



RIVER CROSSINGS: SILVERTOWN TUNNEL

SUPPORTING TECHNICAL DOCUMENTATION

OUTLINE BUSINESS CASE

Jacobs / Transport for London

October 2014

The Silvertown Tunnel Outline Business Case has been prepared in accordance with transport scheme business case guidance published by the Department for Transport. It sets out the evidence for intervening in the transport system to address the issues of congestion and road network resilience at the Blackwall Tunnel. It looks at the alternative options considered and why a new bored tunnel at Silvertown, with traffic demand managed by a user charge, provides the best solution. The economics of providing the new tunnel are appraised along with outline details of how TfL will finance, procure and manage the project.

This report is part of a wider suite of documents which outline our approach to traffic, environmental, optioneering and engineering disciplines, amongst others. We would like to know if you have any comments on our approach to this work. To give us your views, please respond to our consultation at www.tfl.gov.uk/silvertown-tunnel

Please note that consultation on the Silvertown Tunnel is running from October – December 2014.



This report (or note) forms part of a suite of documents that support the public consultation for Silvertown Tunnel in Autumn 2014. This document should be read in conjunction with other documents in the suite that provide evidential inputs and/or rely on outputs or findings.

The suite of documents with brief descriptions is listed below:-

- **Silvertown Crossing Assessment of Needs and Options**

This report sets out in detail, the need for a new river crossing at Silvertown, examines and assesses eight possible crossing options and identifies the preferred option.

- **Outline strategy for user charging at Blackwall and Silvertown Tunnels**

This note sets out TfL's emerging approach to charging at Blackwall and Silvertown Tunnels.

- **Silvertown Tunnel Traffic Forecasting Report**

This report presents the traffic impacts that the Silvertown Tunnel would have on the highway network.

- **Silvertown Tunnel Introductory Transport Assessment**

This report presents the existing transport network and travel demand and assesses the transport impacts of the proposed Silvertown Tunnel.

- **Silvertown Tunnel Outline Business Case, including:**

- **Economic Assessment Report**
- **Distributional Impact Appraisal**
- **Social Impact Assessment**

Sets out the evidence for intervening in the transport system to address the issues of congestion and road network resilience at the Blackwall Tunnel.

- **Silvertown Tunnel Introductory Environmental Assessment Report**

This report summarises the environmental work undertaken to date and presents an early indication of the potential impacts of the proposal and the mitigation measures being considered.

- **Silvertown Tunnel Introductory Equalities Impact Assessment Report**

This report presents an early indication of the potential impacts of the proposal on gender, race and age groups. It also outlines potential mitigation measures to encourage a positive impact.

- **Silvertown Tunnel Introductory Health Impact Assessment Report**

This report presents an early indication of the potential impacts of the proposal on health and wellbeing. It also outlines potential mitigation measures to encourage a positive impact.

Transport for London



Silvertown Tunnel Outline Business Case

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CONTENTS

Executive Summary	4
1. The Approach to the Business Case	16
2. The Strategic Case	21
3. The Economic Case.....	64
4. The Financial Case.....	81
5. The Commercial Case	83
6. The Management Case	85
7. Conclusion	91

Executive Summary

Purpose of this report

1. Transport for London (TfL) is proposing to construct a new tunnel under the River Thames between the Greenwich Peninsula and Silvertown (“the Silvertown Tunnel”).
2. This report is the Outline Business Case for the scheme which is presented in accordance with the DfT’s Business Case Guidance.
3. The guidance stipulates an approach using a five case model to developing transport business cases which considers whether the scheme:
 - is supported by a robust case for change that fits with wider public policy objectives – the ‘strategic case’;
 - demonstrates value for money – the ‘economic case’;
 - is commercially viable – the ‘commercial case’;
 - is financially affordable – the ‘financial case’; and
 - is achievable- the ‘management case’.

The Proposed Scheme

4. The Silvertown Tunnel will be a twin-bored road tunnel providing a new connection from the Blackwall Tunnel Southern Approach on the Greenwich Peninsula to the Tidal Basin roundabout in the Royal Docks area – see Figure E 1. Unlike the existing northbound bore of the Blackwall Tunnel it will be able to accommodate vehicles of height up to 5m, including double decker buses.

E 1 Silvertown Tunnel location

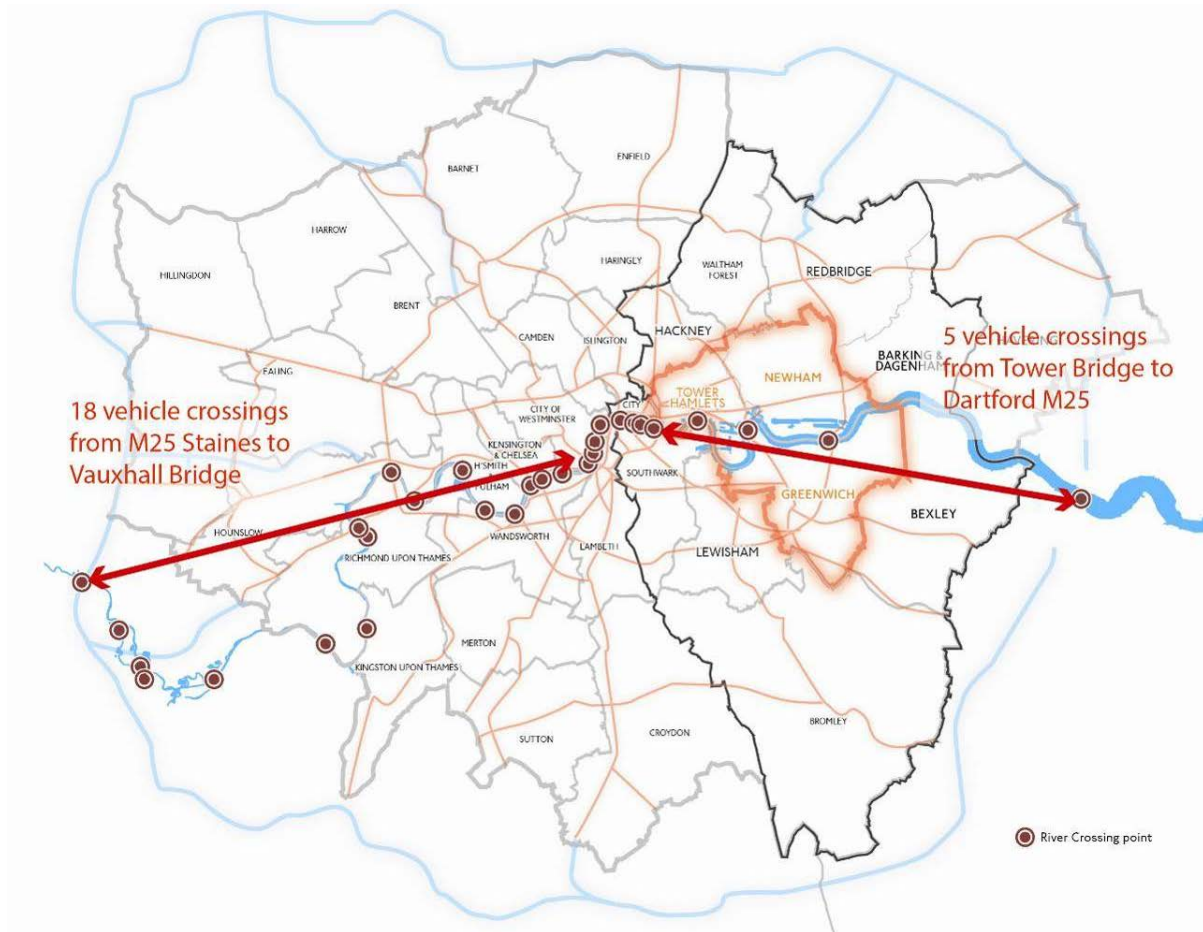


5. New junctions will be built to link the tunnels into the existing road network, and new portal buildings to house the infrastructure necessary to operate the tunnel, including ventilation equipment.

The Strategic Case

6. A new road crossing at Silvertown has extensive national, London-wide and local policy support. In particular it is a project identified in the London Plan and the Mayor's Transport Strategy (MTS), and has been designated a Nationally Significant Infrastructure Project by the Secretary of State for Transport under section 35 of the Planning Act 2008.
7. The Draft National Policy Statement for the National Road and Rail Networks states "*Transport is an engine for growth. Well-connected and high performing road and rail networks with sufficient capacity are vital to meet the country's long term needs and support a prosperous economy.*" By inference the lack of such connections and capacity is a barrier to economic growth, and the Silvertown Tunnel is regarded as an important addition to connectivity in east London.
8. The historical development of east London has resulted in few road-based river crossings, and this has led to the focus of road travel on the few crossings and routes leading to them. The net effect has been to concentrate traffic wishing to cross the river in east London at these places, resulting in very high usage of the crossings.
9. London Thames Gateway is one of the most deprived areas not only in London but also in the UK; and the lack of adequate road transport connections and capacity is a major barrier to the accommodation of population and economic growth which is forecast for south and south east London.
10. The London Plan addresses the potential of London's Thames Gateway to deliver substantial growth and the accommodation of that growth. The Plan designates 12 Opportunity Areas in east London, together covering 9,000 hectares of land, which have capacity for 200,000 jobs and 120,000 homes. To bring forward development on this scale requires substantial infrastructure investment. With regard to transport there has been extensive investment in rail public transport in recent times including extensions to the Docklands Light Rail, the creation and expansion of London Overground and Crossrail which is currently under construction. By contrast, however, similar levels of investment have not been made in respect of the road network.
11. There are only three road vehicle crossings of the River Thames in London east of Tower Bridge (the Rotherhithe and Blackwall Tunnels and the Woolwich Ferry) – see Figure E2. Each crossing suffers from capacity restrictions leading to delays and unreliability issues not only on the crossings themselves but also on the surrounding local road network. In addition the tunnels have vehicle size constraints and dangerous goods restrictions necessitating long diversions for some freight vehicles and severely limiting cross river bus services. The latter constraint has a significant impact on the size of labour catchment areas, as outside central London the bus is by far the most important public transport mode, carrying over 2 billion trips a year.

E 2 Road river crossings to the west and east of London



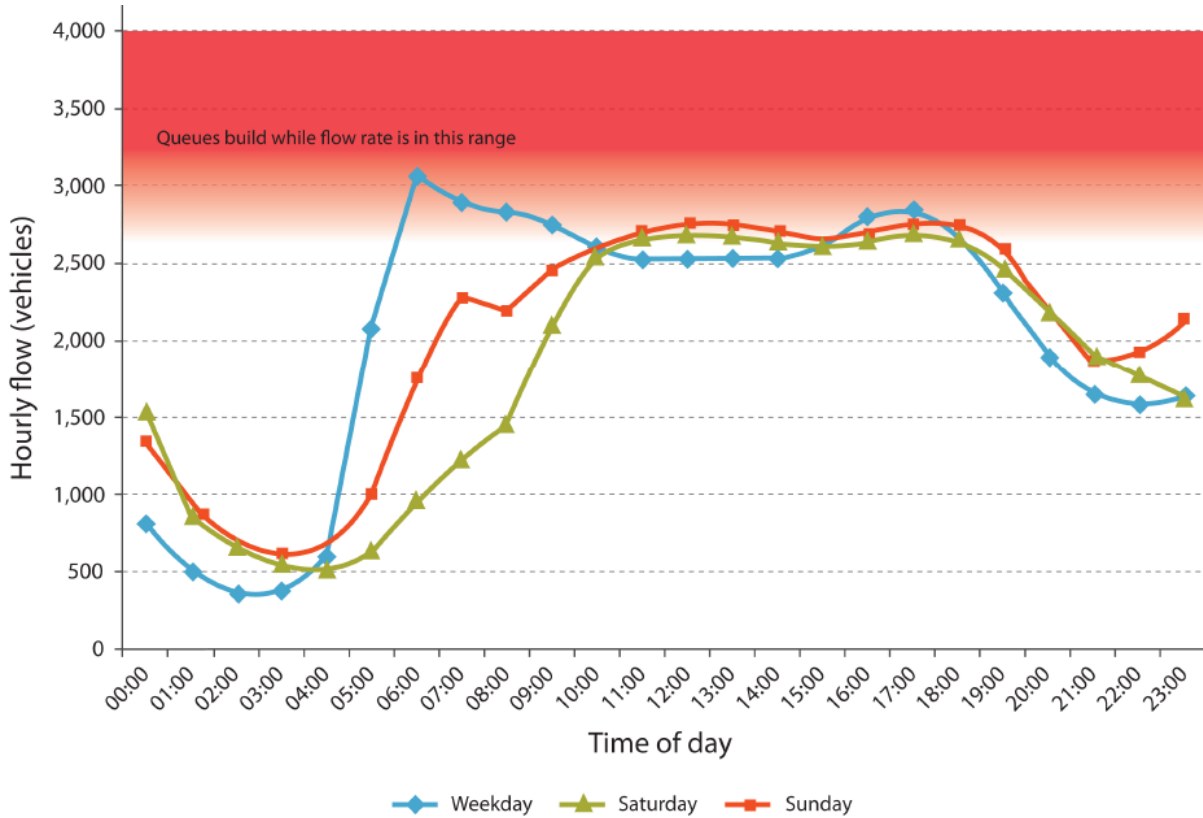
12. Of the three crossings the most important is the Blackwall Tunnel which provides over two thirds of cross river vehicle capacity; it also suffers from the highest level of congestion and reliability problems. Both Blackwall Tunnel bores carry more vehicles daily than was intended when they were built, and severe congestion is a result (see E3). Their restricted size means that not all large vehicles can fit through them. Over-size vehicles have to be stopped and turned away resulting in delays to other traffic.

E 3 Queuing at the Blackwall Tunnel



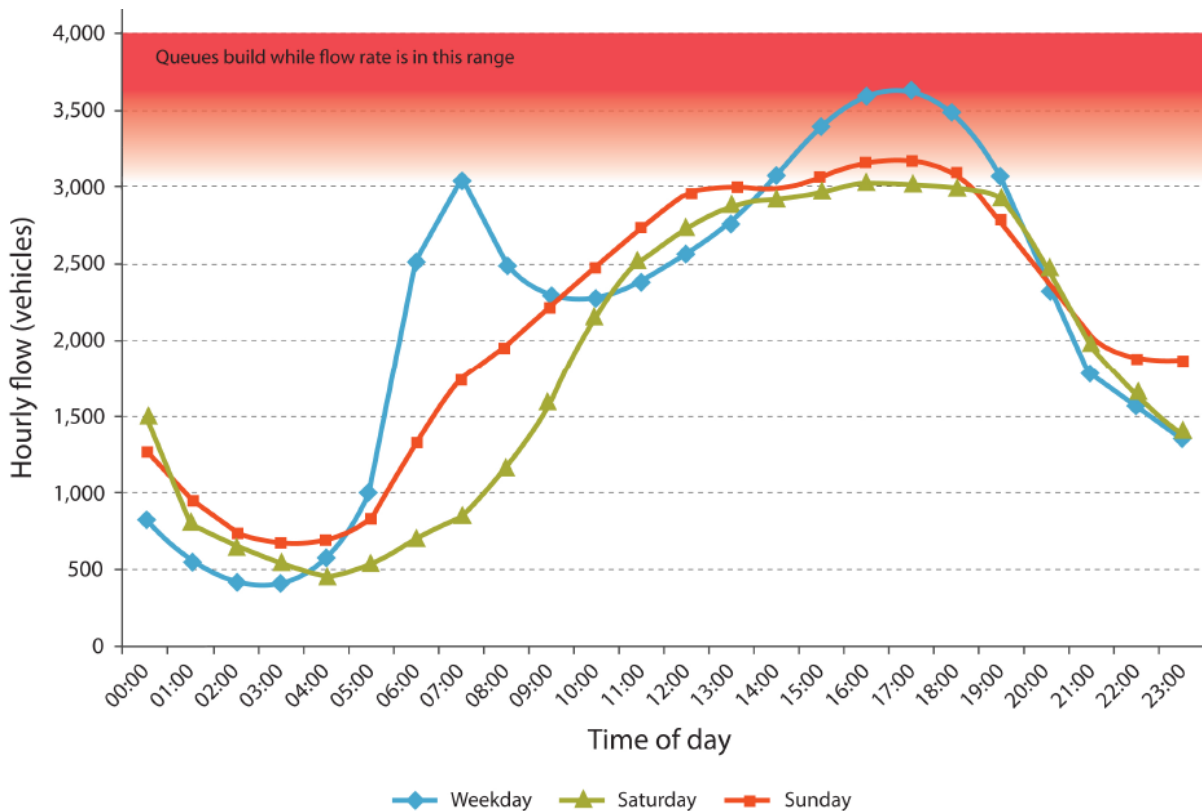
13. The charts below (E 4 and E 5) show the use that is currently made of the tunnel in each direction during an average weekday, indicating how demand regularly exceeds the optimal operational capacity of the tunnel. The Blackwall Tunnel and its approaches are also amongst the most congested roads in London, with estimated costs to motorists of the congestion of some £17.5m per year¹. There are regular delays of 20 minutes (often more) in the peak hours for cars, freight, coaches and buses.

E 4 Blackwall Tunnel flow (northbound) average hourly flows by time of day



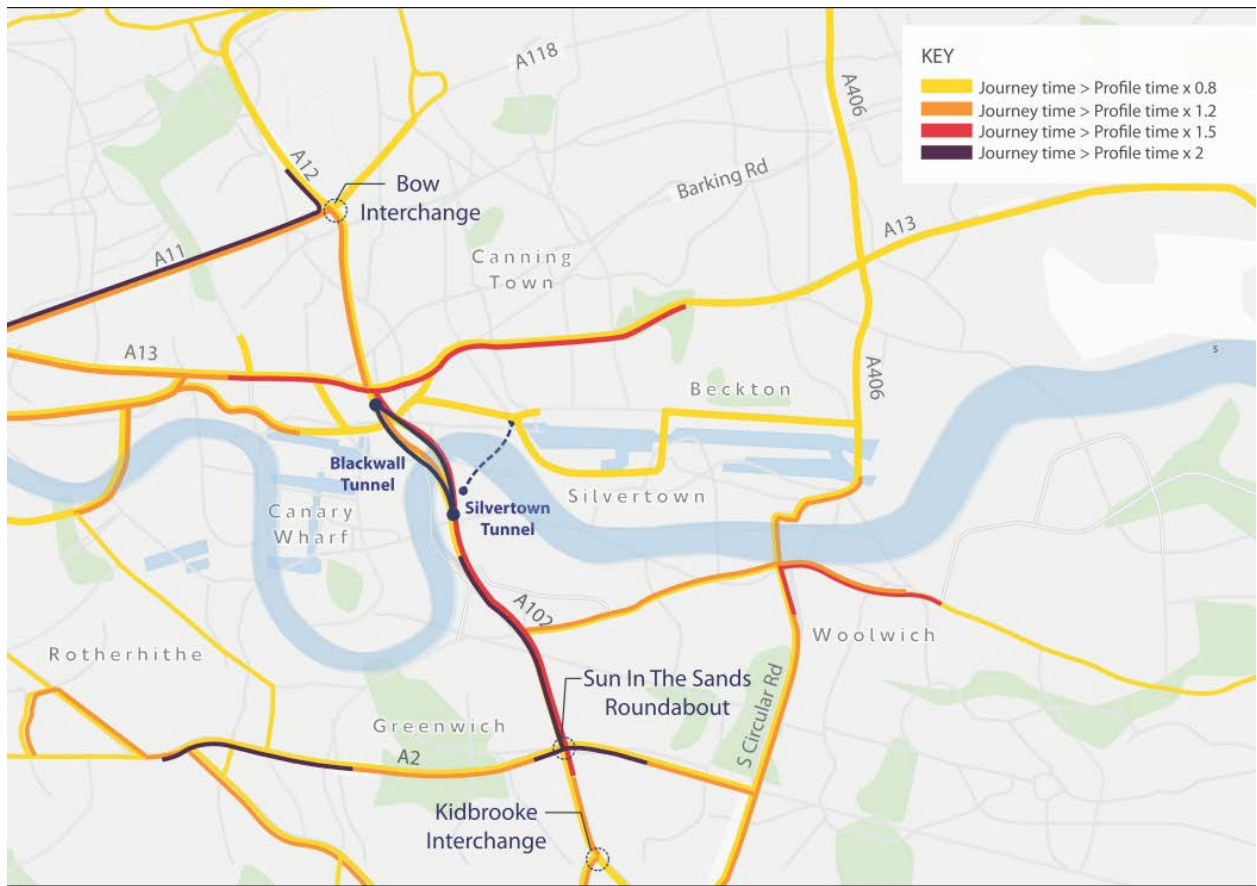
¹ TfL analysis – this excludes impact on the wider network

E 5 Blackwall Tunnel flow (southbound) average hourly flows by time of day



14. Delays are caused not only by an excess of demand, but also by the need to close the Blackwall Tunnel at short notice for a variety of reasons, from obstruction by over-height vehicles to break downs and debris on the road. A detailed log records the time, duration and type of every incident in the tunnels and on the immediate approaches. During 2013 there were only 10 days with no recorded incidents northbound and 35 days when no southbound incidents were recorded. In addition to the estimated £17.5 m in annual congestion costs referred to above, total incidents alone in the tunnel or its approaches are estimated to have caused 160,000 hours of delays to vehicles in 2013 at an economic cost well in excess of £1.5m.
15. The result can be traffic delays over a wide area, both north and south of the River Thames. A consequence of this is that vehicles in the wider area get delayed and gridlock can result. Diversion of traffic creates problems at other crossings such as the Woolwich Ferry. The road network in east and southeast London suffers because of a lack of resilience at the river crossings, which is primarily due to the lack of convenient, alternative ways to cross the river when problems occur. This makes the areas affected less attractive places for business and residents.
16. The figure below shows the extent of the network affected by one example, a relatively short closure of the northbound tunnel bore (9 minutes) to deal with a loose tunnel panel at 6.46 am on 11 September 2014. The queuing extended further back than the Sun in the Sands junction as far back as the A2 Kidbrooke Interchange, with journeys on the A13 also affected (see figure E6). Additional delays were experienced until 9.14 am, when traffic levels had returned to normal and journey times reverted to what would normally be expected.

E 6 Journey times in the Blackwall area at 6.46am following an incident



17. In addition to the above problems of congestion and resilience, the current Blackwall Tunnel has no cross-linking passages to provide a means of evacuation in the event of a fire in the Tunnel. There is a risk that a major tunnel fire (or other serious incident) could result in the closure of one bore for a considerable length of time (or possibly permanently). There is also a need to provide a road river crossing which has a full height capability for vehicles, particularly HGVs and double-decker buses.
18. The existing cross-river road problems also affect bus and coach travel. Bus travel is the dominant public transport mode in outer London. There are 47 bus routes which cross the river west of Vauxhall Bridge and only a single route crossing the river east of Tower Bridge – this route is subject to delays and reliability problems due to congestion and incidents. Cross-river bus services in east London therefore face two barriers (i) congestion and unreliability impacting journey times and costs (ii) physical restrictions on crossing options. With a new crossing at Silvertown that is free of these constraints there is the opportunity to recast services in the area to radically improve cross river journeys opening up access to employment, shopping and leisure services.

TfL have identified a number of corridors where new bus connections could be made via the tunnel.

19. In addition the Blackwall Tunnel is very important for coach use, in particular peak commuter coach trips to Canary Wharf and Central London (there are some 59 coach services scheduled to use the Tunnel between 0730 am and 0830 am on weekdays)². In total an estimated 19% of total person trips at the Blackwall Tunnel in the morning peak hour are travelling by public transport, the vast majority in the northbound direction. The coaches suffer from the existing congestion and reliability problems at the Blackwall Tunnel.
20. In relation to economic activity a survey of businesses in the local area³ found that they (i) value improvements to cross-river journeys (64% of firms regard this as important to the successful operation of their business) (ii) are not satisfied with current crossing options (only 18% agreeing or strongly agree these are adequate) (iii) are concerned about the constraints and disruptions placed on their business by poor reliability of cross-river journey times and (iv) a third of businesses see the river as a barrier to the development of their business
21. A summary of the current issues is that the combination of high road cross-river demand, lack of capacity and incidents leads to severe current problems for the travelling public and businesses, with long delays, unpredictable journey times and hence high travelling costs. These circumstances also impact on current bus and coach services and constrain the ability to increase these.
22. In the context of these current issues, change is required. However when the future growth plans for east London, and its importance in the future development of London as a whole is taken into account, the case for change is even stronger.
23. Analysis shows that the numbers travelling by private vehicle continues to grow due to population growth (despite car mode share decreasing across London), while demand for freight movement in London will continue to increase over the medium to long term as will the trend in the use of smaller vans for servicing and delivery. A development study ⁴ looking at possible development impacts of a new Silvertown crossing found there is potential capacity for over 243,000 residential units, 2.5 million square metres of commercial space, 440,000 square metres of retail space and 1 million square metres of leisure floorspace within the local catchment area. The bulk of this capacity is on the north side of the river so demand for cross-river trips from south to north would increase as the development progresses.
24. In addition the study found that there will be a net positive impact across the study area, with the average number of additional jobs accessible within 37 minutes (the average travel to work time) increasing by 64,000 compared to the reference case. Most of the Borough of Greenwich, as well as large sections of southern Bexley, will see the greatest increase in access to jobs.

² Silvertown Tunnel Transport Assessment, TfL, 2014

³ Business Survey, WSP, May 2014

⁴ Atkins: River Crossings Development Study – Final Report, , June 2014

25. The conclusion of the case for change is that the existing river crossings in east London do not cater adequately for current cross-river road traffic movement; they are operating at or over capacity and there are severe resilience problems, particularly at the Blackwall Tunnel. While rail based public transport, walking and cycling are important sustainable modes of travel actively encouraged by the London Plan and the MTS, efficient travel by road, (including local bus services) is also vital for the proper functioning of the London Thames Gateway area and to enable the accommodation of the growth predictions for significant increases in road travel and congestion in the area. A road transport solution to relieve congestion and improve resilience in the vicinity of the Blackwall Tunnel is needed now and to ensure that the significant growth planned in the area can be catered for and supported.
26. The Mayor and TfL have identified possible options to address the problem of poor cross river connectivity and capacity in east London and have shortlisted those which meet the overall policy in the London Plan and the MTS, are considered to be practical to construct, are environmentally acceptable, are in suitable locations, and are likely to be affordable.
27. This Outline Business Case examines the reason for intervention, possible solutions and the costs and benefits of the preferred option. While entitled the 'Silvertown Tunnel Outline Business Case' by reference to the preferred option, a detailed examination of a range of options located between Greenwich and Woolwich has been undertaken in prior work on the River Crossing Programme including, extensive public consultation.

The Economic Case

28. The economic consequences of the preferred option of a bored tunnel at Silvertown have been assessed. It is proposed to introduce a user charging regime on both the Silvertown and Blackwall tunnels to manage overall demand and help pay for the new crossing.
29. A benefit cost analysis for the Silvertown Tunnel has been produced based on costs and an assessment of benefits⁵. Over the 60-year appraisal period, the project is estimated to result in an overall net benefit of £621m (net present value, in 2010 prices), with a Benefit Cost Ratio of 1.7. The scheme is largely self-funded by user charges and the economic case is very positive, with the scheme being clearly very good value for money.
30. In addition to the above benefits, there are substantial additional wider economic benefits not yet fully assessed – these are in relation to the jobs and housing development enabled by the scheme, agglomeration, movement to higher value jobs and additional savings to businesses. Initial indications are that such benefits could potentially double the existing level of benefits described above – these will be

⁵ Silvertown Tunnel, Economic Assessment Report, TfL, 2014 – Appendix B to this report

described in detail in the Full Business Case accompanying the Development Consent Order (DCO).

The Financial Case

31. The Financial Case sets out the project cost, the funding available to deliver the scheme and the proposed financing arrangements.
32. The project has an estimated cost of £753m (out-turn prices), although further design work is being undertaken which may see this figure revised. When optimism bias is included, the total cost is £926m (out-turn prices)– following guidance, this has been used in the economic analysis (after adjustment to a 2010 price base as required by TUBA).
33. Once built, it is estimated that operations and maintenance will cost £2.5–3.0m per annum (in current prices). A further £18–20m will need to be invested roughly every ten years on lifecycle spend.
34. TfL will fund the project directly up to contract award. TfL then propose to use private finance to deliver the Silvertown Tunnel project via a privately financed solution as the project has characteristics which make it a suitable candidate for delivery via this approach.
35. As part of the project, it is proposed that road user charging is introduced on both Blackwall and Silvertown tunnels and TfL expects that revenue collected will over time cover the cost of the scheme and may also play a part in funding other future transport investment in east London.

The Commercial Case

36. This sets the commercial structure, the accounting treatment and procurement approach for the project.
37. TfL propose to deliver Silvertown tunnel by entering into a long term agreement with a private sector party who would be responsible for the detailed design, construction, finance and maintenance (DBFM) of the new tunnel for around 30 years. In return for the private sector taking on these risks, a series of payments would be made to the private sector from TfL's general funds.
38. TfL would control the day to day operation (traffic management) of Silvertown Tunnel and the Blackwall Tunnel would continue to fall under existing operations and maintenance arrangements. TfL would also control setting the user charges and revenue collection on both Silvertown and Blackwall Tunnels.
39. An initial assessment of the likely accounting treatment of the proposed commercial structure under ESA95/10 indicates that the project is likely to be treated as “off budget” and therefore liabilities would not score towards TfL borrowing.
40. The DBFM contract would need to be competitively tendered via EU compliant means in the Official Journal of the European Union (OJEU).

The Management Case

41. The purpose of the Management Case is to assess whether a proposal is deliverable. It reviews evidence from similar projects, sets out the project planning, governance

structure, risk management, communications and stakeholder management, benefits realisation and assurance.

42. TfL has extensive experience in developing, promoting and implementing significant infrastructure projects. This ranges from modifications to existing infrastructure (such as London Underground or DLR) to major schemes such as Crossrail.
43. The Development Consent Order (DCO) process that will be used for Silvertown Tunnel is a relatively new procedure. While much of TfL's project development experience will be transferrable to this scheme, there will be a need to seek additional support as required.
44. The Silvertown Tunnel project is part of the east London River Crossings Programme sponsored by the Managing Director of TfL Planning.

45. The current anticipated key milestones for the project are shown below.

Milestone Description	Date ⁶
Silvertown Tunnel Non-Statutory Consultation	October/December 2014
Silvertown Tunnel Statutory Consultation	Summer 2015
Silvertown Tunnel DCO Submission	End 2015
Silvertown Tunnel Opens	2022

46. Any changes to baseline scope, cost and schedule will be reviewed, impact assessed and approved following the change control process.

Conclusions

47. The recommendation of the Outline Business Case is that a bored tunnel be progressed as the preferred option in this consultation. The responses to the five key questions raised in the guidance can be summarised as follows:

- there is a clear robust **case for change** for a new tunnel at Silvertown, to address current congestion and unreliability and to cater for the needs of future population and economic growth. This 'strategic case' is closely related to national, London-wide and local road policy objectives, with a particular reference to the London Plan and the Mayor's Transport Strategy
- the analysis demonstrates that the scheme is excellent **value for money** – it has a high net present value (some £620m) and is a scheme that can be delivered and funded by user charges
- is **commercially viable** – thereport sets out the procurement, commercial structure, and proposed allocation of risk and payment mechanisms for the project
- is **financially affordable** – in the 'financial case'; the analysis sets out the project cost, describes the private funding mechanism available to deliver the scheme and the proposed financing arrangements including the accounting treatment and
- is **achievable**- the 'management case' sets out a clear governance, process and programme for the further development of the scheme by TfL, an authority with a very successful experience and record in major project delivery

48. While the Outline Business Case has reported on the majority of the likely impacts of the scheme, further work is required on the air quality, noise and social/distributional impacts in any future Full Business Case. In addition this further work will elaborate on

⁶ Subject to tender returns and DCO process.

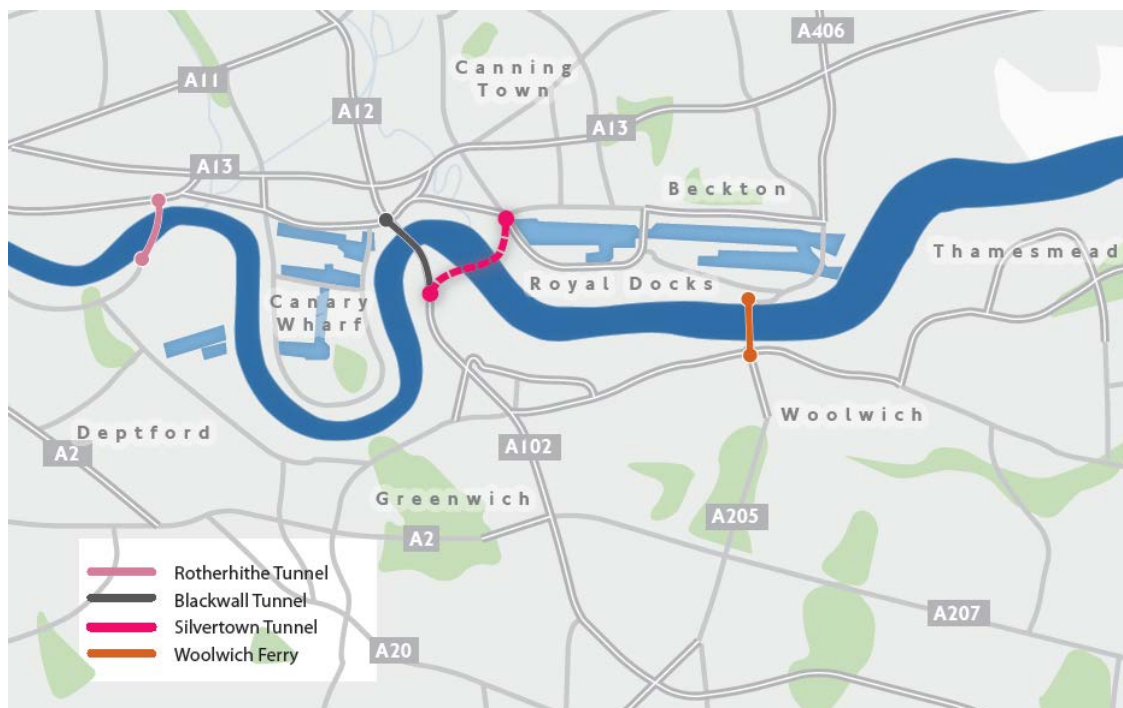
the potential commercial case and charging policy and various sensitivity tests. This work will be undertaken prior to the statutory consultation starting in summer 2015.

1. The Approach to the Business Case

Introduction

- 1.1. Transport for London (TfL) is proposing to construct a new bored tunnel under the River Thames between the Greenwich Peninsula and Silvertown to relieve the current congestion and resilience issues at the Blackwall Tunnel and to cater for future growth – the Silvertown Tunnel. This report is the Outline Business Case for the project, and the figure below shows the proposed location of the Silvertown Tunnel, situated in east London adjacent to the existing Blackwall Tunnel.

Figure 1-1 Silvertown Tunnel location



The Five Case Model

- 1.2. The purpose of a business case is to provide evidence-based information in relation to investment programmes. Guidance for the preparation of Business Cases for Transport Schemes has been published by the DfT⁷. This is based on H.M. Treasury’s advice on evidence-based decision making as set out in the Green Book⁸ and uses the best practice five case model approach.

⁷ See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf - accessed 5 September 2014

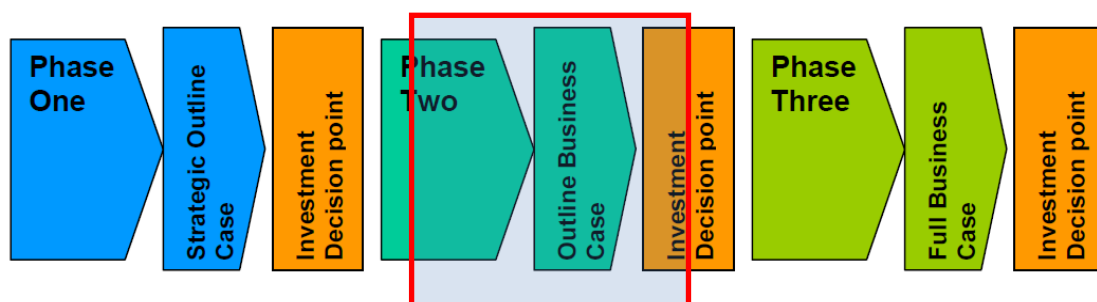
⁸

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf accessed 5 September 2014

- 1.3. This approach assesses whether schemes:
- are supported by a robust case for change that fits with wider public policy objectives – the ‘**strategic case**’;
 - demonstrate value for money – the ‘**economic case**’;
 - are commercially viable – the ‘**commercial case**’;
 - are financially affordable – the ‘**financial case**’; and
 - are achievable – the ‘**management case**’.
- 1.4. The evidence gathered as part of the business case preparation process has been prepared using the tools and guidance provided by the DfT notably WebTAG⁹. This approach ensures that the evidence produced is robust and consistent for all the options examined in detail. This applies equally to those options proposed for investment and those, which following assessment, are not to be developed further.

Decision making process

- 1.5. The decision making process, of which this *Outline Business Case* forms part, usually takes place in three phases. Each phase includes the preparation of a business case followed by an investment decision point. Each business case builds upon that previously prepared. Evidence is reviewed to ensure that it remains up to date, accurate and relevant. The current Outline Business Case is in Phase Two as shown.



- 1.6. **Phase One** of this project has already been completed. In this phase, the need for the intervention was established and a range of options developed and considered. TfL’s east London River Crossings: Assessment of Need¹⁰; and the east London River Crossings: Assessment of Options¹¹ provided the required depth of analysis to establish the need for the project and to consider various options.
- 1.7. Drawing on analysis and evidence in these documents and in consultation responses to them a project-specific ‘Assessment of Needs & Options – Silvertown Crossing’

⁹ See <https://www.gov.uk/transport-analysis-guidance-webtag> accessed 5 September 2014

¹⁰ TfL: East London River Crossings - Assessment of Need, 2012

¹¹ TfL: East London River Crossings - Assessment of Options, 2012

report¹², has been developed for the project and is referred to in this Outline Business Case.

- 1.8. The current **Phase Two** reconfirms the conclusions from Phase One and concentrates on detailed assessment of the options to find the best solution, culminating in this document, the Outline Business Case, which :
- is used to align the progress of the project towards achieving the Mayor's and TfL's objectives;
 - confirms the strategic fit and the case for change;
 - refines the investment/intervention proposal; and
 - provides details of the project's overall balance of benefits and costs against objectives.
- 1.9. The final phase in the process, **Phase Three**, will result in the production of the Full Business Case – this will accompany the DCO application.

The role of the Mayor of London and TfL

- 1.10. This investment proposal is made by TfL acting as the body responsible for planning, organising and controlling and, in some instances, operating transport within London for the Mayor, who is charged with setting the policy and strategy for transport which he has done by the publication of the Mayor's Transport Strategy (MTS).
- 1.11. TfL is responsible for operating, maintaining and improving the strategic road network in Greater London, including the majority of River Thames crossings for vehicular traffic (bridges, tunnels and the Woolwich Ferry) within Greater London.
- 1.12. The business strategy of TfL is decided by the Mayor through the MTS. The MTS is the principal policy tool through which the Mayor exercises his responsibilities for the planning, management and development of transport in London, for both the movement of people and goods. It takes into account the policies in the London Plan and the Mayor's Economic Development Strategy (EDS). It provides the policy context for the more detailed plans of the various transport-related implementation bodies, particularly TfL and the London boroughs.
- 1.13. The legislative framework for the MTS is laid down by the GLA Act 1999 as amended by the GLA Act 2007. The GLA Act 1999 sets out the general transport duties of the Mayor and the GLA. It specifies that the transport strategy must contain policies for 'the promotion and encouragement of safe, integrated, efficient and economic transport facilities and services to, from and within Greater London', and proposals for securing the transport facilities and services needed to implement the Mayor's policies over the lifetime of the MTS, with regard to the movement of people and goods. TfL is under a duty to use its powers to facilitate and implement the policies and proposals of the MTS.

¹² Silvertown Tunnel, Assessment of Needs and Options, TfL, 2014

River crossings programme

- 1.14. The Silvertown Tunnel is just one of a number of options being considered by the Mayor to provide new and enhanced river crossings between east and southeast London. Their purpose is to address issues related to the ageing infrastructure of the existing crossings – notably the Blackwall Tunnel and the Woolwich Ferry – but also to provide capacity needed to enable the development of the Opportunity Areas in the east London sub-region.
- 1.15. All recent additional river crossings in the east sub-region have been provided to enhance public transport connectivity in the area. These crossings – on the Docklands Light Railway, the Jubilee Line, the extended London Overground and the Emirates Air Line – have to a significant extent helped to facilitate development in London’s Docklands. Further development of the public transport links will follow with the opening of Crossrail to Abbey Wood, passing beneath the Thames between Custom House and Woolwich stations. These developments are improving the ease of travel around London especially for cross-river journeys supporting London’s growth.
- 1.16. In contrast, the most recent upgrade to vehicular crossings was in 1967 with the opening of the second Blackwall Tunnel. Since many journeys cannot be made by rail based public transport (e.g. 90% of freight/deliveries in London are reliant on road transport), it is important to improve conditions for road traffic. Additional cross-river capacity is required for buses, taxis goods vehicles and private cars supporting businesses and employment. It is evident from the level of road congestion in east London that investment in the road network has not kept up with increasing demand and threatens to be a constraint on planned growth.
- 1.17. A range of schemes and locations have been put forward for consideration as part of the River Crossings programme, and Figure 1-2 shows the Silvertown Tunnel in relation to other crossings options proposed. Other locations that have been assessed as being potentially suitable for new river crossings are Woolwich, Gallions Reach and Belvedere. TfL also supports government proposals to reduce congestion at the Dartford crossing.

Figure I-2 Options for east London River Crossings Programme



Programme consultations to date

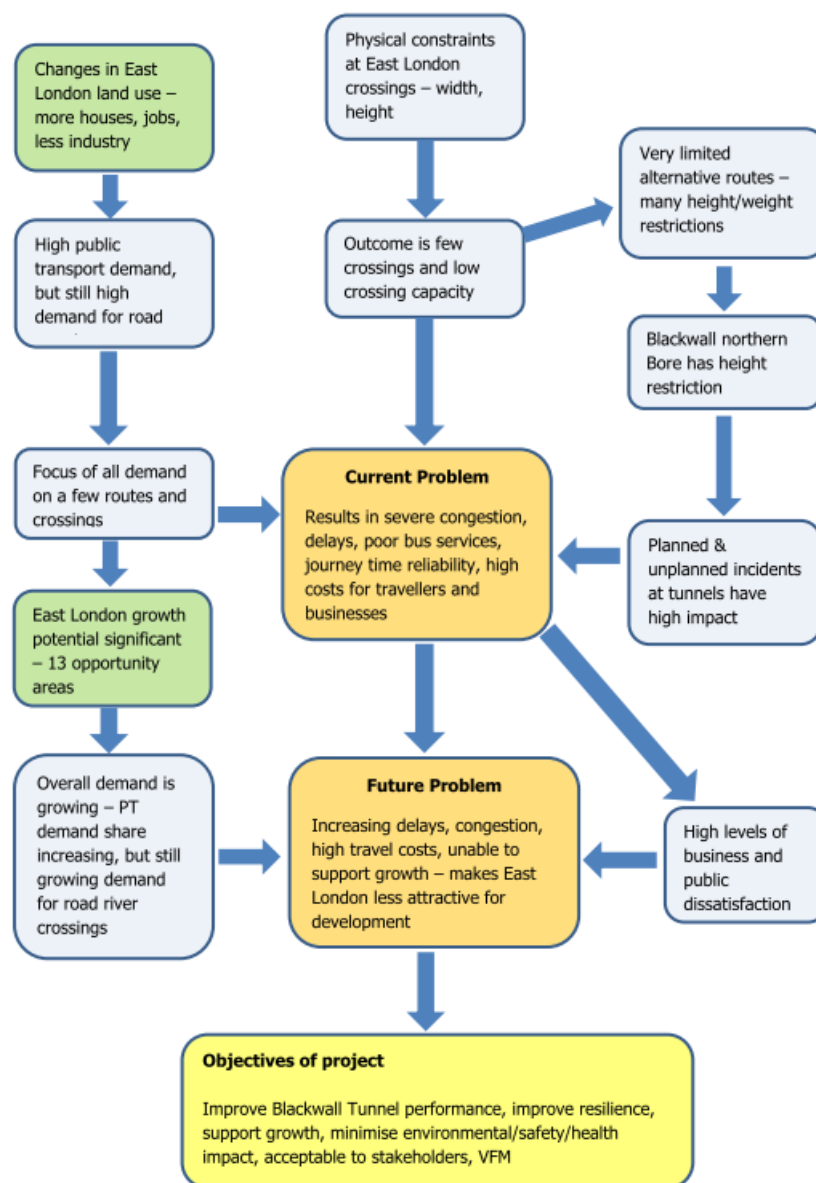
- I.18. There have been four public consultations held on the River Crossings programme to date.
- I.19. The River Crossings proposals were consulted on in 2009 during the preparation of the MTS.
- I.20. In February 2012, TfL held an initial four-week consultation with stakeholders and members of the public on proposals for a new road tunnel at Silvertown and a new vehicle ferry at Gallions Reach. Approximately 3,900 responses were received, with 93% agreeing that more river crossings were required.
- I.21. A third consultation was held over a 14 week period (29 Oct 2012 - 1 Feb 2013). This consultation sought the views of the public and stakeholders on six key issues about the River Crossings programme of which one was the introduction of a road tunnel between Silvertown and the Greenwich Peninsula. Following this consultation, TfL together with the Mayor of London decided to continue the development of the Silvertown Tunnel proposal separately but in tandem with other elements of the River Crossings programme.
- I.22. The most recent consultation, conducted in summer 2014, has focused on river crossings to the east of Silvertown. This consultation sought views from the public and stakeholders on four proposed river crossings:
- a replacement vehicle ferry at Woolwich;
 - a new vehicle ferry at Gallions Reach;
 - a bridge at Gallions Reach; and
 - a bridge at Belvedere.
- I.23. Non-statutory consultation on the Silvertown Tunnel is now taking place (October 2014). Statutory consultation is scheduled for June 2015, with a DCO application in December 2015.

2. The Strategic Case

Introduction

- 2.1. The Strategic Case is the first of the five cases forming the Transport Business Case. Its purpose is to set out the need for investment in the transport system, describe the rationale for making the investment, and how the investment furthers the aims and objectives of the sponsoring organisation.
- 2.2. The strategic case for the scheme is discussed in 2 broad sections (A) the strategic context and (B) the case for change. Figure 2-1 shows the main issues highlighted in the strategic case.

Figure 2-1: The Strategic Case



A: STRATEGIC CONTEXT

- 2.3. Existing national, regional and local policies give general and specific support to new road-based river crossings in east London, particularly at Silvertown, to address strategic and local needs for cross-river accessibility and to relieve congestion and to improve resilience. A number of the national and regional policy documents also contain 'criteria' that will be taken into account in the assessment of a new river crossing at Silvertown.
- 2.4. The policy context is described in detail in the Assessment of Needs and Options report¹³ and is summarised below.

National policy context

- 2.5. The Draft National Policy Statement for the National Road and Rail Networks states "Transport is an engine for growth. Well-connected and high performing road and rail networks with sufficient capacity are vital to meet the country's long term needs and support a prosperous economy." By inference the lack of such connections and capacity is a major barrier to economic growth.
- 2.6. The Draft NPS also states in para 2.23 "in some cases, to meet the demands on the national road network it will not be sufficient to simply expand capacity on the existing network. In those circumstances new road alignments and corresponding links, including alignments which cross a river or estuary, may be needed to support increased capacity and connectivity to meet the needs created by economic and demographic growth".
- 2.7. Following the initial assessment of options, which demonstrated that a new river crossing in the form of a tunnel at Silvertown was the best solution to the problems faced by TfL with the Blackwall Tunnel, the Mayor wrote on 1st June 2012 to the Secretary of State for Transport to seek designation of the proposed Silvertown Tunnel as a Nationally Significant Infrastructure Project (NSIP) under section 35 of the Planning Act 2008.
- 2.8. The reason for seeking this designation was to enable the Silvertown Tunnel project to be taken forward under the provisions of the Planning Act 2008. This provides for a single application to be made for a Development Consent Order (DCO) and is designed to cover all aspects of the proposed project. Without use of the DCO route, a project promoter can have to apply separately for many types of consent, with the attendant possibilities for impact upon a project's programme.
- 2.9. The request for designation of the Silvertown Tunnel as a Nationally Significant Infrastructure Project was granted by a direction made by the Secretary of State on 26 June 2012. In outline, the reasons the Secretary of State gave for her decision were:
 - London is an engine for economic growth nationally;

¹³ East London River Crossings: Assessment of Needs and Options - Silvertown Crossing 2014

- the projected growth of London, particularly in the east of London;
- current congestion at the Blackwall Tunnel is having a direct impact on the strategic road network; and
- the size and nature of the Silvertown Tunnel and comparison to other NSIPs.

2.10. The Secretary of State directed that the development of the Silvertown Tunnel, together with any matters associated with it is to be treated as a development for which development consent is required.

Regional policy context

2.11. The London Plan, first published in 2011, is the statutory spatial plan for London, which sets out the strategic vision for Greater London up to 2031, considers the strategic issues arising from the scale of growth that London would need to accommodate over the next two decades, and puts forward alternative spatial development policies which could be adopted to meet the forecasts for population and employment growth.

2.12. The conclusion is that east London, with its large areas of ex-industrial brownfield land, the focus of the sub-region's Opportunity Areas (see Figure 2-2) and improving transport links, should play a major role in London's growth and that with investment in infrastructure, many of London's new jobs and homes can be accommodated in the east and southeast sub-region. This sub-region is projected to increase by 650,000 people with 286,000 more jobs by 2036, which is nearly a third of London's projected growth overall . Within the immediate catchment area of the Silvertown crossing there is potential capacity for over 130,000 new jobs and 50,000 new homes¹⁴. However, it is recognised that achieving this growth is likely to require investment in infrastructure, including road infrastructure and improving cross-river connectivity.

¹⁴ Silvertown Tunnel Needs and Options report, 2014 TfL

Figure 2-2: Opportunity areas in east London



2.13. A number of policies and statements in the London Plan refer directly to the need for further east London river crossings:

- Policy 6.1 (Strategic Approach) discusses the need for more crossings and the Mayor's approach
- Paragraph 6.20 refers to a 'new road-based tunnel crossing between the Greenwich Peninsula and Silvertown' as one of four proposals to improve crossings.
- Paragraph 6.41 highlights the need for additional road-based river crossings to address resilience and congestion issues at existing crossings and to support a growing economy in east London
- Policy 6.12 (Road Network Capacity) states that the Mayor supports the need for limited improvements to London's road network to 'address clearly identified significant strategic or local needs', and sets out the criteria (Policy 6.12B) that should be taken into account when assessing these proposals.

2.14. The Mayor's Transport Strategy (MTS) contains proposals reflecting the London Plan policies and sets out in section 5.8 the strategic need and case for improving river crossings in east London, and Proposal 39 specifically references a new fixed link crossing at Silvertown to relieve Blackwall Tunnel congestion. In Proposal 130 the MTS notes that charges or tolls to support specific infrastructure improvements, such as river crossings, may be considered.

2.15. The Roads Task Force highlights in Figure 7 in Chapter 1 'inadequate cross Thames connectivity and capacity' as a key connectivity issue that inhibits growth and regeneration in supports the east and southeast sub-region growth agenda.

2.16. The Mayor's Economic Development Strategy (MEDS) emphasises (in para 5.9) how 'east London will continue to be a particular spatial priority, to ensure existing

development and regeneration needs are met and in particular to promote greater convergence of social and economic chances with the rest of the capital’.

- 2.17. The sub-regional Transport Plan (SRTP) for east London, updated in 2014 lists the Silvertown Tunnel as a scheme that will improve connectivity in east and southeast London.
- 2.18. The London Infrastructure Plan¹⁵ sets out the Mayor’s long-term (to 2050) aspirations for the infrastructure to support London’s future growth. The central projection is a 37 per cent increase in population from 2011 to 2050, with a resident population of 11.3 million by mid-century. It notes that the road network caters for 80 per cent of people’s journeys and 90 per cent of freight journeys; and it is vital for the continued economic success and functioning of the city. The Plan notes the proposed Silvertown Tunnel project and sets out aspirations for a series of further new river crossings in east London beyond this current scheme to help overcome the major barrier effect of the river.

Local policy context

- 2.19. References to the Silvertown tunnel or other east London crossings in local planning documents and transport policy from London local authorities are summarised in Table 1. Full list of adjoining and interested local authorities can be found at Table 2-1 of the Assessment of Needs and Options report. Table 1 below only shows a list of authorities where references are made to the Silvertown tunnel. There is significant support for a new crossing at Silvertown from the host boroughs and many other adjacent boroughs, subject to various concerns over local impact.

Table 1 Local policy context summary

Local authority	Core Strategy	LIP / Local Transport Plan
Silvertown Tunnel Host Boroughs		
LB Greenwich	Core Strategy policy IM3 states that the borough will advocate and work in partnership with relevant agencies to deliver a new package of Thames river crossings in east London, including the continued safeguarding of the Silvertown Link Tunnel.	Second Local Implementation Plan (LIP) discusses river crossings in Section 3 and gives support in principle to ‘a vehicle tunnel from the A102 on Greenwich Peninsula to Silvertown’
LB Newham	The Core Strategy states that ‘the Council supports the development of bridge, tunnel or ferry crossings at these locations [Silvertown and Gallions Reach] to provide resilience to the Blackwall Tunnel and to support future growth’ (paragraph 6.197).	The LIP sets out the Council’s support for strategic transport proposals that will contribute towards Newham’s regeneration and economic and physical development and specifically notes a new river crossing at Silvertown in paragraph 2.6.100.
LB Tower Hamlets	The Core Strategy provides support for river crossings to North	The Council’s second LIP sets out the Council’s support for improving

¹⁵ The London Infrastructure Plan, GLA, 2014

Local authority	Core Strategy	LIP / Local Transport Plan
	Greenwich for the improved accessibility, permeability and connectivity that will be provided to Leamouth, a regeneration area adjacent to the north side of the proposed Silvertown crossing where new homes and jobs are being delivered (LAP 7&8, Leamouth).	the provision of river crossings to relieve pressure on the borough's road network, particularly the Blackwall Tunnel (page 38).
ADJOINING BOROUGHs AND OTHER INTERESTED AUTHORITIES		
LB Barking and Dagenham	Support for Thames Gateway Bridge - critical to deliver growth and will improve accessibility to, from and within borough (Policy CM4) ¹⁶	Support for Thames Gateway Bridge ¹⁷
LB Bexley	Support for improvements to ease congestion, improve connectivity and enhance resilience at Blackwall. Support new river crossings providing local traffic flows not increased (para 4.7.12) ¹⁸	Support for a crossing at Silvertown in principle (paragraph 2.51) ¹⁹
LB Hackney	Not mentioned ²⁰	References 'east London SRTP (2010)' including need to reduce physical barriers including River Thames and improving resilience (para 3.2.14) ²¹ .
LB Havering	Commitment to working with relevant authorities to secure provision of the Thames Gateway Bridge (section 1.3) ²²	Notes road freight congestion challenges caused by severance and few river crossings (section 2.5) ²³

Strategic context conclusion

- 2.20. Existing national, regional and local policies thus give both general and specific support to new road-based river crossings in east London, particularly at Silvertown, to address strategic and local needs for cross-river accessibility and to relieve congestion and improve resilience. A number of the national and regional policy documents contain 'criteria' that will be taken into account in the assessment of a new river crossing at Silvertown, while local planning documents also set out some concerns about local impacts.

¹⁶ LB Barking & Dagenham: [Planning for the future of Barking & Dagenham – Core Strategy](#), July 2010

¹⁷ LB Barking & Dagenham: [Second Local Implementation Plan 2011/12-2013/14](#), July 2011

¹⁸ LB Bexley: [Bexley Core Strategy](#), February 2012

¹⁹ LB Bexley: [Bexley Local Implementation Plan 2014/15 to 2016/17](#), June 2014

²⁰ LB Hackney: [Core Strategy - Hackney's strategic planning policies for 2010-2025](#), Nov 2010

²¹ LB Hackney: [Hackney Local Implementation Plan 2 2011/12 - 2013/14](#), October 2011

²² LB Havering: [Core Strategy and Development Control Policies Development Plan Document](#), 2008

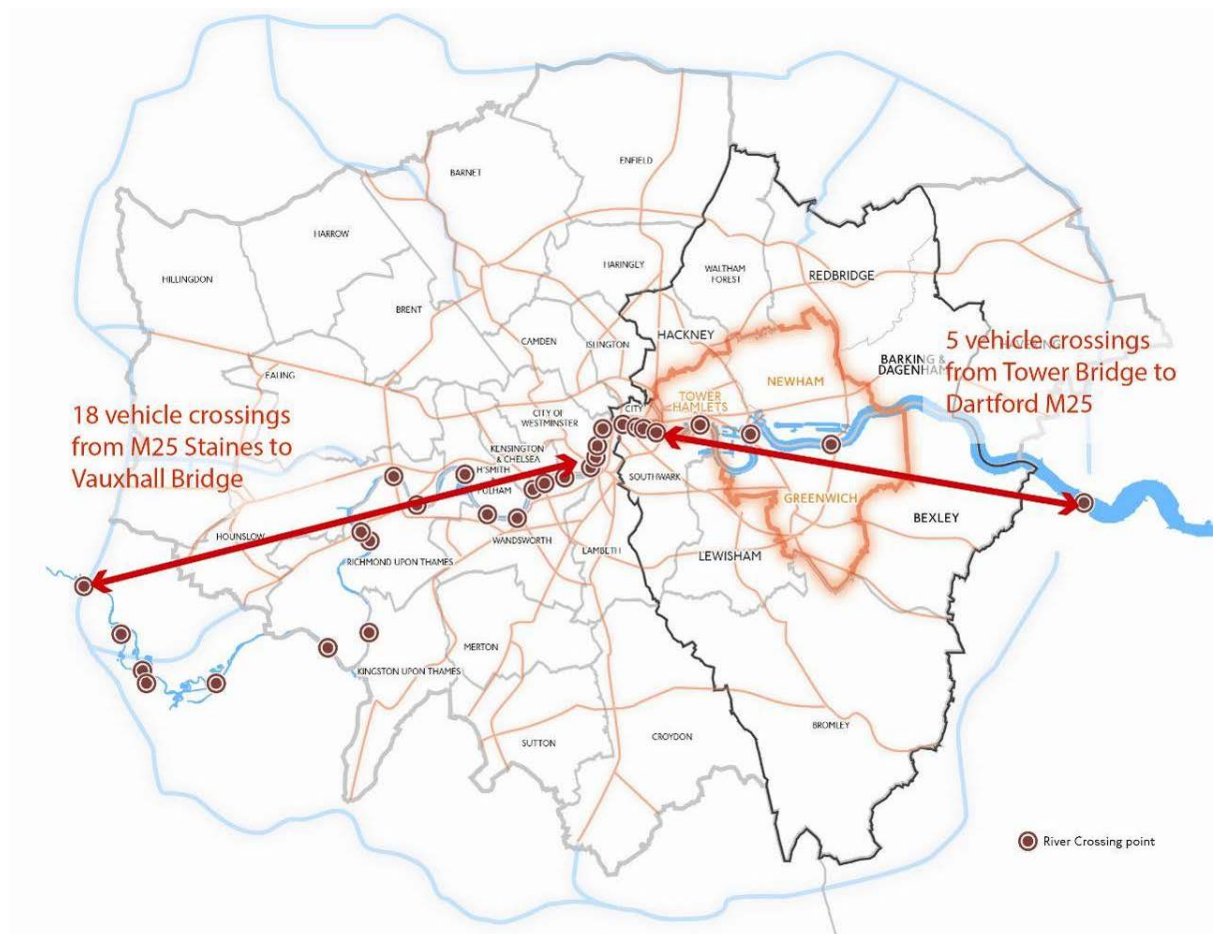
²³ LB Havering: [Local Implementation Plan](#), December 2011

PART B: THE CASE FOR CHANGE

Context

- 2.21. The River Thames historically provided the essential means by which London was linked to the rest of the world. At the same time, it has acted as a barrier to travel between north and south London.
- 2.22. There are significant differences in the size/scale of the river across London and this has helped to dictate the historic pattern of crossing points. In west London, there are frequent bridges across the Thames, as the bridges need to take no account of large ships, and can therefore have low clearances above the river, and frequent piers, making construction relatively simple and low cost.
- 2.23. However, downstream of London Bridge, the river becomes gradually wider, and a right of navigation for large ships exists, adding very significant barriers to construction of bridges. There are only two bridges downstream of London Bridge, Tower Bridge – which includes its famous bascule lifting section – and the Queen Elizabeth II Bridge at Dartford.

Figure 2-3 Road river crossings to the west and east of London



- 2.24. A result of these factors is that there are far fewer river crossings in east than west London, and there are only three road vehicle crossings of the River Thames in

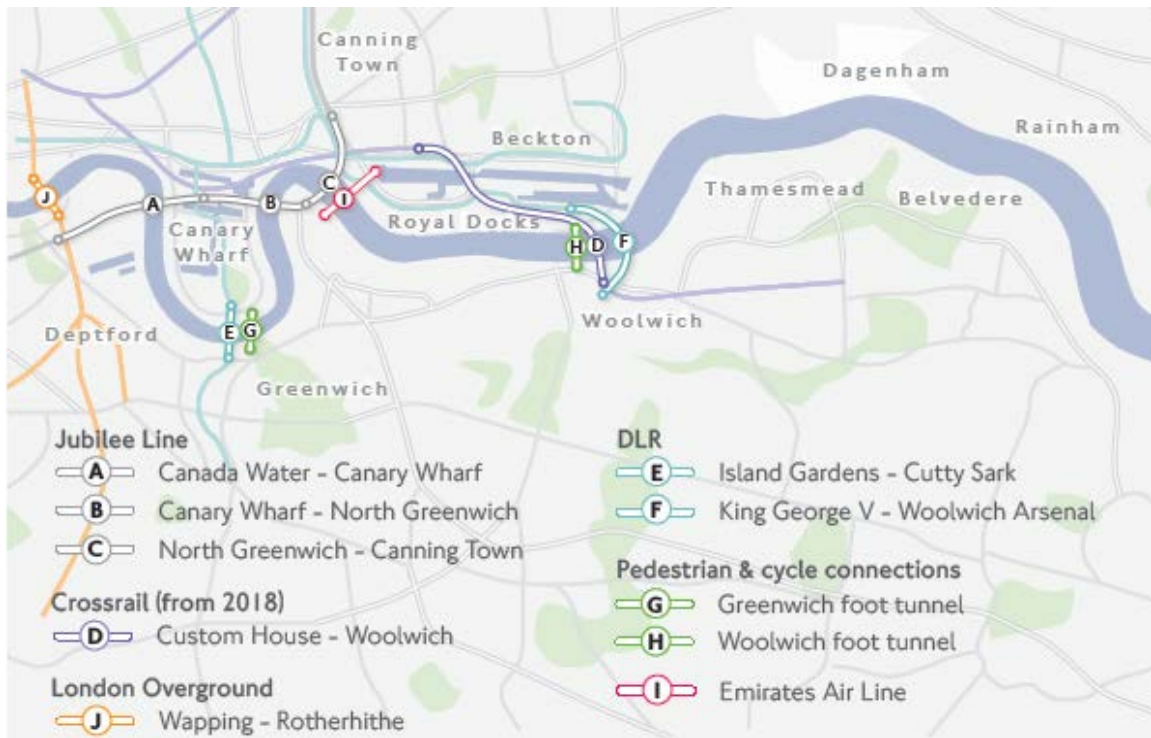
London east of Tower Bridge (the Rotherhithe and Blackwall Tunnels and the Woolwich Ferry).

- 2.25. There is thus a significant dichotomy between cross-river provision to the east and west of central London – when the number of crossings between those at the edge of Central London Zone 1 and the M25 crossings is considered, the balance between west and east is 18 to 5 as illustrated in Figure 2-3.
- 2.26. Measured in terms of capacity provision, the balance tips slightly further in favour of the west, with 33 northbound traffic lanes (plus 2 bus lanes) and 32 southbound traffic lanes (plus 4 bus lanes). In comparison the crossings in the east provide just 8 traffic lanes in each direction, plus the equivalent of around an eighth of a lane at the Woolwich Ferry.
- 2.27. This essentially historic/geographic difference in cross-river capacity has also resulted in the neighbouring road network being developed in such a way as to link with the two higher capacity crossings, at Blackwall and Dartford. The net effect has been to concentrate traffic wishing to cross the river in east London at these two places, resulting in very high usage of the crossings. In contrast, in the west, the capacity is more evenly distributed.

Land use and transport changes in east London

- 2.28. Over the last 20 years regeneration has transformed much of the former Docklands and many previously derelict sites now have successful new uses, particularly those in inner London boroughs. This has been accompanied by a diversification of the economic base and a substantial increase in employment in the area. Clusters of specialist activities have emerged. For example, many high value services which would traditionally have been confined to central London now have bases in Canary Wharf, while a major concert arena (the O2 Arena) on the Greenwich Peninsula and an international conference centre (ExCeL) at the Royal Victoria Dock have also been established. Most recently, the Olympic Park at Stratford occupies formerly industrial land within the Lea Valley, slightly to the north of the Docklands area but closely linked to it by the River Lea, the A12 and the DLR and Jubilee line.
- 2.29. Much of this growth has been facilitated by new fixed public transport infrastructure, which has already seen very significant investment with new cross-river links provided on the DLR, Jubilee Line, East London Line, High Speed One and soon (in 2018) Crossrail. In addition walking and cycling cross-river connections exist in the form of foot tunnels, the Emirates airline and some public transport connections.
- 2.30. Figure 2-4 shows the location of public transport, walking and cycling river crossings in east London.

Figure 2-4 Public transport, walking and cycling river crossings in east London



2.31. As shown in Figure 2-5, there has however been no corresponding increase in cross-river highway provision within London since the construction of the southbound Blackwall Tunnel in the 1960's (although outside London's boundaries the Queen Elizabeth II Bridge on the M25 corridor at Dartford opened in 1991).

Figure 2-5 Public transport and highway capacity, 1992-2022



2.32. Consequently the three road vehicle crossings in London east of Tower Bridge (the Rotherhithe and Blackwall Tunnels and the Woolwich Ferry) all suffer capacity restrictions leading to delays and unreliability issues not only on the crossings themselves but also on the surrounding local road network.

2.33. This is particularly the case on the approaches to Blackwall Tunnel. Both journey time data recorded by TfL and independently recorded Trafficmaster data illustrate that

the Blackwall Tunnel approaches are among the most congested roads in London during the peak hours. TfL have estimated the daily (Monday to Friday) economic cost of delays to traffic on the A102 alone to be around £50,000 northbound and £20,000 southbound and rising year-on-year. This equates to around £17.5 million every year.²⁴

- 2.34. However while existing public transport services are well used, current forecasts show that there is spare capacity (or capacity that can be provided on existing services) to meet long term needs.²⁵

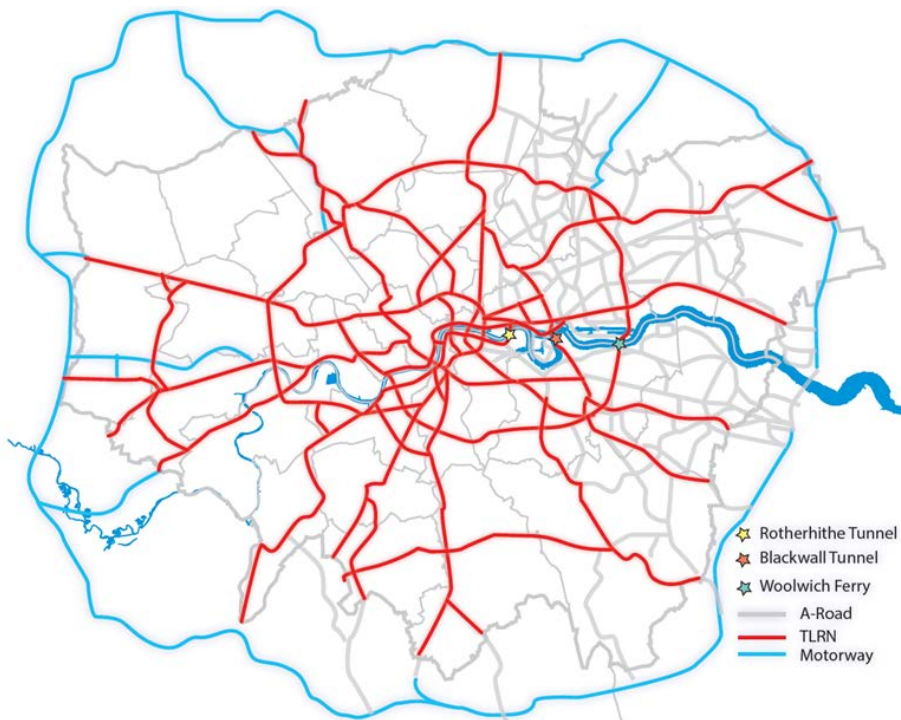
The Blackwall Tunnel's role in the strategic road network

- 2.35. The Blackwall Tunnel (and the Woolwich Ferry) is part of the Transport for London Road Network (TLRN), the strategic London road network that is responsibility of TfL. The TLRN comprises only 4% of London's road length but carries 30% of London's traffic, and provides links to those sections of motorway and primary routes managed by the Highways Agency, which in turn connect the TLRN to the London's orbital motorway the M25. The TLRN is illustrated in **Figure 2-6**. The strategic role that the different east London river crossings play in the strategic network is shown in the plan.

²⁴ TfL analysis

²⁵ Silvertown Crossing: Assessment of Needs and Options, TfL, 2014 Section 3

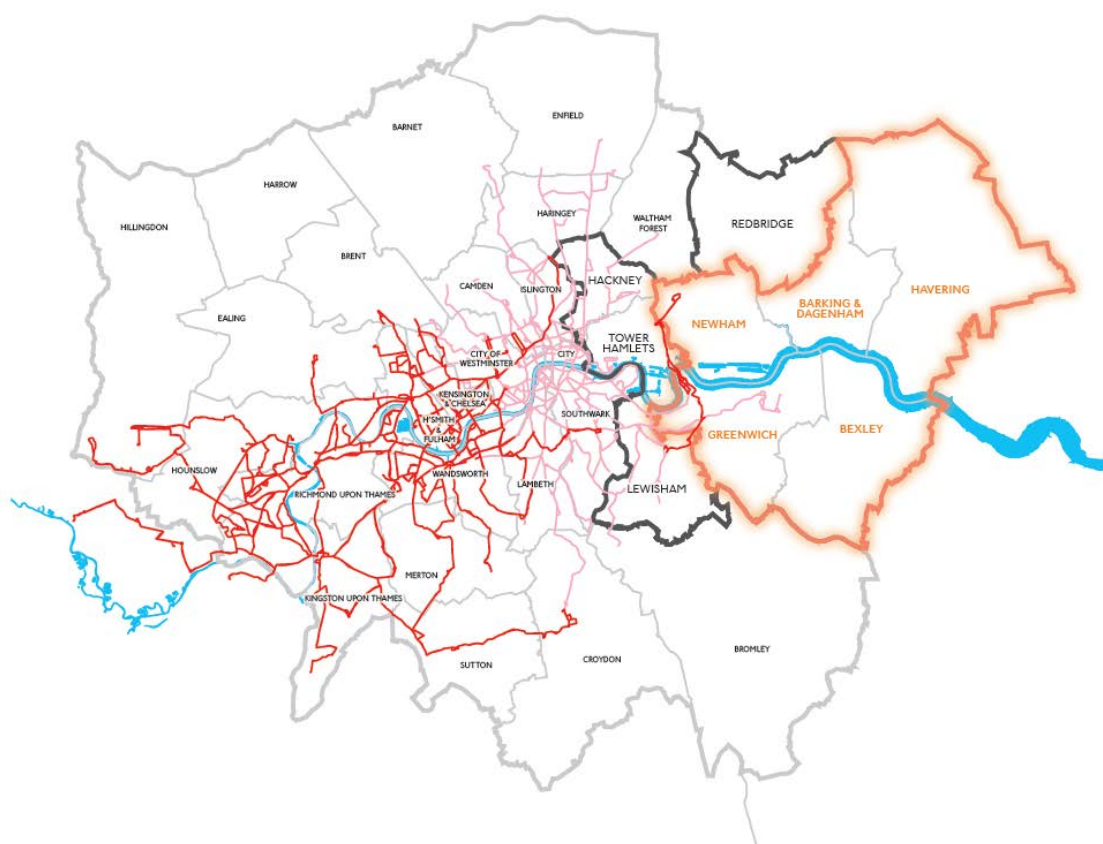
Figure 2-6 TfL Road Network (TLRN)



Cross-river bus and coach services

- 2.36. Bus travel is the dominant public transport mode in outer London. Figure 2-7 highlights the notable disparity in cross-river bus routes between east and west London, which is a consequence of the very limited cross-river road connections. The figure shows all cross-river bus routes in red - there are 47 bus routes which cross the river west of Vauxhall Bridge and only a single route crossing the river east of Tower Bridge; the 108 between Stratford and Lewisham via the Blackwall Tunnel. (Routes which cross the river in central London, using Vauxhall Bridge, Tower Bridge, or crossing points in between these two are coloured light pink. Routes which cross the river outside these two bridges are coloured red).
- 2.37. The barrier to the provision of cross-river bus services in east London is two-fold; physical restrictions on crossing options and congestion impacting on journey times and service reliability. A new river crossing will address both of these constraints and provide a range of options for new bus connections.

Figure 2-7 Cross-river bus services in London



- 2.38. This service can suffer from significant disruption when the Blackwall Tunnel is congested or temporarily closed. The Silvertown Tunnel with much improved reliability offers the opportunity to recast services in the area to radically improve cross-river journeys opening up new employment as well as leisure and shopping opportunities. TfL have commenced looking at how bus routes can be revised or extended to take up the opportunities that the new crossing would offer.
- 2.39. In addition the Blackwall Tunnel is very important for coach use, in particular peak commuter coach trips to Canary Wharf and Central London (there are some 59 coach services scheduled to use the Tunnel between 0730 am and 0830 am on weekdays) . In total an estimated 19% of total person trips at the Blackwall Tunnel in the morning peak hour are travelling by public transport, the vast majority in the northbound direction. These coaches suffer from the existing congestion and reliability problems at the Blackwall Tunnel.

The demand for road travel

- 2.40. Travel to work mode shares within the eastern boroughs also show that commuting by road, whether by car, van, bus, coach, taxi or motorbike as the main transport mode, is important for many people and accounts for around 40% of all journey to work trips. While there will be increasing opportunity for some mode switching to rail once Crossrail opens, road transport will continue to play a significant role. The table

below also shows how vehicle use is rising due to population and employment growth despite a move to the use of more sustainable modes.

Table 2: Changes in study area residents commuting by private vehicle (2001-11)

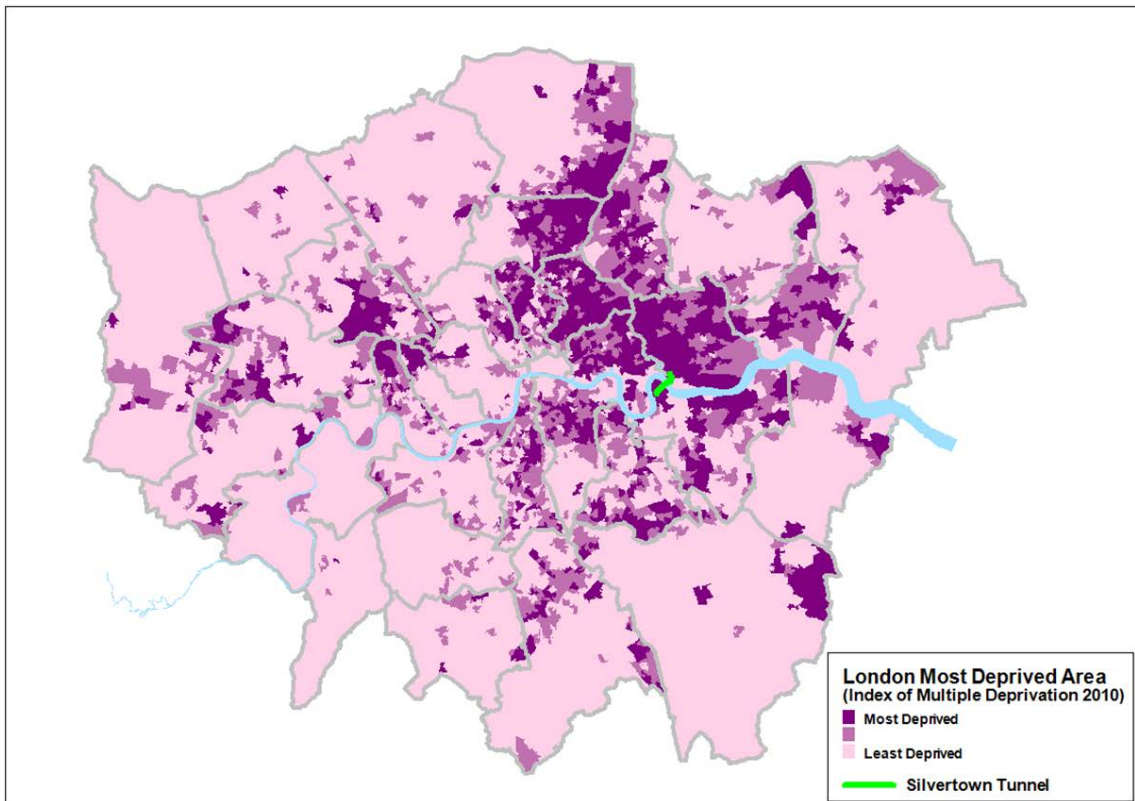
Resident Borough	2001 car and van use		2011 car and van use		Change in number / mode share
	Number	Mode share (%)	Number	Mode share (%)	
Greenwich	33,500	(39%)	33,900	(30%)	+400 / (-9%)
Newham	25,300	(32%)	27,700	(21%)	+2,400 / (-11%)
Tower Hamlets	13,200	(19%)	14,400	(12%)	+1,200 / (-7%)
Totals	72,000		76,000		+4,000 (6%)

- 2.41. The proportion of residents using a private vehicle to travel to work has reduced between 2001 and 2011 in all three of the Silvertown crossing host boroughs, indicating the impact of considerable investment in rail infrastructure and possibly the level of congestion and unreliability of the road network. While the share of commuting taking place by private vehicle has fallen, the absolute number of residents commuting by private vehicle has risen in all boroughs, by a total of 6 percent, as a result of population and employment growth.

Regeneration needs

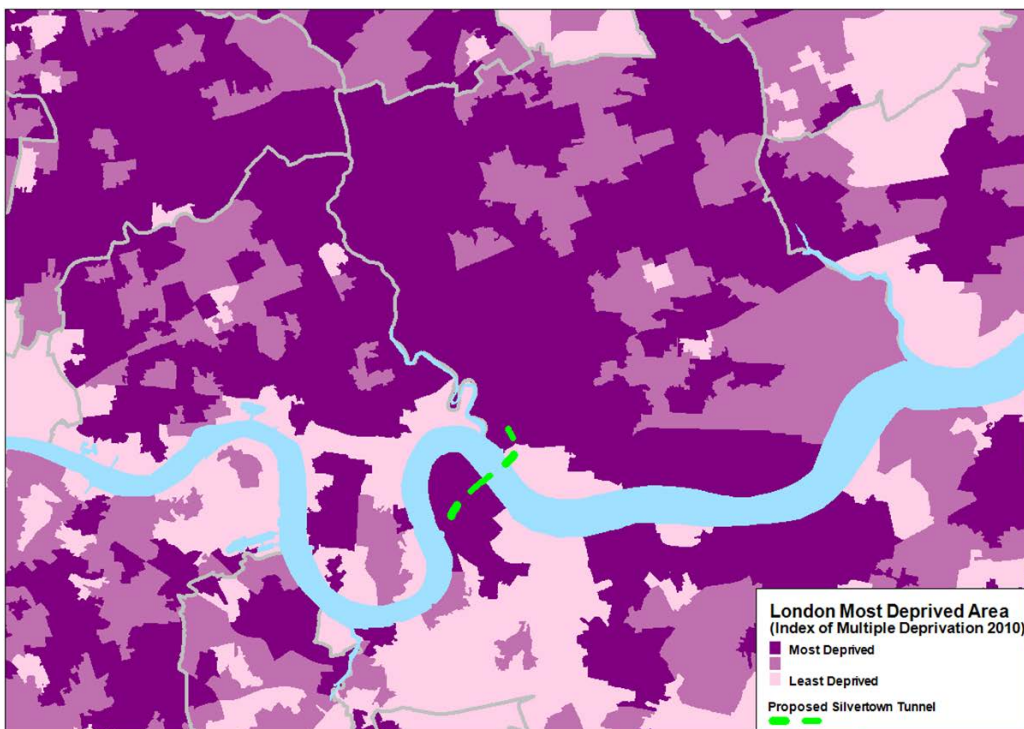
- 2.42. While significant regeneration has already taken place, London Thames Gateway still remains one of the most deprived areas not only of London but of the whole of the UK as illustrated by **Figure 2-8**. As highlighted at the beginning of this section the lack of good transport connections and capacity is a major barrier to the economic growth which is needed in this wider area.

Figure 2-8 London – most deprived areas



2.43. The level of local deprivation in relation to the proposed Silvertown crossing is shown in Figure 2-9. A significant improvement in cross-river connectivity offers the potential to increase access to labour markets thereby improving job opportunities for local people.

Figure 2-9 London Thames Gateway – most deprived areas



The Blackwall Tunnel - current operational issues

- 2.44. The Blackwall Tunnel comprises twin two-lane tunnels carrying northbound and southbound traffic respectively under the River Thames. It is a vital part of the strategic road network in London comprising a gateway to the major regeneration areas of London's Docklands. The Tunnel links North Greenwich and Blackwall, approximately three miles east of Tower Bridge. It forms a primary route link (the A102) between the A2 to the south and the A12/A13 to the north. Access to/from the A205 South Circular Road and A406 North Circular Road is available via these primary routes.
- 2.45. The northbound tunnel opened to traffic in 1897 and has a significantly smaller diameter than the southbound tunnel which was constructed in the 1960s. Vehicles up to 4.0 metres (13'0") in overall height can be accommodated northbound (in the left lane, the right lane has a height restriction of 2.8m/9'0"), while southbound, vehicles up to 4.7 metres (15'6") high can pass through the tunnel with both lanes accessible to all vehicles. The northbound bore also has narrower traffic lanes than the southbound bore which increases the level of restriction.
- 2.46. There are two main causes of the present very high levels of congestion at Blackwall:
- demand significantly exceeding capacity at peak periods Mondays to Fridays.
 - unplanned closures of the tunnels in either or occasionally both directions.

Demand and congestion

- 2.47. Traffic volumes at the Blackwall Tunnel vary by direction and time of day. On weekdays, over 3,000 vehicles an hour travel northbound between 6 am and 10 am. The traffic volume then reduces to between 2,500 and 3,000 vehicles every hour until 8 pm, with some 4 pm to 7 pm evening peak flows rising just above 3,000 vehicles an hour. In the southbound direction, hourly traffic volumes are between 2,500 and 3,500 in the morning peak period from 6 am to 9 am. After 9 am the southbound tunnel carries between 2,000 and 2,500 vehicles up to 12 noon. Volumes then increase every hour until they are at their maximum between 5 pm and 6 pm with a recorded hourly flow of between 3,700 and 3,900 vehicles. After the evening peak, flows reduce hour by hour, though remaining above the 2,000 level until 9 pm.
- 2.48. As previously highlighted because of the higher southbound capacity there are on average, 44,250 vehicles passing through the tunnel heading south between 6 am and 10 pm and 41,000 vehicles heading northwards during the same period.
- 2.49. Traffic composition is the same in both directions, 68% cars, 18% vans and small lorries, 8% heavy lorries, motorbikes 3%, taxis and private hire cars 2% and buses/coaches 1%. This shows the high level of freight use of the Blackwall Tunnel – some 26% of all vehicles are goods vehicles (LGVs and HGVs); results for a survey of the Woolwich ferry showed that 52 percent of PCUs were LGVs/HGVs.
- 2.50. The lower capacity of the northbound tunnel means that demand for travel cannot be accommodated, particularly during the morning peak period from 6 am to 10 am. This leads to very significant lengths of queuing traffic experiencing slower journeys

with lengthened and less reliable journey times. These queues regularly extend to the Sun in the Sands junction with the A2 Shooters Hill in the morning peak period (yellow), a queuing distance of approximately 3 km (see Figure 2-10) and to the Bow Interchange (orange) in the evening peak hour.

Figure 2-10 – Blackwall Tunnel – extent of peak hour queues

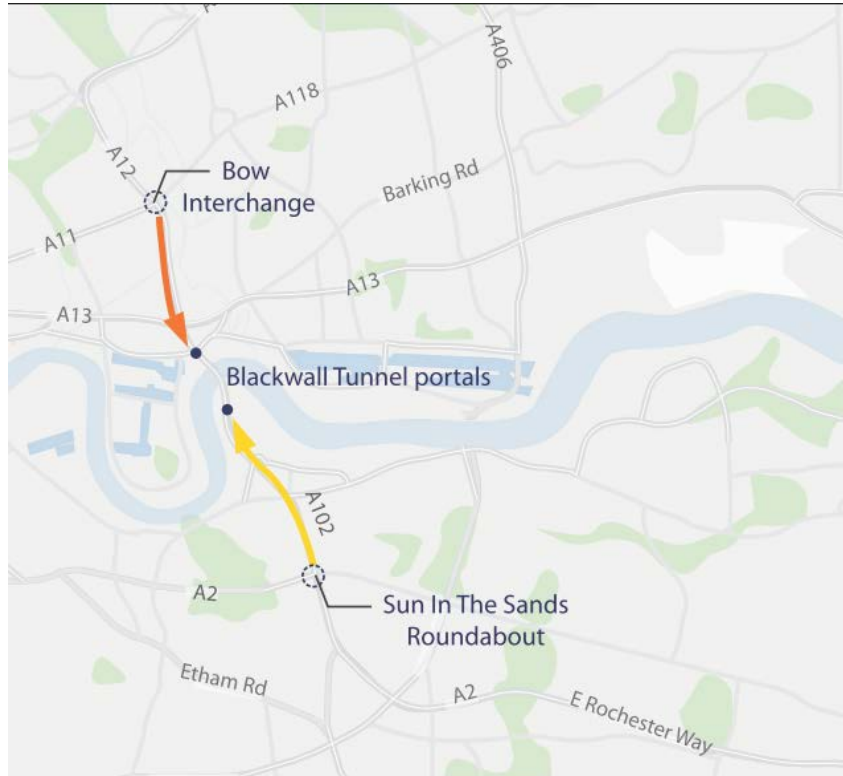


Figure 2-11 Queuing at the Blackwall Tunnel



2.51. The charts below show the use that is currently made of the tunnel in each direction during an average weekday, showing how demand regularly exceeds the optimal operational capacity of the tunnel.

Figure 2-12: Blackwall Tunnel flow (northbound) – average hourly flow by hour

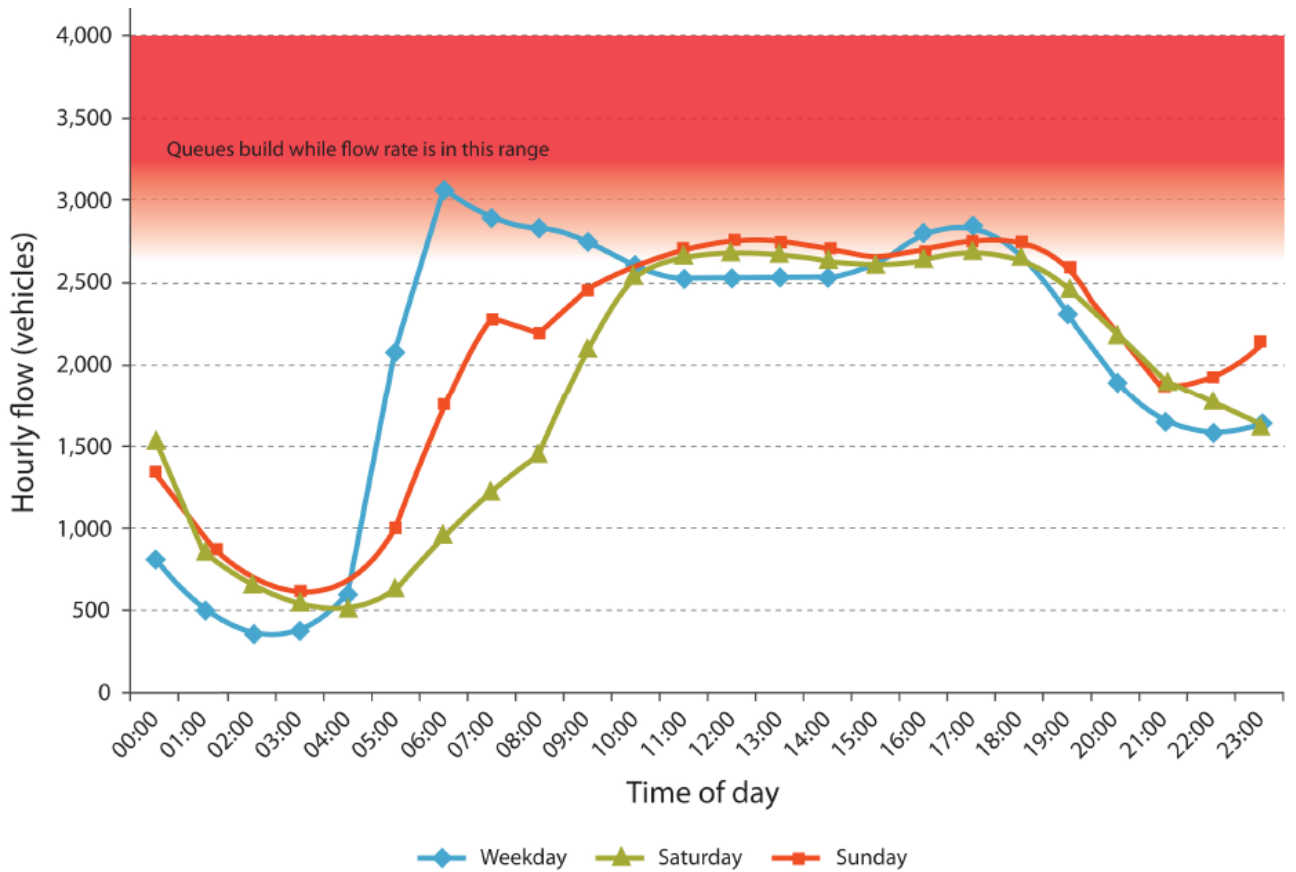
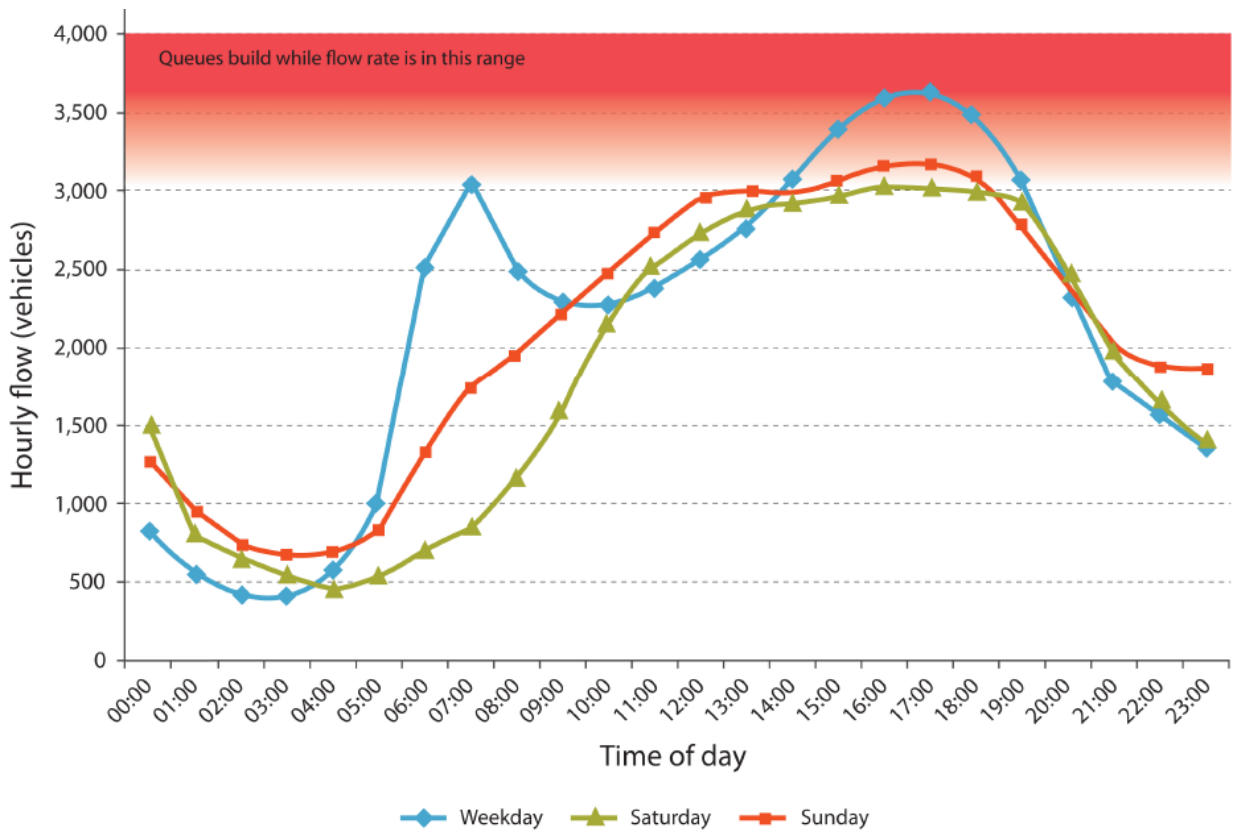


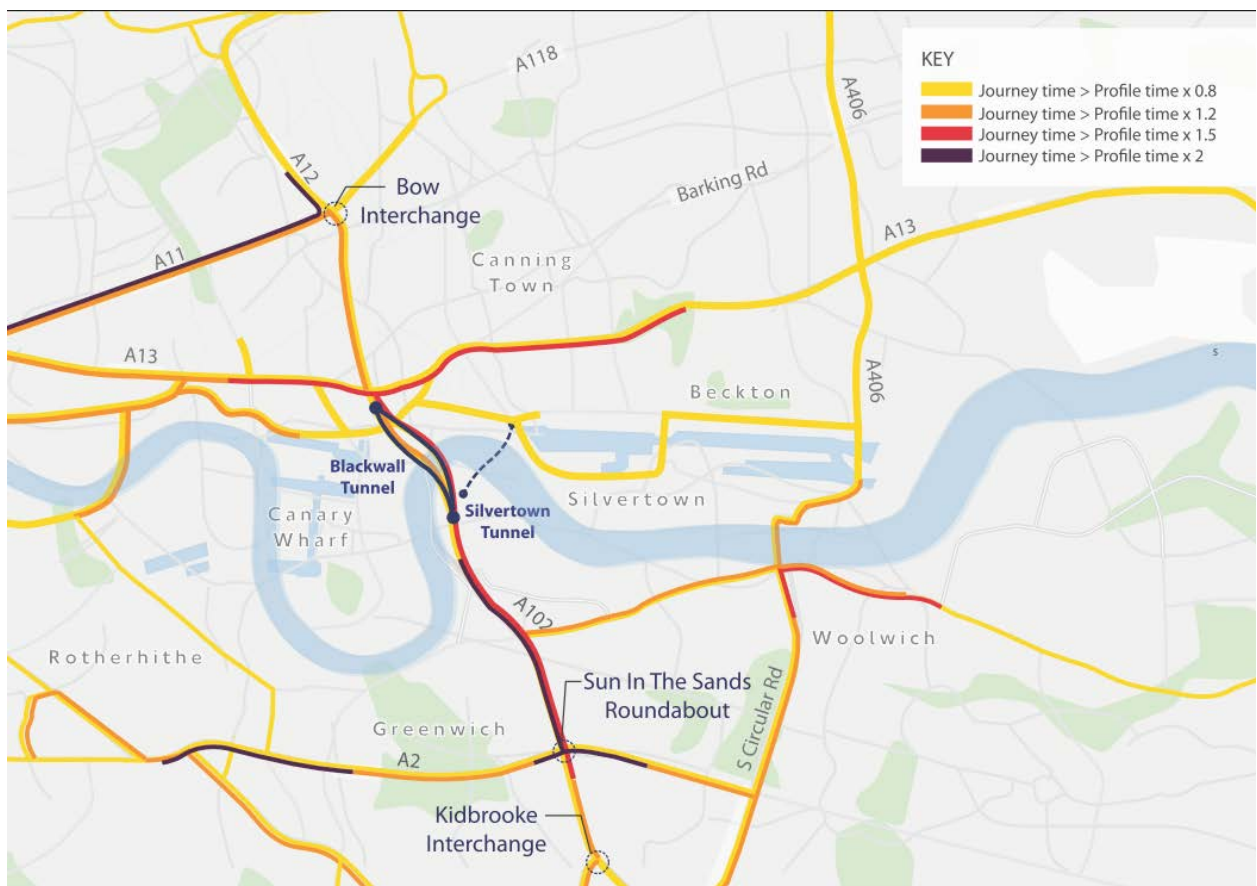
Figure 2-13: Blackwall Tunnel flow (southbound) average hourly flows by hour



Tunnel incidents and resilience

- 2.52. Traffic can also be disrupted when incidents occur in the tunnels and they have to be shut for varying periods. The result can be traffic delays over a wide area, both north and south of the River Thames. A consequence of this is that vehicles in the wider area get delayed and gridlock can result. Diversion of traffic creates problems at other crossings such as the Woolwich Ferry. The road network in east and southeast London suffers because of a lack of resilience at the river crossings, which is primarily due to the lack of convenient, alternative ways to cross the river when problems occur. This makes the areas affected less attractive places for business and residents.
- 2.53. The figure below shows the extent of the network affected by one example, a relatively short closure of one tunnel bore (9 minutes) to deal with a loose panel in the northbound tunnel bore at Blackwall at 6.46 am on 11 September 2014. The queuing extended as far back as the A2 Kidbrooke Interchange, with journeys on the A13 also affected. Additional delays were experienced until 9.14 am, when traffic levels had returned to normal and journey times reverted to what would normally be expected.

Figure 2-14: Journey times in the Blackwall area at 6.30 am following an incident

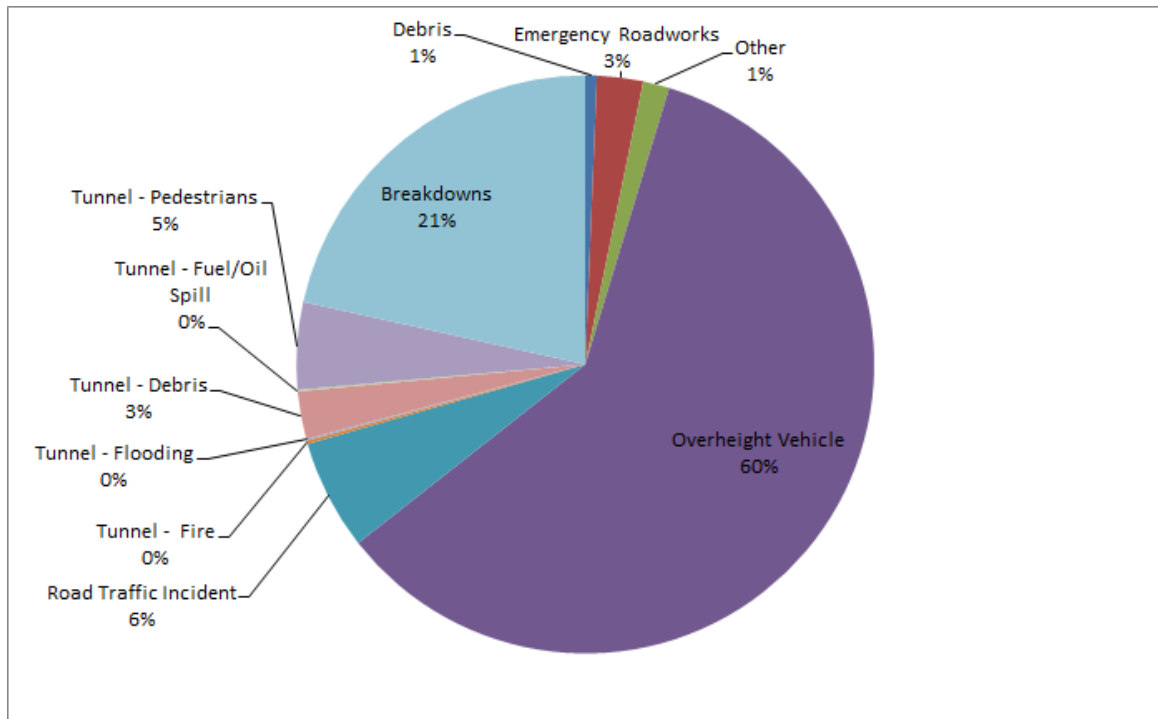


- 2.54. Delays are caused not only by an excess of demand, but also by the need to close the Blackwall Tunnel at short notice for a variety of reasons. A detailed log records the time, duration and type of every incident in the tunnels and on the immediate approaches. In the northbound direction link data was analysed from the Sun in the

Sands Roundabout to Bow Roundabout; and in the southbound direction from the Bow Roundabout to the A12/A13 junction (see Figure 2-14).

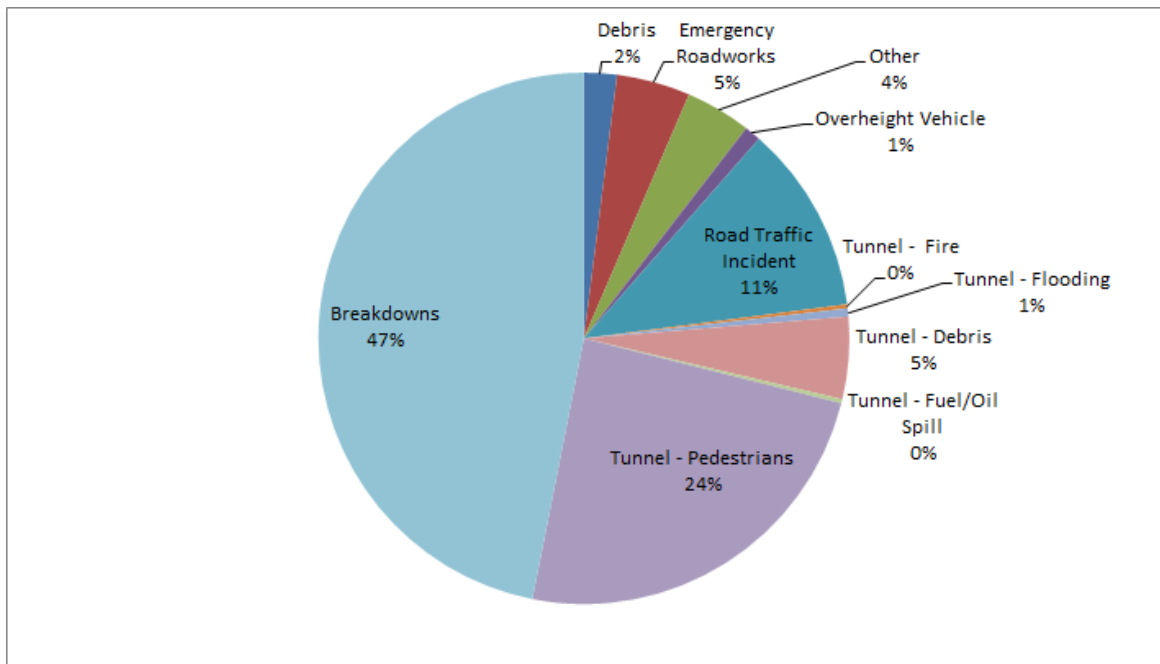
- 2.55. During 2013 there were only 10 days with no recorded incidents northbound and only 35 days with no recorded incidents southbound. Figure 2-15 and Figure 2-16 show the incidents by bore.
- 2.56. In the northbound direction, by far the predominant incident type is over-height vehicles, followed by breakdowns – see Figure 2-15.

Figure 2-15 Incidents by type: northbound



2.57. In contrast the southbound incidents – see Figure 2-16- are predominantly breakdowns, but with a surprisingly high proportion of pedestrian incidents.

Figure 2-16 Incidents by type: southbound



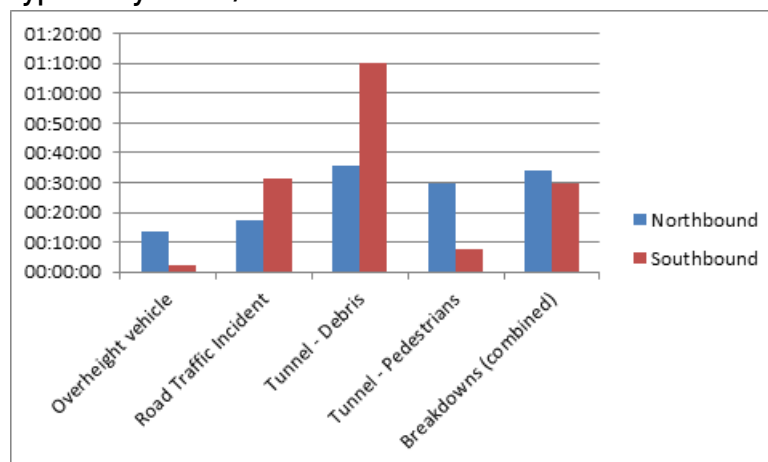
2.58. The issue of over-height vehicles attempting to use the height restricted tunnel, especially the northbound bore which is restricted to vehicles of up to 4 metres in height (see Figure 2-17) has been highlighted above.

Figure 2-17: Blackwall Tunnel northbound bore height restrictions



- 2.59. In the northbound direction, if over-height vehicles ignore the warning signs and voice announcements at junctions before reaching the tunnel and continue northwards along The A102 Blackwall Tunnel Approach road, all the traffic is then stopped at traffic lights prior to the tunnel portal. The over-height vehicle is then removed from the traffic stream, before being escorted up the emergency escape ramp. Once the over-height vehicle is safely out of the way, the remainder of the traffic is then permitted to proceed as the gates open and the traffic lights turn to green. This obviously causes delays to traffic.
- 2.60. For certain types of incident, it is also useful to compare the average duration of each type of incident (as recorded in the incident log) between the northbound and southbound bores – see **Figure 2-18** -the data for broken down vehicles and tunnel breakdowns has been recombined to give an average across all breakdowns.

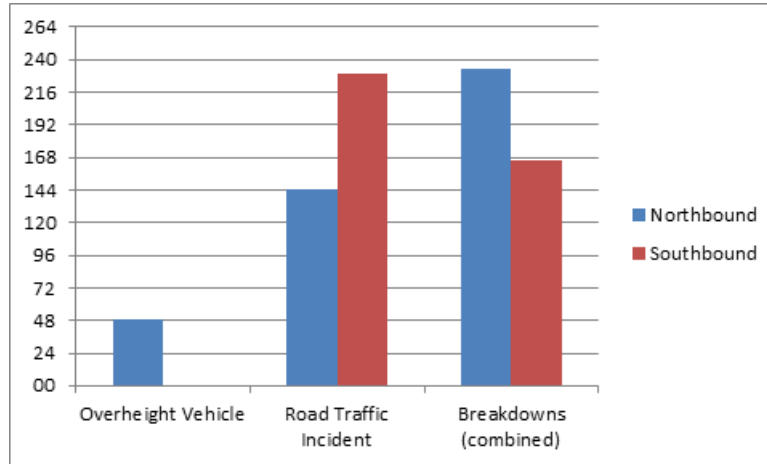
Figure 2-18 Blackwall Tunnel by direction average duration of incidents (selected types only -2013)



- 2.61. A “clean week” average link time profile has been created from analysis of periods when no incidents (other than “congestion”) were recorded as active. This provides a

benchmark against which incident delay can be compared. For each incident type, the total excess link time across the full year 2013, is calculated by comparing the actual link time while the incident was active with the corresponding “clean week” link time. The resulting excess link times per incident type are shown in **Figure 2-19**.

Figure 2-19 : Excess link time per incident type (selected types only)



2.62. These selected incident types account for the following total excess link times:

- Northbound 96,079 hours (88.85% of total)
- Southbound 41,704 hours (82.29% of total)

2.63. The economic cost of these incident delays alone is estimated at £1.5m a year²⁶ - in 2.33 we note that congestion delays are estimated to cost some £17.5m per year. On the occasions when the Blackwall Tunnel suffers from one of the longer unplanned closures, the impact on traffic can be quite substantial.

Impact of congestion and unplanned incidents

2.64. The impact and consequences of both the overall capacity constraint and unplanned closures are:

- unreliable journey times across a major Thames gateway affecting freight and commuter traffic;
- congestion on approach roads to the tunnel affecting local residents and businesses;
- lack of road network resilience over a wide area, with recovery from conditions of severe congestion taking, on occasions, many hours to clear; and
- a considerable cost to the economy arising from drivers caught in congestion and goods taking (much) longer than planned to be delivered.

²⁶ Estimated from WebTAG average value of time and occupancy times delay minutes by vehicle type

Limited alternative routes

- 2.65. The above issues are compounded by the lack of alternative routes. The four principal alternative routes for traffic are shown in **Figure 2-20**. The shorter routes, via Tower Bridge, the Rotherhithe Tunnel and the Woolwich Ferry, are unsuited to substantial additional volumes of traffic. The better route is the longer one taking in the A2, Dartford Crossing and A13 but even that would be overloaded with an additional 2,000+ vehicles an hour should a bore of the Blackwall Tunnel be closed in a peak hour.

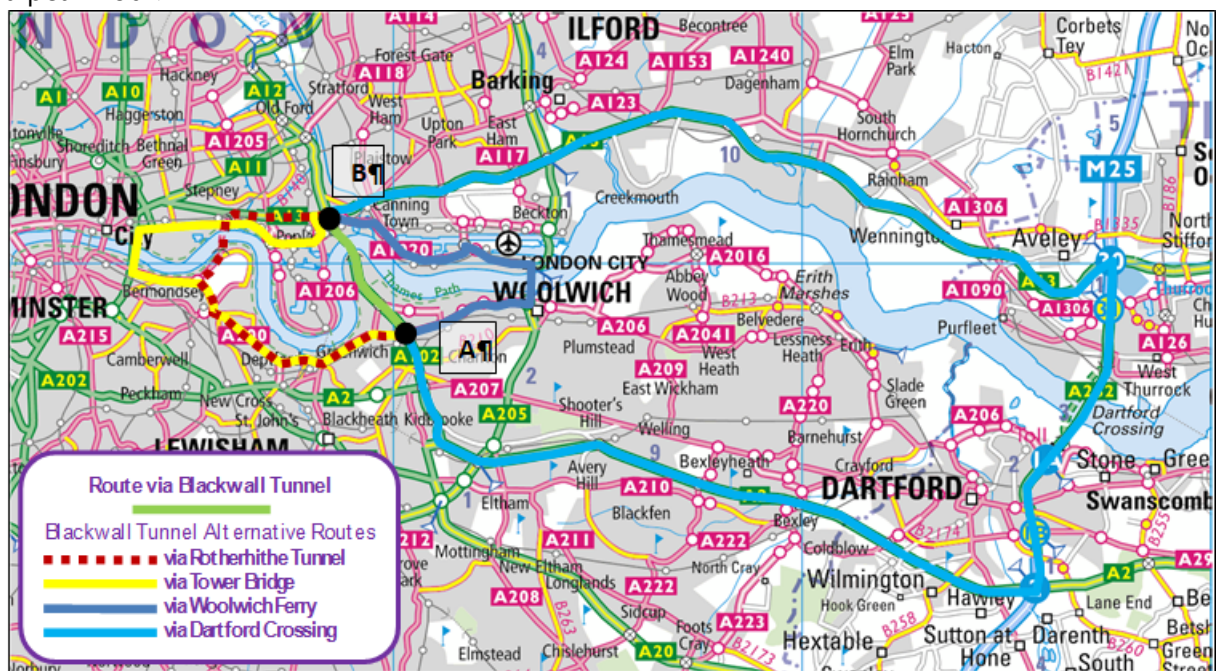


Figure 2-20 Alternative cross-river routes to the Blackwall Tunnel

- 2.66. **Table 3** provides a summary of each alternative route from point A to point B, in comparison to the Blackwall Tunnel route.

Table 3: Blackwall Tunnel and alternative routes

Route via ...	Distance	Free-flow Journey Time*	Fuel Cost ⁺
Blackwall Tunnel	2.4 miles	7 mins	£0.47
Tower Bridge	8.6 miles	30 mins	£2.18
Rotherhithe Tunnel	6.6 miles	23 mins	£1.74
Woolwich Ferry [^]	6.6 miles	42 mins	£1.77
Dartford Crossing**	30.7 miles	40 mins	£5.89

Notes: * From AA Journey Planner Journey Time during tunnel closures may be considerably longer because of congestion. ** there is also a toll at Dartford

[^] includes ferry delay

⁺ For a typical petrol engine car at a fuel price of £1.35 per litre.

- 2.67. Both the map and table illustrate well that there are no practical and realistic alternatives for the majority of cross-river trips using the Blackwall Tunnel at the current level of demand should the tunnel be closed for a significant length of time.
- 2.68. In addition, for certain categories of commercial road user, the number of highway river crossings available east of Tower Bridge is even more limited by virtue of restrictions on the weights, heights, lengths and/or widths of vehicles that may use them. There are also restrictions placed on the nature of loads which may be carried in tunnels by legislation. These restrictions are shown in Table 4.

Table 4 Restrictions for commercial vehicles using east London river crossings

Crossing	Maximum height	Maximum width	Maximum length	Load restriction*
Rotherhithe	4.4m	2.0m	10.0m	Cat E
Blackwall NB	4.0m lane 1 / 2.8m lane 2	None (3.2m lane 1 / 2.24m lane 2)	None	Cat E
Blackwall SB	4.7m	None (2 no. 3 m lanes)	None	Cat E
Woolwich F.	4.8 m	3.5 m	None	None

* Note: Load restrictions categories denote the type and quantities of dangerous goods that are allowed to enter the UK's larger road tunnels. Each regulated tunnel is assigned a particular category, A to E, with A being the least restrictive and E being the most restrictive. New restrictions were put in place in January 2010.²⁷

- 2.69. An implication of these restrictions is that vehicles which are not permitted to use certain crossings may need to take very lengthy diversionary routes, possibly on inappropriate roads, in order to cross the Thames. In this respect, the Woolwich Ferry affords a river crossing opportunity for vehicles which would be barred from using the Blackwall, Rotherhithe, and indeed the Dartford tunnels.
- 2.70. A further consideration for some heavy goods vehicles – those weighing over 18 tonnes – is the London Lorry Control Scheme, which restricts the roads that may be used at night-time and from Saturday lunchtime to Monday morning. During controlled hours, the Blackwall Tunnel is the only permitted river crossing between Richmond and Dartford (a crow-fly distance of around 22 km).

Current traffic management measures

- 2.71. In order to try and address some of the identified problems, over the last three years TfL has introduced a package of management measures at the Blackwall Tunnel, including a dedicated Roads Response Team (RRT), a new over-height detection system and overnight improvement works.

²⁷ For more information: http://www.roadsafeeurope.com/useful_info/tunnel_restrictions

- 2.72. TfL has sought to minimise the number of incidents affecting traffic and the severity of the resulting impacts. The enforcement office tackles over-height, illegal and unsafe vehicles going through Blackwall Tunnel and helps to manage traffic.
- 2.73. Officers from the Driver and Vehicle Standards Agency (DVSA) and the Metropolitan Policing Service Safer Transport Command work closely together to help improve traffic flow and take dangerous vehicles off the road. They also keep in constant contact with London Streets Tunnels Operation Centre (LSTOC), so that everyone has a full picture of the traffic going through London's tunnels.
- 2.74. Active Traffic Management (ATM) was implemented at Kidbrooke during the Olympics and Paralympics and was very effective in improving journey times and journey time reliability at the tunnel.
- 2.75. Excluding this period, a comparison of before and after the implementation of RRT (Feb 2009 to Jan 2011 versus Feb 2012 to Nov 2013) reveals the following:
- in the northbound direction in the AM peak, journey time reliability has improved 0.8% despite journey times deteriorating by about 40 seconds. However it is believed that this deterioration would have been worse without the presence of the RRT.
 - in the southbound direction in the PM peak, journey time reliability has improved 0.4% and journey times improved significantly by about 2 minutes. Both are associated with a drop in flows of about 4% between 2009 and 2010, with a marginal drop since.
 - for both directions across the whole day the number of killed and seriously injured (KSIs) dropped from 18 to 8 (first two years only). The number of incidents recorded by LSTOC fell by 39%, primarily over-heights (46%) and breakdowns (34%). Road Traffic Incidents (RTIs) decreased 13%, with the average duration falling from 48 minutes to 25 minutes.
- 2.76. These traffic management measures illustrate the approach TfL is undertaking to minimise incidents and temporary closures of the Blackwall Tunnel – however it is clear that the impact of such solutions is relatively limited, and other options of creating additional capacity by modifications to existing infrastructure and/or new river crossings are needed.

Future challenges

- 2.77. The Needs and Options report shows clearly the importance of east London in accommodating future London growth. Forecast population growth in all but two of the nine boroughs in the east and southeast sub-region is expected to exceed the London average of 14 percent, and the boroughs in the east and southeast sub-region are expected to account for 37 percent of London's total population growth between 2011 and 2031, while the four with the highest rates of growth (the three Silvertown crossing host boroughs of Tower Hamlets, Newham, Greenwich as well as Barking and Dagenham) are expected to account for 23 percent of London's growth. More recent data appears to show that this growth is happening more quickly than previously anticipated.
- 2.78. There is also expected to be significant employment growth in the east and southeast sub-region with three of the nine boroughs in the east and southeast sub-region

forecast to experience growth rates above the London average; growth of some 33 and 22 percent is envisaged in Tower Hamlets and Newham respectively (two of the Silvertown crossing host boroughs), while Hackney is expected to experience growth of around 17 percent (all these boroughs lie north of the River Thames). Together the three Silvertown crossing host boroughs account for over two-thirds of the employment growth forecast in the east and southeast sub-region (100,000 of the 145,000 new jobs forecast).

- 2.79. Disparities between the amount and location of forecast population and employment growth will generate increased commuter travel demands outside residents' home boroughs, including increased cross-river travel demand. For example, an increase in the number of jobs located in the Royal Docks will increase the number of journeys from Greenwich. It is desirable that existing and future residents of all boroughs in east London have access to the largest number of jobs possible, which means improved connectivity across the river. .
- 2.80. Two trends in future transport needs were also identified. Firstly, the numbers travelling by private vehicle continues to grow due to population growth (despite car mode share decreasing across London (particularly inner London) in line with MTS mode shift objectives. Secondly, demand for freight movement in London will continue to increase over the medium to long term as will the trend in the use of smaller vans for servicing and delivery.
- 2.81. Traffic modelling predictions²⁸ are consequently for significant increases in the volumes of road traffic in the study area together with levels of congestion, particularly at the approaches to the Blackwall Tunnel. As shown by Table 5 congestion levels will increase most in the east and southeast sub-region, in particular at locations adjacent to the Thames.

Table 5 : Change in delay in peak hours 2012-2021

Borough	Change in total PCU-delay-hours (morning peak hour, 2012-2021)	Change in total PCU-delay-hours (evening peak hour, 2012-2021)
Greenwich	+26%	+28%
Newham	+15%	+18%
Tower Hamlets	+29%	+29%
Host boroughs	+24%	+30%
Barking & Dagenham	+31%	+32%
Bexley	+27%	+23%

²⁸ Silvertown Tunnel Traffic Forecasting report, TfL, 2014

Borough	Change in total PCU-delay-hours (morning peak hour, 2012-2021)	Change in total PCU-delay-hours (evening peak hour, 2012-2021)
Hackney	+19%	+10%
Havering	+19%	+25%
Lewisham	+23%	+32%
Redbridge	+29%	+43%
Waltham Forest	+15%	+24%
East sub-region	+24%	+27%

2.82. Figure 2-21 and Figure 2-22 shows the change in traffic flows in the morning and evening peak hours respectively across east and south east London from 2012 to 2021. There are large increases in flows across the strategic road network, e.g. A13, North Circular, A102, A2 and M25 and to a lesser extent across whole sections of the network. There are clearly significant increases on the routes leading to the Blackwall Tunnel.

Figure 2-21: Flow changes on road network in the morning peak hour (0800-0900) from 2012 to 2021



Figure 2-22 : Flow changes on road network in the evening peak hour (1700-1800) from 2012 to 2021



2.83. Apart from the more central Boroughs such as Southwark and Tower Hamlets the neighbouring London boroughs tend to have the smallest business bases in London.

These boroughs' business base is below that of similar boroughs to the west of central London.

- 2.84. The majority of the boroughs are dependent on their ability to access employment opportunities elsewhere notably to the City and Westminster, but also to Tower Hamlets and Southwark.
- 2.85. As noted above the current operation of the Blackwall Tunnel, and particularly in the northbound direction, means that any additional demand for road-based cross-river commuting trips cannot be accommodated within the present infrastructure. This is likely to impact negatively upon the potential pool of people available to take up employment in the developing Royal Docks area, particularly as regards drawing upon residents living to the south of the Thames. There may also be similar impacts north to south, although these are likely to be of a lesser extent, given the higher capacity of the southbound tunnel.
- 2.86. Table 6 shows the number of morning peak trips with an origin or destination in Greenwich, Newham or Tower Hamlets by mode, with and without the Silvertown Tunnel. The definition of car trips includes those driving a car or van and those travelling as passengers. The definition of public transport (PT) trips includes travel by bus, DLR, Underground and National Rail. The mode share proportions refer to share of travel excluding active travel modes.

Table 6: Morning peak trips with an origin in Greenwich, Newham and Tower Hamlets

	2012 base trips (and mode share %)		2021 reference case trips (and mode share %)		2021 central case trips (and mode share %)	
	Car	PT	Car	PT	Car	PT
Greenwich	26,200 (61.5%)	16,400 (38.5%)	29,700 (57.7%)	21,700 (42.3%)	29,700 (57.9%)	21,600 (42.1%)
Newham	20,000 (49.2%)	20,600 (50.8%)	22,400 (45.5%)	26,900 (54.5%)	22,300 (45.4%)	26,900 (54.6%)
Tower Hamlets	13,800 (39.9%)	20,900 (60.1%)	15,600 (37.9%)	25,500 (62.1%)	15,600 (37.8%)	25,600 (62.2%)
Sub-total	60,000 (50.9%)	57,900 (49.1%)	67,600 (47.7%)	74,100 (52.3%)	67,600 (47.7%)	74,100 (52.3%)
East sub-region ²⁹	218,800 (56.4%)	169,200 (43.6%)	236,200 (54.2%)	199,300 (45.8%)	236,200 (54.2%)	199,300 (45.8%)

²⁹ Barking & Dagenham, Bexley, Greenwich, Lewisham, Hackney, Havering, Newham, Redbridge, Tower Hamlets, Waltham Forest

- 2.87. The total volume of travel will continue to rise in line with increases in the number of residents and jobs in east and southeast London. Between 2012 and 2021 the rise in public transport trips is forecast to be greater than car trips due to the ongoing improvements in connectivity and capacity. The number of morning peak hour public transport trips originating in the three host boroughs is expected to increase from around 58,000 to almost 75,000. The impact of the Silvertown Tunnel is very small in contrast to these background changes in travel behaviour.
- 2.88. The data demonstrates that despite the forecast mode shift from car to public transport trips in the east and southeast sub-region, there is still predicted to be a growth in car and other road-based trips (e.g. freight) arising from the population increases forecast, and already being realised, in the area.
- 2.89. The development of Opportunity Areas, both to the north and south of the Thames, in the east sub-region is also unlikely be accomplished without the facilitation of access for deliveries, servicing and freight. As with road-based cross-river commuting trips, capacity will need to be provided for these, so as to support the MTS goal of supporting economic development and population growth.

Business survey views

- 2.90. TfL commissioned a Business Survey³⁰ in 2013 to seek views on the proposals for east London River Crossings. This was a stratified survey of 850 businesses based on the sectoral and size distribution of businesses in Tower Hamlets, Newham, Barking & Dagenham, Havering, Southwark, Lewisham, Greenwich and Bexley.
- 2.91. The first key finding of the research was that businesses expect the east London River Crossings Programme to generate a strong positive economic effect, with 83% of businesses expecting the local economy to improve overall as a result of better cross-river connections.
- 2.92. Another key finding of the research was that businesses value improvements to cross-river journeys, with 64% of firms regarding the ability to cross the River Thames as important to the successful operation of their business with only 18% agreeing or strongly agreeing that current crossing options are adequate.
- 2.93. Two thirds of businesses are concerned about the constraints and disruptions placed on their business by poor reliability of cross-river journey times. This is a particular issue for firms in Greenwich and 80% of firms anticipate more predictable journey times as a result of the east London River Crossings Programme.
- 2.94. Around a third of businesses see the river as a barrier to the development of their business. Again this was particularly felt in Greenwich (49%) as well as Newham (47%) and Bexley (40%). Around two thirds of firms anticipate an increase in business from the other side of the river should the investment package be implemented.

³⁰ Business Survey, WSP, May 2014

- 2.95. In the long term recruitment is expected to be enhanced with implementation of the investment package. Almost half of businesses would expect to recruit additional staff as a result. In the construction sector this proportion jumps to 59%.
- 2.96. Freight and logistics are expected to benefit from the east London River Crossings Programme. More efficient use of supplies and deliveries is anticipated by 65% of firms as a result of the programme.
- 2.97. Some 59% of firms would be happy to pay a reasonable charge to cross the river if journey times became more reliable.
- 2.98. In terms of business development businesses are currently more concerned about accessibility than site-specific characteristics or staffing. 'Congestion and time wasted in traffic' were the main concerns relating to choice of business location in east London.

Development study

- 2.99. TfL also commissioned a River Crossings Development Study³¹ in order to better understand the potential scale and distribution of the economic benefits generated by each crossing. The study investigated possible future land use scenarios, including the potential development and socio-economic impacts for a range of crossing options within east London. The study covered the London Boroughs of Southwark, Lewisham, Greenwich, Bexley, Tower Hamlets, Newham, Barking & Dagenham and Havering.

³¹ East of Silvertown Development Impacts Study, Atkins, June 2014

- 2.100. Improved transport connectivity can facilitate economic growth in a number of ways by:
- improving business efficiency through time savings and reliability, expanding labour markets and increasing competition through improving access to customers and suppliers.
 - increasing the attractiveness and image of a location, thereby increasing demand and property values (hence encouraging further development) and drawing potential inward investors; and
 - improving the resilience and reliability of the transport network reducing costs to operators.
- 2.101. Changes in road based connectivity can be measured to provide an indication of the potential effects on development. Empirical research³² on the link between employment growth and road connectivity improvements found that for every 10% increase in access to jobs by road, employment in the local area grew by 2% within 10 km of the scheme.
- 2.102. The manufacturing and construction sectors are highly road dependent. Similarly outer London Boroughs are much more reliant on road based connectivity than Inner and Central London Boroughs.
- 2.103. High rates of population growth have led to increased demand for housing, larger household sizes and rapid increases in property prices. Further investment in infrastructure is needed so that major housing sites with poor connectivity will be enhanced and will come forward to support economic growth.
- 2.104. The study estimates that there is potential capacity in the study area for over 243,000 residential units and 2.5 million square metres of commercial space, 440,000 square metres of retail space and 1 million square metres of leisure floorspace. The bulk of this floorspace capacity is on the north side of the river so it is likely that demand for trips from the south to the north side would increase.
- 2.105. The study measured changes in connectivity through the change in access to jobs, workforce, adult population and businesses. The Silvertown tunnel will provide an average increase in access by residents within the study area to 64,000 jobs i.e. without the Silvertown Tunnel, there would be 64,000 less jobs within a 37 minute travel catchment.
- 2.106. Improved connectivity will increase development value attracting further development. The improved connectivity would unlock locations such as Thamesmead, the eastern Royal Docks and Barking for greater business density and local employment. In addition, improved accessibility from the opportunity to expand the cross-river bus network will encourage cross-river labour market expansion.
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³² Atkins as above, chapter 3

2.107. A summary of the case for change is given below.

- There has been sustained investment in public transport in east London has resulted in a step change in cross-river rail connectivity over the last 20 years with Crossrail under construction. Investment in road infrastructure has lagged behind and cross-river capacity is now critical.
- The historical development of east London has resulted in few road-based river crossings, and this has led to the focus of road travel on the few crossings and routes leading to them. The net effect has been to concentrate traffic wishing to cross the river in east London at these places, resulting in very high usage of the crossings.
- This in turn has led to severe congestion and resilience issues, particularly at the Blackwall Tunnel, which also suffers from many incidents.
- The combination of high road cross-river demand, lack of capacity and incidents leads to severe current problems for the travelling public and businesses, with long delays, unpredictable journey times and hence high travelling costs.
- These circumstances also impact on current bus and coach services and constrain the ability to increase these.
- Businesses in the area (i) value improvements to cross-river journeys (64% of firms regard this as important to the successful operation of their business) (ii) are not satisfied with current crossing options (only 18% agreeing or strongly agree these are adequate) (iii) are concerned about the constraints and disruptions placed on their business by poor reliability of cross-river journey times. (iv) a third of businesses see the river as a barrier to the development of their business
- In the context of these current issues, change is required. However when the future growth plans for east London, and its importance in the future development of London as a whole is taken into account, the case for change is even stronger.
- Analysis shows that the numbers travelling by private vehicle continues to grow due to population growth (despite car mode share decreasing across London), while demand for freight movement in London will continue to increase over the medium to long term as will the trend in the use of smaller vans for servicing and delivery .
- New public transport routes and connections will be necessary to ensure adequate links are provided between areas of population growth and jobs. In addition to the network of rail crossings, new cross-river bus connections will be necessary in the future.
- The MTS identifies the need for additional crossings in east London including options at Woolwich, Gallions Reach and Belvedere. Whilst these crossings are essential to delivery of the overall package of river crossings, they do not constitute alternatives to the Silvertown Tunnel. These crossings are necessary to provide the levels of connectivity required to support the long term growth of the area.
- Similarly, the Department for Transport is currently considering proposals for a new Lower Thames Crossing to alleviate congestion associated with the Dartford Crossing[1]. The Dartford Crossing provides a strategic function as part of the UK motorway network and any enhancements here would not remove the need for enhancements in east London.

The problem

- 2.108. Based on the available evidence, the problem identified is that the existing river crossings in east London do not cater adequately for current cross-river road traffic movement; they are at or over operational capacity and there are severe resilience problems causing congestion and delays, particularly at the Blackwall Tunnel.
- 2.109. While rail based public transport, walking and cycling are important sustainable transport modes encouraged by the MTS, road travel (including local bus services) is also vital for the proper functioning of the London Thames Gateway area, and growth predictions for east London indicate likely are for significant increases in road travel and congestion.
- 2.110. A solution to relieve congestion and improve resilience in the area around the Blackwall Tunnel is needed now and to ensure that the substantial growth planned in the area can be catered for and supported.
- 2.111. The principal reasons for increasing cross-river capacity for TfL are therefore to resolve issues concerning:
- current congestion, delays and unreliable journey times across a major Thames crossing at Blackwall adversely traffic, business and freight travel in particular as well as bus and coach services; It will also address local political, business and resident concerns about traffic congestion and poor journey time reliability.
 - future capacity requirements to cater for economic development of the east sub-region, which includes Canary Wharf/Docklands and many Opportunity Areas. Providing extra capacity and achieving more reliable journey times will help facilitate additional housing and commercial development.
- 2.112. In addition there are other reasons for additional river-crossing capacity being provided at Silvertown:
- the current Blackwall Tunnel bores were constructed separately and have no cross-linking passages to provide a means of evacuation in the event of a fire in the Tunnel. There is a risk that a major tunnel fire (or other serious incident) could result in the closure of one bore for a considerable length of time (or possibly permanently). There would be substantial impacts upon traffic with significantly increased congestion and an alternative crossing would provide TfL (and London residents and businesses) with the surety that the negative effects of cross-river accessibility of such a disaster scenario could be successfully mitigated.
 - a need to provide a road river crossing which has a full height capability for vehicles, particularly HGVs, thereby improving the efficiency of the movement of goods between east and southeast London and to reduce the impact of incidents in the existing northbound bore.

Objectives

2.113. The analysis of the needs and the identification of the above problem has led to the development of the following project objectives³³ – these have been used in the assessment of river crossing options:

- PO1: to improve the resilience of the river crossings in the highway network in east and southeast London to cope with planned and unplanned events and incidents.
- PO2: To improve the road network performance of the Blackwall Tunnel and its approach roads; and
- PO3: To support growth in east and southeast London by providing improved cross-river transport links for business and services (including public transport).
- PO4: To integrate with local and strategic land use policies.
- PO5: To minimise any adverse impacts of any proposals on health, safety and the environment.
- PO6: To ensure where possible that any proposals are acceptable in principle to key stakeholders, including affected boroughs.
- PO7: To achieve value for money.

2.114. These objectives relate to the strategic objectives for river crossings defined in the London Plan and MTS Proposal 39, and were used to assess a long-list of strategic options in the Silvertown Crossing Assessment of Needs and Options report³⁴.

Project requirements

2.115. In order to meet the project objectives, a successful preferred crossing option developed in response to the MTS would also need to meet a number of other core project requirements.

2.116. The core project requirements for Silvertown are:

- PR1: To provide a fixed link river crossing at Silvertown to relieve congestion and improve resilience at Blackwall Tunnel.
- PR2: Design for future cross-river traffic demand associated with planned economic growth in the east London sub-region, giving specific consideration for:
 - (a) Commercial traffic and the movement of goods; and
 - (b) Bus and coach services.
- PR3: To provide safe links with the local highway networks for all road users (incl. pedestrians and cyclists) and ensure adverse traffic impacts are mitigated.
- PR4: To provide effective travel demand management by a combination of road user charging and strategic road space management (incl. Blackwall Tunnel).
- PR5: Project should be fundable from user charging revenue.

³³ East London River Crossings: Assessment of Needs and Options – Silvertown Crossing'

³⁴ East London River Crossings: Assessment of Needs and Options – Silvertown Crossing'

- PR6: To integrate known land-use and transport development proposals and minimise impacts on developable land and the environment.

2.117. The full list of project requirements is likely to evolve during the period of planning and consultation.

Option development and assessment

2.118. Following identification of the problem and the objectives, the development and assessment of options for new and enhanced crossings of the River Thames between east and southeast London has been carried out in two parts:

- first, a list of options was appraised against the project objectives in the Assessment of Needs and Options report³⁵, leading to the identification of a preferred option, a tunnel.
- Secondly variants of the preferred option (bored tunnel and immersed tube tunnel sub-options) were compared against project objectives and requirements and a final preferred option was selected – this is summarised in chapter 6 of the Needs and Options report.

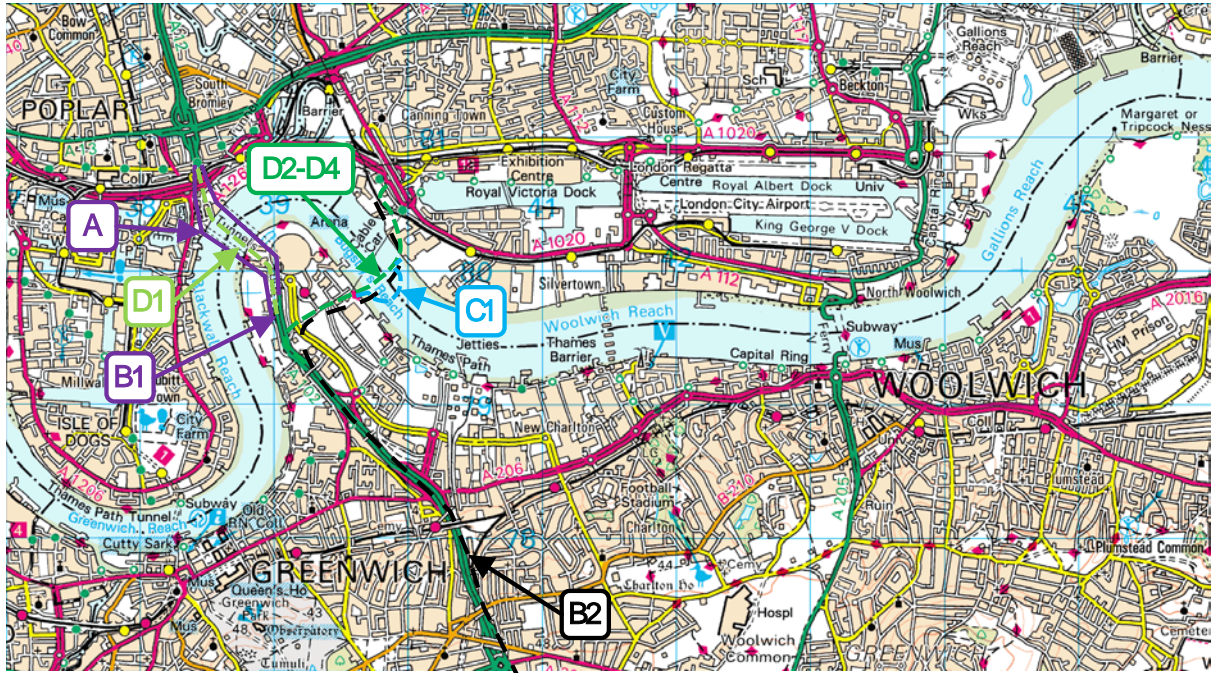
2.119. The Silvertown strategic option development and assessment is documented in detail in the Assessment of Needs and Options report³⁶.

2.120. The full list of strategic options under consideration, relevant to providing a solution to the capacity and network resilience problems at the Blackwall Tunnel, is shown in Table 7 while the locations of these are shown on the map in Figure 2-23.

³⁵ East London River Crossings: Assessment of Needs and Options – Silvertown Crossing'

³⁶ East London River Crossings: Assessment of Needs and Options – Silvertown Crossing'

Figure 2-23 Location plan showing assessed options



2.121. Table 7 describes each option and summarises the conclusion from the option appraisal in the Assessment of Needs and Options report ³⁷.

Table 7 River crossing options identified (being relevant to Blackwall Tunnel)

Option No:	Option Description	Option appraisal conclusion
A	<p>'Do Nothing'</p> <p>Rotherhithe and Blackwall Tunnels and the Woolwich Ferry continue to operate as at present – noting that the Woolwich Ferry will require substantial maintenance and refurbishment over time.</p>	<p>The option will not improve resilience in the study area, improve the operational performance of the Blackwall Tunnel or support the planned growth by providing improved cross-river transport links.</p> <p>The long-standing congestion, network reliability and resilience problems in the study area will persist and worsen, and act as a constraint on economic growth in east and south-east London.</p>

³⁷ East London River Crossings: Assessment of Needs and Options – Silvertown Crossing'

Option No:	Option Description	Option appraisal conclusion
B1	'Congestion Charging at Blackwall' Managing traffic demand through the use of road user charging, or congestion charging at the Blackwall Tunnel. This option aims to encourage drivers to switch to public transport, or re-route or re-time journeys away from the busiest periods and thereby reduce congestion.	Would slightly improve resilience and reduce congestion but is unlikely (on its own) to be able to support planned growth. In addition, the high user charges needed may not be supported and the proposals are unlikely to be politically acceptable or practical.
B2	'DLR Extension to Falconwood' – A proposal by the Royal Borough of Greenwich to extend the DLR from Canning Town southwards via a tunnel at Silvertown to the Greenwich Peninsula and then following the route of the A102 and A2 to Falconwood.	Minimal impact on the project objectives, can only support a small part of cross-river travel catchment and cannot address demand for cross-river road-based travel.
C1	'Ferry at Silvertown' – A new cross-river vehicle ferry between North Greenwich and Silvertown, immediately south of the Emirates Airline cable car.	Would be low capacity and would have a very minimal, if any, impact on congestion and resilience and would conflict with land use policies and the growth planned for the area. Opposed by key stakeholders including the Royal Borough of Greenwich.
D1	'Blackwall Third Tunnel' – A third tunnel alongside the existing twin tunnels at Blackwall to provide additional capacity at peak periods with direction of traffic flow reversible.	Would partially address congestion and resilience problems but operationally it would be very difficult to manage. Would not provide new connectivity and so its contribution to economic growth is limited. The feasibility of construction very uncertain due to development of tall buildings on piled foundations.
D2	'Silvertown Lifting Bridge' - A road bridge between Silvertown and North Greenwich with a central lifting section which is raised to permit transit of shipping.	Partially address resilience and congestion problems but would have its own resilience issues with regular closures due to shipping. Considerable physical and visual impact, incompatible with London Plan's vision for the peninsula and contrary to local planning policy
D3	'Silvertown Bored Tunnel' – A twin	Effectively addresses existing

Option No:	Option Description	Option appraisal conclusion
	bored tunnel between Silvertown and North Greenwich.	congestion and resilience problems and supports economic and population growth. This option has minimal adverse impacts on surrounding urban areas and the river environment
D4	'Silvertown Immersed Tunnel' – A tunnel between Silvertown and North Greenwich constructed using prefabricated sections floated into position and then immersed into a trench cut into the riverbed.	Addresses existing congestion and resilience problems and supports economic growth. However, this option would adversely impact on the surrounding urban area and the river environment.

2.122. The table below summarises the overall performance of each option against the project objectives. It is clear that Options D3 and D4 (bored and immersed tunnels) are the only options which meet all 3 core objectives.

Table 8: Summary of performance of each option against project objectives

Options / Project objectives	PO1 (resilience)	PO2 (performance)	PO3 (growth)
A: Do Nothing	Negative	Negative	Negative
B1: Blackwall Tunnel charge	Slight positive	Slight positive	Neutral
B2: DLR extension	Neutral	Neutral	Slight positive
C1: Silvertown Ferry	Negative	Slight positive	Negative
D1: Blackwall Tunnel third bore	Slight positive	Positive	Slight positive
D2: Silvertown lifting bridge	Slight positive	Slight positive	Neutral
D3: Silvertown bored tunnel	Strong positive	Strong positive	Strong positive
D4: Silvertown immersed tunnel	Strong positive	Strong positive	Strong positive

2.123. While it was clear from the option assessment that a tunnel option will best meet the project objectives and has significant stakeholder support, further consideration was required of the comparisons between bored and immersed tube tunnel variants before deciding on the final preferred option.

2.124. A total of eight tunnel options were therefore identified for comparison on the basis that they were feasible in engineering terms but presented contrasting impacts. The eight options split into two groups – bored and immersed tube (four each) and included 'full length' and 'short' length variants.

- 2.125. Further detailed studies were undertaken of these options, as described in more detail in the Needs and Options Report³⁸ (chapter six). The outcome of this analysis was confirmation of the bored tunnel option as the preferred option.
- 2.126. The conclusion of this option appraisal was that a Silvertown Tunnel option located in the safeguarded area between the Greenwich Peninsula and the Royal Docks, would be the only option that would fully address the three core project objectives. The tunnel option provides a comprehensive solution to relieve congestion and address the severe resilience problems that exist now at the Blackwall Tunnel and will provide additional capacity to ensure that the significant growth planned in the area can be catered for and supported. More information on the tunnel concept is provided in the following section.

Preferred Option – the Silvertown Tunnel concept

- 2.127. A tunnel at this location would significantly reduce congestion at the Blackwall Tunnel, by providing another high capacity crossing adjacent to it.

Figure 2-24: Silvertown Tunnel location



- 2.128. The size of the tunnel will ensure it is highly resilient and the tunnel will make a very significant contribution to a reduction in the number of incidents occurring at the Blackwall Tunnel; clear signing will be provided to guide over-height vehicles towards

³⁸ Silvertown Tunnel Assessment of Needs and Options, TfL, 2014

the Silvertown Tunnel. When incidents do occur at the Blackwall Tunnel, the Silvertown Tunnel would provide a very clear diversionary route for traffic, to ensure that the effects are contained and do not cause such major congestion as currently occurs. Whilst there would be a loss of capacity across the network at these times, resulting in some queuing at the approaches, the impacts of these may only be felt during peak periods and the delays would be very small compared to the current position where no feasible diversion route exists.

- 2.129. Journey times in the peak direction would be greatly reduced under this option and the delays for current Blackwall Tunnel users (of around 20 minutes northbound during morning peak periods) are likely to be effectively eliminated.
- 2.130. A tunnel would offer a relatively fast and direct route into the Canary Wharf and Royal Docks areas from the south, offering connectivity benefits to these Opportunity Areas. If the levels of local congestion at the Blackwall Tunnel are reduced, and resilience greatly improved, there would be general benefits for a large area of east and southeast London. In addition, a full gauge road tunnel between the Greenwich Peninsula and the Royal Docks enables opportunities for new cross-river bus services, further improving connectivity.
- 2.131. The tunnel concept is well supported by stakeholders generally and features in the host boroughs' local plans (as set out above). Specific comments made by boroughs in response to the 2012/13 consultation about a tunnel at Silvertown is summarised in Table 9.

Table 9: 2012/13 consultation – London Borough responses³⁹

Borough responses	Consultation response
Greenwich	Strongly supports Silvertown Tunnel. Strongly opposes ferry options - would not provide capacity to support growth
Newham	Welcomes resilience for Blackwall that Silvertown Tunnel would provide, subject to concerns over traffic impacts in borough
Tower Hamlets	Supports the proposed tunnel at Silvertown, in principle
Barking & Dagenham	Broadly supportive of new Thames river crossings. Concerned that Silvertown Tunnel will 'clog up the local road network'
Bexley	Supports the proposed tunnel at Silvertown, in principle
Lewisham	Supports the principle of increasing capacity across the river but has concerns that traffic impacts will result from Silvertown Tunnel
Corporation of London	Supports a new crossing at Silvertown
Hackney	Concerned about impacts of increased traffic on the approaches to Silvertown Tunnel and lack of cross-river links for cyclists
Havering	Supports proposals for new river crossings but notes they should include provision for pedestrians and cyclists
Redbridge	Neither support nor oppose – further traffic flow information needed
Southwark	Concerned about traffic impacts from Silvertown Tunnel and believe tolling could increase traffic levels at Rotherhithe tunnel

³⁹ Accent: River Crossings Consultation - Report, 2013

- 2.132. The scope of the project will be to deliver the Silvertown Tunnel and link roads to the adjoining road network along with the necessary charging infrastructure and charge collection operation at the Silvertown and Blackwall Tunnels.
- 2.133. The Silvertown Tunnel project excludes other elements of the River Crossings programme, such as namely a replacement ferry at Woolwich or Gallions Reach, or a bridge at Gallions Reach and/or Belvedere.

The role of road user charging

- 2.134. TfL proposes to charge for the use of Blackwall and Silvertown Tunnels for two principal reasons:

Traffic management

- 2.135. TfL would use charging as a way to manage demand and therefore levels of traffic passing through Blackwall and Silvertown Tunnels. This, alongside the additional capacity that Silvertown Tunnel brings, will help TfL manage overall traffic levels within acceptable limits and support its objectives of improving the resilience and road network performance of the Blackwall Tunnel and its approach roads.
- 2.136. While the provision of additional capacity is fundamental to addressing the problems at Blackwall Tunnel, the absence of charging to manage demand would mean that the benefits would in all likelihood be short-lived. As journey times improve with the introduction of Silvertown Tunnel, new demand attracted from the network would rapidly take up the additional capacity through the tunnels up to a point where the approach roads (both north and southbound) would reach capacity. At this point, congestion on the road network surrounding the crossing would increase, offsetting the benefits of the scheme.
- 2.137. Preliminary traffic modelling undertaken by TfL support this by suggesting that implementing Silvertown Tunnel without a complementary system of user charging would lead to considerable negative impacts on the surrounding network in terms of additional traffic generated. The scenarios with charging, perform better in managing the demand on the tunnels and surrounding network and show improved journey times and indicate almost no queues at Blackwall Tunnel in the peak periods.
- 2.138. The introduction of charging alongside the new capacity provided by Silvertown Tunnel should also improve the air quality in the surrounding area by reducing levels of congestion and queues on the local road network, although further assessment is needed.

Financial

- 2.139. TfL would also use revenue generated by the user charging scheme to help pay for the new tunnel. To deliver Silvertown Tunnel, TfL propose to enter into an agreement with a private sector party for the design, construction, finance and maintenance of the works comprised in the Silvertown Tunnel project. It is expected that the contract would cover a term around 30 years. Private finance arrangements would be put in place to fund the construction as well as the ongoing operating and maintenance costs of Silvertown tunnel. While the costs of the scheme would be met by TfL, revenue collected from charging on both Blackwall and Silvertown

Tunnels would over time be used to balance out any impact this has on TfL's overall budget.

- 2.140. User charging revenue is therefore a key component of the financial arrangements for the Silvertown Tunnel project. In overall terms TfL expects that revenues from both Blackwall and Silvertown Tunnels will over time cover the cost of the scheme and may also play a part in funding other future transport investment in east London.

Stakeholders

- 2.141. As previously described, TfL has recently carried out three non-statutory consultations of the east London River Crossings Programme. For the consultations, stakeholders were identified as belonging to several broad groups:
- Statutory Stakeholders, comprising the Highways Agency, the Environment Agency, the Port of London Authority, the Crown Estates and the Marine Management Organisation;
 - Affected boroughs, comprising the elected members and officers in the London Borough of Newham, the Royal Borough of Greenwich, the London Borough of Tower Hamlets, the London Borough of Barking and Dagenham, the London Borough of Bexley and the London Borough of Southwark;
 - Interested Local Authorities, comprising the elected members and officers of all other London Boroughs, the County Councils of Essex, Hertfordshire, Kent and Surrey, the District Councils of Brentwood, Broxbourne, Epping Forest, Sevenoaks, Tandridge, Thurrock and Welwyn Hatfield, the elected members of the London Assembly, local Members of Parliament, London TravelWatch, the Local Government Ombudsman and the London Thames Gateway Development Corporation;
 - National Trade Associations and Interest Groups, comprising Emergency Services, Motorists organisations (AA, RAC, Green Flag), the Confederation of Passenger Transport, the Road Haulage Association, the Freight Transport Association, the National Motorcycle Council, the London Cycling Campaign, Living Streets, the Institute of Advanced Motorists, English Heritage, Sustrans, Road Peace, BIDS, London First, the Confederation of British Industry, the Institute of Directors and Environmental Groups; and
 - Local Networks and Groups (within the affected boroughs), comprising residents, businesses, public service institutions (schools, hospitals, etc.), pedestrians, cyclists, motorists, public transport users, people with disabilities, people with mobility issues (including older people), people who work, deliver or collect in the area and national and international businesses that rely on transportation.
- 2.142. There will be ongoing liaison with these stakeholders in relation to the project, and mapping of views and requirements and where these could conflict.

Appraisal Summary Tables (AST) and Social and Distributional Impact

- 2.143. The Social Impact Assessment is provided in (separately bound) Appendix C, while the Distributional Impact Assessment is included as Appendix D. The AST table combines all of the assessment elements and is included in Appendix A

3. The Economic Case

Introduction

- 3.1. The Economic Case for the Silvertown Tunnel project has been prepared following the guidance set out in the DfT's WebTAG⁴⁰ documents. WebTAG sets out, for transport schemes, the requirements of HM Treasury's Green Book (A Guide to Investment Appraisal in the Public Sector)⁴¹. The Green Book is used across government for investment decisions through identification, selection and appraisal of options.
- 3.2. The purpose of the economic case is to determine whether the Silvertown Tunnel project will be beneficial to the UK economy relative to its costs. Measures used to express the economic case for each assessed option include the Net Present Value (NPV) and the Benefit to Cost Ratio (BCR).
- 3.3. All options assessed are compared to the same base case and the benefits and costs are calculated in terms of changes from the base case. The base case for the Silvertown Tunnel project comprises the current road and tunnel layout, configuration and method of operation, but takes into account population growth and travel changes in the east Sub-region. This base case is assumed to continue for the standard road scheme appraisal period of 60 years with minimal change. This base case is known as the 'Do Minimum' scenario.
- 3.4. The preferred options(either bored or immersed tunnel), of having the Silvertown Tunnel in place and operational, and with user charging in force at both Silvertown and Blackwall tunnels to raise revenue and assist with the management of traffic demand, is the 'Do Something' scenario, which also uses the same population growth and travel change assumptions as the base case. This too is assessed for a period of 60 years from implementation to enable the comparison with the 'Do Minimum' to be made.
- 3.5. In addition to the appraisal of the preferred option without any other effects, some initial sensitivity tests have been undertaken to determine the effect upon the economic case for the Silvertown Tunnel in the event that other changes occur – either to other river crossings or a different user charging strategy being proposed. Further work on this will be undertaken for a full business case.
- 3.6. At this Outline Business Case stage, the project's benefits have been assessed solely in terms of Transport Economic Efficiency benefits, comprising changes in user travel times, vehicle operating costs, user charges and greenhouse gas emissions (CO₂e). In addition, the change in Indirect Tax Revenue (principally VAT and fuel duty) – treated

⁴⁰ WebTAG – Web (internet) base Transport Appraisal Guidance – <https://www.gov.uk/transport-analysis-guidance-webtag> accessed 5 September 2014

⁴¹ <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government> accessed 5 September 2014

as a 'benefit' – has been assessed. Costs assessed at this stage include the Investment and Operating costs for the Silvertown Tunnel.

- 3.7. Additional monetised costs and benefits from Wider Impacts, changes in journey time reliability, delays at roadworks during construction and maintenance, environmental impacts (noise and local air quality) will be considered for inclusion in a Full Business Case.
- 3.8. The monetised benefits included in the present economic appraisal are derived from the highway assignment model prepared by TfL to estimate the effects of the implementation of the Silvertown Tunnel and road user charging⁴². The model determines likely traffic flows on each main road in the east sub-region. The differences in journey times and costs for all trips between origin and destination zones in the traffic model between the 'Do Minimum' and 'Do Something' scenarios have been calculated using the DfT TUBA computer program which expresses the results in monetised form. The monetisation is carried out using standard values published by the DfT in the WebTAG data book⁴³.
- 3.9. The assessment of the value for money of the Silvertown scheme has been carried out by calculating the project's NPV and BCR.
- 3.10. Appendix B of this report is the Economic Assessment Report which provides details of the assessment, while Appendix C and D are the Social and Distributional Appraisals respectively, which input into the Appraisal Summary Tables (AST). These appendices are separately bound.

Accident benefits

- 3.11. TUBA does not calculate benefits that are due to changes in accident costs. Accident benefits are calculated using the DfT's COBALT (Cost and Benefit to Accidents – Light Touch) software tool.
- 3.12. COBALT assesses the safety aspects of road schemes using inputs of either (a) separate road links and road junctions that would be impacted by the scheme; or (b) combined links and junctions. The assessment is based on a comparison of accidents by severity and associated costs across an identified network in 'Without-Scheme' and 'With-Scheme' forecasts, using details of link and junction characteristics, relevant accident rates and costs and forecast traffic volumes by link and junction.
- 3.13. Initial work on the COBA-LT analysis indicates that the overall study area shows an increase in accident costs of £6,556,000 for the defined area of 11,321 links over 60 years - this is a 0.04% change from the 'without scheme' total, well within the margin of error of the model used. However this initial estimate does not yet take into account the fact that much of the change in traffic volumes is due to the reduction in existing queuing rather than additional traffic volumes, and that there are significant numbers of accidents related to the existing queuing/merging points at Blackwall

⁴² Silvertown Tunnel Traffic Forecasting Report, TfL, 2014

⁴³ <https://www.gov.uk/government/publications/webtag-tag-data-book-may-2014> accessed 5 September 2014

Tunnel, which will be reduced by the scheme. Future work will clarify these changes and identify any mitigation necessary, but for the initial estimate the conservative assumption of an increase in cost has been applied.

Options appraised

- 3.14. The Strategic Case sets out the possibilities for new river crossings between east and southeast London at Blackwall/Silvertown which are considered appropriate to providing additional capacity on the A102 Blackwall Corridor. These have been assessed against the Silvertown project objectives in the Assessment of Needs and Options report⁴⁴. The two best performing options are:
- a bored tunnel at Silvertown; and
 - an immersed tube tunnel at Silvertown.
- 3.15. Both of these tunnel options would follow broadly the same horizontal alignment and route, with the immersed tunnel being closer to the surface and river bed than the bored tunnel. Construction impacts of the immersed tunnel would be greater than for the bored tunnel as river traffic would be disrupted while the river bed was excavated to form a trough into which the tunnel units could be lowered. An adjacent site would also be needed to construct the tunnel units prior to floating and sinking into position. Alternatively, and possibly cheaper, is an option to construct the tunnel units at a yard remote from the site and then tow them by barge to Silvertown for positioning.
- 3.16. For each type of tunnel construction, two variations have been considered.
- 3.17. For the bored tunnel, these comprise twin tunnels with linking cross passages at either 100 metre or 350 metre intervals. Of the two variations, that with cross passages at 100 metre intervals is the more expensive on account of there being more cross passages.
- 3.18. The immersed tunnel variations differ only in the location of the casting yard for the tunnel units. Costings show that constructing a bespoke tunnel casting basin close to the tunnel site would be more expensive than casting in an existing facility remote from the site.
- 3.19. To give the immersed tunnel the best chance of ‘success’, the economic appraisal was carried out after selecting the cheaper of the two immersed tunnel variations (that with casting of tunnel units remote from the tunnel site) and the more expensive of the bored tunnel options (that with 100 metre intervals between the cross passages).

⁴⁴ East London River Crossings: Assessment of Needs and Options – Silvertown Crossing’

Assumptions

- 3.20. The Economic Appraisal for the Silvertown Tunnel (including road user charging) is set out in the Economic Assessment Report⁴⁵. It comprises an assessment of Transport Economic Efficiency benefits and the cost to the Public Accounts. The benefits and costs are drawn together in the Analysis of Monetised Costs and Benefits leading to the generation of the project's Net Present Value and Benefit Cost Ratio. The assessment included options of either a bored tunnel or an immersed tube tunnel.
- 3.21. The DfT's WebTAG guidance has been followed in undertaking the economic appraisal. Throughout the appraisal, standard values of time and operating costs have been used, which were consistent with the May 2014 WebTAG databook and TAG Unit A1.3 – User and Provider Impacts
- 3.22. As the Silvertown Tunnel scheme includes Road User Charging, which has been assumed (for the purposes of the appraisal) to be applied on a 'free-flow' basis, the traffic modelling and costs have been carried out and prepared in accordance with DfT guidance that all users are assumed to pay the charge due, and that the costs of ensuring that they do so – the Penalty Charge Notice (PCN) system – are included up to the point of being able to issue the first PCN⁴⁶. Subsequent volume PCN operational costs are excluded from the economic assessment as these deal with defaulters (and cost recovery is generally by higher penalties for these).
- 3.23. The Silvertown Crossing User Charging Note sets out a range of charging options to manage demand for the river crossings. The charge rates due to be implemented at the M25 Dartford Crossing in October 2014 have been used as a benchmark, based on the cash charge rates for Cars: £2.50, LGV: £3.00 and HGV: £6.00). Under the central case tested, both the Silvertown and Blackwall Tunnels assume a charge at the same level as the Dartford Crossing (including discounts) in the morning peak northbound and the evening peak southbound. A charge of 50% of the Dartford charge has been assumed to apply to vehicles travelling in the contra-peak directions, and in both directions in the inter-peak period at weekends and Bank Holidays and is free between 22.00 and 06.00 daily. Note that work on charging options is ongoing, but the central case represents a realistic scenario common to all of the assessments.

⁴⁵ Silvertown Tunnel Economic Assessment Report, TfL, 2014

⁴⁶ The inclusion of the 'fixed' PCN costs but not the variable (volume) costs mirrors exactly the assessment of the free-flow charging economic appraisal carried out by the Highways Agency for the Dartford Crossing which is to be implemented in 2014.

Sensitivity tests

- 3.24. Sensitivity tests have been carried out to assess the impact on the proposed Silvertown tunnel scheme. These four tests were undertaken to assess the impact of external influences upon the economics of the project or, in the case of one sensitivity test, if only part of the project was undertaken.
- 3.25. The sensitivity tests were as follows:
- Sensitivity test 1 - the Blackwall Tunnel and the Silvertown Tunnel, both charged plus, the replacement of the Woolwich 'Free' Ferry with a charged fixed link (vehicle bridge or tunnel) at Gallions Reach and a charged fixed link at Belvedere.
 - Sensitivity test 2 –the Blackwall Tunnel and the Silvertown Tunnel, both uncharged
 - Sensitivity test 3 –the Blackwall Tunnel and the Silvertown Tunnel, with only Silvertown Tunnel charged
 - Sensitivity test 3 –the Blackwall Tunnel and the Silvertown Tunnel, with only Silvertown Tunnel charged
 - Sensitivity test 4 - the Blackwall Tunnel and the Silvertown Tunnel, both charged with higher peak direction charges
 - The modelling tests already assume improved capacity at the Dartford Crossing through implementation of Free-flow technology. The results of all these tests are described in the appendices of the Silvertown Tunnel Traffic Forecasting report⁴⁷.

Headline scheme benefits

- 3.26. Table 10 shows a summary of the scheme benefits - these benefits are identical for both the Bored and Immersed Tunnel options. Over the 60 year appraisal period the scheme will generate a total user benefit of about £720 million. The user benefits are net of user charges (shown as a negative as these are costs to the users), showing that the scheme provides additional benefits to the charge incurred by users.

⁴⁷ Silvertown Tunnel Traffic Forecasting Report, TfL, 2014

Table 10 User benefit summary

Description	Value
Travel time	£1,446m
Vehicle operating costs	£100m
User charges	-£823m
Total user benefits	£722m

(a) User benefits and charges by journey purpose

3.27. Table 11 shows the user benefits by class of transport system user. This shows that some 35% of the travel time and vehicle operating cost benefits accrue to car users, with another 24% accruing to freight vehicles. Some 12% of benefits accrue to car commuters, 24% to cars with other journey purposes and 6% to bus and coach users. Only some 6% of all user benefits relate to a reduction in operating costs. The distribution of user charges which will be introduced at Blackwall and Silvertown Tunnels upon the opening of the latter follows a different pattern. Freight Vehicles pay the highest proportion of the total charges (43%).

Table 11 User benefits and charges

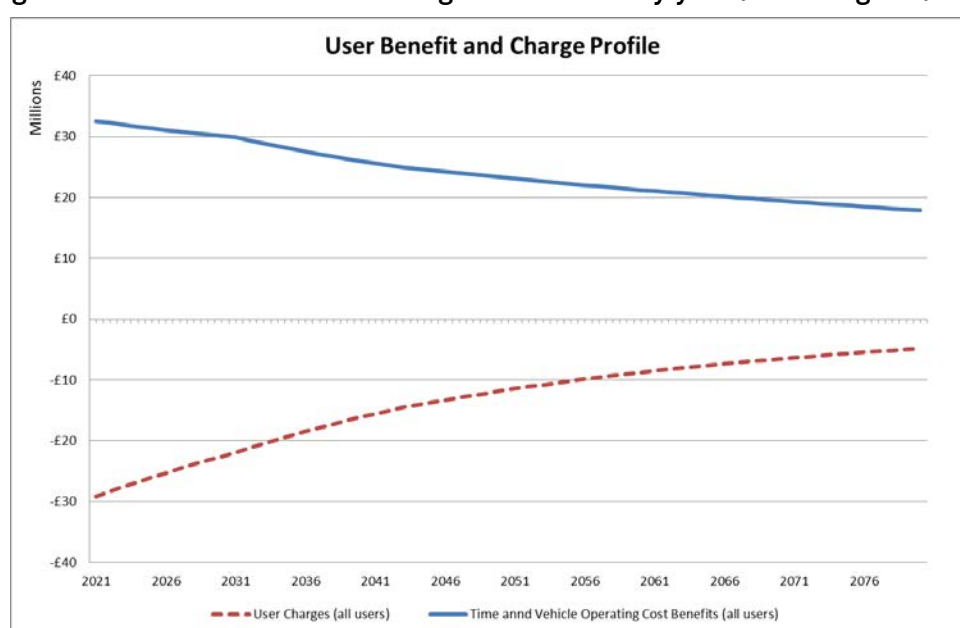
Benefit type	Other users			Business users			Total
	Car commuting	Car other	Bus & coach	Car & taxi	LGV & HGV	Bus & coach	
Travel time	£172.8m	£337.4m	£97.1m	£515.7m	£322.9m	£0.2m	£1,446.1m
Vehicle operating costs	£11.3m	£15.8m		£21.3m	£46.2m		£94.6m
Total user benefits	£184.1m	£353.2m	£97.1m	£537.0m	£369.1m	£0.2m	£1540.7m
% benefits	11.9%	22.9%	6.3%	34.9%	24.0%	0%	100%
User charges							
User charges	-£117.8m	-£252.1m			-£96.7m	-£356.8m	-£823.4m
% user charges	14.3%	30.6%			11.7%	43.3%	100%

(b) Benefits by year

3.28. Figure 3-1 shows the user benefit and charge profile for the appraisal period. Benefits were plotted on a yearly, non-cumulative, basis. The profiles showed that both business and consumer benefits decreased year-by-year up to 2031, the final modelled year. Thereafter, the shape of the benefits curve, for both business and consumer users, is affected by:

- an assumption of zero traffic growth after the final modelled year (in this case 2031);
- growth in value of time; and
- discounting to the present value year of 2010.

Figure 3-1 User benefit and charge distribution by year (excluding bus/coach)



(c) Benefits and charges by time period

3.29. Table 12 shows the user benefits and charges by time period. The evening and morning peaks account for the largest proportion of benefits (37% and 34% respectively), which is to be expected given the congestion relief expected in the peak periods. Benefits at weekend are lowest, as with lower traffic flows, the relief to congestion provided by the Silvertown Tunnel is lower. The table also shows a similar analysis by time period for the user disbenefits arising from the application of road user charging at the two tunnels – the user charges are greatest in the interpeak. The balance between the rates per hour is broadly consistent with average traffic volumes during the time periods.

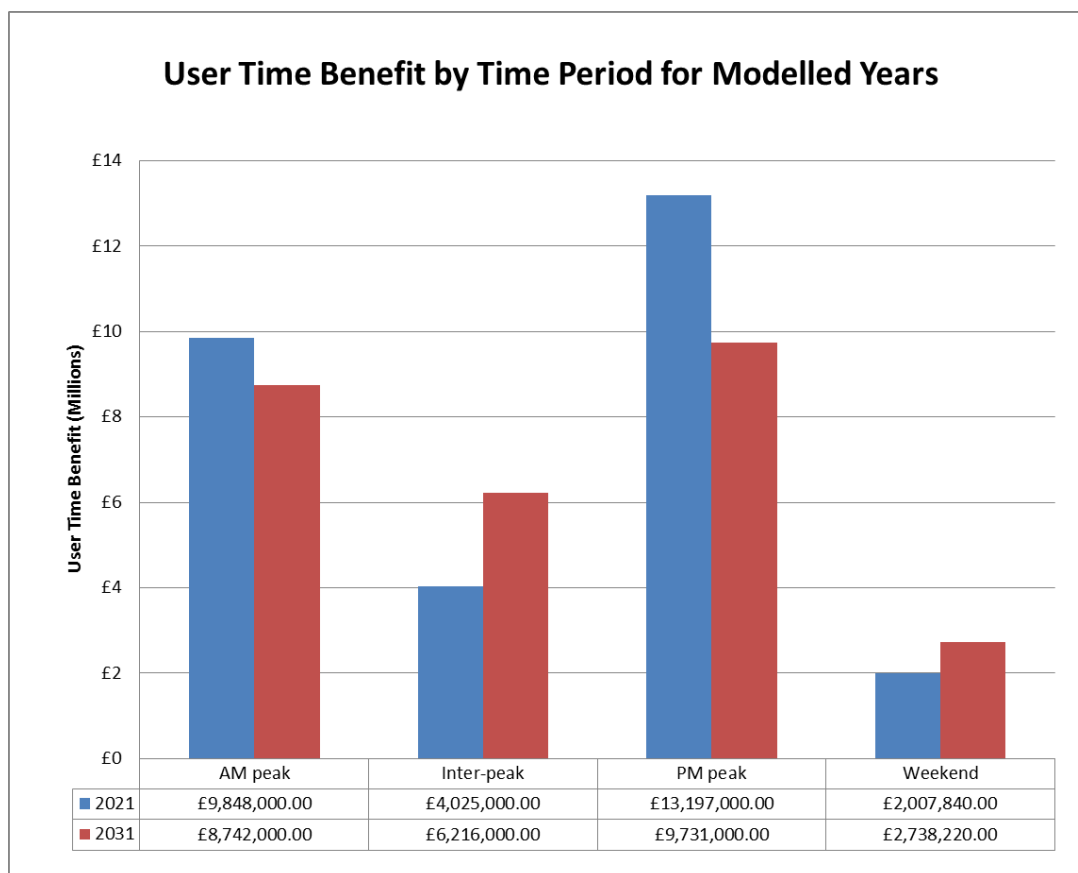
Table 12 User benefits and charges by time period

Benefit type	AM peak	Inter-peak	PM peak	Off-peak & weekend	Total

Benefit type	AM peak	Inter-peak	PM peak	Off-peak & weekend	Total
Travel time	£484.8m	£292.2m	£539.5m	£129.7m	£,446.1m
VOC	£32.0m	£21.5m	£30.6m	£10.4m	£94.6m
Total	£516.8m	£313.7m	£570.1m	£140.1m	£1,540.7m
% Benefit	33%	20%	37%	9%	100%
Hours per week	15 (3 x 5)	30 (6 x 5)	15 (3 x 5)	108 (12 x 5) +(24 x 2)	
Benefits per hour/week*	£34.2m	£10.5m	£38.2m	£1.3m	
User charges	-£171.2m	-£301.0m	-£184.7m	-£166.5m	-£823.4m
Total	21%	37%	22%	20%	100%
Hours per week	15	30	15	108	
Charge per hour/week*	-£11.4m	-£10.0m	-£12.3m	-£1.5m	
* summed over the 60 year appraisal period.					

- 3.30. Figure 3-2 shows the user time benefits for each modelled year. The travel time benefits in the morning peak reduce after opening of the Silvertown Tunnel and by 2031 are only just above 50% of the 2021 value. This may be due to higher levels of traffic in the 2031 scenario, which erodes some of the.- this will be analysed in more detail for the Full Business Case and . The decline in the evening peak time benefits is much lower. During the inter-peak period and at weekends, when traffic volumes are lower, benefits rise slightly over the ten year period, indicating that the additional capacity is still sufficient for forecast growth.

Figure 3-2 User time benefits by time period and modelled year



3.31. Analysis of user benefit and charge totals by vehicle type and journey purpose is shown in Table 13 and Table 14. The distribution of the benefit and charge by time period is also shown. In respect of user benefits, there is considerable benefit (£839m) accruing to business and freight users, with car ‘other’ being the next highest category of benefit. Benefits are generally higher in the peak hours as expected.

Table 13 User benefits by user type and time period

User type	Benefit total	AM	IP	PM	Weekend
Car commute	£172.8m	49%	9%	38%	3%
Car other	£337.4m	20%	24%	35%	21%
Car business	£515.7m	33%	24%	39%	3%
LGV	£233.7m	32%	19%	37%	11%
HGV	£89.2m	36%	27%	23%	14%
Bus & coach	£97.3m	53%	0%	47%	0%
Total	£1,446.1m	-	-	-	-

3.32. In respect of user charges, these are obviously closely related to the volumes of different user types using the tunnels at the different times of day. Just over half of the total charges (£453m) are paid by business and freight users.

Table 14 User charges by user type and time period

User type	Charge total	AM	IP	PM	Weekend
Car commute	-£117.8m	39%	20%	35%	7%
Car other	-£252.1m	12%	37%	22%	30%
Car business	-£96.7m	26%	42%	30%	2%
LGV	-£207.2m	19%	37%	22%	21%
HGV	-£149.6m	21%	45%	9%	25%
Total	-£823.4m	-	-	-	-

(d) Assessment of traffic delays during construction and maintenance

3.33. An assessment of traffic delays during construction and maintenance will be prepared as part of the preparatory work for the full business case for the DCO application. It is currently expected that the DfT's QUADRO software will be used for this exercise.

(e) Monetised environmental assessment

3.34. An assessment of the monetised environmental implications of the scheme will be prepared as part of the preparatory work for the full business case for the DCO application, applying WebTAG guidance.

(f) Transport economic efficiency (TEE)

3.35. The transport economic efficiency results for the bored and immersed tube tunnel options, and are shown in Table 15. Total user benefits are estimated at £723m, with some £458m of this being attributable to business users. These benefits are after taking into account the charges paid by users.

Table 15 Transport Economic Efficiency – Bored Tunnel

Non-business: Commuting	ALL MODES	ROAD	BUS and COACH	RAIL	OTHER
<u>User benefits</u>	TOTAL	Private Cars and LGVs	Passengers	Passengers	
Travel time	£ 265,878	£ 172,833	£ 93,045	£ -	£ -
Vehicle operating costs	£ 11,281	£ 11,281	£ -	£ -	£ -
User charges	-£ 117,814	-£ 117,814	£ -	£ -	£ -
During Construction & Maintenance	£ -	£ -	£ -	£ -	£ -
NET NON-BUSINESS BENEFITS: COMMUTING	£ 159,345 (1a)	£ 66,299	£ 93,045.40	£ -	£ -
Non-business: Other	ALL MODES	ROAD	BUS and COACH	RAIL	OTHER
<u>User benefits</u>	TOTAL	Private Cars and LGVs	Passengers	Passengers	
Travel time	£ 341,415	£ 337,386	£ 4,030	£ -	£ -
Vehicle operating costs	£ 15,794	£ 15,794	£ -	£ -	£ -
User charges	-£ 252,137	-£ 252,137	£ -	£ -	£ -
During Construction & Maintenance	£ -	£ -	£ -	£ -	£ -
NET NON-BUSINESS BENEFITS: OTHER	£ 105,073 (1b)	£ 101,043	£ 4,029.70	£ -	£ -
Business		Goods	Business		
<u>User benefits</u>		Vehicles	Cars & LGVs	Passengers	Freight
Travel time	£ 838,822	£ 322,899	£ 515,714	£ 209	£ -
Vehicle operating costs	£ 67,504	£ 46,193	£ 21,311	£ -	£ -
User charges	-£ 453,520	-£ 356,809	-£ 96,711	£ -	£ -
During Construction & Maintenance	£ -	£ -	£ -	£ -	£ -
Subtotal	£ 452,806 (2)	£ 12,283	£ 440,314	£ 208.90	£ -
Private sector provider impacts				Freight	Passengers
Revenue	£ -			£ -	£ -
Operating costs	£ 5,449			£ 5,449	£ -
Investment costs	£ -			£ -	£ -
Grant/subsidy	£ -			£ -	£ -
Subtotal	£ 5,449 (3)			£ 5,449	£ -
Other business impacts					
Developer contributions	£ - (4)			£ -	£ -
NET BUSINESS IMPACT	£ 458,255 (5) = (2) + (3) + (4)				
TOTAL					
Efficiency Benefits (TEE)	£ 722,672 (6) = (1a) + (1b) + (5)				

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

(g) Public accounts (PA)

3.36. The Silvertown Tunnel project would use user charging for two reasons:

- Traffic management - TfL would use charging as a way to manage demand and therefore levels of traffic passing through Blackwall and Silvertown Tunnels.
- Financial - TfL would also use revenue generated by the user charging scheme to help pay for the new tunnel.

3.37. Consequently the current scheme:

- Is expected to be funded and maintained largely from user charges;
- The consequent net cost to the public purse will be very small over the 60 year appraisal period; and
- There will be residual (post charges) net benefits to users.

- 3.38. WebTAG guidance on the Public Accounts assessment is that the Present Value Costs “should only comprise Public Accounts impacts (i.e. costs borne by public bodies) that directly affect the budget available for transport“. The guidance notes further that “Where a scheme leads to changes in public sector revenues (for example tolling options) careful consideration should be given to whether they will accrue to the Broad Transport Budget and all assumptions, and their justifications, should be clearly reported.“
- 3.39. Clearly in this case, the cost borne by TfL in implementing the project would not directly affect the broad budget available for transport, as the scheme is largely self-funding. In these circumstances, DfT advice (reproduced in Appendix B) is that the revenue would have to be accounted for on the Present Value Benefit side of the BCR calculation. This means that the revenue is treated as public revenue and the costs accrue to the Present Value Costs.

Preferred Option appraisal

- 3.40. The overall effect of this treatment as shown in the Public Accounts and AMCB tables below is a Net Present Value (NPV) of £621m and consequently a Benefit/Cost Ratio of 1.69. This means the charges largely pay for the investment and operating costs and result in a residual user benefit (after charges) – clearly a very positive outcome.

Table 16 Public accounts – Bored Tunnel

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue	-£898,534		-£898,534	-	-	-
Operating Costs	£279,943		£279,943	-	-	-
Investment Costs	£625,662		£625,662	-	-	-
Developer and Other Contributions	-		-	-	-	-
Grant/Subsidy Payments	-		-	-	-	-
NET IMPACT	£7,071	(7)	£7,071	-	-	-
Central Government Funding: Transport						
Revenue	-		-	-	-	-
Operating costs	-		-	-	-	-
Investment Costs	-		-	-	-	-
Developer and Other Contributions	-		-	-	-	-
Grant/Subsidy Payments	-		-	-	-	-
NET IMPACT	-	(8)	-	-	-	-
Central Government Funding: Non-Transport						
Indirect Tax Revenues	£ 100,366	(9)	£100,366	-	-	-
TOTALS						
Broad Transport Budget	£ 905,605	(10) = (7) + (8)				
Wider Public Finances	-£ 798,168	(11) = (9)				
Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers. All entries are discounted present values in 2010 prices and values.						

Table 17 Analysis of monetised costs and benefits (including user charges)

Noise	-	(12)
Local Air Quality	-	(13)
Greenhouse Gases	£11,976	(14)
Journey Quality	-	(15)
Physical Activity	-	(16)
Accidents	-£6,556	(17)
Economic Efficiency: Consumer Users (Commuting)	£159,345	(1)
Economic Efficiency: Consumer Users (Other)	£105,073	
Economic Efficiency: Business Users and Providers	£458,255	(5)
Wider Public Finances (Indirect Taxation Revenues)	-£100,366	- (11a) - sign changed from PA table, as PA table represents costs, not benefits
Wider Public Finances (Public sector operator revenue)	£898,534	(11b)
Present Value of Benefits (see notes) (PVB)	£1,526,260	(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1) + (5) - (11)
Broad Transport Budget	£905,605	(10)
Present Value of Costs (see notes) (PVC)	£905,605	(PVC) = (10)
OVERALL IMPACTS		
Net Present Value (NPV)	£620,655	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.69	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

3.41. The alternative method of assessing the impact of the scheme in the accounts tables is to net off the revenue against the costs, resulting in a small net change to public sector finances. The revenue would be netted off against costs under the Broad Transport Budget and is included in the PVCs as revenue, but this would lead to a negative Benefit Cost Ratio – the NPV would be identical. DfT advice is that in terms of “Value for Money” assessment- negative BCRs of “revenue positive” schemes are not informative. It is advisable in such cases to look as well at the Net Present Values of transport options to compare them. In the present case, the NPV of the two approaches is identical.

Sensitivity test results

3.42. As part of the preparatory work for the DCO application, a number of transport economic sensitivity tests will be undertaken. This chapter will present and discuss the results for sensitivity tests, with tests likely to include:

- high and low economic growth;
- a range of different user charges and potentially discounts; and

- a range of different capital and operating/maintenance costs.

Appraisal summary table

3.43. The appraisal summary table for the Silvertown Tunnel scheme in the DfT WebTAG format, containing a summary of impacts currently assessed, is in Appendix A.

Value for money statement

3.44. Reference has already been made above to the DfT's Value for Money Guidance. This provides a table to place the scheme, on the basis of its Benefit to Cost Ratio, into one of the DfT's Value for Money categories.

Benefit to cost ratio range	Value for money scale
Less than 1.0	Poor value for money
Between 1.0 and 1.5	Low value for money
Between 1.5 and 2.0	Medium value for money
Between 2.0 and 4.0	High value for money
Greater than 4.0	Very high value for money

3.45. A BCR for the Silvertown Tunnel scheme of 1.7 places the scheme in the Medium Value for Money range. However, this needs to be treated with caution as the usual use of a BCR is to ascertain whether a project's social welfare benefits are greater than its taxpayer funded costs. In this case the scheme is being paid for by users and not the taxpayer (subject to financing arrangements) and the BCR is principally showing the benefit to users is greater than the cost they have to pay to use the scheme. In addition, as described in the following section, there are substantial wider economic benefits that have not been taken into account in this BCR estimate.

Wider Economic Benefits

3.46. The DfT defines "Wider Impacts" as the economic impacts of transport that are additional to transport user benefits. The types of Wider Impacts that DfT includes in transport appraisals are :

- Agglomeration
- Output change in imperfectly competitive markets
- Tax revenues arising from labour market impacts (from labour supply impacts and from moves to more or less productive jobs)

3.47. More detailed work is needed at the Full Business Case stage to develop detailed estimates of these additional benefits and the results will be reported in a scheme Appraisal Report and in the Wider Impacts Column of the Appraisal Summary Table. These Wider Impacts will be included in an Adjusted BCR, and taken account of in the overall assessment of Value for Money.

- 3.48. There are other economic benefits that are either not included or quantified in standard transport appraisals which include the financial quantification of regeneration benefits and direct cost savings to businesses and logistic companies.
- 3.49. The text that follows gives an indication of the additional benefits that are likely in this case arising from the above – these will be material additions to total scheme benefits.

Agglomeration

- 3.50. Agglomeration” refers to the concentration of economic activity within an area. Transport can alter the accessibility of firms in an area to other firms and workers, thereby affecting the level of agglomeration. Businesses derive productivity benefits from being close to one another and from being located in large labour markets. If transport investment brings firms closer together and closer to their workforce this may generate an increase in labour productivity above and beyond that which would be expected from the direct user benefits alone. Knowledge and technology spillovers are also important aspects of agglomeration effects.
- 3.51. The calculation of agglomeration benefits will be undertaken for the Full Business Case and based on the experience of other projects may add between 5-20% to the total benefits.

Output change in imperfectly competitive markets

- 3.52. This is the welfare impact that results because increases in the output of goods and services are valued more highly by consumers than the cost of producing this output. This impact is estimated as a proportion of total user benefits for business journeys, calculated as a 10% uplift to business user benefits. Based on the current Silvertown economic appraisal, this additional benefit would equate to approximately £90m NPV for the 60 year appraisal.

Tax revenues arising from labour market impacts

Move to more productive jobs

- 3.53. People will move to more productive jobs if the earnings obtained from the job move exceeds the additional generalised cost of travel to those jobs. Silvertown Tunnel will open up new job opportunities for people due to improved accessibility by both bus and car. Median wages vary quite considerably across the Thames from just under £21k in Bexley to £43k in Tower Hamlets and wages on the south side appear to markedly lower than on the north –see Table 18.

Table 18 Median Wages in the study area⁴⁸

Borough	Jobs within borough	Median wage all employees
Bexley	57	20,640

⁴⁸ Annual Survey of Hours and Earnings 2013 ONS

Lewisham	38	23,183
Greenwich	54	23,957
Newham	52	23,964
Hackney	51	28,572
Barking and Dagenham	48	29,966
Tower Hamlets	187	43,544

- 3.54. DfT require use of a LUTI model to assess these impacts and this will be examined for the Full Business Case. However to provide an indication of the possible impacts some simplifying assumptions have been used at this stage.
- 3.55. If just 1% of those who work in the south of the Thames boroughs on median wages took up jobs in the northern Thames boroughs on median wages there would be a financial gain to those employees of £21m a year. Given a marginal income tax rate of 20% this would lead to additional tax revenues of £4m a year. Over a 60 year period the npv discounted benefit to employees would be £520m and £100m to the Treasury. In reality the dynamics would be expected to be more complex but one would expect, all other things being the same, a greater equalisation of wages between north and south of the Thames as labour markets became larger and more efficient delivering benefits to businesses, employees and the Treasury. As highlighted above this approach is not in line with that outlined in WebTAG but provides an indication of the possible benefit that could arise.

Regeneration benefits

- 3.56. The River Crossings Development Study examined the development impacts of various Thames crossings. Its conclusion was that a crossing at Silvertown would support 12,000 – 15,500 net jobs and 9,000-11,200 housing units.
- 3.57. The present government established the Regional Growth Fund, which was set up to support growth and jobs in areas that rely on the public sector. The NAO have undertaken two reviews of the fund and in the latest review reported that the cost per job supported was £37,400 and that this was broadly in line with similar government schemes. . This can be taken as a proxy regarding the amount of money Government is prepared to spend to create a job in an area of deprivation. The area to be served by the Silvertown crossing is one of the most deprived in the country. Given the level of expected job creation in the area and the degree of deprivation the Government would in theory be willing to spend between £444m-£573.5m to achieve a similar outcome via other policy interventions.
- 3.58. The present government has also established a Growing Places fund which amongst other schemes helps to support stalled development. While it is difficult to produce a clear mapping across from spend to housing starts the Government's progress report suggests that it has supported 77,000 homes through spend of £650m . The money has also supported other types of development but offsetting that, additional public sector funding has also been provided mainly via local authorities. On the basis that spend per home of £8,000 is a reasonable amount Government is willing to pay for each additional home provided, it would be will be willing to provide funding of £72 to £90m via other policies to support the expected scale of development that the proposed Silvertown tunnel will facilitate.

- 3.59. Another way of examining willingness to pay for additional homes is via the Government's New Homes Bonus. While the level of payment will vary by type of property and whether the home is affordable or not it provides an average payment of £8,600 for a Council Tax Band D property. On this basis the Government would be willing to pay £77m-£96m for the number of homes facilitated by Silvertown tunnel.
- 3.60. In total it appears likely that the Government will be willing to pay up to £750m to achieve the development and employment impacts that Silvertown tunnel will deliver.

Direct cost savings to businesses & freight

- 3.61. Evidence from previous improvements in river crossings shows there can be major savings for business. This can range from opportunities to centralise depots (no need to have one on each side of the river), gains of economies of scale from being able to serve a larger market, and reductions in fleet size due to time savings.
- 3.62. These are difficult to quantify and there is a danger of double counting as time savings and reliability savings are already captured in the appraisal. However, based on freight journey time savings an estimate can be made of vehicle savings that could be achieved which are not captured elsewhere. Taking a very conservative view that freight vehicles are operated 300 days a year and 12 hours a day it is possible to estimate that discounted vehicle savings over a 60 year period in the order of £100m can be achieved.
- 3.63. There are also potential savings in the value of stock being held which is a more complex assessment. The argument being if stock is held for one less day then there is a one day reduction in interest payments due on the value of a stock held. If fewer vehicles are required due to the time savings arising then this would suggest a smaller amount of stock is in circulation and a saving will accrue. The value of savings will depend on the value of goods carried and real interest rates. These may amount to £25m discounted savings over a 60 year period but the figure is subject to a very wide margin of error, at a conservative estimate say £5-£25m.
- 3.64. The conclusion from this initial review of potential wider economic impacts is that it is likely that there are substantial additional benefits of the Silvertown tunnel not yet captured in the economic appraisal. These may add the following benefits (all figures are shown as 60 year NPV):
- Agglomeration – 5-20% of total user benefits i.e. £30-£140m
 - Output change in imperfectly competitive markets - £90
 - Move to more productive jobs - £100m
 - Regeneration benefits – job creation £440m-£570m, housing £70-£90m - total £500m to £650m
 - Direct cost saving to business and freight –£5-25m

4. The Financial Case

Introduction

- 4.1. The Financial Case sets out the project and ongoing operating costs and financing and funding arrangements to deliver the scheme.

Project costs

- 4.2. The project currently has an Estimated Final Cost (EFC) of £753m, although further design work is being undertaken which may see this figure revised. The EFC comprises £30m for powers / procurement, a £21m allowance for land acquisition and £691m for design and construction. A further £12m is set aside to cover project management and supervision costs during the construction period.
- 4.3. The operational cost is estimated to be £2.8m per annum, made up of routine and reactive maintenance and utility costs. A further £17.86m is set aside every 10 years, to cover the lifecycle costs.

Financing

- 4.4. TfL propose to use a privately finance solution to deliver the Silvertown Tunnel project. The project has characteristics which make it a suitable candidate for delivery via a privately financed solution. The basic structure is unlikely to be subject to significant change and technical advancements over the asset life and interface risks are limited to the connections at either end. The value of the scheme is large enough to attract interest from the markets and road and tunnel risks are well understood by financing markets which should ensure a competitive cost of capital.
- 4.5. Although the use of private finance may mean that the base projected cost of the scheme is greater for TfL than if it finances the scheme itself, the use of a privately financed solution has a number of key advantages:
- a) Risk is effectively transferred to a private party who is best placed to manage it;
 - b) Total costs are minimised by transferring the responsibility to the private sector for the design, construction and ongoing responsibility for the asset; and
 - c) There are greater opportunities for innovation through an outputs based contract.
- 4.6. There are also advantages for TfL in that repayment of private finance can be deferred until the scheme is operational, which frees up funds for investment in other schemes which may not be suitable candidates for a privately financed solution. Repayment of private finance can also be spread out over time, allowing TfL to use revenues generated from user charging to cover repayment charges (although charging levels and the impact on traffic behaviour needs to be considered).

Funding

- 4.7. A privately-financed solution will see the private sector take on the responsibilities for design, construction and other risks of the project, in return for a series of

payments by TfL. The payments to the private sector would be made from TfL's general funds.

- 4.8. As part of the project, it is proposed that road user charging is introduced on both Blackwall and Silvertown tunnels and TfL expects that revenue collected will over time cover the cost of the scheme and may also play a part in funding other future transport investment in east London.

5. The Commercial Case

Introduction

- 5.1. This section of the paper provides details on the, commercial structure, and procurement approach and accounting implications of the project.

Procurement Strategy and Sourcing Options

- 5.2. Silvertown Tunnel will be delivered using a privately financed solution which meets the following objectives and constraints:

Objectives – the solution must:	Constraints – the solution must:
<p>Be affordable over the long-term</p> <p>Ensure integration of tunnel operations with the wider road transport operations</p> <p>Allow for operational support between Blackwall and Silvertown Tunnels</p> <p>Achieve value for money – ensuring that risk transfer is justified and worthwhile</p> <p>Have support from key internal and external stakeholders</p> <p>Match responsibilities with management and organisational capability</p> <p>Have strong confidence of delivery within the current market</p>	<p>Achieve “off budget” status to meet affordability constraints</p> <p>Ensure TfL remains principle on charge levying to achieve favourable treatment on VAT on charges</p> <p>Ensure TfL retains control of charging strategy to achieve traffic management objectives</p> <p>Ensure TfL retains control of traffic management operations to meet provisions under the Traffic Management Act</p> <p>Consider integration with existing contractual arrangement where it makes sense operationally and is deemed value for money</p>

Proposed Commercial Structure

- 5.3. Based on the above conclusions, it is proposed that TfL deliver Silvertown tunnel by entering into a long term DBFM agreement with a private sector party who would be responsible for the financing of and undertaking of the detailed design, construction and on-going maintenance of the new tunnel for around 30 years (based on debt repayment profile and time to generate target shareholder return). At the end of the contract the asset would be handed back to TfL.
- 5.4. TfL would make regular payments to the private sector party once the tunnel was operational. Deductions would be made from these payments to the extent that the private sector party fails to meet the specified availability, performance and safety requirements.
- 5.5. TfL would control the day to day operation (traffic management, vehicle recovery and gritting – currently covered under the LTrACS and LoHAC contracts) of Silvertown Tunnel and the Blackwall Tunnel would continue to fall under existing operations and maintenance arrangements.
- 5.6. TfL would also control setting the user charges and revenue collection on both Silvertown and Blackwall Tunnels. Within this structure, there is flexibility over the

delivery and operation of a user charging system. This could either be integrated into the existing congestion charge or can be let out as a separate collection contract, with or without the risk on collection cost.

- 5.7. Other models such as Design Build Finance Transfer and Regulatory structures have been considered, but are not suitable as they have significant drawbacks in terms of affordability and value for money.

Payment Mechanisms, pricing framework and charging mechanisms

- 5.8. The payment mechanism will determine how payment amounts are calculated and is fundamental to the contract by putting into financial effect the allocation of risk and responsibility between TfL and the private sector.
- 5.9. TfL are proposing to adopt an availability based structure where payments are based on the level of availability. Deductions are applied where the crossing is not available. TfL would control user charge pricing and retain demand and revenue risk. This structure allows TfL to pass over risks that the private sector can control and manage. There is also a strong appetite amongst both debt and equity investors for availability based road structures and strong competition between bidders can be expected. Recent examples; M25, Mersey Gateway Bridge, Scottish roads programme (M8, AWPR, M80), Dutch / German / Norway / Irish roads programmes and recent Australian and Canadian road schemes;
- 5.10. Usage and shadow toll payments arrangements have been ruled out. Under current HMT policy on use of public private partnerships (now termed PF2 by the UK government), the presumption is that authorities do not transfer usage risk unless there is a clear rationale for doing so. In the case of the Silvertown Tunnel project, usage risk would be difficult for the private sector to price efficiently given the complexity predicting the behaviour of traffic on the surrounding network, the impact that other future transport investments might have and their ability to predict usage levels over time, even if given control of user charging pricing. This therefore makes both shadow toll and real toll payment structures unsuitable as the primary payment mechanism.

Accounting Implications

- 5.11. An initial assessment of the likely accounting treatment of the proposed commercial structure under ESA95/10 has been undertaken. The assessment is that the project is likely to be treated as “off budget” and therefore liabilities would not score towards TfL borrowing.

Procurement Route

- 5.12. A DBFM contract for Silvertown Tunnel would need to be competitively tendered via EU compliant means in the Official Journal of the European Union (OJEU). It is currently being assumed that either a competitive dialogue or negotiated procedure would be adopted to allow bidders to develop alternative proposals to meet TfL’s requirements. This would encourage innovation as well as maintain competitive pressure during the bidding process.

6. The Management Case

Introduction

- 6.1. The purpose of the Management Case is to assess whether a proposal is deliverable. It reviews evidence from similar projects, sets out the project planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance.

Evidence of similar projects

- 6.2. TfL has extensive experience in developing, promoting and implementing significant infrastructure projects. This ranges from minor modifications to existing infrastructure (such as Hammersmith flyover refurbishment) to major schemes.
- 6.3. Major schemes developed, promoted and implemented by TfL in recent years include the Jubilee Line Extension, a major programme of extensions to the DLR, the London Overground Network, the Thames Cable Car and Crossrail. These projects have been progressed through the planning system using a range of routes including Transport and Works Act Orders (TWAOs) and the Private Member's Bill Process.
- 6.4. There is some experience with major highway projects in London, but none with tolled road tunnels, although TfL has extensive experience of user charging with the Central London Congestion Charge. Furthermore, the Development Consent Order (DCO) process that will be used for the Silvertown Tunnel is relatively new. While much of TfL's project development experience will be transferrable to this scheme, there will be a need to seek additional support and advice from experienced promoters of major highway schemes and operators of similar projects. This could include the Highways Agency and the operators of the Mersey and Tyne Tunnels, the only existing examples of tolled urban tunnels in the UK.

Linkages

Programme linkages

- 6.5. The east London River Crossings Programme is exploring the impacts and benefits of proposals for new river crossings in east London, including options for the Woolwich Ferry service, whose current operating contract expires in spring 2020. Options include replacing the ferry and associated infrastructure at Woolwich, introducing a new ferry service at Gallions Reach; bridge options at Gallions Reach and Belvedere are also being explored.
- 6.6. The east of Silvertown Crossings is in the Optioneering stage. Public consultation has been carried out during summer 2014 to identify a preferred single option.
- 6.7. A key linkage between the east of Silvertown Crossings project and Silvertown Tunnel has been identified, that the statutory consultation for Silvertown Tunnel should not proceed until TfL and the Mayor of London have decided which option/s to proceed with at Woolwich/Gallions Reach/Belvedere. This is to enable the implications of the preferred option on the Silvertown Tunnel project to be understood prior to statutory consultation.

Key project assumptions

- 6.8. TfL will rely on user charging for the Silvertown Tunnel and Blackwall Tunnel as a means of managing traffic demand and as a source of funding. The River Crossings Programme does have a budget for planning and development stages up to securing powers and consents but does not have a budget for the main design and build costs.
- 6.9. In addition to user charging, TfL is considering delivering the project via a Private Finance Initiative, whereby the Contractor with private sector funding would be responsible for the detailed design, construction, financing and maintenance of the tunnel over a suitable concession period (typically 30 years).
- 6.10. The land for the proposed route has been safeguarded since 1990. Continued safeguarding of the route has been identified as an external dependency for the delivery of the Silvertown Tunnel.

Governance, organisational structure and roles

Internal governance

- 6.11. The Silvertown Tunnel project is part of the east London River Crossings Programme. The River Crossings Programme is overseen by a Sponsor Group, chaired by the Managing Director of TfL Planning and attended by senior managers from TfL Strategy and Planning, Surface Transport and Corporate Finance. Specific project meetings for Silvertown Tunnel take place within the overall east London river crossings programme, and a dedicated Project Board has been established to guide and oversee delivery and realisation of benefits.

Independent peer review group

- 6.12. An Independent Peer Review Group (IPRG) was established in November 2013 to provide independent expert scrutiny of the Silvertown Tunnel project, initially regarding the selection of a preferred tunnel option and to review the proposed ground investigation works.
- 6.13. The IPRG will remain in place to undertake reviews on technical and engineering matters at key stages during the design, procurement and delivery of the project.

Programme/Project Plan

- 6.14. Some key future milestones for the project are shown in the table below.

Table 19: Key future project milestones

Milestone Description	Date ⁴⁹
Silvertown Tunnel Non-Statutory Consultation	October/December 2014
Silvertown Tunnel Statutory Consultation	Summer 2015
Silvertown Tunnel DCO Submission	End 2015
Silvertown Tunnel Opens	2022

Assurance and approvals plan

- 6.15. The assurance and approvals process will follow TfL's established project assurance procedures which include assurance at three levels: internal, Programme Management Office (PMO) and external.
- 6.16. Internal assurance is provided through Pathway (TfL's project management methodology) project stage gates and/or peer reviews staffed by the sponsor and delivery personnel either from within the project or from a peer project. Underlying these stage gates are a number of assurance activities conducted by both TfL and the suppliers and include activities such as design reviews, safety assessments, risk reviews, commercial assessments, estimate validation, material testing, site inspections and product testing.
- 6.17. The number and timing of the stage gates are established by the delivery organisation, based on guidance in Pathway, and informed by a characterisation tool that considers such things as scale, complexity, novelty, project team experience and the strategic importance of the project. A number of Products are required to be completed to provide evidence at the stage gate that the project is fit to proceed to the next stage.
- 6.18. Products are outputs that are signed off by authorised individuals, and include such documents as project execution plans, risk management plans, project estimates and design compliance certificates.
- 6.19. The PMO is part of TfL but is not accountable for delivery. These reviews are typically Integrated Assurance Reviews (IAR), staffed by a combination of PMO staff, consultant external experts (EE) or peer groups from outside the delivery organisation.
- 6.20. The EEs are selected on the basis of their relevant experience and suitability to the project under review. Each review is covered by a Terms of Reference that sets the

⁴⁹ Subject to tender returns and DCO process.

scope and the brief to the EE, who is procured from a TfL consultancy framework. The Terms of Reference is based on the Pathway IAR Lines of Enquiry, aimed at generating a comprehensive review. Each Line of Enquiry includes up to 20 detailed challenges, devised to match the maturity of the project at its particular point in its lifecycle.

- 6.21. The Lines of Enquiry were developed as part of the Corporate Gateway Approval Process (CGAP) in 2008, following a comprehensive benchmarking process that assessed the assurance regimes in other organisations and the Office of 3 Government Commerce who produced gateway processes and guidance (now part of the Cabinet Office). Some additions have been made since 2008, including more explicit challenges covering cost benchmarking following consultation with IIPAG.
- 6.22. The IAR report is considered by appropriate bodies prior to seeking authorisation. For projects over £50m the Finance and Policy Committee and Board are informed of the assurance reviews carried out.
- 6.23. IARs are conducted at key stages of the project:
- initiation;
 - option selection;
 - pre-tender;
 - contract award;
 - project close out;
 - benefits delivery; and
 - annual review (where no other IAR would happen within 12 months).
- 6.24. The involvement of the IIPAG is determined on both a risk based approach and a project value threshold. The IIPAG reviews are normally commissioned on projects with a value of £50m or more. The IAR process is as detailed above and the IIPAG then attends the Gate Review Meeting once the EE Interim Report has been produced. The IIPAG then produces its own reports, which are submitted at the relevant approval meetings alongside the PMO Report, based on its review of the IAR material and discussions at the final Gate Review Meeting.

Communications and stakeholder management

Internal stakeholders

- 6.25. The Project Manager for the Silvertown Tunnel project is responsible for keeping internal stakeholders appropriately engaged and informed. In accordance, formal, minuted meetings with set agenda and actions have been arranged with all internal stakeholders.

External stakeholders

- 6.26. A Stakeholder Engagement Lead has been appointed for the project. A Stakeholder Engagement Strategy has been prepared for the project and provides a brief on the objectives of the stakeholder engagement, target audience and methodology.
- 6.27. The external stakeholders identified are summarised below:
- Boroughs

- Political Stakeholders
 - Statutory Stakeholders
 - Representative Organisations (businesses, freight interests, motorists and public transport users)
- 6.28. A draft Consents Strategy has been prepared by the Consents team with TfL Transport Strategy and Planning, and identifies the statutory stakeholders.
- 6.29. There is an interface between the Silvertown Tunnel project and the east of Silvertown Crossings project. Therefore, the consultation for Silvertown Tunnel is being undertaken in two stages.
- 6.30. A non-statutory consultation was carried out in October 2014. Following the decision on the preferred option for Woolwich / Gallions Reach, the Silvertown Tunnel Project will proceed with undertaking a statutory public consultation in accordance with the pre-application requirements of the Development Consent Order (DCO) process, Planning Act 2008. A plan for the statutory consultation has been drafted by the Stakeholder Engagement Lead.

Sharing of information, coordination and cooperation arrangement

The project uses TfL's comprehensive information systems, including the TfL Document Manager (Livelink) and SharePoint. A document library for the River Crossings Programme and sub-projects has been created to store programme and project related documents.

Programme/Project Reporting

- 6.31. TfL will develop programme controls supported by robust reporting processes that align with the Project governance framework, integrating key stakeholder requirements, facilitating continuous monitoring, and incorporating accurate performance measurement. The purpose is to provide accurate project information in a timely way to ensure well informed decisions are made and appropriate action is taken.
- 6.32. The project management model will be designed to deliver a robust reporting regime, including:
- governance meetings which form part of the reporting process as the forum where performance issues are raised, possible mitigation is discussed and key decisions required are made; and
 - project reporting requirements will be fully defined, together with content requirements, target audience and timing.

Implementation of work streams

6.33. There are a number of different workstreams for the project, and responsibilities and resources for each of these have been identified.

- Engineering design and technical studies
- Transport assessment and traffic modelling
- Environmental assessment
- Funding and procurement
- Contract management
- Commercial and Legal
- Land assembly
- Risk management strategy -
- Monitoring and evaluation
- Project management

7. Conclusion

- 7.1. The recommendation of the Outline Business Case is that a bored tunnel be progressed as the preferred option in this consultation. The responses to the five key questions raised in the guidance can be summarised as follows:
- there is a clear robust case for change for a new tunnel at Silvertown, to address current congestion and unreliability and to cater for the needs of future economic growth. This 'strategic case' is closely related to national, London-wide and local road policy objectives, with a particular reference to the London Plan and the Mayor's Transport Strategy.
 - the analysis demonstrates that the scheme is excellent value for money – it has a high net present value (some £620m) and is a scheme that can be delivered and funded by user charges.
 - is commercially viable – the report sets out the procurement, commercial structure, and proposed allocation of risk and payment mechanisms for the project.
 - is financially affordable – the 'financial case'; the analysis sets out the project cost, describes the private funding mechanism available to deliver the scheme and the proposed financing arrangements including the accounting treatment and
 - is achievable- the 'management case' sets out a clear governance, process and programme for the further development of the scheme by TfL, an authority with a very successful experience and record in major project delivery.
- 7.2. While the Outline Business Case has reported on the majority of the likely impacts of the scheme, further work is required on the air quality, noise and social/distributional impacts in any future Full Business Case. In addition this further work will elaborate on the potential commercial case and charging policy and various sensitivity tests.

Appendix A - Appraisal Summary Table

Appendix B – Economic Assessment Report (attached)

**Appendix C – Silvertown Tunnel Social Impact Assessment
(attached)**

**Appendix D – Silvertown Tunnel Distributional Impact Assessment
(attached)**

Date produced: 14 Oct 2014

Contact:

Name of scheme:	River Crossings Package: Silvertown Tunnel with Blackwall/Silvertown Tunnel road user charging - Bored Tunnel Option	Name	Richard de Cani
Description of scheme:	The scheme involves the construction of a new tunnel between the Greenwich Peninsula and Silvertown, with tunnel approaches linking to the existing road network and the implementation of user charging at both the new infrastructure and the existing Blackwall Tunnel. Two construction methods are under consideration. This AST is for the Bored Tunnel option.	Organisation	TfL
		Role	Project Sponsor

Impacts		Summary of key impacts		Assessment					
				Quantitative			Qualitative	Monetary £(PV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Business users benefit significantly from the provision of Silvertown Tunnel through reduced travel time (including reductions in congestion) and vehicle operating costs amounting to £839m PV and £68m PV respectively. The introduction of a road user charge will be a disbenefit to users of £454m PV, giving an overall net benefit of £453m PV.	Value of journey time changes (£) £839m						
	Net journey time changes (£)			n/a	£453m	n/a	n/a		
	< 2min		2 to 5min		> 5min				
	-£9m		£171m		£676m				
	Reliability impact on Business users	Journey time reliability is expected to improve markedly for users and other travellers in the vicinity. In addition to the additional river crossing capacity, the new tunnel will provide a route for over-height vehicles that are unable to use Blackwall Tunnel. It is expected that the incidents of overheight vehicles blocking the tunnel approach at Blackwall will be substantially reduced.	n/a		Significant Beneficial	n/a			
	Regeneration	The new Silvertown Tunnel will enhance connectivity between the Royal Docks and Beckton Waterfront Opportunity Area, enhancing regeneration opportunities on both sides of the river, with widespread benefits across the wider Thames Gateway area.	n/a		Beneficial	n/a			
	Wider Impacts	A formal wider impacts assessment has not yet been undertaken but it is expected that the improvement in accessibility in a congested urban area will generate some significant agglomeration benefits.	n/a		Beneficial	n/a			

Environmental	Noise	The initial modelling indicates there would be an increase in noise from new roads through the Silvertown area. A small number of residential receptors may experience additional noise. Further modelling will confirm the level of impact and we would include mitigation measures in the design such as low noise road surfacing and acoustic barriers to reduce noise.	n/a	tbc	tbc	tbc	
	Air Quality	As a result of the Silvertown Tunnel there will be changes in traffic flows on the local road network. Our initial calculations indicate that as a result of the scheme there will be both increases and decreases in emissions across local road network. Our current forecasts do not however include NO2 or PM10 concentrations, or the effects of any steps we might take to mitigate the air quality impacts of the new tunnel. An air quality model will be used to predict future concentrations of pollutants in the opening year of the scheme. This information will be used to inform a judgment on what the overall impact of the scheme is on air quality, as a result of these changes in emissions.	n/a	tbc	tbc	tbc	
	Greenhouse gases	The reduction in queuing at Blackwall and wider decongestion effects are likely to lead to a reduction in traffic-related greenhouse gas generation which could be expected to be directly proportional to the reduction in vehicle operating costs.	Change in non-traded carbon over 60y (CO2e)	-259,659t	n/a	£12m	
			Change in traded carbon over 60y (CO2e)	-90t			
	Landscape	No landscape assessment required.	n/a	n/a	n/a		
	Townscape	Construction activities, stockpiling of materials and heavy vehicle movements could cause temporary disruption to townscape and views however construction best practice such as targeted use of hoarding would be used to limit disruption to townscape and visual amenity. The scheme design is being carefully considered in order that the proposals would be integrated with the local townscape and, where possible, opportunities are taken to enhance townscape and visual amenity such as landscaping.	n/a	TBC	n/a		
	Historic Environment	Excavations associated with construction of the Scheme and associated working areas could impact potential subsurface archaeological remains particularly land surfaces and peat deposits dating from the Mesolithic to Bronze age periods. There is also a possibility of relatively shallow post-medieval remains relating to industrial development. The likely potential for archaeological remains could be further understood by field surveys and if necessary mitigated by carrying out archaeological excavations in advance of development and watching briefs during construction.	n/a	TBC	n/a		
	Biodiversity	Potential impacts that could arise would be temporary disturbance of habitats during the construction period. Noise and visual disturbance and pollution from runoff could potentially impact on foraging and nesting birds and the River Thames Site of Importance for Nature Conservation. Mitigation would be implemented to ensure that construction (site clearance) in these areas is undertaken outside of nesting season, work sites are visually screened and run off is prevented. Permanent impacts would be in the form of loss of existing habitat for birds, invertebrates and reptiles through land take. If species are impacted as a result of unavoidable land take, suitable replacement habitat would be created.	n/a	TBC	n/a		
Water Environment	Construction work may cause heavily silted or contaminated runoff to nearby water bodies. Drainage discharge would be treated prior to entry into the water environment. We would adhere to the EA's Pollution Prevention Guidelines and a Construction Environmental Management Plan. Current drainage arrangements would be improved. Once the tunnel is operational, due to its location within Flood Zone 3, the tunnel will always carry a risk of flooding. The scheme would introduce impermeable surfaces which may increase both the risk of surface water flooding on site and flood water levels downstream. However, it is understood that currently there is failure/collapse of current drainage system. The development proposes to fix and improve this. It is believed that once this has been done the drainage system will be able to cope with the additional increase in surface water so will not increase surface water flood risk on site or downstream of the site.	n/a	TBC	n/a			

			Value of journey time changes (£)		n/a	£264	n/a		
			Net journey time changes (£)					£607m	
			< 2min	2 to 5min					> 5min
			-£29m	£119m					£517m
Social	Commuting and Other users	Commuting and Other users benefit significantly from the provision of Silvertown Tunnel through reduced travel time (including reductions in congestion) and vehicle operating costs amounting to £607m PV and £27m PV respectively. The introduction of a road user charge will be a disbenefit to users of £370m PV, giving an overall net benefit of £264m PV.							
	Reliability impact on Commuting and Other users	Journey time reliability is expected to improve markedly for users and other travellers in the vicinity. In addition to the additional river crossing capacity, the new tunnel will provide a route for over-height vehicles that are unable to use Blackwall Tunnel. It is expected that the incidents of overheight vehicles blocking the tunnel approach at Blackwall will be substantially reduced.	n/a		Significant Beneficial	n/a			
	Physical activity	The key impact on physical activity is likely to be a slight reduction of public transport users, who switch to car. However this impact is predicted to be very small, and there is likely to be increased public transport use from better reliability and more bus services. Therefore, the current assessment is that the impact is neutral.	n/a		Neutral	n/a			
	Journey quality	Improvement in reliability and lack of congestion is expected to reduce driver stress.	n/a		Slight Beneficial	n/a			
	Accidents	The full accident analysis is reported in the Silvertown Economic Assessment Report, and shows that there is expected to be an very small increase of 0.05% in accidents across the study area when the Silvertown Tunnel is in place. This very small change is considered to be a neutral impact.	n/a		Neutral	n/a	n/a		
	Security	There is unlikely to be a material impact on the security of road users.	n/a		Neutral	n/a	n/a		
	Access to services	The scheme will provide improved access to jobs and services for residents on both sides of the river. It is estimated that the tunnel will provide an increase in access to 64,000 jobs across the Study Area.	Improved access to 64,000 jobs		Significant Beneficial	n/a	n/a		
	Affordability	No assessment of the impacts of the proposed user charges on lower income groups has yet been completed. An assessment of the distribution of these impacts in terms of geography, journey purpose and time of the day/week will be undertaken for the Full Business Case, and appropriate mitigation measures identified where relevant.			To be confirmed		n/a		
	Severance	There is a neutral impact on the severance issues identified.	n/a		Neutral	n/a	n/a		
Option and non-use values	This is not applicable to this scheme.	n/a		n/a	n/a				
Public Accounts	Cost to Broad Transport Budget	The Silvertown Tunnel scheme (including introduction of road user charging) will require an investment in the transport network of £626m PV. Operating costs over 60 years amount to £269m PV, giving a total PV of costs of £906m. It is currently assumed that revenues are treated as part of wider public finances for appraisal purposes. If the revenues from road user charging of £899m PV were offset against costs, then the overall PV of net costs would be-£7m.	£906m costs, offset by £899m revenue		n/a	£906m costs, offset by £899m revenue			
	Indirect Tax Revenues	As a result of reduced operating costs from reductions in congestion and delays, and in particular a reduction in fuel consumption, there will be a loss in indirect taxation of £100m (PV over 60 years).	-£100m		n/a	-£100m			