used also means that small changes to timetables can push services from one side of the threshold to another, which will then have implications for their PiXC measures.

**Performance in the Thameslink core**

7.3.16 Network Rail and GTR are discussing the development of bespoke performance measures for the Thameslink core in addition to the industry standard measures. This will need to be taken into account in the ex-post period once the relevant performance metric(s) have been defined and agreed. It is expected that the metric will be able to make use of existing data collected on performance and as such it should be possible to calculate the metric back to a 2012 baseline.

## 7.4 Primary data collection

7.4.1 As set out in this report, surveys were undertaken at the four stations in the Thameslink core to address a data gap for those using the core related to:

- The origin/destination of trips; and

- The routes used, interchange locations and use of other modes (e.g. London Underground); and

7.4.2 This survey will need to be repeated in the ex-post period, maintaining maximum comparability with those conducted here. However, the ex-post assessment will need to take into account that there will be services going through the core for the first time in 2018 from parts of the current Great Northern, Southern and Southeastern networks. These trips have not been surveyed in the 2017 survey baseline, but there is an opportunity to explore collecting information from passengers on how or whether their origins/destinations or their routeing have changed in the immediate ex-post period and the change will need to be explored specifically through the analysis.

## 7.5 Contribution analysis

7.5.1 A key challenge for the evaluation is how to attribute observed changes in benefit measures to the Thameslink Programme or other contextual factors. This is fundamental to determining the net benefit of the Programme compared to the counterfactual scenario. We recommend that this will be achieved by exploring the 'contribution' of the Programme to the observed outcomes relative to other potential explanations. This should draw on a contribution analysis approach that involves working through the following set of steps:

- Setting out the attribution problem to be addressed and developing the Theory of Change (the overarching narrative for the evaluation, detailing the expected route to impact). This has been prepared for the Thameslink Programme and is presented in Chapter 1 of this report;
- Describing the theoretical assumptions and contextual factors: the key assumptions and risks on which the Theory of Change is based, as well as the wider contextual factors that are not in the control of the Programme;
- Populating the Theory of Change with data and evidence: data for elements relating to the Programme and external factors – this baseline report will be a key resource for this exercise;
- Assembling and assessing the contribution story: the baseline commission has defined the position in 2012 for Key Output 2 and identified ongoing monitoring required to inform the ex-post assessment; and
- Ongoing review of the contribution story: future evaluation activities will be required after the completion of this phase of research to fully understand the emerging benefits of the Thameslink Programme.

7.5.2 Contextual factors that may influence either the delivery of the Thameslink Programme or its outcomes and benefits include:

- Crossrail;
- Changes in fares and ticketing;
- Changes in timetables;
- Other transport infrastructure projects;
- Changes in rolling stock;
- Increases or decreases in demand; and
- Other factors influencing passengers' experience.

7.5.3 Crossrail (the Elizabeth line) is a key external factor that will impact the evaluation of the Thameslink Programme. The first Crossrail trains entered service in 2017, but the main impact will be in December 2018 when Crossrail services commence operation between Paddington and Abbey Wood, providing direct interchange with Thameslink services at both Farringdon and Abbey Wood.

7.5.4 Adopting a contribution analysis methodology would help assess the relative contribution of Crossrail and the Thameslink Programme to observed change, assessing both areas impacted by the Programme and comparator areas to assess the relative impact of external factors. The ex-post evaluation will need to review and if necessary update the selection of comparator areas to ensure they remain valid.

7.5.5 c2c services were selected as a comparator in this report as service patterns and rolling stock have remained relatively stable during the period of Key Outputs 0 and 1, and are envisaged to remain relatively stable through to 2018/2019 to help inform the Key Output 2 ex-post evaluation. However, the Thameslink network is significantly larger and more complex, incorporates the only cross-London rail services through central London, and interacts with several other operators across different parts of its network. This complicates the selection of suitable comparators. The choice and selection of comparators can be revisited in the ex-post evaluation.

7.5.6 This will necessitate discussion with stakeholders to explore Thameslink Programme impacts and inform the contribution analysis to support the interpretation, synthesis and triangulation of evidence on Programme impacts.

# Appendices

# Appendix A Glossary

| | |
|---|---|
| ATO | Automatic Train Operation |
| CaSL | Cancellations and Significant Lateness |
| core | Thameslink core: St. Pancras International, Farringdon, City Thameslink, and Blackfriars stations |
| DfT | Department for Transport |
| DLR | Docklands Light Railway |
| dp | decimal place |
| EB | eastbound |
| ETCS | European Train Control System |
| GTR | Current Thameslink, Southern and Great Northern (TSGN) franchise operator (Train Operating Company) |
| KO | Key Output |
| LUL | London Underground Limited |
| MAA | moving annual average |
| NB | northbound |
| NRPS | National Rail Passenger Survey |
| ORR | Office of Rail and Road (Regulator) |
| PiXC | Passengers in excess of capacity |
| pp | percentage point |
| PPM | Public Performance Measure |
| RODS | Rolling Origin Destination Survey (TfL) |
| SB | southbound |
| TfL | Transport for London |
| TLN | Thameslink stations north of the core |
| TLS | Thameslink stations south of the core |
| TOC | Train Operating Company |
| tph | trains per hour |
| TSGN | Thameslink, Southern and Great Northern franchise operator |
| WB | westbound |

# Appendix B Thameslink Maps

B1. **Figure B1** shows the current Thameslink network as depicted on the Thameslink website at the time of writing. After December 2014 Thameslink services were diverted away from London Bridge due to the reconstruction works at the station (although some services did terminate there), as can be seen on the map. Before December 2014, there were few peak Thameslink trains serving London Bridge (this was due to capacity constraints).

B2. **Figure B2** shows the proposed network from 2018 from the GTR 2018 Timetable Consultation (consultation 15 September – 08 December 2016). This shows Thameslink services being extended to cover a wider area.

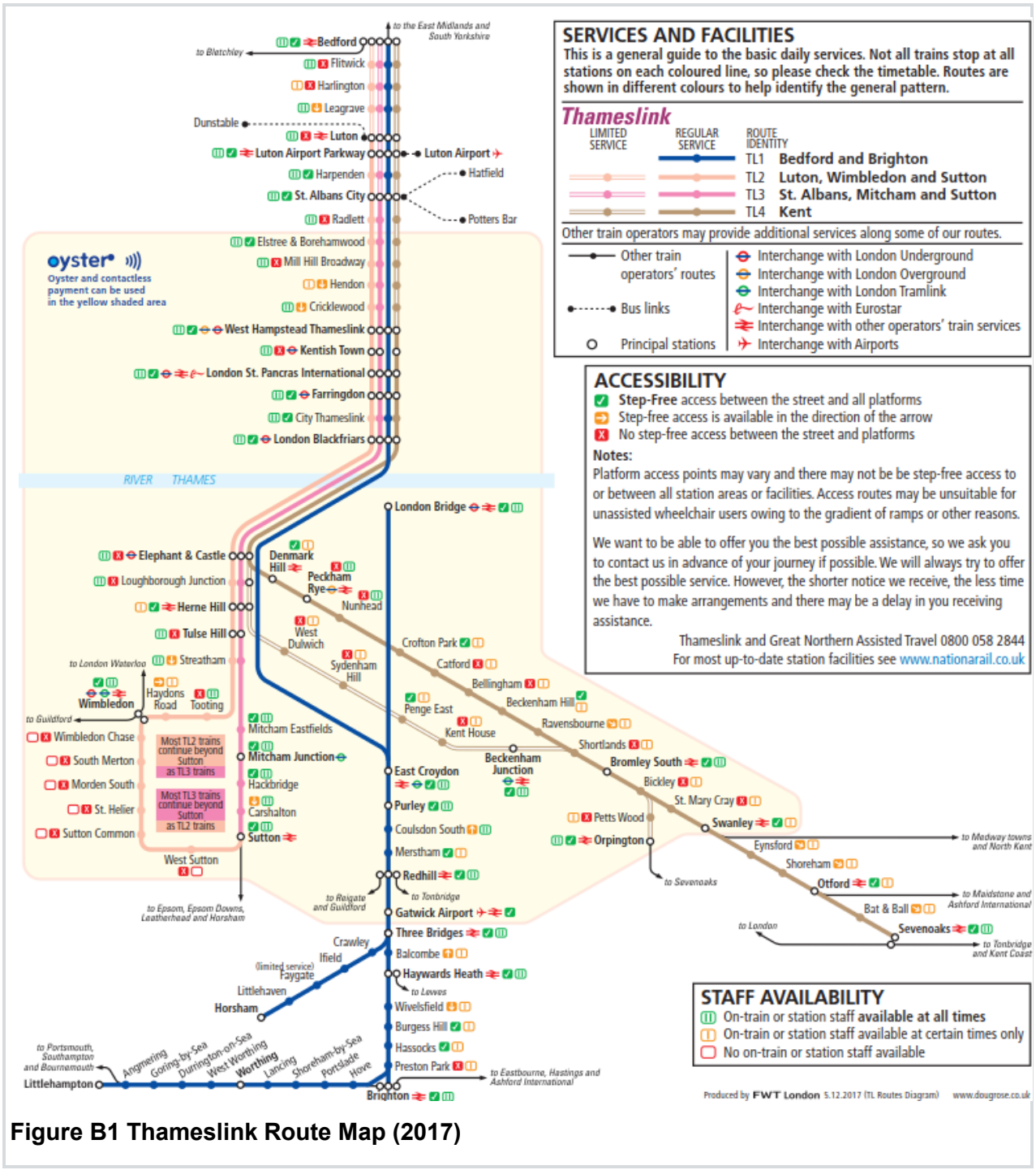


**Figure B1 Thameslink Route Map (2017)**

*Source: https://www.thameslinkrailway.com/destinations-and-offers/where-we-travel-to/our-routes* (as at 31st January 2018)

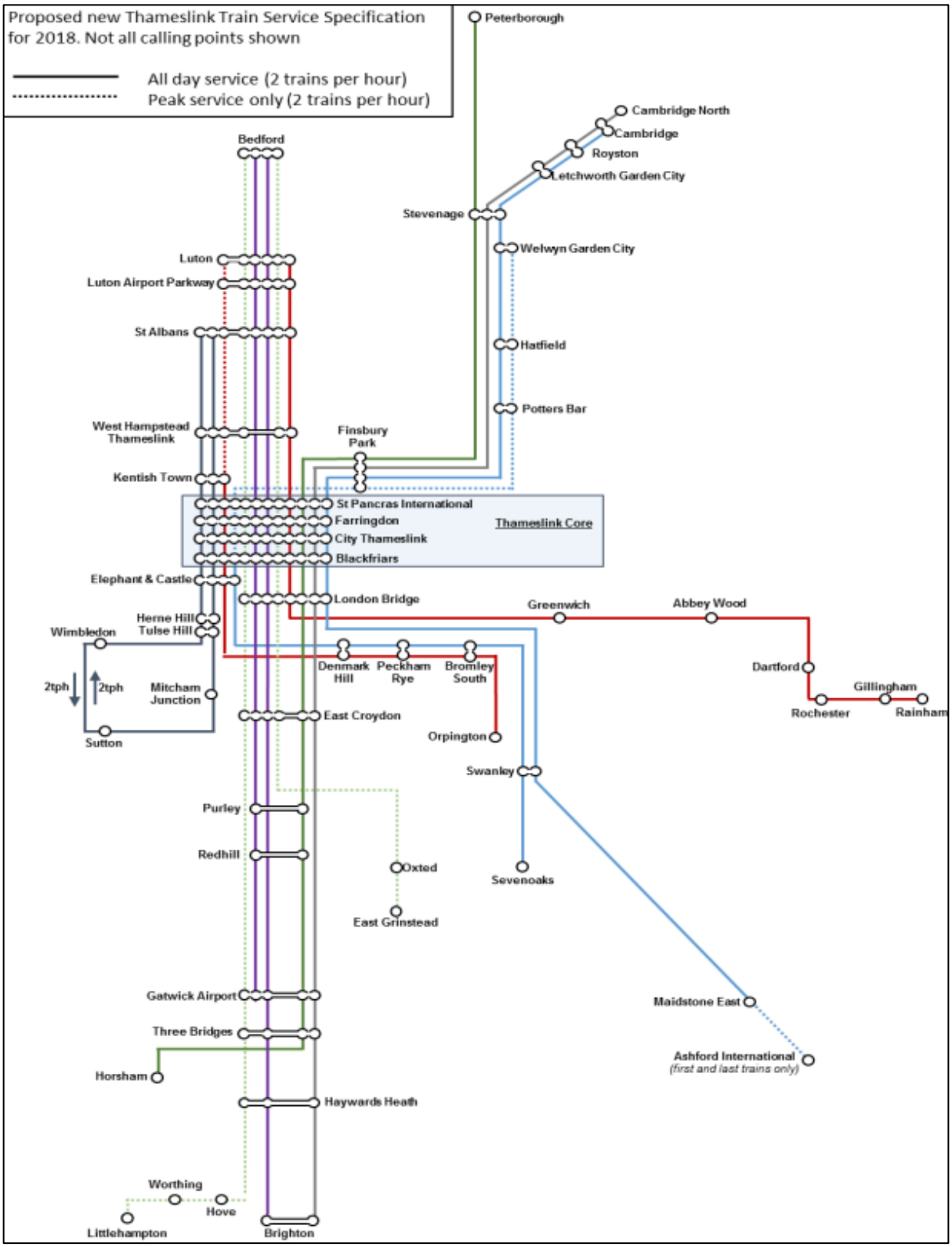


**Figure B2 Proposed Thameslink Route Map (2018)**

*Source: GTR 2018 Timetable Consultation (consultation 15 Sep. – 08 Dec. 2016)*

# Appendix C March 2017 Survey Questionnaire

*C1.* The survey questionnaire for St. Pancras International is presented in this appendix. The questionnaires were identical for the other stations in the core, except for replacing reference to St. Pancras International with the name of the survey station.

Department for Transport

# Thameslink Travel Survey

As part of the Thameslink Programme, the Department for Transport (DfT) is undertaking a travel survey to find out about journeys people make from this station. We would be grateful if you would tell us about the journey you were making when you were handed this questionnaire. For example, if you were on your way home from work we want to know about where you started your journey (work) and where you ended your journey (home).

This survey is being carried out by AECOM/Tracsis on behalf of the DfT under the Market Research Code of Conduct. All data will be securely stored and used only for transport planning purposes by DfT or its agents.

The questionnaire will only take 5 minutes to complete. When complete, please return it in the FREEPOST envelope provided or alternatively you can complete the survey online at www.thameslinksurvey.com.

*Please complete this questionnaire even if you recently filled in a similar one on a different day.*

If you have any queries about the survey please contact AECOM on FREEPHONE 0800 6528646. **PLEASE COMPLETE THE SURVEY AS SOON AS POSSIBLE.**

Please either tick the relevant box ☑ **or write in the appropriate answer e.g.** 15:37

## Section 1: Your journey to St Pancras International station

**Q1** **What type of journey were you making when you were handed this questionnaire?**

Single ☐1 Outward stage of a return journey ☐2 Return stage of a return journey ☐3

**Q2** **Which of the following options below best describes where you had just come from? Please do not answer with another station.** *Please tick one box only*

| | | | |
|---|---|---|---|
| Home | ☐1 | School/college (accompanying student) | ☐8 |
| Usual workplace | ☐2 | Taking someone to airport/ station etc | ☐9 |
| Other workplace/business | ☐3 | Meeting someone at airport/ station etc | ☐10 |
| Theatre/cinema/concert/sporting activity/ | | Personal business (e.g. doctor, bank) | ☐11 |
| Event/other social (e.g. restaurant/pub) | ☐4 | Sightseeing | ☐12 |
| Museum/exhibition | ☐5 | Hotel/guesthouse/visiting friends/relatives | ☐13 |
| Shopping | ☐6 | Other (please tick and write in) | ☐14 |
| School/college/university (as student) | ☐7 | | |

**Q3** **It would help us if you were willing to enter the address of the place where you started this journey THIS AFTERNOON/EVENING.** This information is used for station and train planning and will not be used for marketing purposes. Please give as much information as possible.

*Name of shop/hotel etc. (if appropriate)*

*House number and street*

*District/town*

*Postcode*

**Q4** **At which National Rail/ Underground/ DLR/ London Overground station did you get your first train/tube after leaving the place mentioned in Q3?** This may be St Pancras International, if that was your first station.

**Q5** **How did you get to the station mentioned in Q4 from the place where you started your journey in Q3?**
*Please tick all that apply*

- Car/Van dropped off ☐ 1
- Car/Van drove ☐ 2
- Bus ☐ 3
- Motorcycle ☐ 4
- Walked ☐ 5
- Cycled ☐ 6
- Taxi/private hire ☐ 7
- Air ☐ 8
- Other (please tick and write in) ☐ 9

**Q6** **Please write in the names of all National Rail/Tube/Underground/DLR/London Overground stations where you changed trains during your journey from the station in Q4 to St Pancras International station. Please also tick the type of service you changed to at that station.**
Please leave blank if you did not make any changes

| *First change at* | *Second change at* | *Third change at* |
|---|---|---|
| Tick service changed to: | Tick service changed to: | Tick service changed to: |
| ☐ National Rail (Incl Eurostar) | ☐ National Rail (Incl Eurostar) | ☐ National Rail (Incl Eurostar) |
| ☐ Tube/Underground | ☐ Tube/Underground | ☐ Tube/Underground |
| ☐ DLR | ☐ DLR | ☐ DLR |
| ☐ London Overground | ☐ London Overground | ☐ London Overground |

## Section 2: Your journey from St Pancras International station

**Q7** **At what time did the train you caught from St Pancras International leave? (24hr format i.e. 5pm would be 17:00)**

:

**Q8** **Please write in the names of all National Rail/Tube/Underground/DLR/London Overground stations where you change trains during your journey from St Pancras International station to your final station. Please also tick the type of service you change to at that station.**
Please leave blank if you did not make any changes.

| *First change at* | *Second change at* | *Third change at* |
|---|---|---|
| Tick service changed to: | Tick service changed to: | Tick service changed to: |
| ☐ National Rail (Incl Eurostar) | ☐ National Rail (Incl Eurostar) | ☐ National Rail (Incl Eurostar) |
| ☐ Tube/Underground | ☐ Tube/Underground | ☐ Tube/Underground |
| ☐ DLR | ☐ DLR | ☐ DLR |
| ☐ London Overground | ☐ London Overground | ☐ London Overground |

**Q9** **At which National Rail/Tube/Underground/DLR/London Overground station will you finish your journey THIS AFTERNOON/EVENING?**

**Q10** **When you arrive at your destination station (in Q9) how will you complete your journey to your final destination address?** *Please tick all that apply*

- Car/Van picked up ☐ 1
- Car/Van as driver ☐ 2
- Bus ☐ 3
- Motorcycle ☐ 4
- Walk ☐ 5
- Cycle ☐ 6
- Taxi/private hire ☐ 7
- Air ☐ 8
- Other (please tick and write in) ☐ 9

**Q11** **Why are you going there?**
*Please tick one box only*

- Home ☐ 1
- Usual workplace ☐ 2
- Other workplace/business ☐ 3
- Theatre/cinema/concert/sporting activity/ Event/other social (e.g. restaurant/pub) ☐ 4
- Museum/exhibition ☐ 5
- Shopping ☐ 6
- School/college/university (as student) ☐ 7
- School/college (accompanying student) ☐ 8
- Taking someone to airport/ station etc ☐ 9
- Meeting someone at airport/ station etc ☐ 10
- Personal business (e.g doctor, bank) ☐ 11
- Sightseeing ☐ 12
- Hotel/guesthouse/visiting friends/relatives ☐ 13
- Other (please tick and write in below) ☐ 14

**Q12** **It would help us if you were willing to enter the address of the place you are travelling to. This information is used for station and train planning and will not be used for marketing purposes.** Please give as much information as possible.

*Name of shop/hotel etc. (if appropriate)*

*House number and street*

*District/town*

*Postcode*

## Section 3: Ticket type

**Q13** What ticket type(s) were used for this journey?

**Oyster or contactless/Travelcards**

- Oyster/ contactless Pay As You Go [1]
- One Day Travelcard (anytime) [2]
- One Day Travelcard (off-peak) [3]
- 7 Day Oyster/ contactless/ Travelcard /Season Ticket [4]
- Monthly Oyster/Travelcard /Season Ticket [5]
- Annual Oyster/Travelcard /Season Ticket [6]
- Other length Travelcard /Season Ticket [7]
- 16+ Zip Oystercard [8]
- 18+ Student Oystercard [9]
- 60+ Rail Card [10]

**Paper Tickets**

- Single ticket [11]
- Return ticket [12]
- Extension ticket [13]
- Privilege pass [14]

**Passes**

- Elderly Freedom Pass [15]
- Disabled Freedom Pass [16]
- TfL/Network Rail Staff/nominee staff [17]
- Police pass [18]
- Travelling using National Rail only [19]

Other (please write in below)

**Q14** Travelcard users only, otherwise go to Q15.
Please tick ALL zones covered by your Travelcard.

Zone 1 ☐ Zone 2 ☐ Zone 3 ☐ Zone 4 ☐ Zone 5 ☐ Zone 6 ☐ Zones 7,8,9 ☐

**Q15** If the journey you are answering about does not start or finish at home, please write in your home postcode.

## Section 4: Background information

**Q16** How often do you make this particular journey?

- 5 or more days a week [1]
- 1-4 days a week [2]
- Once a fortnight [3]
- Once a month [4]
- Less than once a month [5]
- First time ever [6]

**Q17** Which of these age groups are you in?

- Under 16 [1]
- 16-19 [2]
- 20-24 [3]
- 25-34 [4]
- 35-44 [5]
- 45-59 [6]
- 60-64 [7]
- 65-70 [8]
- 71-74 [9]
- Over 74 [10]

**Q18** Are you...?

- Male [1]
- Female [2]
- Prefer not to say. [3]

**Thank you for taking the time to complete this questionnaire.**

The questionnaire is to be returned in the envelope provided. If you lose your envelope please send the completed questionnaire to the below address (NO STAMP IS REQUIRED) or you can complete online at : www.thameslinksurvey.com **PLEASE COMPLETE THE SURVEY ASAP**

**Freepost RTCU – LLTT – UHJA**
**AECOM Limited**
**AECOM House**
**179 Moss Lane**
**Altrincham**
**HALE**
**WA15 8FH**

Please be assured that your responses will be treated as strictly confidential and used by DfT for planning purposes only.

**THANK YOU FOR YOUR HELP**

# Appendix D March 2017 Survey Method

## Introduction

D1. As part of the Thameslink Programme Baseline Evaluation, surveys and counts were carried out at the four stations in the Thameslink core:

- St. Pancras International (Monday 6th March);
- Farringdon (Tuesday 7th March);
- City Thameslink (Wednesday 8th March); and
- Blackfriars (Thursday 9th March).

D2. This appendix provides a brief overview of the survey approach. An example of the survey questionnaire used at St. Pancras International has been provided in **Appendix C** of this report. The data were collected through self-completion questionnaires distributed to passengers entering Thameslink station platforms to board a Thameslink train in the afternoon/evening (1530 – 1930).

D3. 2042 questionnaires were returned, nearly all of which were returned by post, with a negligible number completed via an on-line option (13 responses).

## Approach

D4. The questionnaire distribution involved surveyors handing out reply paid envelopes containing the questionnaire to passengers boarding both northbound and southbound Thameslink services at each of the four stations. Two teams of three surveyors (three per direction northbound or southbound) completed this task. They were positioned so as to minimise any disruption to the main passenger flow. Surveyors recorded the number of questionnaires handed out for each 15 minute period.

D5. In order to achieve a representative sample of individuals, surveyors were instructed to distribute the forms randomly to adult station users (aged over 16). Surveyors handed out questionnaires to those willing to take one (they did not ask for age). Each questionnaire had a unique serial number and was assigned a hand-out time (in fifteen minute time bands from 1530 to 1930) which was recorded on hand-out control sheets.

D6. In addition, boarding counts were carried out by two teams of eight surveyors (8 per platform) during the same four hour period. The surveyors were spread along the platform and out of the way to minimise any disruption to the passenger flow to/from departing and arriving trains.

D7. As the surveys were undertaken between 1530 and 1930, they will typically have intercepted passengers' home-bound and return journeys (assuming there was an outbound journey earlier in the day). As such, the end destination for a large proportion of these journeys was expected to be 'home'. The survey (and hence the questionnaire) was targeted at boarders in the evening peak (i.e. those getting on a train departing from the survey station).

### Response Rates

D8. Survey response rates by station are shown in **Table D1**. Overall, just over 9,300 questionnaires were handed out and 2,042 questionnaires had been returned by the cut-off date (28th March 2017), giving an overall response rate of 22%. 75 of the questionnaires (3.7%) did not contain a valid departure time; it was either missing or was before or after the survey took place so these were excluded from the analysis. In addition, 75 responses where the origin and destination were the same were filtered out (3.7%). The number of valid responses was therefore 1,892.

**Table D1 Survey response rates**

| | St. Pancras International | Farringdon | City Thameslink | Blackfriars | Total | *As % of total boarders* |
|---|---|---|---|---|---|---|
| a Total number of boarders | 10,535 | 13,160 | 10,662 | 10,723 | **45,080** | *100.0* |
| b Total number handed out | 2,663 | 2,590 | 1,530 | 2,518 | **9,301** | *20.6* |
| c Total number of returned questionnaires | 595 | 543 | 441 | 463 | **2,042** | *4.5* |
| d Missing/outside range | 45 | 42 | 28 | 35 | **150** | *0.3* |
| e Valid questionnaires | 550 | 501 | 413 | 428 | **1,892** | *4.2* |
| Response rate % (c/b) | -22% | 21% | 29% | 18% | **22%** | |
| Average Expansion Factor (a/e) | 19.15 | 26.27 | 25.82 | 25.05 | **23.82** | |

### Weighting

D9. Over the survey period the number of boarders was 45,080, generating an average expansion factor of 23.82. To generate the weights (expansion factors) boarding counts were compiled for each survey station by quarter hour period, and by direction (northbound or southbound). For example at St. Pancras International, 159 passengers were counted boarding southbound services between 15:30 and 15:45. The survey had 5 valid returns in this direction/period. The weight or expansion factor was therefore 159/5=31.8. **Table D2** shows the quartile range, mean, minimum and maximum for each expansion factor by station and overall.

**Table D2 Distribution of expansion factors by station and overall**

| | St. Pancras International | Farringdon | City Thameslink | Blackfriars | Total |
|---|---|---|---|---|---|
| Minimum | 5.8 | 4.8 | 11.3 | 6.5 | 4.8 |
| 25% | 15.2 | 19.3 | 15.7 | 17.4 | 15.7 |
| Median | 18.1 | 25.6 | 20.1 | 23.8 | 20.4 |
| 75% | 21.1 | 30.5 | 26.2 | 30.7 | 27.8 |
| Maximum | 96.0 | 82.0 | 207.0 | 93.5 | 207.0 |
| Mean | 19.2 | 26.3 | 25.8 | 25.1 | 23.8 |
| **Total sample size** | **550** | **501** | **413** | **428** | **1892** |

London Bridge station, December 2017
Source: Network Rail Media Centre
www.networkrailmediacentre.co.uk/resources

AECOM Limited
Aldgate Tower
2 Leman Street
London E1 8FA
United Kingdom
aecom.com

Thameslink Programme Evaluation: Baseline Report
Final Report to DfT, March 2018