



A40 Western Avenue Tunnels

Strategic Outline Business Case



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Document control

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V1.0	November 2016	Initial Draft <ul style="list-style-type: none"> • Incorporation of material received from consultants to November 2016 via TA/SV • Includes MO work on additionality 	TA/AM	
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Executive Summary

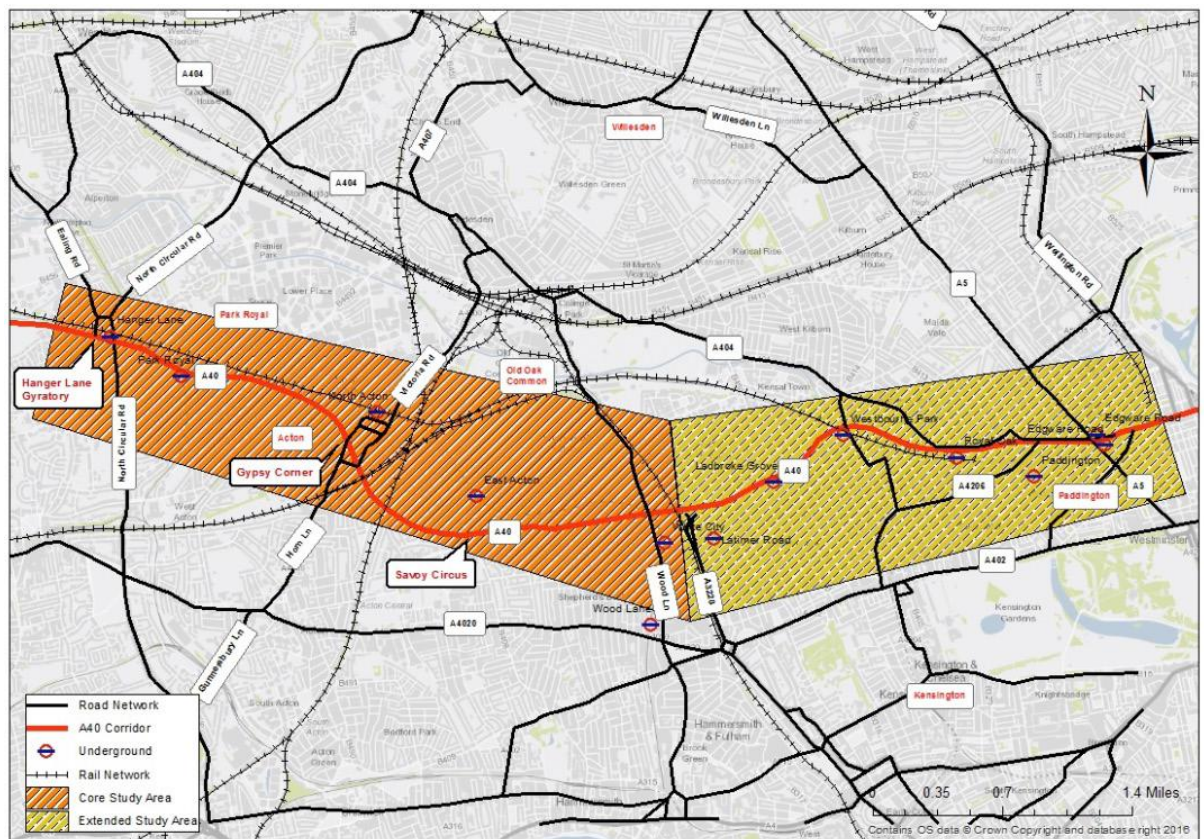
Purpose of this document

1. Transport for London (TfL) is proposing a series of interventions along the A40 corridor between Hanger lane and either Savoy Circus or the Marylebone Road Flyover. These interventions could take the form of at grade or tunnel structures.
2. Figure 1 shows the location of the study area investigated for the proposed schemes.

Introduction to the scheme

3. The A40 is a major arterial road linking west and central London, carrying heavy and strategically important traffic flow. However, it exerts a strongly negative impact on the area around it in terms of congestion, air pollution and noise.

Figure 1: The study area investigated for tunnelling of the A40

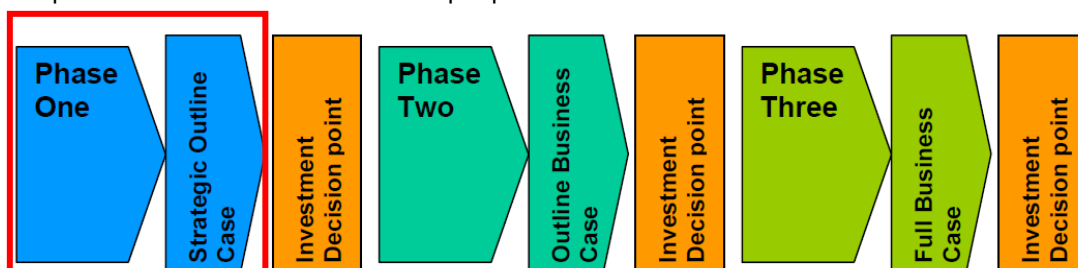


4. Six tunnel options have been identified that address the issue of severance and poor local environment caused by the A40, while retaining its vital strategic movement function.
5. The A40 scheme would unlock a transformational change for the local area by tackling problems of severance, inhospitable local environment and poor prospects for redevelopment. Some of the tunnelling schemes investigated have the potential

to enable significant housing and commercial development to take place on development sites around West London.

About this document

6. This document is the Strategic Outline Business Case (SOBC), the first phase of the decision making process. The SOBC sets out the strategic fit for the scheme and scopes out the initial intervention proposal.



7. This SOBC is presented in accordance with the DfT's Business Case Guidance which stipulates 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 Strategic Case

8. The Strategic Case demonstrates the need for an intervention, the problems identified, and the possible solutions to the problems.

PART A: MAXIMISING THE ECONOMIC POTENTIAL OF LONDON THROUGH SUPPORTING SUSTAINABLE GROWTH

The future of the UK's economic performance lies in improving the performance of its cities. In particular, London is the driver of the UK's economic growth

9. Cities drive the UK economy – they are home to 54% of the population, generating 60% of its GVA, containing 53% of all businesses and 72% of all highly skilled workers¹ within just 9% of the UK's land area. London contributes an estimated 21% of total UK tax revenues².
10. London's rapidly growing population is linked to and necessary to its strong economic performance. Over the period 1991 to 2011, London's population increased by 1.4 million, enabling the number of jobs in the capital to increase by 900,000. London's

¹ Centre for Cities website, 'City by City', <http://www.centreforcities.org/cities/>

² Research Report: London's Finances and Revenues: City of London Corporation & CEBR (2014)

population surpassed its 1939 peak of 8.6 million in early 2015 and is forecasted to reach 10.1 million by 2036.

11. Since 1994, on average, 29,700 new jobs a year have been created within London. This employment growth is expected to continue. London Plan forecasts suggest that the number of jobs in London is expected to grow by 1.4m between 2011 and 2036. This growth is expected to be largely concentrated within central London, as businesses take advantage of agglomeration and clustering benefits.

London is ranked alongside New York as the most competitive city in the world³, but its success cannot be taken for granted

12. Recent evidence suggests some deterioration in London's international rankings, including cost of staff (a result of a high cost of living) and quality of life. The housing issues that lie behind these factors are fundamental to maintaining London's competitiveness and will be exacerbated by continued population growth.

London must offer an attractive public realm to remain competitive

13. Some of the most successful cities around the world have invested in improvements to the quality of the urban realm alongside investment in public transport capacity. Providing cover over major roads helps to maintain road network functioning while delivering higher-quality places where people will want to live and socialise.
14. By contrast, failing to invest in the road network while congestion is increasing will lead to a deteriorating quality of place. This could make London a less attractive location for footloose companies to be based, reducing investment and the economic success of the city.

London's future economic growth depends on having an increased housing availability to support labour supply

15. As shown in Figure 2, London's projected employment and population growth provide an opportunity for further driving the UK's economy, but also present a considerable challenge. The Greater London Authority (GLA) estimates that 49,000 new housing units need to be built each year for housing supply to keep up with the growth in demand. An even higher figure of 62,000 new housing units are estimated to be needed every year up to 2031 if the current gap between supply and demand (which has built up due to the failure in recent years to construct sufficient housing) is to be eliminated.

Figure 2: Summary of housing supply and affordability issues facing London

³ based on the Global Financial Competitive Index assembled by Longman Finance and the Qatar Financial Centre Authority, 2015





London must unlock new development opportunities to support delivery of new housing and jobs

16. London's supply of new land to support housing and jobs growth is limited and the development potential of brownfield land must be maximised. An innovative approach to unlocking this land to support new development is therefore urgently required if the Capital's housing needs are to be met.
17. A number of key sites with potential to host high levels of housing growth, such as Leytonstone, are currently under-utilised due to the negative impacts of busy roads on public realm, connectivity and environmental quality. By unlocking these areas, several thousand new homes and large numbers of jobs could be created.

PART B: THE PROBLEMS AFFECTING TLRN CORRIDORS IDENTIFIED

TLRN roads have a movement function and a place function – the relative importance of each function varies

18. The road network in London serves a wide range of functions. At one end of the scale, core roads and main corridors form the TLRN function as the principal routes for movement of vehicular traffic.
19. At the other end of the scale, streets with lower traffic flows often have a primary 'place' function. TfL and boroughs need to work together to find the appropriate balance between the movement and place demands on roads and streets.
20. The Roads Task Force report identifies nine typologies of road corridors or streets that reflect whether they play a strategic or local movement or place function. These nine street types are shown in the matrix in Figure 3. Traffic levels can affect the vitality of town centres and quality of place and life through creating severance, noise and air pollution.

Figure 3: The RTF street types matrix



TLRN traffic levels will increase significantly in future: without infrastructure interventions, this will lead to both worsening congestion and impacts on quality of life

21. As shown in Figure 4, there will be increasing demand for vehicle travel. On many corridors, delays in vehicle traffic, including buses, are forecast to worsen, particularly at junctions. This will significantly affect quality of life for those living and working near these road corridors, leading to higher levels of noise and air pollution, worsening of existing severance, and having substantial negative impacts on health. In turn, these impacts will make locations along the TLRN, including Chalkers Corner, less attractive for development.

There has been extensive recent investment in rail public transport, but similar levels of investment have not been made to the road network in London

22. To enable the city to grow, and to continue to succeed economically, London will require investment to increase the capacity and efficiency of its road-based and rail, underground, DLR and tram systems. If this investment is not forthcoming, congestion will worsen and levels of crowding on public transport systems will increase. This will lead to longer and less predictable journey times for London residents and in-commuters from the rest of the South East. These delays cause an economic cost and would reduce the attractiveness of London as a place to live and work.
23. To address the challenges of growth, a planned 70 per cent increase in rail capacity through Tube upgrades, Crossrail and Thameslink programmes is underway. This is likely to aid modal shift from private vehicles to rail but is not sufficient by itself to address London's road congestion issues.
24. A project such as the A40 requires substantial infrastructure investment. However, despite the fact that efficient travel by road is vital for the proper economic functioning of London, and despite vehicle traffic's 36 percent mode share in

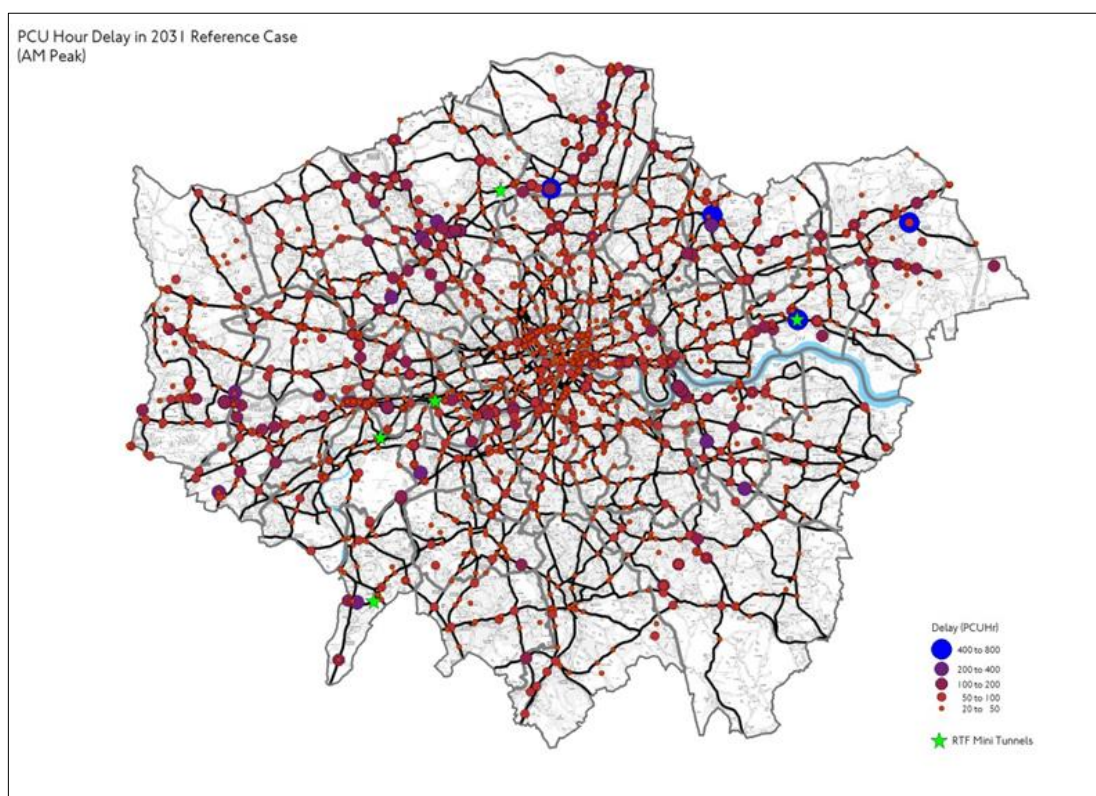
London, similar levels of investment to that seen for public transport have not been made to the Capital's road network.⁴

25. As the population of London grows, congestion on the TLRN will increase. So London's growing population will continue to strain TfL's strategic road network as car-dependency remains a key issue in outer London. In particular, this will lead to significant increases in congestion on key strategic core roads into London, including the A40 which is forecast to experience some of the highest increases, delays at junctions and other bottlenecks as illustrated in Figure 4.

⁴ Compared to 8 percent for tube/DLR, and less than 5 percent for rail. Source: Three year average data for mode share of trips originating in all London boroughs, 2011-2014, London Travel Demand Survey.



Figure 4: PCU Hour delay in 2031 reference case



PART C: OBJECTIVES FOR ACTION FOR IMPROVEMENT ON TLRN CORRIDORS

Any proposal seeking to reduce congestion and strike a better balance between the movement and place function of a road must also comply with, and seek to meet, wider public policy objectives

26. These arise from two key sources, the Mayor's Transport Strategy and the Roads Task Force report 'Vision for London's Roads and Streets.'⁵
27. The Mayor's Transport Strategy (MTS) sets out six goals for transport in London:
 - Support economic development and population growth;
 - Enhance the quality of life for all Londoners;
 - Improve the safety and security of all Londoners;
 - Improve transport opportunities for all Londoners;
 - Reduce transport's contribution to climate change, and improve its resilience; and
 - Support delivery of the London 2012 Olympic Games and its legacy.
28. The Roads Task Force Vision sets out the following core objectives:
 - To enable people and vehicles to move more efficiently on London's streets and roads;

⁵ Roads Task Force, July 2013
MAYOR OF LONDON

- To transform the environment for cycling, walking and public transport; and
 - To improve the public realm and provide better and safer places for all the activities that take place on the city's streets, provide an enhanced quality of life and help to unlock development and deliver new homes.
29. The RTF vision identified that measures including fly unders, over-decking and tunnels had the potential to address the following objectives:
- Address congestion;
 - Reduce severance;
 - Enable improvements for sustainable modes and public realm on the surface; and
 - Unlock development

PART D: THE APPROACH TAKEN BY THE ROADS TASK FORCE TO ADDRESS TLRN CHALLENGES

The Mayor's Roads Task Force (RTF) has set the vision for London's roads and streets

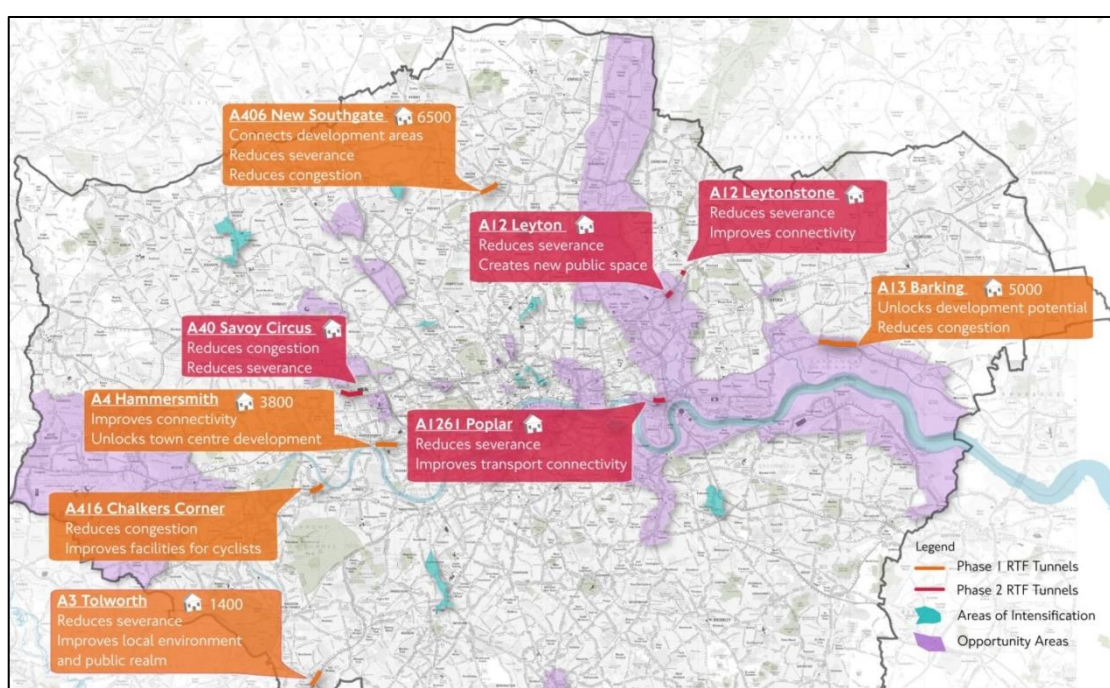
30. The RTF's report set out three core aims:
- To enable people and vehicles to move more efficiently on London's streets and roads;
 - To transform the environment for cycling, walking and public transport; and
 - To improve the public realm and provide better and safer places for all the activities that take place on the city's streets, and provide an enhanced quality of life.
31. Particular objectives from the RTF report of relevance to this business case include:
- Release land at the surface for development;
 - Improve the public realm;
 - Create new green space;
 - Provide better facilities for pedestrians, cyclists and public transport users;
 - Reduce severance;
 - Reduce the negative impacts of roads on noise and air quality.
32. Following the publication of the RTF report, TfL undertook a series of studies to identify opportunities for decking over or tunnelling under roads at a number of locations around London in order to unlock development opportunities.
33. The initial phase of work identified 70 potential locations, and sifting work identified 15 locations suitable for high level feasibility work. This feasibility work identified nine locations with the potential to make a significant contribution to achieving the aims and objectives of the Roads Task Force. Further feasibility work was carried out for five of these locations during 2015, resulting in the production of a Strategic Outline Business Case for each scheme. A second phase of the remaining four schemes has

been developed over 2015 and early 2016, and Leytonstone is one of these second tranche of schemes.

34. A key recommendation of the RTF report was that the potential of major highway interventions on the TLRN such as tunnels and 'fly unders' should be investigated to determine the role they could play in achieving the vision for London's roads and streets across the strategic highway network.
35. From an initial list of approximately 70 locations, through a Multi-Criteria Analysis (MCA) a shortlist of fifteen sites was identified as having sufficient potential for initial feasibility studies

From a short list of 15 schemes, nine have been taken forward for further feasibility work

Figure 5: The locations of the nine RTF tunnel/decking schemes



36. As part of a rolling feasibility assessment programme, five initial locations were taken forward for further assessment in 2015. These five locations are:
 - A13, Barking Riverside
 - A3, Tolworth
 - A316, Chalkers Corner
 - A4, Hammersmith
 - A406, New Southgate
37. A further four locations have been taken forward in 2015/16. These four locations are:
 - A40.
 - A12 Decking, Leytonstone

- A12 Decking, Leyton
 - A1261 Decking, Poplar
38. All nine schemes are shown above at Figure 5.

PART E: THE PROBLEMS IDENTIFIED ON THE A40

There is a need to improve surface connectivity without impacting upon the capacity or functionality of the A40

39. The problems identified on the A40 from Hanger lane towards central London include:
- i. The A40 is one of the busiest radial corridors in London
 - ii. A growing population in west London requires higher density residential development in accessible locations
 - iii. Planned growth in west London is high with Old Oak and Park Royal Opportunity Area alone providing 25,500 homes and 65,000 jobs
 - iv. The A40 is in the top 10% of London's busiest roads and often operates beyond its capacity
 - v. Maintaining of capacity and strategic function protection are among the issues and challenges for the A40 corridor
 - vi. The A40 is a vital freight corridor and serves a strategic movement function, which in turn delivers substantial economic benefits to London and the United Kingdom
 - vii. A large number of bus routes cross the A40 and are experiencing journey time delays due to the scales of congestion at certain junctions along the A40.
 - viii. The existing form of the A40 corridor creates severance for pedestrians and there is limited provision for crossing movements
 - ix. The existing form of the A40 corridor also creates severance for cyclists and there is limited provision for crossing movements but phase 2 of the East-West Cycle Superhighway is planned from Paddington to Acton on the A40 Corridor and this must form part of the concept for the A40
 - x. There is a high incidence of collisions at all major junctions with vulnerable road user accidents focused around Savoy Circus and White City.
 - xi. Air and noise pollution along the A40 corridor is extremely high, particularly at Gypsy Corner, Hanger Lane and West Cross area.

PART F: OBJECTIVES FOR THE A40 AND OPTIONS IDENTIFIED

Objectives and measures for success for the A40

40. The following key objectives and measures of success have been identified for the A40, supplemented by a consultant designed Value Assessment framework.

Table 1: Objectives and measures of success for the A40

Objective	Measures of success
<ul style="list-style-type: none">• Maintaining core movement function	<ul style="list-style-type: none">• Maintain as a key route for freight and construction based traffic.• Manage and regulate flow and capacity into central London.
<ul style="list-style-type: none">• Delivering connectivity and capacity enhancements to support existing and planned new homes and jobs in growth areas	<ul style="list-style-type: none">• Reduce severance across the A40 and support improved access from and across the A40 to planned growth areas, particularly for buses, cyclists and pedestrians.
<ul style="list-style-type: none">• Improving the environment, safety and asset quality	<ul style="list-style-type: none">• Reduce the impacts of noise and improving air quality along the A40.• Reduce collisions, particularly among <i>vulnerable road users</i>.• Maintain high quality assets.

Options for the A40

The options appraisal process described in Part E concluded that further feasibility investigation into interventions for the A40 should be undertaken

41. The following eight options were identified:
- Tunnel Option 1: Two-Way Tunnel from Park Royal to Savoy Circus
 - Tunnel Option 2: Westbound Only Tunnel from Park Royal to Savoy Circus
 - Tunnel Option 3: Westbound Only Tunnel from Park Royal to Savoy Circus with a Spur to Old Oak Common
 - Tunnel Option 4: Two-Way Tunnel from Park Royal to Edgware Road
 - Tunnel Option 5: Two-Way Tunnel from Park Royal to Savoy Circus
 - At-grade Option 6: At-Grade options at Hanger Lane, Gypsy Corner and Savoy Circus
 - Grade Separation Option 7: Grade separated options at Hanger Lane, Gypsy Corner and Savoy Circus
 - Hybrid Option 8: A combination of options at Hanger Lane, Gypsy Corner and Savoy Circus

PART G: HOW THE OPTION ADDRESSES THE ISSUES AND CHALLENGES

A shortlisting was carried out from which options 1, 2A, 4 and 5 were assessed

42. These four options were subjected to more detailed analysis, and to the Value Assessment Framework.

Options 1 and 5 were determined to be the best options to take forward for further work, with option 7 (grade separated option) as a back up option

43. Options 1 and 5 were scored as being most compliant with the objectives of the scheme and the Value Assessment Framework.

PART H: SCHEME FIT AGAINST STRATEGIC AND LOCAL POLICY, STRATEGIES, FRAMEWORKS AND OBJECTIVES

Overall, the A40 scheme conforms to policy at all levels, helping to secure London and the UK's continued prosperity

44. Due to the role of the A40 tunnel interventions in addressing the challenges London faces, it makes a significant contribution to policy at all levels. At a National level the proposal strongly supports the intended outcomes in the DfT's priorities for the transport network. The scheme also supports London-wide and local policy – in particular in the Mayor's Spatial Development Strategy (known as the London Plan), the Mayor's Transport Strategy (MTS), and London 2050 Infrastructure Plan. It is also supportive of goals in local planning documents.
45. The key points arising from the Strategic Case can therefore be summarised as:

- The preferred Option based scheme would improve opportunities for development and the continued growth of west London, through enabling higher density development and providing better connectivity between areas either side of the A40 corridor.

The Economic Case

A tunnel would help to deliver new housing, jobs and growth in GVA along the wider A40 corridor

46. In line with WebTAG guidance, cost-benefit analysis has been undertaken to assess the scheme's value for money. This has been undertaken using TUBA, a DfT compliant modelling appraisal tool using DfT (national) volumes of time.
47. Over the appraisal period, the Present Value of Benefits (PVB) relating to the provision of the shortlisted A40 tunnel options are -£37m for Tunnel Option 1, -£133m for Tunnel Option 4 and -£145m for Option 5. The PVB for the Grade-separated option is -£3m.
48. The BCRs for the A40 tunnel options are -0.061 for Tunnel Option 1, -0.059 for Tunnel Option 4, -0.158 for tunnel Option 5 and -0.013 for the grade separated

option.

49. Based on these BCRs, then all options would represent 'poor' value for money.
50. However, these values do not take into account the regeneration benefits of the scheme at a local and a London-wide level.
51. Although WebTAG guidance requires the reporting of a Benefit to Cost Ratio (BCR) this is not an appropriate metric by which to solely judge the A40 scheme. It is important to note that the scheme has an additional purpose: to address environmental and severance effects of the high volumes of traffic carried on the corridor, and by doing this it will unlock development potential along the A40 corridor and adjacent sites including parts of Old Oak Common, enabling regeneration and the delivery of housing and commercial space.
52. The results of the additionality approach are summarised in Table 2 below.
53. The figures presented in Table 2 show the benefits to be delivered by the A40 Tunnel Options 1 and 5 in addition to the 'do-nothing' scenario.

Table 2: Summary of additional impacts of A40 (at London level)

<i>Development and regeneration benefits of the tunnel option⁶</i>	Tunnel Option 1	Tunnel Option 5
Net Additional homes – London level	209	5,845
Net Additional jobs (direct and indirect) – London level	1,148	5,810
GVA generated by additional jobs (direct and indirect) (£m PV)	41	72

*takes account of displacement effects

54. When deadweight, leakage and displacement effects are considered, Option 1 would enable delivery of 209 net additional dwellings at the London-level, then Option 5 would enable 5,845 additional dwellings. When deadweight, displacement and multiplier effects are considered, the net additional employment that Option 1 would enable 1,148 additional jobs to be created, and Option 5 would enable 5,180 jobs to be created (direct and indirect). Alongside the indirect employment associated with this housing, this would generate a net additional GVA of £41m (Option 1), or £113m (Option 4) or £72m (Option 5) at the London level.

⁶ These figures are developed by looking at the individual residential and commercial development in each of the surrounding boroughs; Brent, Ealing, Hammersmith and Fulham, Kensington and Chelsea, and The City of Westminster. Some of the development sites cross borough boundaries. Therefore there is likely to be double counting of the development figures. If the business case is progressed, further analysis will be done to provide more accurate development figures.



55. These are significant economic benefits that would help to strengthen London's economy and boost tax receipts.

Other benefits could be quantified, such as improved quality of life, improved air quality, reduced noise, reduction in severance and improvements to the public realm

56. The scheme would also improve air quality, quality of life through an improved public realm and reduced severance and noise impacts, with additional associated economic impacts.
57. It is proposed that these benefits and impacts will be assessed and quantified as part of the next stage of the appraisal process, using appropriate tools.

The Financial Case

Some funding from associated new development could be secured for the tunnelling schemes

58. The key findings from this assessment are:
- i. Each of the tunnel options would impact positively upon the development opportunities of sites within their study areas. Though there are many development sites across the study areas, the majority of development opportunities fall within the area overseen by the OPDC, in the White City and Paddington Opportunity Areas and in Westminster.
 - ii. In comparison to Option 1, Option 5 has the potential to support significantly larger amounts of new dwellings and commercial floorspace, and generate a larger net additional effect. The release of land associated with the A40 Westway Flyover demolition is the primary factor behind the higher levels of development.
 - iii. The gross intervention case for Option 5, is 19,500 homes and 346,000m² commercial space; Option 1, 12,300 homes and 339,000m² of commercial space.
59. Though construction could generate adverse environmental impacts, development is likely to come forward earlier as landowners and developers seek financial returns earlier and house buyers and businesses act in anticipation of the benefits that could arise following the opening of new / improved infrastructure. This could see Option 1 deliver an additional 300 homes and 8,000m² of commercial space.
60. Funding sources considered to be highly suitable for supporting the delivery of a scheme were identified to be business rates, road charging and stamp duty land tax (SDLT). Community Infrastructure Levy (CIL), which is paid by developers to mitigate against any adverse impacts on infrastructure, including social and community infrastructure (such as education and health) is not considered to be a likely funding source.

The Commercial Case

61. This case sets out the commercial structure, the accounting treatment and

procurement approach for this scheme.

62. The scheme is being promoted by TfL. All potential suppliers will be required to consider the Mayor of London's Responsible Procurement Policy in their bid as part of any Invitation to Tender (ITT) for the design and build contract.

TfL has substantial experience of delivering complex highway schemes, which will be applied to the procurement, funding and financing of this scheme

63. TfL has significant experience in the procurement and construction of major infrastructure projects, such as Crossrail, Docklands Light Railway extensions and major station schemes such as Kings Cross St Pancras. Examples of significant highway improvements delivered by TfL include the Chiswick Bridge refurbishment and the Cycle Superhighways programme.
64. It is expected that the construction stage of the project would be led by TfL and where involving infrastructure owned by other stakeholders, these parts of the scheme will be delivered in partnership.

TfL can achieve efficiencies by delivering the A40 scheme within a wider programme of tunnel/decking schemes and linked into a wider highway capital investment programme

65. TfL is undertaking and proposing a range of large capital infrastructure projects that involve procurement of skills and services that will all be highly relevant to approaches that will need to be adopted for this scheme. For example, the Cycle Superhighways, Better Junctions programme and Roads Modernisation Plan along with design and planning work associated with the planned Silvertown Tunnel and other proposed Thames river crossings has led to an increase in skills associated with large scale highway engineering and construction traffic management.
66. The scheme is being proposed as part of a wider programme of Roads Task Force (RTF) schemes at a range of locations throughout London. If these projects are progressed, some significant economies and efficiencies of scale could be achieved as a result of co-ordinated delivery.

TfL utilises supply chains from across the UK – ensuring the construction of the scheme could support employment outside London

67. Although TfL schemes take place within the Capital, the wider benefits to the UK economy are extensive, with over 60,000 jobs estimated to be supported by services TfL procures from outside of London. The construction of the scheme would add to the pipeline of capital investment that supports jobs across the UK.
68. The procurement strategy for this stage of the project will be refined and improved as the scheme is developed further.
69. The key points arising from the Commercial Case can therefore be summarised as:

The Management Case

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

management, benefits realisation and assurance.

TfL will make full use of best practice within the company and more widely from industry

71. TfL has extensive experience in developing, promoting and implementing significant infrastructure projects. This ranges from modifications to existing infrastructure (such as repairs to the A4 Hammersmith flyover, modernisation of the London Underground, extensions to Tramlink and DLR) to major schemes such as Crossrail. TfL also has demonstrable experience in delivering major road junction improvements, pedestrian and cycle schemes, and wider public realm improvements. TfL will continue to actively incorporate best practice and experience from these schemes into the development of the A40 tunnelling project.
72. The proposed intervention on the A40 is part of the wider Roads Task Force programme sponsored by the Managing Director of TfL Planning. There are a number of programme linkages with other schemes being taken forward as part of the RTF Key Corridor Interventions Programme, which will present opportunities to share best practice as these schemes progress.

A comprehensive and robust project management framework will be applied, helping to ensure scope, cost and benefits are controlled

73. TfL uses a number of mechanisms to improve the management of its major projects in order to help ensure the objectives and benefits of a scheme at inception are realised following implementation. TfL's project management framework, known as 'Pathway' provides consistency in approach and the tools required for planning and delivery teams, whilst retaining flexibility in its application to manage and control a project. Embedded into Pathway is a delivery assurance process using stage gates, upon which TfL utilises industry-leading external expertise to review and challenge all aspects of the project.

Rigorous assurance processes will provide close scrutiny and challenge of risk management and decision-making throughout the project

74. TfL also receives project review and assurance from the Independent Investment Programme Advisory Group (IIPAG), which report to the Mayor of London concerning TfL's Investment Programme. This includes all maintenance, renewal, upgrades and major projects (excluding Crossrail).
75. TfL has the option of establishing an Independent Peer Review Group (IPRG). This approach has been followed for other major TfL projects, so given the scale of the Leytonstone decking project, this could warrant a similar approach. If appropriate, an IPRG can be set up for the scheme if further development of the project is approved. Initially it could oversee the refinement of delivery sub-options and review engineering feasibility studies and scheme appraisal undertaken.
76. Stakeholder engagement has already been undertaken and there is strong support for the scheme from the local boroughs. A future programme of stakeholder engagement as the scheme progresses has been developed.
77. The current anticipated key milestones for the project are shown in Table ES 2 below. Any changes to baseline scope, cost and schedule will be reviewed, impact assessed and approved following the change control process.

Table 3: Key project development milestones

Milestone Description	Date
Further feasibility – scheme development, modelling, construction methodology, finance and funding options	2017
Planning, Design, Approval and Procurement	2019
Construction and Testing	2014-2029 (depending on option)
Operation	2030

78. The key points arising from the Management Case can therefore be summarised as:

Conclusions

There are strong non-WebTAG benefits of an intervention on the A40, and TfL should continue to consider this scheme

79. The proposed options for the A40 would unlock development in an area of high housing need. It would improve connectivity within west London, encourage sustainable transport, improve the urban realm and better link communities. It would also protect the key transport infrastructure in this area, while reducing its dominance over the local landscape.
80. The SOBC for tunnelling of the A40 demonstrates that across the Five Case Model:
- There is a clear robust case for change (based on wider economic impacts and addressing of urgent housing issues) for an intervention to address existing issues of severance, poor connectivity and environmental problems caused by the A40. This ‘strategic case’ is closely related to national, London-wide and local policy objectives, with particular reference to the London Plan, the Mayor’s Transport Strategy and the Roads Task Force Vision document.
 - The scheme assists in the economic regeneration of Old oak Common, and supports the delivery of additional housing and employment. It would enable an increase in economic activity. If looked at only in terms of the transport benefits and traditional BCR measure, the ‘economic case’ suggests the scheme is poor value for money. However, this is not the appropriate measure by which to judge the scheme given its focus is on regeneration and improving the urban realm.
 - The scheme is commercially viable – the ‘commercial case’ demonstrates that although project development is at an early stage, the report sets out the procurement, commercial structure, and proposed allocation of risk and funding.
 - The scheme is not currently affordable within the current TfL Business plan horizon. The total estimated cost of Option 1 is £1.08bn and £1.64bn for

option 5 but in the 'financial case' analysis sets out the project team will need to explore all the funding mechanisms available to deliver the scheme and the proposed financing arrangements.

- v. The proposed scheme is deliverable – 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.

Further stages

81. As may be required for each option in particular, the following steps are recommended in further developing the initial engineering feasibility design for any of the options that are taken forward:
- i. Optimise alignments based on the findings of traffic modelling and development studies.
 - ii. Confirm based on traffic modelling results if a reduced/increased number of surface lanes at some portals can be accommodated.
 - iii. Undertake a formal Risk Appraisal and Assessment to compile a Project Risk Register in conjunction with TfL.
 - iv. Identify further Risks and Constraints, including an assessment of the provision for transportation of hazardous goods.
 - v. Develop vertical alignments for the preferred route(s).
 - vi. Agree and confirm design standards to be applied and any deviations if necessary.
 - vii. Undertake outline design calculations to size structural elements more accurately.
 - viii. Undertake preliminary discussions with TBM manufacturers regarding size, cost, feasibility, radius of curvature, lead-in time etc., particularly for the larger diameters tunnels currently proposed.
 - ix. Undertake a Geotechnical Desk study and Preliminary Ground Investigation.
 - x. Undertake a Topographical Survey to confirm ground levels.
 - xi. Confirm Third Party approval procedures where structures and infrastructure are affected.
 - xii. Undertake a Phase I Settlement Analysis to determine buildings and infrastructure at risk from tunnelling induced settlement.
 - xiii. Approach Building Owners and Statutory Undertakers for details of their underground assets for the whole alignments and optimise route if required.
 - xiv. Undertake utilities searches.
 - xv. Confirm foundation details and depths for the A40 Westway Flyover.
 - xvi. Work with a Bridge Engineer to determine the potential impact on the Westway and develop outline solutions e.g. temporary support.

- xvii. Confirm if areas identified for land-take are feasible.
- xviii. Identify potential compensation grouting shaft locations.
- xix. Outline construction sequencing and traffic modelling for construction stage.
- xx. Identify potential spoil removal routes in greater detail and confirm the feasibility of connecting to the existing railway infrastructure as proposed in this study to reduce traffic impact during construction.
- xxi. Develop an initial Sustainability Plan, particularly considering the quantity of excavated material generated by the project.
- xxii. Environmental Impact Assessment.
- xxiii. Develop Fire and Evacuation Strategies in conjunction with the Emergency Services.
- xxiv. Develop Ventilation Strategies potentially including Computational Fluid Dynamics Modelling. This includes approaching jet fan manufacturers where the diameter of the fan is critical in determining tunnel sizes.
- xxv. Consider Architectural requirements within the tunnel and assess impact, if any, on tunnel sizing.
- xxvi. Develop Drainage and Water Management Strategies.
- xxvii. Refine the current Cost Estimates.

Development funding and capacity

- 82. The initial work has considered the development capacity within the study area and to what degree the A40 schemes could enable development. Bringing vacant sites back into use and intensifying development on sites has been considered as part of this work. For the next stage it is recommended that this is taken further and that site specific assessments are undertaken for developments along the route. This could also consider potential individual site intensification as a result of the A40 There should also be further consideration of assessing different policy scenarios which will impact on the potential scale of developments. For example, a relaxed planning policy scenario could be assessed which reduces the amount of SIL in a particular area and replaces it with a high value added employment use which would increase the amount of development. This could also include liaison with local planning authorities.
- 83. As a result of the above, it would also be necessary to consider the funding implications particularly in terms of the increased net funding which could be secured due to the A40 schemes.

Transport modelling

- 84. All the strategic modelling has been carried out without the inclusion in the modelling of any tolls. The introduction of some form of road charging should be investigated in the future, as appropriate, to determine the impacts on traffic volumes and hence revenues.

Summary of conclusions and recommendations

85. The Roads Task Force (RTF) was set up by the Mayor of London in 2012 to tackle the challenges facing London's streets and roads. The RTF was published in July 2013 and addresses what is needed in the short, medium and long term to enable London as a city to be able to accommodate its growing population. In relation to this, the RTF identified different constraints related to traffic and congestion problems that would affect the development of the city.
86. As a response to this report, TfL stated they would undertake different strategic studies with the main aim of finding corridors where measures can be applied with the objective of not only relieving congestion and connecting the city in a more effective way, but also increasing the space for living, alongside with improving the facilities for cyclist and pedestrians.
87. The A40 corridor has been identified by TfL as a suitable location for such improvements, as increased capacity is required here to ease the existing congestion. The local area is affected by the negative impact of the A40 where the severe congestion limits planned and potential development in the wider area. These issues affect not only people living in the area, but also vehicles on the roads, public transport, cyclists and pedestrians.
88. This business case has identified and assessed opportunities to relieve congestion and transport problems on the A40 corridor, ease severance issues and provide opportunities to stimulate and unlock growth potential in the area.
89. All the tunnel options assessed have been considered feasible in engineering terms although option3 was ruled out early as incompatible with OODC objectives. Options 1 and 5 were found to perform best against the project objectives
90. All the options come with a high level of risk and associated cost. It should also be noted that for the purposes of this study, in all options, the A40 has been significantly downgraded and ambitious junction improvements have been promoted that would improve the urban realm and improve connectivity for pedestrians, cyclists and buses. However, even with a large amount of traffic using the tunnels, these ambitious schemes have struggled from a surface transport capacity perspective, and this is reflected in the modelling and analysis of the options.



1. The Approach to the Business Case

Introduction

- 1.1. Transport for London (TfL) is proposing a series of interventions on the A40 including a tunnel. Figure 6 shows the location and extent of the scheme.
- 1.2. The need for this intervention has been identified following the recommendations of the Roads Task Force (RTF) Report: 'Vision for London's Roads and Streets' published in 2013. The scheme is one of four schemes along key RTF corridors which form part of the second tranche of opportunities identified by the RTF to address challenges on the Transport for London Road Network (TLRN), and which have been subject to detailed feasibility work. Notwithstanding this, all schemes are at an early stage in their development phase and further, detailed design and assessment will be undertaken in due course.
- 1.3. The proposed scheme options are located along an existing stretch of the A40 between Hanger lane and either Savoy Circus or Marylebone Road Flyover, and is shown in Figure 6 and Figure 7 below.
- 1.4. This document is the Strategic Outline Business Case (SOBC) for the project.

Figure 6: Proposed location of the A40 tunnelling scheme (Option 5 shown)

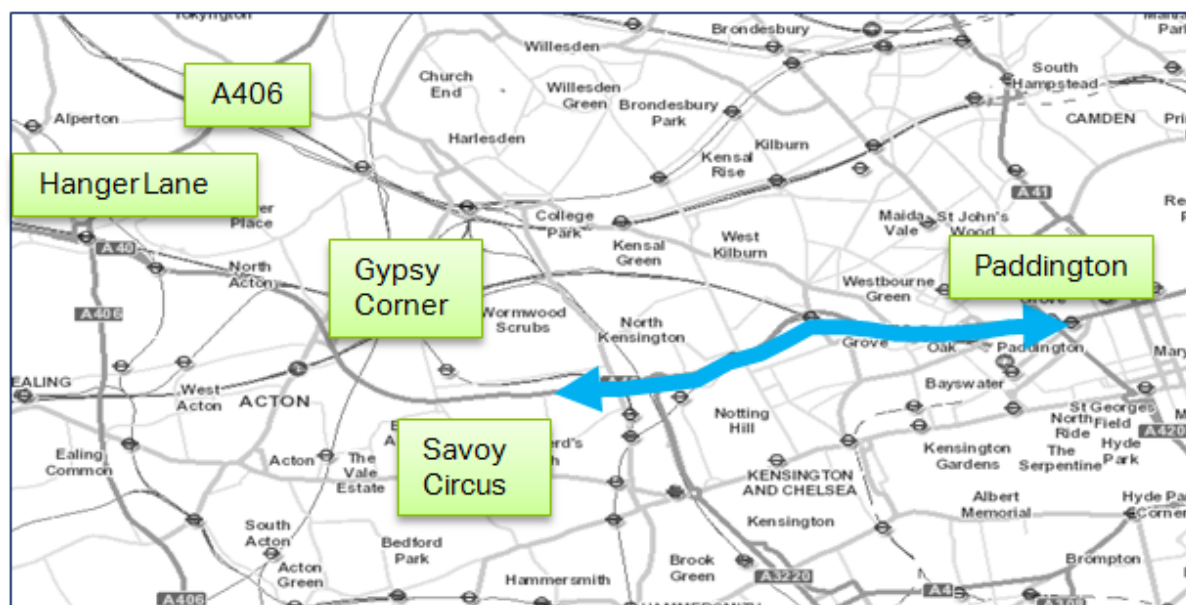


Figure 7: Proposed location of the A40 tunnelling scheme (Option 1 shown)



The Five Case Model for Transport Appraisal

- 1.5. The purpose of this Strategic Outline 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 HM Treasury's advice on evidence-based decision making as set out in the Green Book⁸ and uses the best practice five case model approach.
- 1.6. This approach assesses whether schemes:
- i. are supported by a robust case for change that fits with wider public policy objectives – the '**strategic case**';
 - ii. demonstrate value for money – the '**economic case**';
 - iii. are commercially viable – the '**commercial case**';
 - iv. are financially affordable – the '**financial case**'; and
 - v. are achievable – the '**management case**'.
- 1.7. The evidence gathered as part of the business case preparation has been prepared using the tools and guidance provided by the DfT, notably WebTAG⁹. This approach ensures that the evidence that has been 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.

The Decision Making Process

- 1.8. The decision making process, of which this Strategic 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

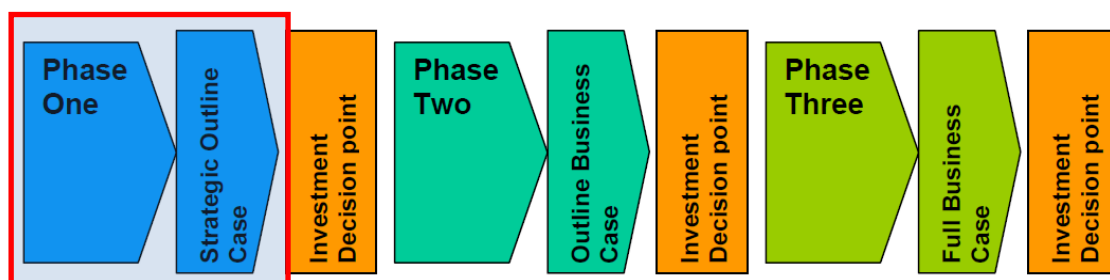
⁷ See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf - accessed 5 September 2014

⁸

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

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

builds upon that previously prepared. Evidence is reviewed to ensure that it remains up to date, accurate and relevant. The current Strategic Outline Business Case is in 'Phase One' of this iterative process, with two further future stages of development to follow, as shown below.



- I.9. The current '**Phase One**' focuses on articulating the need for the intervention and summarising the range of options developed and considered, and:
 - i. is used to set out the strategic fit of the project with achieving relevant national and London Mayoral and TfL policy objectives;
 - ii. confirms the strategic fit and the case for change;
 - iii. scopes out the initial investment/intervention proposal; and
 - iv. provides details of the project's overall balance of benefits and costs against objectives.
- I.10. In '**Phase Two**', which will follow over the course of 2016, TfL will reconfirm the conclusions from Phase One and will concentrate on a more detailed assessment of the options to find the best solution, culminating in the preparation of an Outline Business Case, which will build on this Strategic Outline Business Case.
- I.11. The final phase in the process, '**Phase Three**', will result in the production of the Full Business Case – this will accompany the application for consent.

The Role of the Mayor of London and TfL

- I.12. 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).
- I.13. TfL is responsible for operating, maintaining and improving the strategic road network (TLRN) in Greater London, including the A40 within London. The TLRN represents 4 per cent of London's road network, but carries 30 per cent of all traffic in London.
- I.14. The 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.

- 1.15. 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.

Summary of Consultation to Date

There is support among stakeholders for tunnelling the A40 in west London and consultation with the general public on Options 1 and 5 will form the next step subject to affordability

- 1.16. No formal public consultation has taken place to date. However, three workshops have been conducted with key stakeholders throughout the study to establish common objectives and direct the study. The following stakeholders have been engaged throughout the study; the London Boroughs of Ealing, Hammersmith & Fulham and the Old Oak and Park Royal Development Corporation (OPDC).
- 1.17. As the project develops TfL would seek to consult with the public and stakeholders at the earliest appropriate opportunity.

2. The Strategic Case

- 2.1. Transport for London (TfL) is proposing a major set of interventions on the A40.
- 2.2. This Strategic Case has been prepared by TfL, in consultation with the local London Boroughs. It forms the first of the five cases forming the Transport Business Case. Its purpose is to set out the need for investment in the road network at west London.

Structure of the strategic case

- 2.3. This part of the Strategic Outline Business Case will:

- describe the key challenges and pressures facing London's strategic road network including the need to protect and enhance the economic efficiency of London, including south London;
- set out the findings from the Mayor's Roads Task Force's report;
- set out the objectives for how problems and issues across London's strategic road network should be addressed;
- identify the specific problems and issues that this decking project will need to address and the elements of the RTF's toolkit that will be applied in addressing the problems and issues;
- based on the problems and issues, define scheme objectives and measures of success for an intervention on the A40 corridor;
- based on the option assessment, show how interventions on the A40 would help towards solving some of these local challenges as well as those facing London as a whole, such as enabling housing growth; and
- demonstrate how the proposed interventions will achieve a strong fit with policy at all spatial scales.

- 2.4. The Strategic Case is structured into eight sections:

- **Part A:** Maximising the economic potential of London through supporting sustainable growth
- **Part B:** The problems identified affecting TLRN corridors
- **Part C:** Objectives for action for improvement of TLRN corridors
- **Part D:** Options for addressing the problems on the TLRN at priority locations
- **Part E:** The problems identified for the A40
- **Part F:** Objectives for the A40 and options identified

- **Part G:** How the tunnel options address the issues and challenges
- **Part H:** Scheme fit against strategic and local policy, strategies, frameworks and objectives



PART A: MAXIMISING THE ECONOMIC POTENTIAL OF LONDON THROUGH SUPPORTING SUSTAINABLE GROWTH

Section Summary:

London is a growing world city - which needs its transport system to function efficiently now and in the future

- London is a thriving, globally competitive economic centre that makes a significant and growing contribution to the UK economy in employment, GVA and tax revenues
- Employment levels in London are growing rapidly, helping to encourage population growth in response
- Dense cities accommodate growth most sustainably and efficiently
- London is delivering only 25,000 new homes a year, when it needs to deliver at least double this volume, resulting in worsening housing affordability
- London's growth is being constrained by a chronic shortage of housing which is driving up housing costs as a proportion of household income. To achieve housing targets existing brownfield land must be unlocked
- By investing in its road network, TfL can unlock more land for urban regeneration and contribute to meeting London's housing targets
- As London grows, the level of congestion on its strategic road network is forecast to grow, even with sustained investment in public transport capacity

Better use of road space on strategic roads is a possible means of improving quality of place and unlocking additional development, but this needs to be balanced against continued needs for movement

- A joined-up approach to planning and infrastructure investment by the GLA, TfL and boroughs would help to unlock development in areas with high regeneration and growth potential
- The road tunnel schemes being considered aim to release the potential of specific areas for housing and wider development, while maintaining the vital movement function of strategic roads, thereby helping underpin London's growth more widely
- To retain London's competitiveness, further investments in transport links and the public realm are required to facilitate delivery of more successful places and new housing in areas adversely impacted by traffic

London is a growing world city - which needs its transport system to function efficiently now and in the future

London is a thriving globally competitive economic centre that makes a significant and growing contribution to the UK Economy in employment, GVA and tax revenues

- 2.5. London is the UK's core engine of economic growth, contributing 22 per cent of total UK Gross Value Added (GVA) in 2013 and generating £56,687 GVA per worker compared to the UK average of £41,088. Evidence suggests that within large cities, greater employment density drives higher productivity through skills specialisation and clustering. These agglomeration effects help London to drive UK's international competitiveness through increasing employment densities in the Central Activities Zone (CAZ).
- 2.6. The strength of London's economy makes it a vital contributor to the UK's finances. In 2013/14, an estimated £127 billion of tax revenue was estimated to have been generated through economic activity in London, comprising an estimated 21% of total UK tax revenue. Investing to support the growth of London is essential to build strong public finances.
- 2.7. Since 1994, on average, 29,700 new jobs a year have been created within London. The city's economic growth is forecast to be 4.2 per cent in 2014 and 3 per cent each year to 2020. This is faster than the projected UK growth rate overall, partly driven by forecast increases in population and the size of the workforce. The latest GLA employment forecasts suggest that on average, 41,000 new jobs a year in London will be created to 2036.

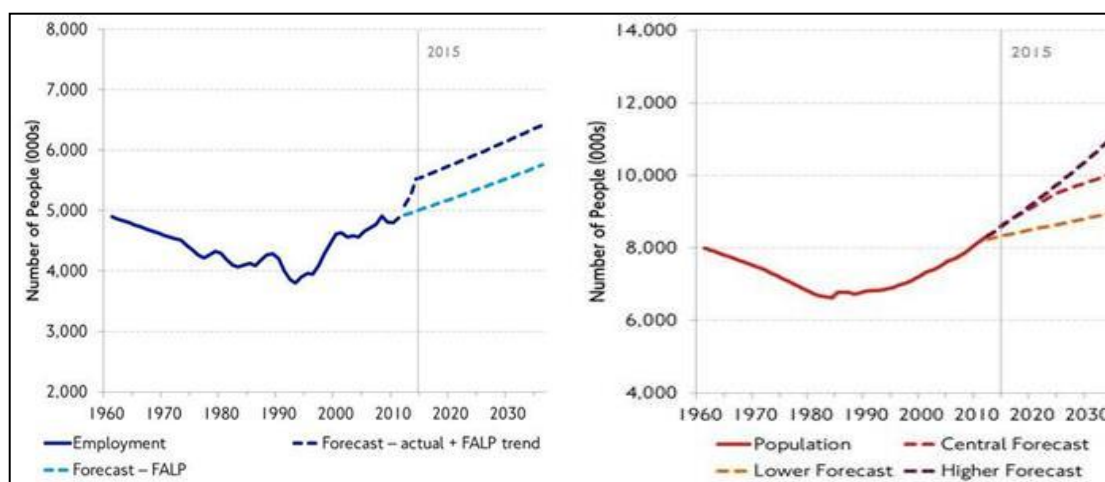
Key Finding:

The London economy makes a vital contribution to the success and competitiveness of the UK, and if London succeeds, the UK as a whole benefits.

Employment levels in London are growing rapidly, helping to encourage population growth in response

- 2.8. After reversing a steady period of decline, London has been on a growth trajectory since the 1980s. These trends are shown in Figure 8.

Figure 8: Historic trends and projected growth in London's employment and population to 2036



- 2.9. Between 1991 and 2011, the number of jobs in London rose by 900,000 and over the same period, the population rose by 1.4m. The number of jobs in London is expected to grow by 1.4m between 2011 and 2036. As the left hand graph in Figure 8 above shows, a total of 650,000 of these jobs have already been created between 2012 and 2014¹⁰. Rapid employment growth in London has been driven by a range of factors including the UK's flexible labour markets, high skill levels and openness to Foreign Direct Investment. Employment growth has been felt most acutely within central London, where connectivity is highest.
- 2.10. The UK Office for National Statistics projections expect a 23 per cent rise in London's population between 2011 and 2031 which equates to a 1.9m increase, taking the population to 10.1m¹¹ by 2036, as shown in the right hand graph in Figure 8. The London Infrastructure Plan predicts a 37 per cent increase in population between 2011 and 2050, driving the need for an additional 1.5m additional homes and a 50 per cent increase in public transport capacity over and above what is already planned¹².
- 2.11. As Figure 9 shows, London's continued economic growth and competitiveness is increasingly being threatened by a constrained supply of housing, which frustrates population growth and labour supply.

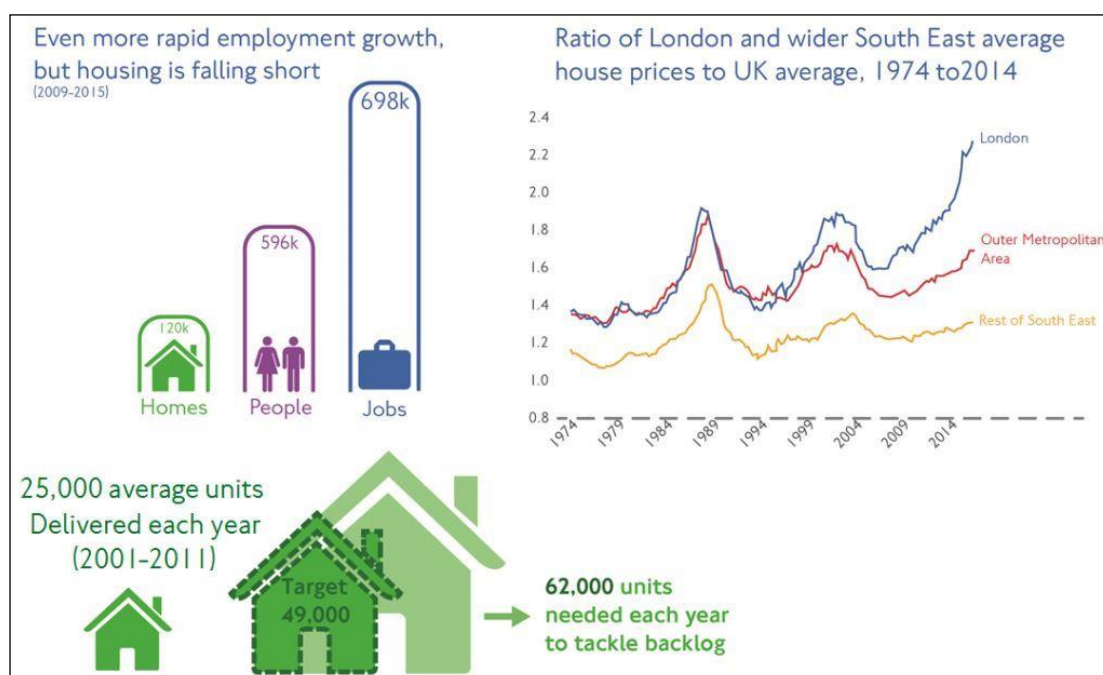
¹⁰ This trend is regarded as a short term phenomenon reflecting London's resilience to economic shocks in recent years and it is expected that job growth will revert to historic trend levels going forward.

¹¹ FALP (2014) - GLA Population forecasts

¹² London Infrastructure Plan 2050

<https://www.london.gov.uk/sites/default/files/LIP%202050%20update%20presentation%20March%202015.pdf>

Figure 9: Summary of housing supply and affordability issues facing London



- 2.12. This housing shortage could potentially result in a deteriorating quality of life. The sense of place and quality of life is becoming more important in supporting London's competitiveness as a world city and for London's success. London is competing on quality of its offer, not on cost. These labour supply and housing cost problems affects the decisions of businesses to invest in London and workers to live there.

Key Finding:

London's population and employment levels are growing rapidly. This is due to the clustering of economic activity, particularly within central London. London's future economic success depends on its ability to continue to accommodate population and employment growth and offer a high quality environment.

Dense cities accommodate growth most sustainably and efficiently

- 2.13. Densification reduces the capital and operating costs of infrastructure as well as increasing agglomeration benefits. Within London, there are opportunities to increase the density of housing development and there are opportunities to create new sites for development but these require co-ordinated investment.
- 2.14. London has grown sustainably through densification and efficient recycling of redundant or under-utilised land. It has successfully recycled redundant industrial land. In the period 2001-10 London lost over 800 hectares of industrial land (10 per cent of its total stock) enabling this land to be recycled into other uses, predominantly residential.
- 2.15. This densification has been made possible by increases to the capacity of the public transport network, to meet increased levels of travel demand from a growing population. Alongside growth in use of rail and bus networks, recent travel trends have seen increased levels of walking and cycling. Nevertheless the

road network plays a vital role in the efficient functioning of the city.

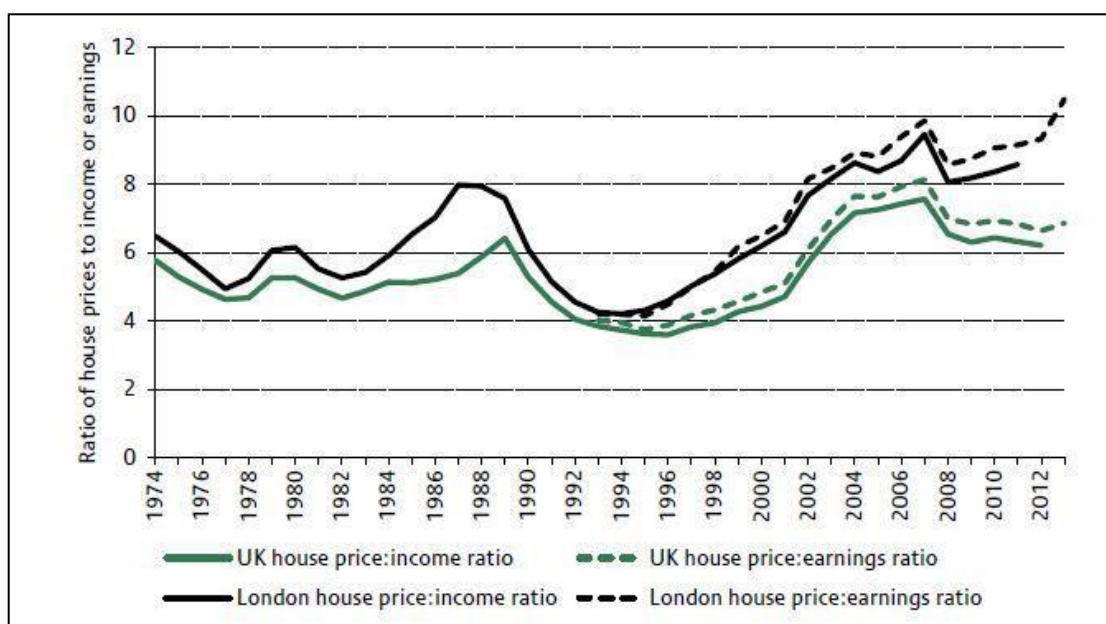
Key Finding:

Further densification will require further investment in transport infrastructure enabling London's increasing population the opportunity to access London's jobs and simultaneously giving London's businesses access to a large pool of well qualified labour. Investment to ensure a well-functioning strategic road network will help support this growth.

London is delivering only 25,000 new homes a year, when it needs to deliver at least double this volume, resulting in worsening housing affordability

- 2.16. Housing delivery is falling well short of demand. This is leading to rapid house price and rent inflation, which is reducing affordability of housing and squeezing disposable income or leading to longer, less sustainable commuting patterns.
- 2.17. Demand for new housing is outstripping supply by a factor of three to one. Over the decade when London's population grew by more than a million, its housing stock grew by less than 300,000. At least a 47 per cent increase from current levels of delivery is now required to meet London's housing targets for 2015-2025.
- 2.18. As a result, house prices have spiralled - the average house in inner London now costs over 13 times the average wage. Properties in some prime central London areas cost more than 30 times the average wage. This has priced many people on modest incomes out of large parts of the city. Figure 10 shows the ratio of house prices to both income and earnings for the UK and for inner London. Housing in London is significantly less affordable than in the rest of the UK.

Figure 10: House price to income and earnings ratios for the UK and London¹³



- 2.19. Providing sufficient housing to meet demand is essential to London's ability to attract and retain talented workers and in turn maintain the city's

¹³ Source: Nationwide, Labour Force Survey, Family Expenditure Survey and Family Resources Survey
MAYOR OF LONDON

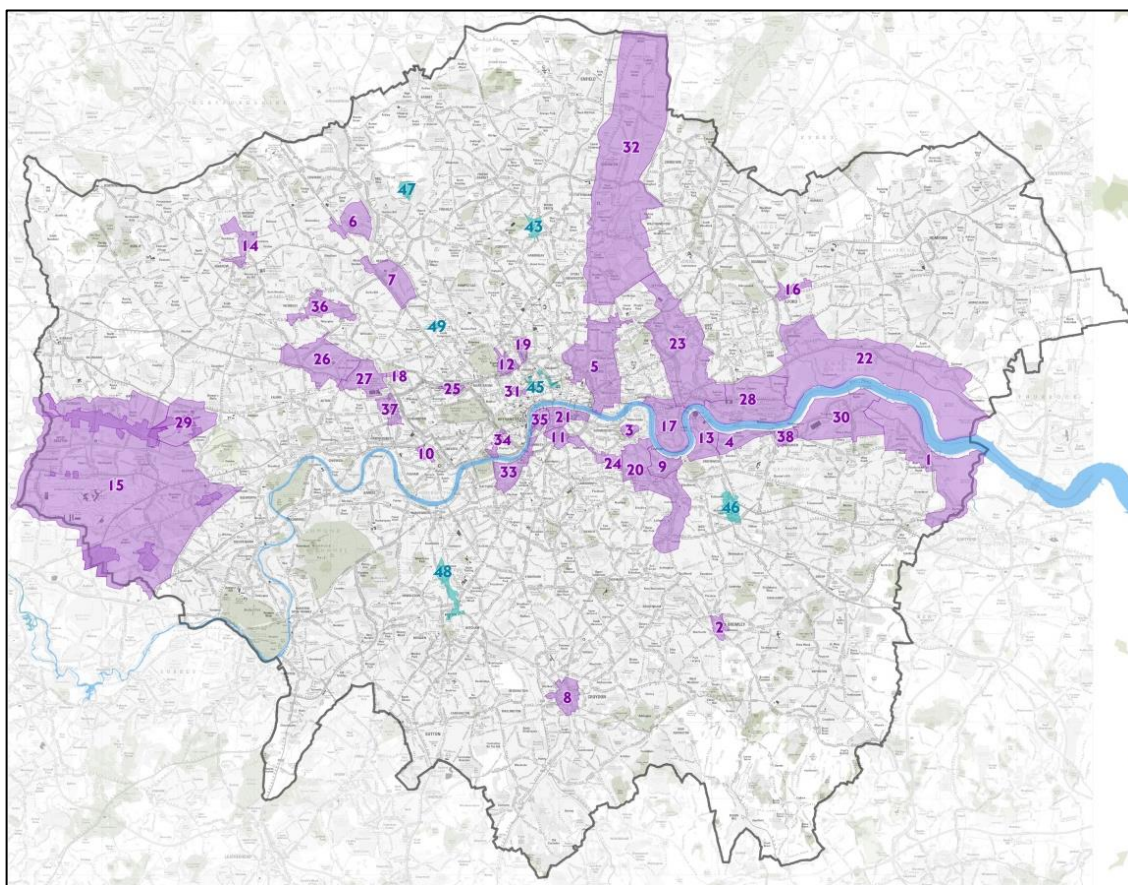


competitiveness. Providing sufficient – and sufficiently affordable – housing is also important if the city’s communities are to remain cohesive and vibrant and avoid the problems associated with social polarisation.

London’s growth is being constrained by a chronic shortage of housing which is driving up housing costs as a proportion of household income. To achieve housing targets existing brownfield land must be unlocked

- 2.20. London has limited opportunities for accommodating large scale development. A range of suitable areas are identified in the Mayor’s London Plan (March 2015), including 38 Opportunity Areas, shown in Figure 11. London’s 38 Opportunity Areas represent “London’s major source of brownfield land with significant capacity for new housing, commercial and other development linked to existing or potential improvements to public transport accessibility¹⁴”. The Old Oak Common, White city, Kensal Canalside and Paddington OAs are in the London Boroughs surrounding the A40 corridor. All parts of outer London must help to accommodate more homes.

Figure 11: London’s Opportunity Areas



¹⁴ London opportunity areas for large-scale development
<https://www.london.gov.uk/priorities/planning/opportunity-areas>

Opportunity Areas				Area of Intensification
1 Bexley Riverside	11 Elephant and Castle	21 London Bridge, Borough & Bankside	31 Tottenham Court Road	42 Farringdon/Smithfield
2 Bromley	12 Euston	22 London Riverside	32 Upper Lea Valley	43 Haringey Heartlands/Wood Green
3 Canada Water	13 Greenwich Peninsular	23 Lower Lea Valley	33 Vauxhall, Nine Elms & Battersea	45 Holborn
4 Charlton Riverside	14 Harrow & Wealdstone	24 Old Kent Road	34 Victoria	46 Kidbrooke
5 City Fringe/ Tech City	15 Heathrow	25 Paddington	35 Waterloo	47 Mill Hill East
6 Colindale/Burnt Oak	15 Heathrow Core	26 Park Royal	36 Wembley	48 South Wimbledon/Colliers Wood
7 Cricklewood/Brent Cross	16 Ilford	27 Old Oak Common	37 White City	49 West Hampstead Interchange
8 Croydon	17 Isle of Dogs	28 Royal Docks & Beckton Waterfront	38 Woolwich	
9 Deptford Creek/Greenwich Riverside	18 Kensal Canalside	29 Southall Hinterland		
10 Earls Court	19 King's Cross - St Pancras	29 Southall Development Sites		
	20 Lewisham, Catford & New Cross	30 Thamesmead & Abbey Wood		

- 2.21. If London is to meet its housing needs, it has to utilise its land as effectively as possible and be creative about assembling sites for development and identifying more usable space. Policy 3.3E of the London Plan states: “Boroughs should identify and seek to enable additional development capacity to be brought forward to supplement these targets having regard to the other policies of this Plan and in particular the potential to realise brownfield housing capacity through the spatial structure it provides”.
- 2.22. Infrastructure schemes can play a role in creating the right incentives for developers through boosting the attractiveness of locations through provision of enhanced transport accessibility and public realm improvements.

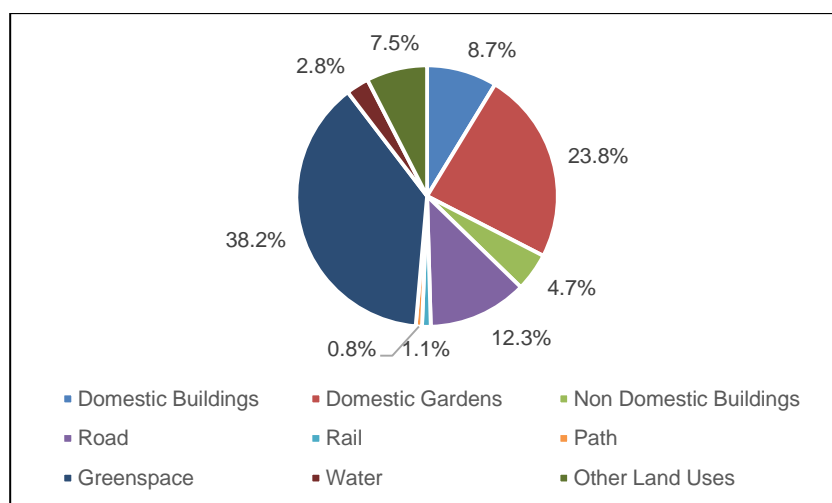
Key Finding:

Alongside growth within OAs, Areas for Intensification and Housing Zones, there is a need to unlock development potential of other areas. Increasing the density of development in these more accessible locations is a sustainable way of accommodating London's growth.

By investing in its road network, TfL can unlock more land for urban regeneration and contribute to meeting London's housing targets

- 2.23. Figure 12 shows that in 2005, 12.3 per cent of the total area of London was taken up with roads, more than the amount of land occupied by domestic dwellings. Better use of road space is a potential source of development land that is worth exploring further. However, given the challenges of increasing congestion and the economic impacts of this, it needs to be done in such a way that also protects the function of key strategic road corridors.

Figure 12: London Area by Land Use¹⁵



¹⁵ Source: Land Use Generalised Land Use Database 2005

Key Finding:

There is a need for innovative ways of unlocking housing potential within London's boundaries. A better use of the TLRN, balancing the sense of place and its strategic movement function, could enable higher housing densities.

As London grows, the level of congestion on its strategic road network is forecast to grow, even with sustained investment in public transport capacity

- 2.24. In 2013, road congestion cost the London economy £5.4bn, accounting for 41 per cent of costs to all of UK's large urban areas¹⁶.
- 2.25. Around two-thirds of these costs accrue from delays in Outer London where car driver/passenger share within/to/from Outer London accounts for 48 per cent of modal share compared to 10 per cent in within/to/from Central London¹⁷.
- 2.26. London's growing population, as well as supporting employment growth in the CAZ will strain TfL's strategic road network as car-dependency remains a key issue in Outer London. In particular, this will lead to significant increases in congestion on key strategic arterial roads into London.
- 2.27. The Government's National Infrastructure Plan 2014¹⁸ clearly sets out the scale of investment required for the UK's Strategic Road Network (SRN), committing £15.2bn between 2015-16 and 2021-21 to transform it – the biggest programme of investment since the 1970s with investment tripling from current levels by 2020. The importance of addressing issues on the A40 in support of sustainable economic growth has been highlighted by the Government's commitment to investing in other junction improvements along its route as part of the Government's 'Road Investment Strategy' to help unlock Britain's economic potential.
- 2.28. However, the £15bn precludes any investments to improve the Transport for London Road Network (TLRN) – the Roads Task Force Vision states that at least £30bn of investment is required over the next 20 years on London's streets and roads.
- 2.29. Without significant investment, congestion and road traffic delay will grow in many areas as illustrated in Figure 13.
- 2.30. A planned 70 per cent increase in rail capacity through Tube upgrades, Crossrail and Thameslink programmes is underway. This is likely to aid modal shift from private vehicles to rail but is not sufficient by itself to address London's road congestion issues.
- 2.31. Strategic TLRN routes in London, whilst playing a strategic traffic function differ significantly from inter-urban motorway and trunk road corridors outside London. The majority pass through urban and suburban areas, with active frontages of retail, employment and residential uses. Traffic has an impact of quality of life.

¹⁶ The future economic and environmental costs of gridlock in 2030, Centre for Economics and Business Research/INRIX, July 2014 http://www.cebr.com/wp-content/uploads/2014/10/INRIX_costs-of-congestion_Cebr-report_v5_FINAL.pdf

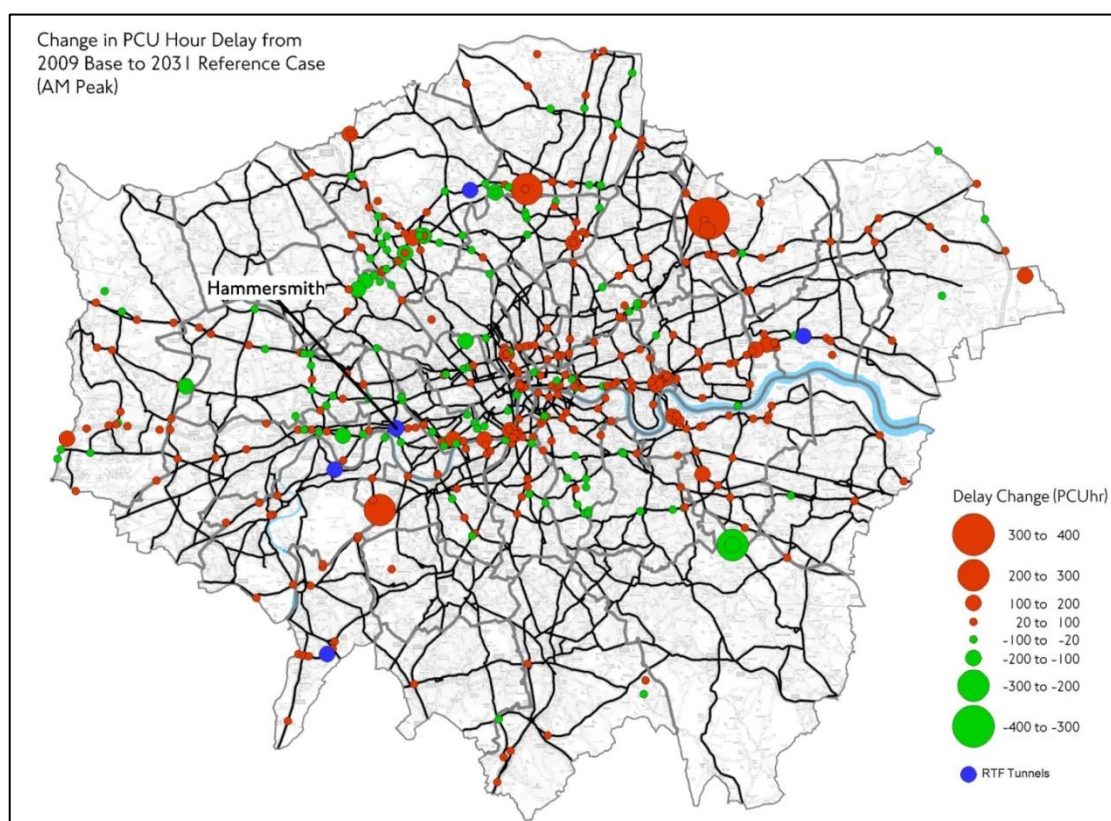
¹⁷ Based on percentage of average daily trips in three year period 2007/8 to 2009/10

¹⁸ National Infrastructure Plan 2014

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/381884/2902895_NationalInfrastructurePlan2014_acc.pdf



Figure 13: Change in PCU hour delay, 2009 – 2031



Key Finding:

The pressures on London's roads are growing and there is a need for a major investment programme to maintain the strategic movement function of roads such as the A40, whilst tackling other issues which require commensurate investment such as enabling growth, and improving quality of place. The urban nature of the TRLN requires different solutions to those suitable for inter-urban corridors outside of London.

Better use of road space on strategic roads is a possible means of improving quality of place and unlocking additional development, but this needs to be balanced against continued needs for movement

- 2.32. The Mayor's 2020 Vision¹⁹ is for London to be the greatest city in the world to live, play, study, invest and do business.
- 2.33. Inevitably, this Vision requires balancing the competing spatial demands for transport infrastructure, urban realm and housing – all of which are crucial to attracting skilled labour to work in London's agglomeration clusters.
- 2.34. Whilst motorised traffic has fallen by 10 per cent in Greater London Area between 2000 and 2011, during 2014 and 2015, traffic volumes have increased. Between 2000 and 2011, congestion has risen by around 10 per cent. In central London, this is partly due to an increase in construction activities disrupting the

¹⁹ Mayor's 2020 Vision <https://www.london.gov.uk/mayor-assembly/mayor/vision-2020>

road network. It is also due to the reallocation of road space from private traffic to public transport, cycling and walking. This reflects existing trends in modal shifts and TfL's vision for better quality public spaces and more sustainable transport.

- 2.35. However, motorised traffic remains critical to London, whether it is for deliveries, taxis, emergency services or driving commuters, further investment in roads is required to keep London moving.
- 2.36. The need for maintaining and improving traffic flows is especially relevant to the A40 corridor – as this route plays a strategic role for vehicle trips between different areas of west and central London towards major growth areas at Heathrow and the Thames Valley.

Key Finding:

Land in the vicinity of TLRN corridors has the potential to help accommodate new housing development to help meet some of London's need

A joined-up approach to planning and infrastructure investment by the GLA, TfL and Boroughs will help to unlock development in areas with high regeneration and growth potential

- 2.37. Investment to enhance the attractiveness of locations both for businesses and also local residents and potential workers will stimulate regeneration of under-utilised land.
- 2.38. There is a clear role for public intervention in the form of targeted investment, enabling sites such as Leytonstone to maximise their development potential. There are co-ordination market failures that act as constraints on urban sites coming forward for development even in areas where the development gains are potentially quite high.
- 2.39. A package of measures at various scales and geographies will be required to ensure that land and potential sites for development within all parts of London are used efficiently to support sustainable growth.

The road tunnel schemes being considered aim to release the potential of specific areas for housing and wider development, while maintaining the vital movement function of strategic roads, thereby helping underpin London's growth more widely

- 2.40. Road tunnels and decking schemes will do this in the following ways:
 - They will ensure companies maintain access to a larger and higher quality workforce, customers and suppliers, supporting the agglomeration impacts arising from faster or more reliable journey times by road;
 - They enable development of housing and employment on under-utilised land along the road corridor which might have otherwise been constrained to a lower density; and
 - They will provide a focus for regeneration and improvements in quality of life, including urban realm improvements, which can help drive investment and jobs in

otherwise struggling local economies through increased footfall or attracting new employers and residents.

- 2.41. Each tunnel or decking scheme will have a different mix or focus.
- 2.42. This is part of a major shift in needing to support greater growth in London and the changing role of town centres, including the increasing importance of the quality of place in our city's success.

Key Finding:

Investment in decking-over, tunnelling and flyunder schemes on London's road network will help to enable regeneration and support economic growth

To retain London's competitiveness, further investments in transport links and the public realm are required to facilitate delivery of more successful places and new housing in areas adversely impacted by traffic

- 2.43. Some of the most successful cities around the world have invested in improvements to the quality of the urban realm alongside investment in public transport capacity. Providing cover over ring roads and building tunnels helps to maintain road network functioning while reducing traffic impacts, creating new spaces for city life and delivering high quality cycle and walking infrastructure.
- 2.44. London's streets account for 80 per cent of public space in London and therefore schemes which are able to unlock spaces for living and working whilst not impeding network functioning are 'win-wins'.
- 2.45. An improved public realm delivered through reallocation of road space or capacity (as shown in Figure 14) can also reduce severance for pedestrians and cyclists. This is particularly the case for heavily congested core road corridors, where provision of public realm along the existing alignments can enable people to gain quicker and easier access to key amenities and rail/underground stations.

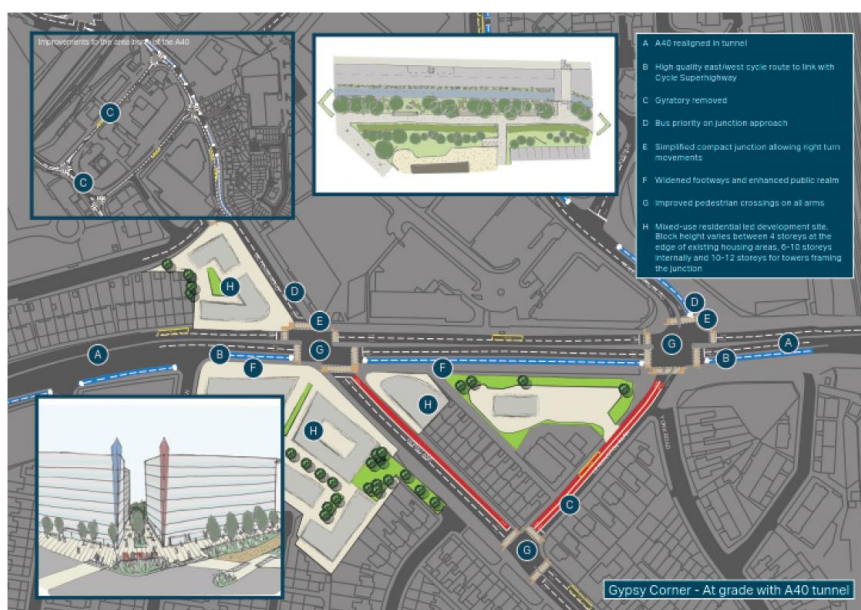


Figure 14 Gypsy Corner Surface Junction Layout (Options 1 and 4)

- 2.46. Three important dimensions to helping ensure London's continued growth and competitiveness are: expanding the capacity of its transport network, releasing more land for housing and protecting and enhancing quality of place.
- Insufficient transport capacity to access jobs and enable reliable servicing or freight access across the city would hinder employment growth and agglomeration impacts. Decking-over, tunnelling and flyunder schemes would address congestion pinch points on and around strategic corridors into London.
 - Housing within or close to London is becoming increasingly unaffordable for many workers. The failure to supply new volumes of housing to meet increasing demand has resulted in rapid house price and rental inflation, reducing disposable income. Decking-over, tunnelling and flyunder schemes would release land and enable higher density developments to be brought forward.
 - A deteriorating quality of place and quality of life for Londoners and workers could make the city comparatively a less attractive place for footloose companies to be based. Decking-over, tunnelling and flyunder schemes would reallocate road space on the surface to pedestrians and cyclists, reduce severance and noise impacts.

Key Finding:

Solutions which continue to support the functioning of the road network whilst reducing traffic impacts on communities around London's ring roads, gyratories and town centres and enhance conditions for pedestrians and cyclists must be found. Delivery of 'win-win' solutions is increasingly important to London's continued success.

PART B: THE PROBLEMS AFFECTING TLRN CORRIDORS IDENTIFIED

Section Summary:

There is a close relationship between London's road network and its ability to bring forward the necessary level of housing and commercial development to support growth

- TLRN roads have a movement function and a place function – the relative importance of each function varies
- A growing city population will travel more using different modes, resulting in more congestion and crowding, and poorer air quality, reducing the overall quality of life
- Areas of outer London are currently more dependent on car-based travel for commuting to work
- Road corridors with a strong “movement” emphasis cause severance impacts that inhibit walking and cycling connectivity
- Doing nothing to improve London's road network is not an option

There is a close relationship between London's road network and its ability to bring forward the necessary level of housing and commercial development to support growth

- 2.47. As outlined earlier, London is seeing strong employment growth, and a rapidly growing population, trends that are projected to continue into the future. However, there are several challenges that could hinder London's ability to attract new talented workers, create jobs and sustain this high level of competitiveness.
- 2.48. Within London the number of homes being built has fallen short of the level of need.
- 2.49. Much of London's land is already developed. The city's Opportunity Areas (OAs), shown in Figure 11, are its largest remaining brownfield sites for potential development. Many TLRN corridors run through these OAs.
- 2.50. The scope to regenerate and develop land along busier TLRN corridors is currently severely reduced by the adverse impacts of traffic. High traffic volumes and severance, air quality and noise impacts limit the viability of development and the success of neighbourhoods.
- 2.51. If nothing is done to reduce the impact of the road corridor, then it is unlikely that development will come forward, or it will come forward only at a significantly lower density, as new properties will be harder to sell or less profitable than alternative sites.
- 2.52. If these negative impacts can be reduced through improvements to 'place' and local connectivity, then redevelopment is likely to become a more attractive and viable commercial investment proposition. However, this needs to be done

without undermining the movement function or there will be wider adverse economic impacts. Therefore investment in improving quality of place that addresses these issues can enable significant quantities of new housing to be unlocked without unduly constraining the ongoing operation of the strategic road network.

TLRN roads have a movement function and a place function – the relative importance of each function varies

- 2.53. The road network in London serves a wide range of functions. At one end of the scale, core roads and main corridors form the TLRN function as the principal routes for movement of vehicular traffic.
- 2.54. At the other end of the scale, streets with lower traffic flows often have a primary 'place' function. TfL and boroughs need to work together to find the appropriate balance between the movement and place demands on roads and streets.
- 2.55. The Roads Task Force report identifies nine typologies of road corridors or streets that reflect whether they play a strategic or local movement or place function. These nine street types are shown in the matrix in Figure 15. Traffic levels can affect the vitality of town centres and quality of place and life through creating severance, noise and air pollution.

Figure 15: The RTF street types matrix



- 2.56. Roads such as the A40 have a strategic movement function, which takes priority

over place functions, so have a “core road” typology. These core roads are a vitally important part of London’s road network and congestion on these routes presents challenges in terms of the cost to businesses of variable and unpredictable journey times in different directions at different times of day. Other roads have to balance a clear movement function with an equally important place function.

- 2.57. The higher traffic volumes become, the more the quality of the public realm can be adversely affected, and the less willing people would be to use the street to meet, interact with others, to shop, enjoy food or drink or take a break.
- 2.58. In some cases, the current typology of a road or street may not reflect a borough’s place-making aspirations or be conducive to achieving proposed land use changes in an area. Heavy traffic volumes in those typologies towards the top left of Figure 15 have the effect of discouraging new residential development and lowering property prices.
- 2.59. With good planning, careful design and investment, more emphasis can be given to the place function of a particular TLRN road corridor without unduly compromising its strategic movement role. Such win-wins are increasingly important in a growing world city where the competing demands and challenges on these corridors are increasing.

Key Finding:

Tunnels, over-decking or flyunders in locations such as west London would maintain the strategic movement role of roads such as the A40 while tackling other issues which require commensurate investment (such as enabling development opportunities to be maximised and improving quality of place).

A growing city population will travel more using different modes, resulting in more congestion and crowding, and poorer air quality, reducing the overall quality of life

- 2.60. A higher employment base and higher population in London will result in increased demand for travel and for freight and servicing. This will generate a need for investment to accommodate the increasingly diverse demands being placed on strategic roads – such as more bus passengers, cyclists, pedestrians and growth in freight movements to service more people.
- 2.61. To enable the city to grow London will require investment to increase the capacity and efficiency of its road-based and rail, underground, DLR and tram systems.
- 2.62. If this investment is not forthcoming, congestion will worsen and levels of crowding on public transport systems will increase. This will lead to longer and less predictable journey times for London residents and in-commuters from the rest of the South East.
- 2.63. These increases in travel times will result in longer commutes and increased risk of employees arriving late for work. A less efficient transport system will result in a more stressful and frustrating travel experience for its users. This will have an impact on the productivity of workers. Londoners and employees’ quality of life



will deteriorate.

- 2.64. This will result in some choosing to relocate to areas that offer a better quality of life or skilled workers choosing to work elsewhere, which would be detrimental to overall UK productivity given the agglomeration gains of dense cities.

Key Finding:

Under-investment in transport infrastructure improvements is likely to result in a worsening quality of life and place for residents and workers in London

Road corridors with a strong “movement” emphasis cause severance impacts that inhibit walking and cycling connectivity

- 2.65. Road corridors with a strong ‘movement’ function present barriers that inhibit crossing movements by cyclists and pedestrians. If there is not provision in the form of at-grade crossings or over-bridges or subways at sufficient intervals, this can act as a significant deterrent to movement by these modes.
- 2.66. These severance impacts can also reduce the willingness of nearby residents to use public transport if the walking trip to access a station or bus stop is too circuitous or unpleasant.
- 2.67. If streets on either side of a busy road are impermeable and not pedestrian and cycle friendly, and the busy road is difficult to cross, this can reduce the propensity to walk or cycle to access services or facilities by these modes.
- 2.68. If people find it more convenient to drive to access shops or services, then this can also adversely affect the vitality of district or neighbourhood shopping areas and lead to their decline.

Key Finding:

In many cases, severance effects result in households living nearby making less sustainable travel choices and having greater reliance on the private car.

Doing nothing to improve London’s road network is not an option

- 2.69. London’s strategic road network is relied upon by businesses, provides workers with access to employment across the city, to services and hospitals. It forms the backbone for freight and servicing movements and the bus network. It is also used extensively for business travel. To compete as a world city, London also needs to invest to improve quality of public spaces and encourage more use of sustainable travel modes, but if road space is reallocated, then this would increase the costs of congestion.
- 2.70. If insufficient investment comes forward to manage London’s road capacity to cope with increased levels of, and more diverse travel demand, then levels of highway congestion will rise and bus services will become less reliable.
- 2.71. This will result in longer travel times and higher travel costs for commuters, residents and visitors. Increased congestion, delays and longer travel times have a significant cost on London’s economy.
- 2.72. The more congested and crowded the transport network becomes, the less resilient it will be in the face of planned or unplanned disruption. Longer, less

comfortable and less reliable travel systems will adversely affect people's quality of life.

- 2.73. Furthermore, if the Mayor, TfL, the boroughs and other partners do not implement measures that will help to tackle the problems of poor air quality and noise from transport sources, then this will result in worsening health for Londoners. The costs of treatment of people will increase and these costs would have to be met from the public purse. Increased numbers of vehicular journeys, more buses and lorries to serve a growing city is likely to result in greater air pollution and noise, affecting the health of people who live and work next to busy road corridors.
- 2.74. If people living near these busy roads perceive a worsening in their quality of life, from congestion, longer travel times, noise, pollution and severance then some may relocate out of London, resulting in a reduced pool of skilled labour available to businesses.

Key Finding:

In an urbanised London context, there are competing demands placed on the strategic road network. There is a need to both protect the vital 'movement' role of London's strategic road network, whilst at the same time improving provision for pedestrian and cycle movements and enhancing quality of place. The delivery of tunnel and decking schemes, whilst requiring significant investment, can achieve both of these goals, providing 'win-win' outcomes.

PART C: OBJECTIVES FOR ACTION FOR IMPROVEMENT ON TLRN CORRIDORS

Section Summary:

The Roads Task Force report 2013 recommends that TfL consider the delivery of major highway interventions on the TLRN, including tunnels, fly unders and over-decking.

A process of prioritisation has been adopted, with a long list of 70 locations assessed using Multi-Criteria Analysis to identify which locations tunnel, fly under and decking solutions would deliver the greatest benefits.

From a short list of 15 schemes, five have been taken forward as a first tranche of projects for further feasibility work. Further feasibility work has since commenced on four other scheme proposals. The A40 corridor scheme being one of the latter.

- 2.75. Any proposal seeking to strike a better balance between the movement and place function of a road must also comply with and seek to meet wider public policy objectives for the area under consideration.
- 2.76. These arise from two key sources, the Mayor's Transport Strategy and the 2013 Roads Task Force "Vision for London's Roads and Streets".
- 2.77. The Mayor's Transport Strategy (MTS) sets out six goals for transport in London:
- Support economic development and population growth;
 - Enhance the quality of life for all Londoners;
 - Improve the safety and security of all Londoners;
 - Improve transport opportunities for all Londoners;
 - Reduce transport's contribution to climate change, and improve its resilience; and
 - Support delivery of the London 2012 Olympic Games and its legacy.
- 2.78. The Roads Task Force Vision sets out the following core objectives:
- To enable people and vehicles to move more effectively on London's streets and roads;
 - To transform the environment for cycling, walking and public transport; and
 - To improve the public realm and provide better and safer places for all the activities that take place on the city's streets, provide an enhanced quality of life and help to unlock development and deliver new homes.
- 2.79. The RTF vision identified that measures including flyunders, decking and tunnels had the potential to address these three objectives and help balance them. They can help to achieve particular priorities without undermining the other objectives.

PART D: THE APPROACH TAKEN BY THE ROADS TASK FORCE TO ADDRESS TLRN CHALLENGES

Section Summary:

In 2013, the Mayor of London's independent Roads Task Force (RTF) published a report recommending the delivery of major highway interventions on the TLRN, including tunnels, flyunders and over-decking

- Since the recommendations of the Roads Task Force were published, TfL has conducted a number of strategic studies to understand opportunities for roofing over or tunnelling under existing infrastructure
- A process of prioritisation has been adopted, with a long list of 70 locations assessed using Multi-Criteria Analysis to identify at which locations tunnel, flyunder and decking solutions would deliver the greatest benefits
- From a short list of 15 schemes, 9 have been taken forward for further feasibility work

In 2013, the Mayor of London's independent Roads Task Force (RTF) published a report recommending the delivery of major highway interventions on the TLRN, including tunnels, flyunders and over-decking

- 2.80. The Roads Task Force (RTF), comprises a diverse group of road users, developers, local authorities and other statutory highway authorities. The RTF vision is designed to tackle congestion and improve quality of life in London.
- 2.81. A key recommendation of the RTF report, published in July 2013, was that the potential of major highway interventions on the TLRN such as tunnels and 'flyunders' should be investigated to determine the role they could play in achieving the vision for London's roads and streets across the strategic highway network.
- 2.82. In particular, whether major interventions at key locations could 'relocate or provide substitute capacity for motorised traffic to unlock surface space for 'living', more sustainable modes and development – enabling different use of space above and reducing impacts such as severance and noise, while maintaining network functioning'.
- 2.83. This view built on experience from other cities around the world such as Paris, Oslo and Boston, which have undertaken these kinds of ambitious projects and have seen dramatic results.

Since the recommendations of the Roads Task Force were published, TfL has conducted a number of strategic studies to understand opportunities for roofing over or tunnelling under existing infrastructure

2.84. Three main types of infrastructure were considered:

- Tunnels to release land at the surface for either development, green space, improved public realm or better facilities for pedestrians, cyclists and public transport users but also relieve congestion and improve journey time reliability (where relevant)
- Flyunders to release land at the surface for either development, green space, improved public realm or better facilities for pedestrians, cyclists and public transport users but also relieve congestion and improve journey time reliability (where relevant)
- Decking of roads to provide public parks, reduce severance and the negative impacts of roads including noise and poor air quality and helping to bring forward development on neighbouring land especially where there is good existing or future public transport connectivity which can support high-density development

2.85. To identify locations where tunnels, flyunders or decking solutions would deliver strong potential benefits, a prioritisation process has been followed.

A process of prioritisation has been adopted, with a long list of 70 locations assessed using Multi-Criteria Analysis to identify at which locations tunnel, flyunder and decking solutions would deliver the greatest benefits

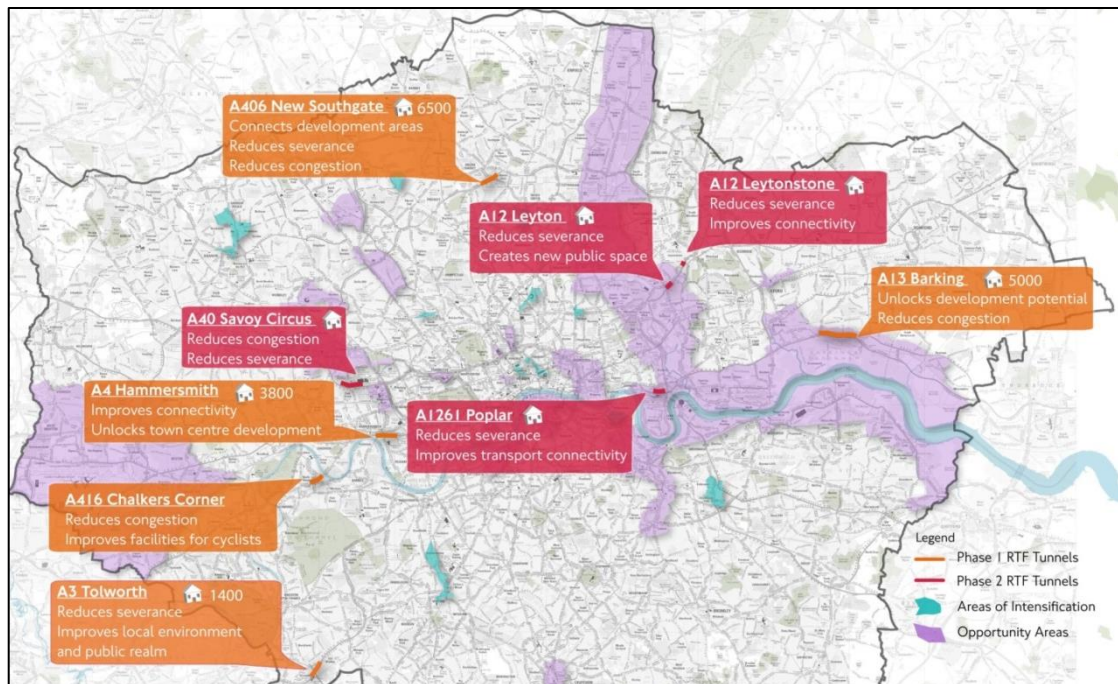
2.86. From an initial list of approximately 70 locations, through a Multi-Criteria Analysis (MCA) a shortlist of fifteen sites was identified. These sites were identified as having sufficient potential for initial feasibility studies. A combined score was developed from SAF²⁰ and RTF appraisals. For each identified site, the following was also investigated:

- Potential intervention types;
- Engineering feasibility;
- Transport impact for all users including those travelling by car, foot, cycle and public transport;
- Local and strategic environmental impacts including on visual amenity, noise and air quality;
- Level and quality of enabled development;
- Likely programme;
- Route to consent; and
- Cost of delivery

²⁰ TfL Strategic Assessment Framework (SAF) is a tool that allows planners, managers and sponsors across Transport for London (TfL) to assess projects and programmes using a set of strategic criteria. SAF is used as part of the process of developing projects and programmes within TfL.

From a short list of 15 schemes, nine have been taken forward for further feasibility work. The Leytonstone decking scheme is one of these nine

Figure 16: The locations of the nine RTF tunnel/decking schemes



2.87. As part of a rolling feasibility assessment programme, five initial locations were taken forward for further assessment in 2015. These five locations are:

- A13, Barking Riverside
- A3, Tolworth
- A316, Chalkers Corner
- A4, Hammersmith
- A406, New Southgate

2.88. A further four locations have been taken forward in 2015/16. These four locations are:

- A40.
- A1261, Poplar
- A12, Leytonstone
- A12, Leyton

2.89. All nine schemes are shown above at Figure 16.

PART E: THE PROBLEMS IDENTIFIED ON THE A40

Section Summary:

The A40 is one of the busiest radial corridors in London.

A growing population in west London requires higher density residential development in accessible locations

- Planned growth in west London is high with Old Oak and Park Royal Opportunity Area alone providing 25,500 homes and 65,000 jobs
- The A40 is in the top 10% of London's busiest roads and often operates beyond its capacity

Maintaining of capacity and strategic function protection are key challenges for the A40 corridor

- The A40 is a vital freight corridor and serves a strategic movement function, which in turn delivers substantial economic benefits to London and the United Kingdom
- A large number of bus routes cross the A40
- The existing form of the A40 corridor creates severance for pedestrians and there is limited provision for crossing movements
- The existing form of the A40 corridor also creates severance for cyclists; and
- There is limited provision for crossing movements but phase 2 of the East-West Cycle Superhighway is planned from Paddington to Acton on the A40 Corridor and this must form part of the concept for the A40.
- There is a high incidence of collisions at all major junctions with vulnerable road user accidents focused around Savoy Circus and White City.
- Air and noise pollution along the A40 corridor is extremely high, particularly at Gypsy Corner, Hanger Lane and West Cross area.

The A40 is one of the busiest radial corridors in London

- 2.90. The A40 corridor is one of the busiest traffic and freight radial corridors in London, playing a fundamental part in generating the agglomeration benefits that accrue in London.
- 2.91. It directly serves the growth areas in West London, Old Oak Common and Park Royal Opportunity Area, providing access to central London and the Royal Oak-Paddington-Edgware Road (ROPER) area. There are also significant routes crossing the A40, such as the A406 North Circular at Hanger Lane gyratory, and wider access to major residential, industrial and employment centres.

A growing population in west London requires higher density residential development in accessible locations

Planned growth in west London is high with Old Oak and Park Royal Opportunity Area alone providing 25,500 homes and 65,000 jobs

- 2.92. Significant development growth is proposed in the West London sub-region, particularly focused on a number of major development sites such as at Old Oak and Park Royal, White City, Earl's Court. Coupled with London's projected population growth, the cumulative effect of this growth will increase transport movement demand along the A40 corridor and across it.
- 2.93. In February 2015, the Mayor consulted on the draft Old Oak and Park Royal Opportunity Area Planning Framework (OAPF). Old Oak will provide 24,000 homes and 55,000 jobs while Park Royal, the UK's largest industrial estate, will continue to be protected and enhanced to provide an additional 1,500 homes and 10,000 jobs. The OAPF was accompanied by an Old Oak Common Strategic Transport Study, which assessed the impact of the proposed development on the transport network and recommended a transport strategy required to support the quantum of development proposed for the area. The OAPF transport strategy acknowledged the need to:
- i. Improve pedestrian and cycle connectivity to the proposed East-West Cycle Superhighway on the A40 and also across the A40
 - ii. Ensure good bus connectivity to neighbouring centres, including across A40 (towards White City, North Kensington, Shepherd's Bush and Hammersmith)
 - iii. Ensure good connectivity for service vehicles to A40 and the wider strategic road network

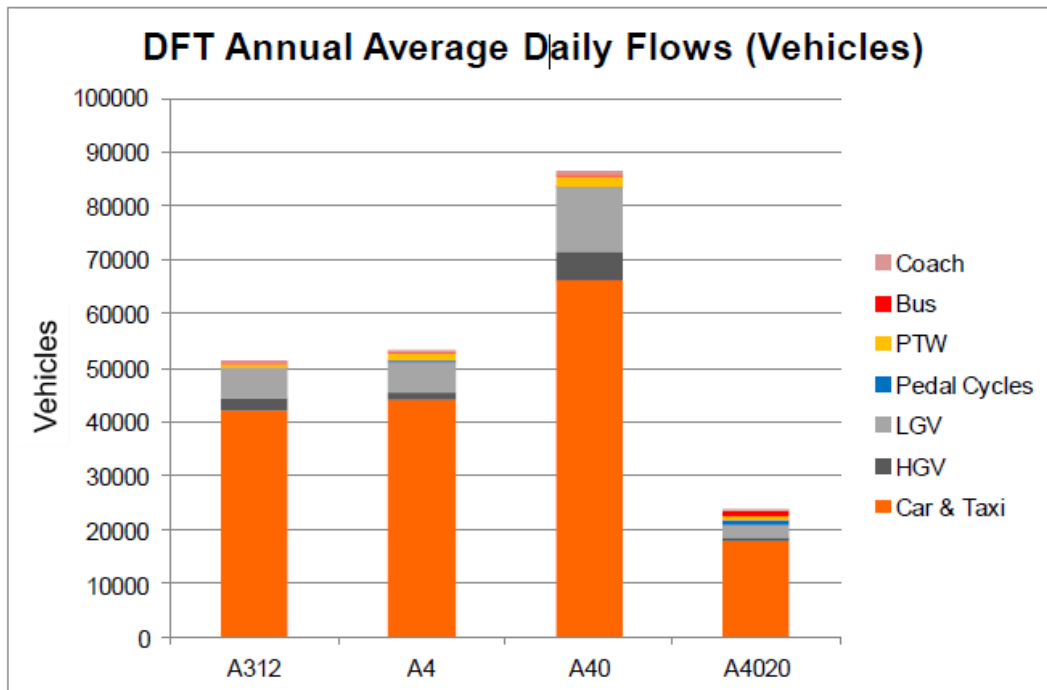
Key Finding:

The A40 and its environs are at the heart of the Old Oak and Park Royal development strategy, including the development of the OAPF. The future role of the A40 in accommodating 25,500 homes and 65,000 jobs in the area is clearly critical in opening up the future success of the area.

The A40 is in the top 10% of London's busiest roads and often operates beyond its capacity

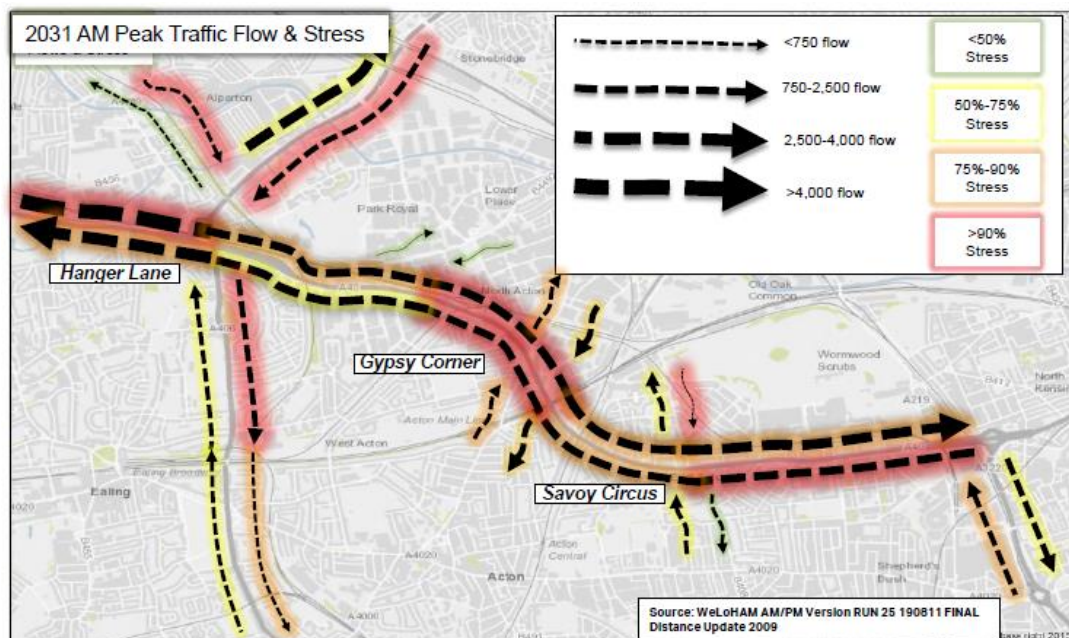
- 2.94. The A40 corridor operates close to and often above capacity during the peak periods. The A40 within the core study area between Hangar Lane Gyratory and Savoy Circus has an average of 50,000 vehicles per day in each direction. This is within the top 10% of London's busiest roads.

Figure 17: Annual average daily flows on the A40 and neighbouring routes



2.95. Therefore congestion, delay and journey time reliability issues are common along this stretch of road.

Figure 18: A40 peak flow and stress levels



2.96. In its current form the A40 corridor struggles to accommodate such volumes of traffic and it is consequently regarded as one of the worst performing roads in Central London with regards to delays and Journey Time Reliability (JTR).

Figure 19: Journey time reliability on the TLRN

Journey Time Reliability (JTR) on the TLRN

The JTR values on each of the main radial routes on the TLRN in the AM and PM peaks in both directions are:

AM Peak		Inbound										Outbound											
Route Type	Corridor	2013/14	2013/14	2013/14	2013/14	2013/14	2014/15	2014/15	2014/15	2014/15	2013/14	2013/14	2013/14	2013/14	2014/15	2014/15	2014/15	2014/15	2014/15	2014/15	2014/15	2014/15	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Radial	A4	90.2%	89.5%	90.7%	89.5%	87.6%	90.9%	88.9%	90.5%	94.3%	93.2%	89.3%	92.5%	91.9%	93.5%	91.0%	93.2%	94.3%	93.2%	89.3%	92.5%	91.9%	93.5%
Radial	A40	77.8%	80.9%	78.0%	79.6%	80.8%	81.3%	78.3%	79.5%	94.2%	95.9%	92.5%	92.4%	91.9%	94.6%	92.0%	91.7%	94.2%	95.9%	92.5%	92.4%	91.9%	94.6%
Radial	A41	87.7%	89.2%	85.8%	86.4%	84.1%	88.0%	83.1%	87.4%	89.6%	90.6%	89.6%	90.5%	91.6%	93.0%	90.7%	90.2%	89.6%	90.6%	89.6%	90.5%	91.6%	93.0%
Radial	A1	82.9%	81.3%	79.3%	82.4%	80.6%	80.0%	78.2%	82.8%	90.8%	93.5%	88.3%	88.9%	90.1%	93.1%	87.8%	88.3%	90.8%	93.5%	88.3%	88.9%	90.1%	93.1%
Radial	A10	85.8%	87.1%	83.8%	82.7%	86.0%	88.3%	84.5%	84.5%	88.7%	88.7%	87.1%	88.5%	90.0%	90.5%	88.2%	87.5%	88.7%	88.7%	87.1%	88.5%	90.0%	90.5%
Radial	A12	88.8%	89.4%	81.9%	86.7%	85.5%	87.6%	82.4%	84.4%	96.3%	96.3%	95.5%	94.8%	95.9%	95.1%	95.5%	95.1%	96.3%	96.3%	95.5%	94.8%	95.9%	95.1%
Radial	A13	87.2%	87.6%	78.8%	85.6%	85.4%	85.7%	81.4%	83.8%	97.2%	98.9%	98.0%	97.4%	98.5%	98.3%	98.0%	96.2%	97.2%	98.9%	98.0%	97.4%	98.5%	98.3%
Radial	A2	87.0%	86.4%	83.2%	84.5%	83.1%	85.9%	80.2%	81.9%	97.7%	98.0%	96.7%	97.2%	97.6%	97.5%	97.8%	96.1%	97.7%	98.0%	96.7%	97.2%	97.6%	97.5%
Radial	A20	89.5%	91.6%	85.8%	87.3%	86.0%	88.4%	85.4%	84.4%	95.7%	95.6%	93.7%	93.1%	92.7%	95.4%	95.9%	90.4%	95.7%	95.6%	93.7%	93.1%	92.7%	95.4%
Radial	A21	87.2%	88.4%	88.6%	87.6%	87.9%	93.1%	85.1%	86.1%	92.8%	93.8%	91.4%	91.5%	92.2%	96.3%	92.5%	91.6%	92.8%	93.8%	91.4%	91.5%	92.2%	96.3%
Radial	A23	89.1%	89.7%	87.5%	87.7%	85.7%	88.7%	86.5%	86.2%	91.4%	91.7%	89.3%	90.1%	91.3%	91.7%	89.9%	88.5%	91.4%	91.7%	89.3%	90.1%	91.3%	91.7%
Radial	A24	88.2%	88.2%	84.1%	85.9%	84.0%	89.6%	83.2%	83.9%	92.7%	94.3%	90.5%	93.7%	91.4%	94.0%	92.8%	93.5%	92.7%	94.3%	90.5%	93.7%	91.4%	94.0%
Radial	A3	87.7%	91.3%	89.2%	89.2%	86.7%	89.6%	89.2%	89.3%	96.5%	96.3%	94.2%	95.3%	95.5%	95.9%	94.0%	95.0%	96.5%	96.3%	94.2%	95.3%	95.5%	95.9%
Radial	A316	84.0%	92.4%	85.9%	86.0%	83.9%	87.1%	87.0%	88.3%	98.2%	96.4%	93.2%	94.9%	95.9%	96.4%	95.9%	88.3%	98.2%	96.4%	93.2%	94.9%	95.9%	96.4%

PM Peak		Inbound										Outbound											
Route Type	Corridor	2013/14	2013/14	2013/14	2013/14	2013/14	2014/15	2014/15	2014/15	2014/15	2013/14	2013/14	2013/14	2013/14	2014/15	2014/15	2014/15	2014/15	2014/15	2014/15	2014/15	2014/15	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Radial	A4	91.1%	91.6%	88.3%	90.6%	89.8%	89.4%	88.5%	90.0%	81.1%	83.0%	80.2%	80.1%	79.7%	81.6%	79.8%	81.3%	83.5%	86.3%	82.1%	83.8%	85.2%	84.7%
Radial	A40	86.3%	83.8%	83.0%	86.4%	84.5%	84.6%	82.0%	85.4%	83.5%	86.3%	82.1%	83.8%	85.2%	84.7%	82.5%	83.3%	84.7%	85.2%	82.1%	83.8%	85.2%	84.7%
Radial	A41	91.4%	91.2%	90.1%	92.6%	90.5%	92.0%	90.0%	91.0%	84.7%	85.2%	82.3%	83.4%	85.0%	83.3%	81.4%	84.0%	85.0%	84.6%	80.2%	82.3%	81.9%	85.3%
Radial	A1	85.6%	85.3%	81.7%	86.6%	85.8%	84.3%	81.9%	86.1%	85.0%	84.6%	80.2%	82.3%	81.9%	85.3%	81.4%	83.2%	85.6%	85.3%	81.7%	86.6%	85.8%	84.3%
Radial	A10	90.5%	96.4%	87.1%	87.6%	89.5%	89.6%	88.9%	88.2%	82.3%	83.3%	80.3%	81.0%	80.2%	81.9%	80.6%	78.4%	82.3%	83.3%	80.3%	81.0%	80.2%	81.9%
Radial	A12	87.6%	87.3%	85.2%	87.4%	88.3%	87.5%	83.9%	87.4%	85.7%	86.1%	83.8%	84.1%	84.8%	83.2%	82.8%	84.3%	86.1%	86.1%	83.8%	84.1%	84.8%	83.2%
Radial	A13	92.6%	92.1%	90.2%	89.9%	92.7%	90.8%	90.0%	93.7%	84.1%	84.3%	86.7%	86.1%	87.1%	83.4%	85.5%	84.1%	92.6%	92.1%	90.2%	89.9%	92.7%	90.8%
Radial	A2	92.5%	91.5%	91.1%	93.2%	89.7%	91.5%	90.9%	92.7%	85.1%	86.8%	84.3%	84.6%	81.7%	84.9%	83.1%	82.8%	92.5%	91.5%	91.1%	93.2%	89.7%	91.5%
Radial	A20	92.1%	93.0%	90.2%	91.2%	90.2%	88.3%	90.3%	91.0%	89.7%	90.3%	89.4%	89.4%	88.6%	88.5%	89.8%	89.1%	92.1%	93.0%	90.2%	91.2%	90.2%	88.3%
Radial	A21	97.3%	96.4%	95.8%	94.6%	95.4%	98.1%	91.3%	95.0%	89.9%	89.9%	90.0%	88.5%	89.5%	92.7%	87.3%	88.5%	97.3%	96.4%	95.8%	94.6%	95.4%	98.1%
Radial	A23	90.9%	96.7%	89.5%	89.6%	89.5%	89.5%	89.4%	89.8%	83.3%	82.2%	81.0%	82.8%	82.1%	83.8%	81.4%	82.7%	90.9%	96.7%	89.5%	89.6%	89.5%	89.4%
Radial	A24	91.9%	91.9%	90.7%	91.5%	92.2%	92.8%	91.8%	94.5%	89.5%	91.4%	87.0%	88.0%	88.4%	92.1%	87.5%	89.1%	91.9%	91.9%	90.7%	91.5%	92.2%	92.8%
Radial	A3	94.5%	94.8%	92.8%	93.5%	93.6%	93.3%	92.3%	94.2%	90.6%	92.1%	86.7%	88.4%	89.7%	92.5%	86.2%	88.7%	94.5%	94.8%	92.8%	93.5%	93.6%	93.3%
Radial	A316	93.2%	94.5%	88.6%	90.5%	92.2%	88.4%	90.4%	88.6%	92.2%	92.2%	90.3%	92.4%	91.3%	91.2%	93.1%	91.7%	93.2%	94.5%	88.6%	90.5%	92.2%	88.4%

- 2.97. Delay and journey time reliability issues are particularly noticeable at Hanger Lane, Gypsy Corner and Savoy Circus and is likely to worsen as PCU hour delays are forecasted to increase (refer to Figure 20).

Figure 20: PCU hour delays on the A40 corridor

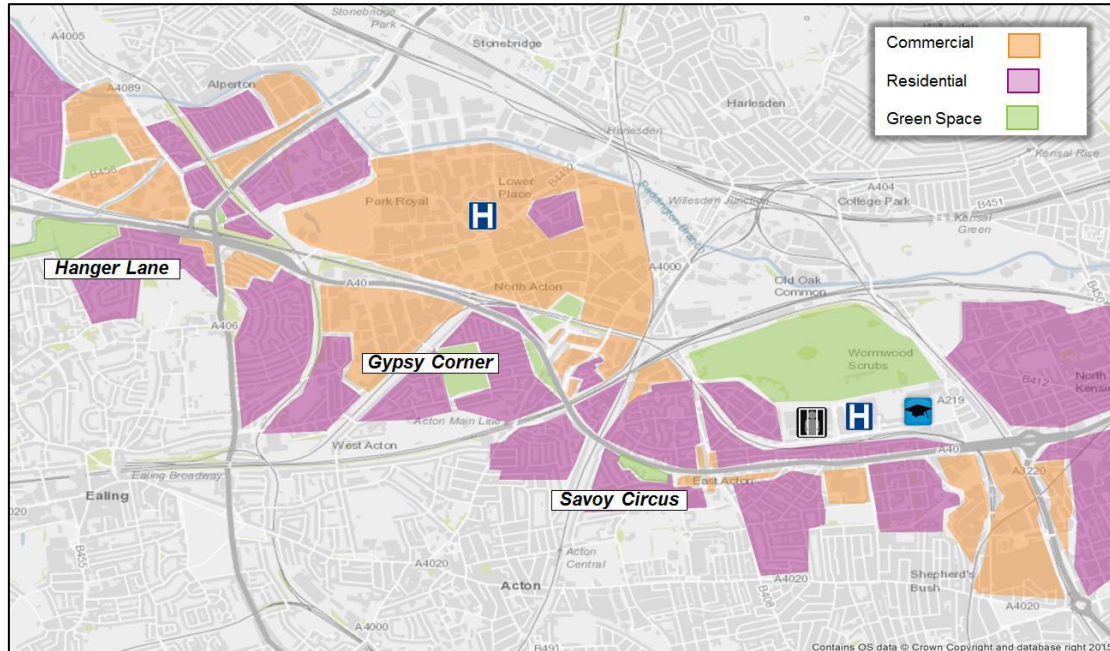


Key Finding:

Traffic flow and congestion issues on the A40 corridor are severe and will get worse into the future.

Maintaining of capacity and strategic function protection are among the issues and challenges for the A40 corridor

Figure 21: Spatial challenges that an A40 strategy must address



- 2.98. The current issues and challenges faced were documented at a corridor level and specifically for the key junctions of Hanger Lane Gyratory, Gypsy Corner and Savoy Circus. At a corridor level the challenges identified are the following:
 - i. The capacity and function of the A40 strategic road corridor must be maintained
 - ii. The A40 is the among the busiest strategic radial corridors serving Central London and suffers from high levels of delay and congestion
- 2.99. The A40 corridor also plays a vital role in linking strategic orbital routes such as the M25, A312, A406 and A3220. Any worsening in the functionality of the A40 corridor will have a ripple effect on the strategic orbital routes that it links to and it's fundamental ability to connect Central London to the wider United Kingdom.
- 2.100. Local roads are sometimes used as rat-runs by people attempting to avoid the congestion on the A40. The added pressure about this rat running increases the stress on the network. The network of local access roads is also limited and features narrow lanes, poor sight lines and in some places does not meet current highway design standards. The significant flow of vehicles on the A40 corridor and rat running on the local road network has attributed to a very poor quality sense of place.

Key Finding:

The A40 has a vital role linking key orbital routes in west London and to Great Britain and the wider UK more widely. The pressure on the A40 is compounded by drivers using local roads as rat-runs, meaning even less reliable journeys.

The A40 is a vital freight corridor and serves a strategic movement function, which in turn delivers substantial economic benefits to London and the United Kingdom

- 2.101. The A40 corridor is critical for both traffic and freight movement and operates close to and often above capacity during the peaks. Whilst cars and LGVs (91%) dominate traffic flow on the A40 corridor HGVs also make up 7%. Free flowing freight movements are important as commercial premises and industrial estates are vital to the local and regional economy. The A40 corridor directly services Park Royal, London's largest industrial estate, and is in close proximity to Heathrow Airport and key strategic routes. Consequently, freight activity was identified as a significant service function of the corridor and any delays for freight traffic will have a notable impact on both the local and regional economy.

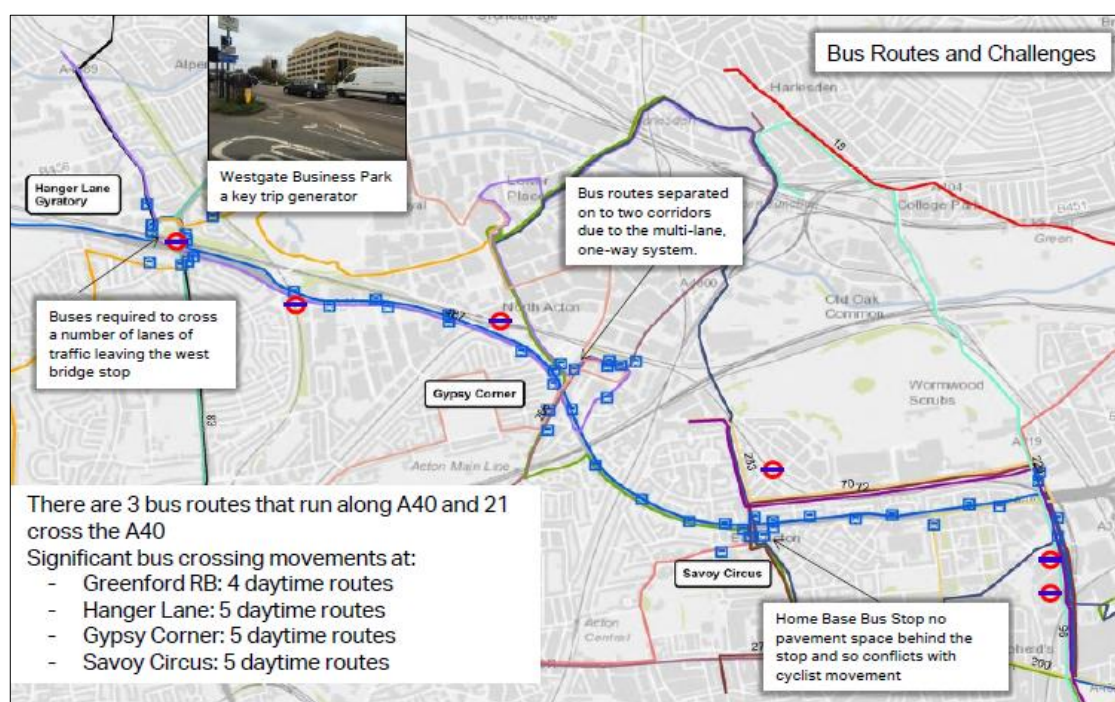
Key Finding:

The A40 has a vital role in the freight network. With 7% of journeys being freight related, the A40 is a key corridor which if disrupted can affect the supply chain across London.

A large number of bus routes cross the A40

- 2.102. There are a number of important north-south bus routes that cross the A40 at Hanger Lane, Gypsy Corner and Savoy Circus but congestion on the roads can cause unreliable bus journey times. There are 3 bus routes that run along A40 and 21 which cross the A40. Significant bus crossing movements within the study area include:
- i. Hanger Lane: 5 daytime routes: 83, 95, 112, 226, 487.
 - ii. Gypsy Corner: 5 daytime routes: 95, 260, 266, 440, 487.
 - iii. Savoy Circus: 5 daytime routes 7, 20, 95, 228, 260, 272.
 - iv. Wood Lane: 5 daytime routes: 72, 95, 220, 272, 283.
- 2.103. Congestion and delays on the A40 make it increasingly difficult for north-south bus routes to cross the A40, therefore impacting bus journey time reliability. As bus journey time reliability continues to worsen so to do the levels of patronage as buses become a less favourable mode choice for local commuters due to excessive journey times and delays experienced. Encouraging more people to use bus services to cross the A40 corridor is becoming increasingly challenging as bus journey time reliability continues to decline.

Figure 22: Bus routes on the A40 corridor



Key Finding:

The A40 acts a block to the numerous bus routes that cross it; and to the 95 bus route that runs along it. There is an urgent need to address bus reliability problems at the junction pinch points between Hanger Lane and Savoy Circus.

The existing form of the A40 corridor creates severance for pedestrians and there is limited provision for crossing movements

- 2.104. The A40 and its major junctions within the study area are also a significant form of severance for pedestrian movement. There are a total of 38 pedestrian crossings within the study area.
- 2.105. The A40 creates significant severance for pedestrian and cyclists and the major junctions on the A40 are intimidating for some. Although a combination of at-grade, subways and bridges provide several crossings points for pedestrians, the quality of most of these crossings is generally poor and there are large sections with no pedestrian facilities. As development and growth comes forward, demand for pedestrian movement, particularly north-south is likely to increase.
- 2.106. The A40 and its major junctions within the study area are also a significant form of severance for pedestrian movement. There are a total of 38 pedestrian crossings within the study area. However, the quality of many of these crossings is generally poor and there are large sections with no pedestrian facilities.

Key Finding:

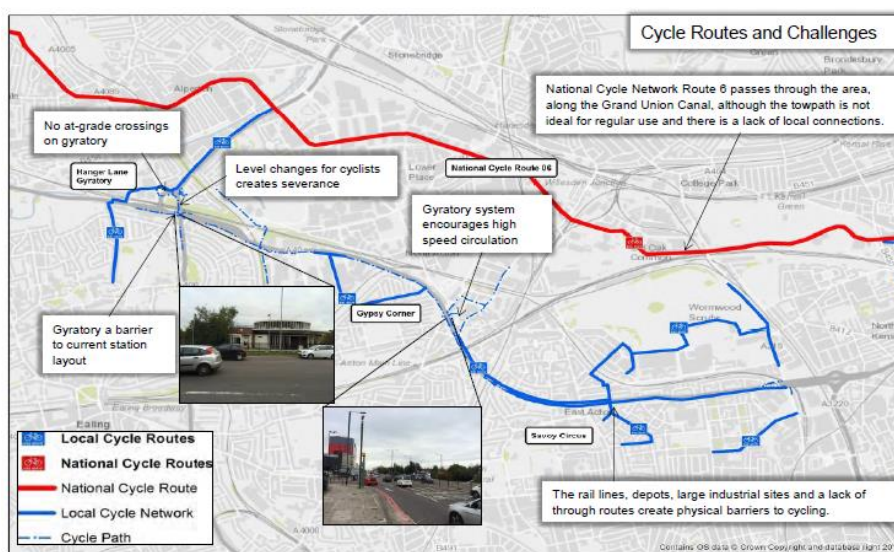
The A40 causes significant severance to pedestrians and is an unpleasant environment. Access can be poor, although there are a number of crossing points, and the urban environment requires an upgrade, including at those junctions which function as local centres.

The existing form of the A40 corridor also creates severance for cyclists and there is limited provision for crossing movements

- 2.107. In general there is significant severance for cyclists wanting to either ride along (east-west movements) or through (north-south movements) the A40. As development and growth comes forward, demand for cyclist movement, particularly north-south is likely to increase. The A40 creates significant severance for cyclists and the major junctions on the A40 are intimidating for some.

Phase 2 of the East-West Cycle Superhighway is planned from Paddington to Acton on the A40 Corridor and this must form part of the concept for the A40

Figure 23: Cycle interventions in the A40 corridor



- 2.108. The East-West Cycle Highway Phase 2 proposes to extend the route along the A40 from Paddington to Gypsy Corner. TfL has been preparing outline scheme designs for this scheme and public consultation on these proposals finished on the 20th March 2016. Any proposed interventions on the A40 corridor must take into consideration the likely scenario of the E-W Cycle Superhighway being built out and the affects this has on the existing capacity of the A40.

Key Finding:

The A40 causes significant severance to cyclists and is an unpleasant environment. Access can be poor, although there are a number of crossing points, and the urban environment requires an upgrade, including at those junctions which function also as local centres. Interventions including the Cycle Superhighway are planned in the area and these must form part of the overall concept for the area.

High incidence of collisions at all major junctions with vulnerable road user accidents focused around Savoy Circus and White City.

- 2.109. Hanger Lane, Gypsy Corner and Savoy Circus which form the core study area were all identified as priority 1 junctions for road safety intervention, due to their high number of collisions involving Vulnerable Road Users (VRUs). Improving the level of safety for VRU's at these junctions is a key challenge that must be resolved.

Key Finding:

The A40 contains several junctions identified as being Category 1 for intervention which shows the severity and urgency of dealing with road safety challenges on the A40.

Air and noise pollution along the A40 corridor is extremely high, particularly at Gypsy Corner, Hanger Lane and West Cross area.

- 2.110. High traffic volumes on the A40 result in high levels of local emissions (refer to Figure 24) and noise, significantly impacting on the local residents and businesses.

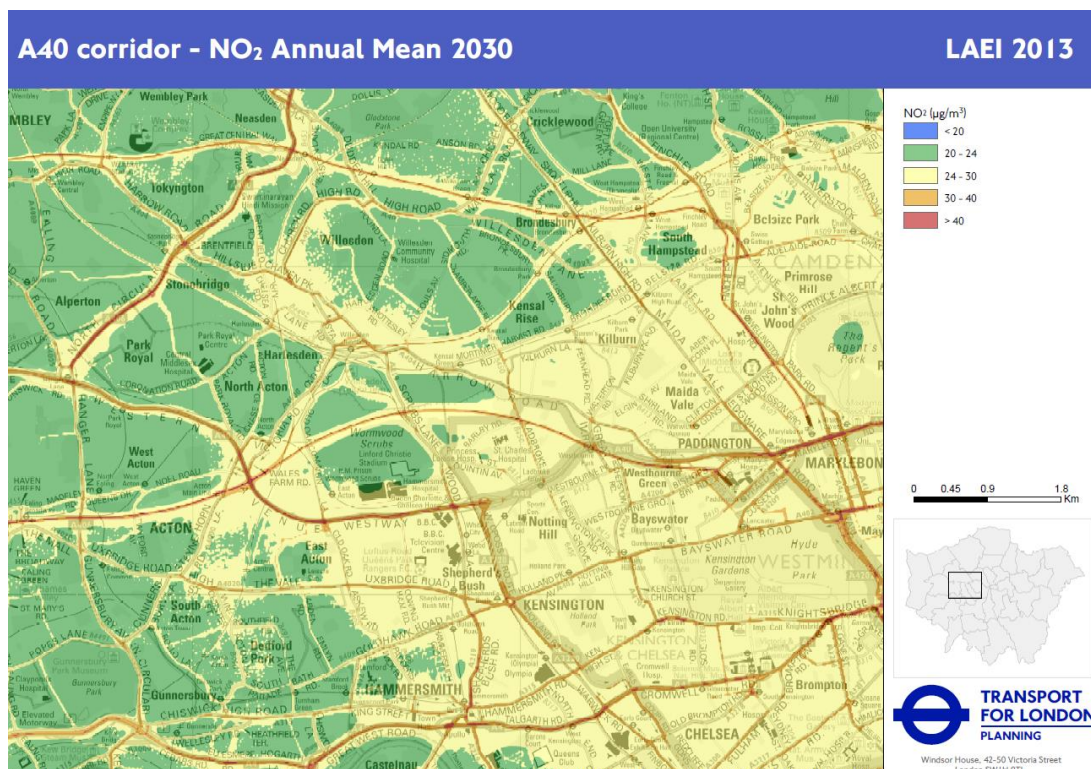
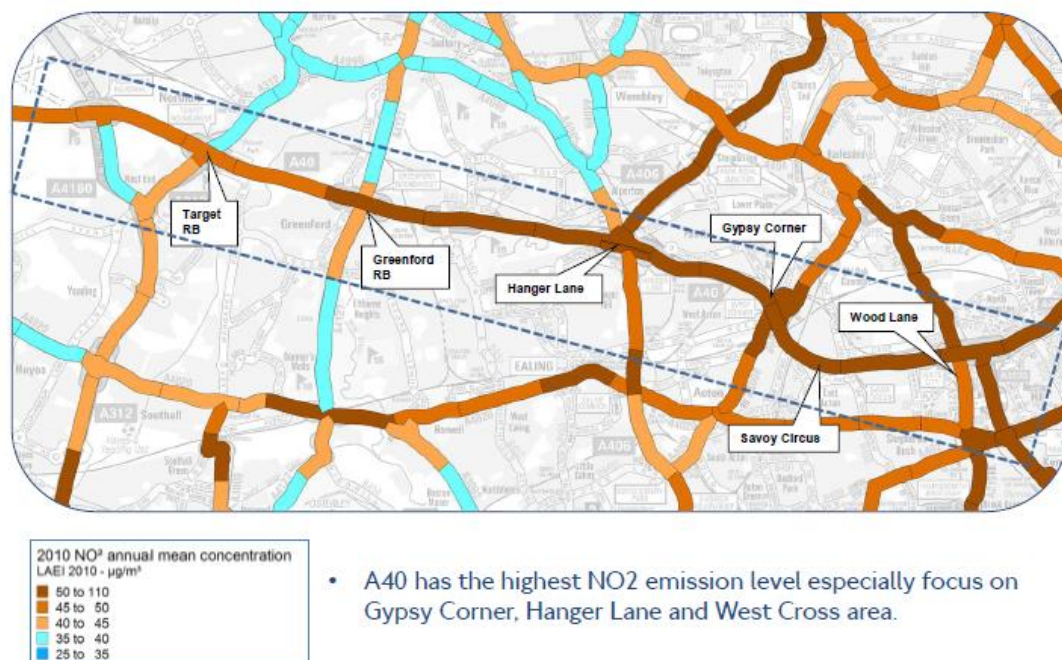


Figure 24 A40 Corridor NO₂ Annual Mean 2030

- 2.111. The physical and perceptual severance caused by the A40, coupled with the noise, air quality and visual impacts of up to 110,000 vehicles using the A40 daily, means that local quality of life is substantially negatively impacted. Furthermore, air quality levels are further worsened by the high levels of congestion and delays along the corridor.
- 2.112. The A40 reaches the highest measured daily noise level for roads of 75+ decibels, whilst air pollution levels along the road corridor are so high that they breach European Union limits on air quality. The road corridor is considered to be one of the most polluted roads in London. This creates an unpleasant, polluted environment for any potential pedestrians and non-motorised transport users of the road.
- 2.113. Air and noise pollution are known to have significant health impacts on residents exposed to them: it is estimated that between 6 and 9 per cent of deaths in London are currently attributable to long-term exposure to particulate matter as a result of poor air quality. Building residential development along this highly polluted road corridor at locations like Parky Royal, Old Oak Common, Gypsy Corner and Savoy Circus, would expose new residents to high levels of pollution and potential negative health impacts.
- 2.114. Together, these factors act as a key constraint on the viability of residential development, making the area less attractive to potential buyers and in turn to developers.



Figure 25: Air quality (NO2)



Key Finding:

The A40 has some of the worst noise and air pollution in London, requiring urgent attention.

PART F: OBJECTIVES FOR THE A40 AND OPTIONS IDENTIFIED

Section Summary:

Objectives and measures of success for an intervention on the A40 have been defined.

At the beginning of the study, eight options (including some sub-options) were considered for the A40.

- The options were then evaluated against the objectives identified for the study and the A40 which resulted in some options being negated.
- Of the eight original options identified, four tunnelling options (Options 1, 2A, 4 and 5) were identified as achieving the objectives and were taken forward for further investigation.
- The options recommended for further work are Option 1 and Option 5.

Objectives and measures for success for the A40 have been defined

- 2.115. A number of workshops have been conducted with key stakeholders throughout the A40 corridor study to establish common objectives and derive at suitable options for consideration. These discussions have informed the conclusions of Section D above.
- 2.116. During the first workshop, that was held in November 2015, a common set of corridor objectives were agreed upon to evaluate whether the potential interventions would meet the needs of the corridor. These objectives are shown in Table 4.

Table 4: Objectives and measures of success for the A40 corridor

Objective	Measures of success
<ul style="list-style-type: none">• Maintaining core movement function	<ul style="list-style-type: none">• Maintain as a key route for freight and construction based traffic.• Manage and regulate flow and capacity into central London.
<ul style="list-style-type: none">• Delivering connectivity and capacity enhancements to support existing and planned new homes and jobs in growth areas	<ul style="list-style-type: none">• Reduce severance across the A40 and support improved access from and across the A40 to planned growth areas, particularly for buses, cyclists and pedestrians.
<ul style="list-style-type: none">• Improving the environment, safety and asset quality	<ul style="list-style-type: none">• Reduce the impacts of noise and improving air quality along the A40.• Reduce collisions, particularly among <i>vulnerable road users</i>.• Maintain high quality assets.

Eight options (including some sub-options) were considered for the A40

2.117. The list of options considered is:

- i. Tunnel Option 1: Two-Way Tunnel from Park Royal to Savoy Circus
- ii. Tunnel Option 2: Westbound Only Tunnel from Park Royal to Savoy Circus
- iii. Tunnel Option 3: Westbound Only Tunnel from Park Royal to Savoy Circus with a Spur to Old Oak Common
- iv. Tunnel Option 4: Two-Way Tunnel from Park Royal to Edgware Road
- v. Tunnel Option 5: Two-Way Tunnel from Park Royal to Savoy Circus
- vi. At-grade Option 6: At-Grade options at Hanger Lane, Gypsy Corner and Savoy Circus
- vii. Grade Separation Option 7: Grade separated options at Hanger Lane, Gypsy Corner and Savoy Circus
- viii. Hybrid Option 8: A combination of options at Hanger Lane, Gypsy Corner and Savoy Circus



Tunnel Option 1: Two-Way Tunnel from Park Royal to Savoy Circus

Figure 26: Option 1 Eastern Portal



Figure 27: Option 1 Western Portal



Description of Option 1

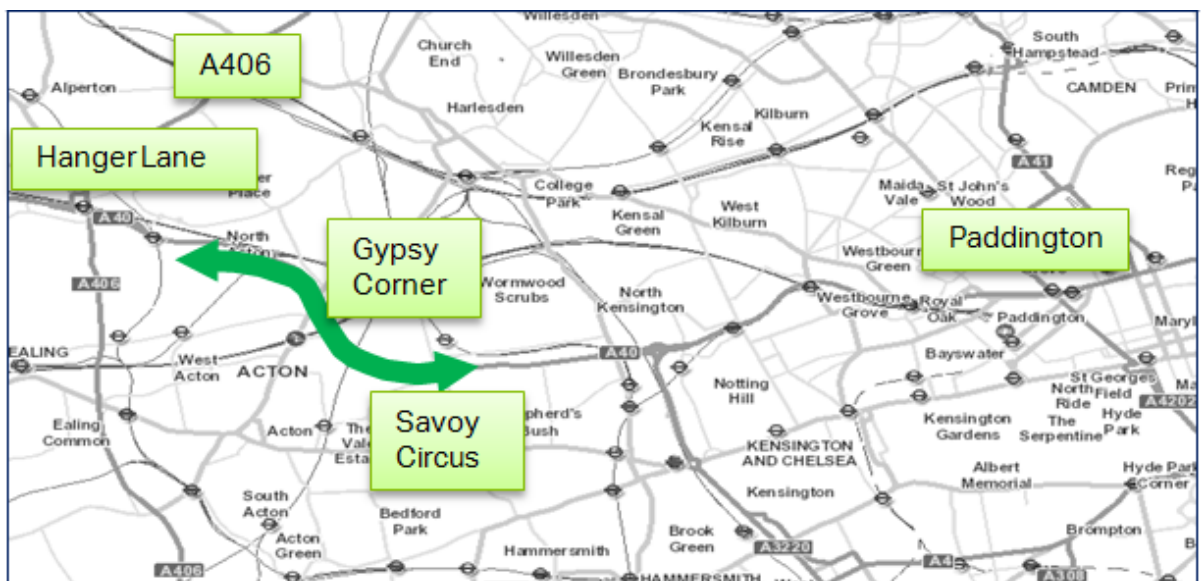
- 2.118. Option 1 was developed based on a previous feasibility study carried out by CH2M Hill. It would introduce a two-lane bi-directional tunnel with a 40mph speed limit. The tunnel proposed as part of Option 1 would allow a reduction in

the A40 surface-level through traffic between the two tunnel portals and would also:

- i. Allow a step-change improvement in north-south connectivity over the A40 for other modes;
- ii. Free-up road space at the surface enabling improvements in the 'place' function of the surrounding environment, including the provision of better pedestrian and cycle facilities; and
- iii. Reduce noise and air pollution.

- 2.119. The Option I tunnel would have a staggered eastern portal to the east of Savoy Circus and a western portal in Park Royal South Leisure Complex and Western Avenue Business Park between Hanger Lane and Gypsy Corner. The western portal would be located adjacent to the London Underground Central Line West Ruislip Branch and hence it will be situated where there is already north-south severance.
- 2.120. It would not be possible to locate the west portal within the existing A40 corridor due to clashes with the safeguarded HS2 alignment.

Figure 28: Location of Option I



- 2.121. Option I would reduce the surface A40 to two lanes in each direction, with a speed limit reduction to 30mph. There are no surface changes at Hanger Lane. This option would include the removal of the gyratory at Gypsy Corner and the removal of the Old Oak Common Lane northbound approach at Savoy Circus. The design incorporates the proposed A40 Cycle Superhighway.

Strategic Modelling Results

Table 5 Option 1 key modelling design inputs

Junction/Road	Scheme
Hanger Lane	No changes
Gypsy Corner	Removal of gyratory – 2 way movements included and bus only link on Wales Farm Road. Lane reductions and all movements permitted at A40 junctions. Lengthened all red traffic signal timings to accommodate cycle crossings.
Savoy Circus	Removal of Old Oak Common Lane northbound approaching the A40. East Acton Lane bi-directional up to new junction with Old Oak Road. Lane reductions and all movements permitted at A40 junctions. Lengthened all red traffic signal timings to accommodate cycle crossings.
A40	Reduced to 2 lanes in each direction and 30mph in both directions between tunnel portals
Tunnel	40mph 2 lane tunnel in westbound and eastbound directions with free flowing portal entrances and exits

- 2.122. The tunnel proposed under Option 1 would be a popular route choice; the strategic modelling showed that between 73% - 85% of A40 traffic would choose to use the tunnel in both directions across all peaks. More motorists would use the tunnel in the PM peak than in the AM Peak. Journey times for east-west traffic would improve through the tunnel in both directions. The tunnel is mainly used for journeys through West London, which is to be expected. There is also a strong link to zones outside the M25.
- 2.123. In comparison to the 2031 base, westbound trips through the study area from west of Hanger Lane to east of Savoy Circus show improvements (about one minute in the AM and 6 minutes in the PM). The eastbound movements show a smaller benefit in the AM but are slightly longer in the PM. The main issue is the congested network east of Savoy Circus which means the benefits are not as great as they could be (refer to Figure 29).
- 2.124. Due to the ambitious plans to downgrade the surface junction capacities, north and southbound surface journey times across Hanger Lane, Gypsy Corner and Savoy Circus are generally expected to increase across the board (refer to Table 6). Option 1 does not amend the layout at Hanger Lane (refer to Table 5), yet the majority of journey times become slightly longer. This could be due to the extra vehicles attracted to the area due to the tunnel. The only shorter journey time is experienced by vehicles travelling between the A40 eastbound off slip and the A406 northbound.

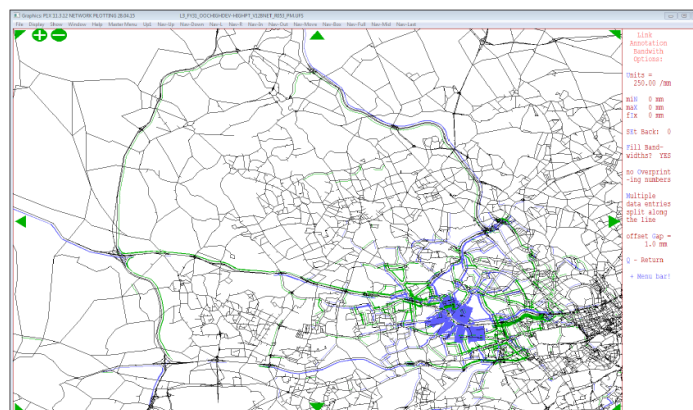


Figure 29 Tunnel Option 1 PM: Re-routing impacts compared to the base model



Table 6 Tunnel Option 1 Node Delays (in seconds) compared to the Base Model (2031)

Arm:	AM Base	Tunnel Option 1 AM	Difference (secs)	PM Base	Tunnel Option 1 PM	Difference (secs)
Hanger Lane Gyratory						
A4005	31	25	-6	36	21	-15
North Circular N	125	210	85	277	387	110
N Circular S	82	163	81	170	201	31
A40 EB off slip	28	28	0	32	23	-9
Gypsy Corner						
Horn Lane/A40/Victoria Road	58	276	218	28	377	349
A4000/A40/Leamington Park	31	35	4	53	35	-18
Horn Lane/Leamington Park	3	46	43	2	31	29
A4000/Victoria Road	16	37	21	28	190	162
Savoy Circus						
Old Oak Common Lane S/N/A40	83	546	463	249	832	583
Old Oak Common Lane N/Du Cane Rd	48	33	-15	140	313	173

Opportunities

- 2.125. Option I could generate 500 additional dwellings and 74,000m² of additional Commercial Floor space. Journey time savings of 38% could be achieved for east to west traffic by the Option I tunnel. Overall, a greater sense of place could be created on the surface.

Challenges

- 2.126. Option I would generate several challenges that would require addressing. These challenges would include:
- The attractiveness of a tunnel; in particular portals and vents.
 - Getting the balance right between tunnel movement vs surface movement.
 - Traffic delays at surface junctions.
 - The size and scope of a tunnel and its construction.
 - The funding gap – estimated at £235m

Synergies and dependencies

- 2.127. Current development plans and aspirations for the area will benefit from, if not require, a step-change in local highway capacity and north-south connectivity. A key dependency for Option I is that a large land-take would be required for the western tunnel portal.

Possible costs and funding

- 2.128. The estimated total cost of implementing Option I is £1.08 billion. This includes construction, land-take, traffic management and 66% Optimism Bias.
- 2.129. Operating costs should be limited to routine highway maintenance and repairs and structural inspections.
- 2.130. Potential funding from Community Infrastructure Levy. Business rate and road charging high potential funding sources.
- 2.131. There is a significant funding gap of £235m for this high cost option which would have to be addressed if this option were proposed for implementation.

Delivery programme

- 2.132. It is estimated that the timescale for implementing Option I, including both design and construction would be in the region of 6.5 years, as a minimum.

Delivery risks and issues

- 2.133. Option I is a complex urban tunnelling project and the delivery risks and issues to be addressed reflect this complexity:
- i. Significant land-take required for western portal, involves removal of existing industrial units. Permanent landtake would total 2,803m² and temporary landtake could be 11,534m².
 - ii. The eastern portal lies on the line of existing A40 with potential traffic disruption during construction.
 - iii. Severance caused by the open ramps at the portals.

Overall performance of Option I

- 2.134. This option scored highly in the Value Assessment Framework (see section G) which was based on the work of the RTF, for the Moving, Protecting and Living sections. It would improve cycle and pedestrian facilities and enable improvements to the public realm and reduce severance.
- 2.135. Option I would provide improved strategic eastbound and westbound highway connections. The scope of this option, to downgrade the existing A40 and improve the place functions are ambitious and result in significant increases in traffic delays.
- 2.136. There are limited opportunities for introducing re-development if the current surface A40 were to remain unchanged.
- 2.137. Although there is a funding gap, Option I was taken forward for shortlisting given the high level of performance against the VAF.

Tunnel Option 2 (later 2A): Westbound Only Tunnel from Park Royal to Savoy Circus

Figure 30: Option 2 Western Portal



Figure 31: Option 2 Eastern Portal



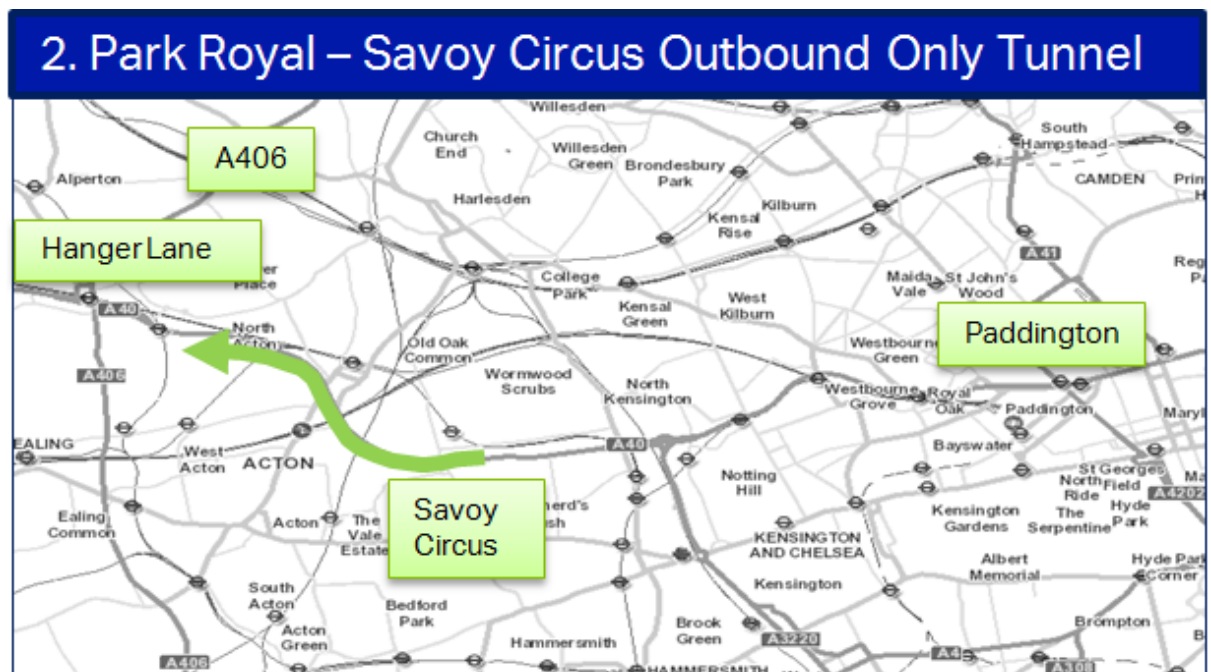
Description of Option 2

- 2.138. This option would introduce a two-lane tunnel for westbound traffic only, with a 40mph speed limit. The tunnel would allow a reduction in the westbound A40 through traffic on the surface-level route between the two portals and would

also:

- i. Enable provision of a step-change improvement in north-south connectivity over the A40 for other non-car modes;
 - ii. Free-up road space at-surface to improve the 'place' function of the surrounding environment including better pedestrian and cycle provisions; and
 - iii. Reduce noise and air pollution.
- 2.139. The eastern tunnel portal would be located to the east of Savoy Circus and the western portal in Park Royal South Leisure Complex and Western Avenue Business Park between Hanger Lane and Gypsy Corner.
- 2.140. The western portal would be located adjacent to the LU Central Line West Ruislip branch. Therefore it would be situated where there is already north-south severance. It is not possible to locate the west portal within the existing A40 corridor due to clashes with the safeguarded HS2 alignment.

Figure 32: Location of Option 2



- 2.141. Option 2 would reduce the surface A40 carriageway to one lane westbound with a speed limit reduction to 30mph. It would provide three lanes eastbound on the A40, with a 40mph speed limit. There are no surface changes at Hanger Lane. This option includes the removal of the gyratory at Gypsy Corner and removal of the Old Oak Common Lane northbound approach at Savoy Circus. The design incorporates the proposed A40 Cycle Superhighway.

Tunnel Option 2: Evolution to Options 2A and 2B

- 2.142. Subsequent to an evacuation strategy review of an outbound only tunnel, option 2 evolved to become option 2A and option 2B with the key difference being:
- i. Option 2A provided a separate parallel emergency tunnel;

- ii. Option 2B accommodated an evacuation corridor within the main bore, separated from the main carriageway by an internal wall.
- 2.143. The Option 2A tunnel bypasses Gypsy Corner and Savoy Circus and includes a 2-lane bored tunnel for westbound only A40 traffic. An additional bored tunnel is also driven parallel to the main tunnel to provide access for emergency vehicles and passenger evacuation.
- 2.144. To investigate the feasibility of an outbound only tunnel that priorities traffic flows out of London and manages traffic flows into London at the surface through intelligent signal optimisation. Accompanying managed flow or tidal flow options are integral to this option.
- 2.145. Option 2B was disregarded due to its unfeasible size, returning only two uni-directional lanes. Upon further investigation, the tunnel and evacuation corridor combined would be the third largest Tunnel Boring Machine (TBM) diameter in the world, thus creating issues in manufacture resourcing and competition, as it would be at the upper limit of the current maximum diameter of TBMs in operation.

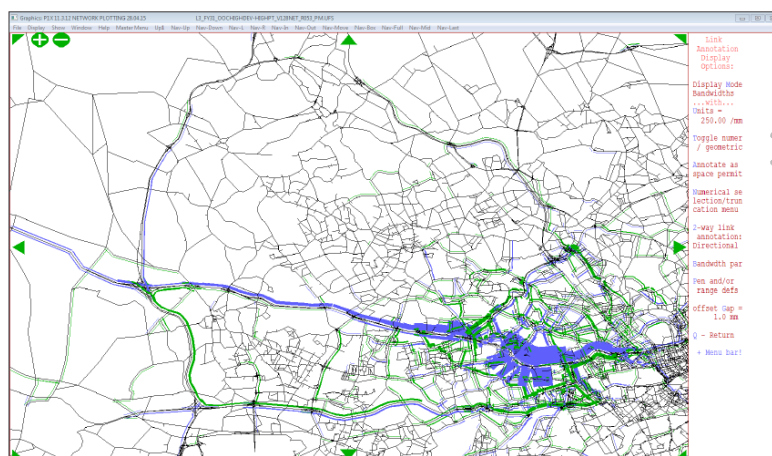
Strategic Modelling Results

Table 7 Option 2A key modelling design inputs

Junction/Road	Scheme
Hanger Lane	No changes
Gypsy Corner	Removal of gyratory – Two way movements included and bus only link on Wales Farm Road. Lane reductions and all movements permitted at A40 junctions. Lengthened all red traffic signal timings to accommodate cycle crossings.
Savoy Circus	Removal of Old Oak Common Lane northbound approaching the A40. East Acton Lane bi-directional up to new junction with Old Oak Road. Lane reductions and all movements permitted at A40 junctions. Lengthened all red traffic signal timings to accommodate cycle crossings.
A40	3 lanes and 40mph eastbound. Reduced to 1 lane and 30mph westbound between tunnel portals
Tunnel	40mph 2 lane tunnel in westbound only direction with free flowing portal entrance and exit

- 2.146. The tunnel proposed under Option 2A would be a popular route choice; the strategic modelling undertaken indicates between 78% - 92% of A40 traffic would choose to use the tunnel in both directions across all peaks. More motorists would use the tunnel in the PM peak compared to the AM Peak. Journey times for westbound traffic would improve through the tunnel. The tunnels are mainly used for journeys through West London, which is to be expected. There is also a strong link to zones outside the M25.
- 2.147. In comparison to the 2031 base, westbound trips through the study area from west of Hanger Lane to east of Savoy Circus show reductions in their journey times (about one minute in the AM and 6 minutes in the PM). The surface level eastbound movements increase by about 39 minutes in the AM and 52 minutes in the PM (refer to Figure 33).

The ambitious plans to improve the place function and the downgrading of the surface surface junctions on the A40 (refer to Table 7) will result in increased vehicular congestion at



these surface junctions (refer to

Figure 33 Tunnel Option 2 PM: Re-routing impacts compared to the base model

2.148. Table 8). Traffic flows will increase at Hanger Lane due to the attractiveness of the tunnel, creating increased delays to traffic. Long traffic delays will occur at Gypsy Corner and Savoy Circus for East – West and North – South movements.

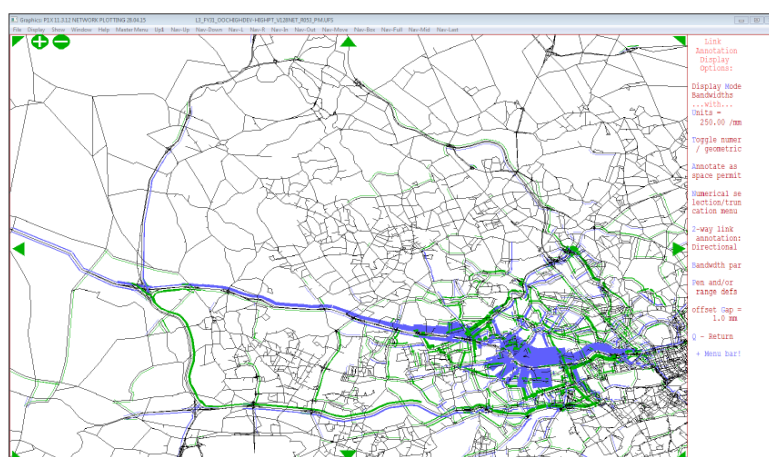


Figure 33 Tunnel Option 2 PM: Re-routing impacts compared to the base model

Table 8 Tunnel Option 2A Node Delays (in seconds) compared to the Base Model (2031)

Arm:	AM Base	Tunnel Option 2A AM	Difference (secs)	PM Base	Tunnel Option 2A PM	Difference (secs)
Hanger Lane Gyratory						
A4005	31	32	1	36	25	-11
North Circular N	125	134	9	277	231	-46
N Circular S	82	156	74	170	209	39
A40 EB off slip	28	28	0	32	23	-9
Gypsy Corner						
Horn Lane/A40/Victoria Road	58	577	519	28	589	561
A4000/A40/Leamington Park	31	25	-6	53	37	-16
Horn Lane/Leamington Park	3	72	69	2	28	26
A4000/Victoria Road	16	96	80	28	628	600
Savoy Circus						
Old Oak Common Lane S/N/A40	83	667	584	249	898	649
Old Oak Common Lane N/Du Cane Rd	48	97	49	140	574	434

Opportunities

- 2.149. Option 2A would generate approximately 400 new dwellings and 74,000m² of additional commercial floorspace. Journey time savings in the region of 40% could be achieved for east to west traffic.
- 2.150. Importantly, a greater sense of place could be achieved at the surface, including at the key junctions

Challenges

- 2.151. As with Option 1, the attractiveness of a tunnel, particularly portals and vents, would need to be worked through the engineering design process and through consultation.
- 2.152. A clear disadvantage of Option 2 is the westbound only A40 route and the safety implications this introduces for evacuation scenarios. The solutions proposed to deal with this introduce additional costs and engineering challenges with no obvious benefit for eastbound traffic.
- 2.153. The balance between tunnel vs surface, again as with Option 1, would need to be further worked through with additional strategic modelling.
- 2.154. Traffic delays at surface junctions would continue to be an issue under this option.
- 2.155. The size and complexity of the Option 2A tunnel and its construction is another key challenge that would have to be overcome.

Synergies and dependencies

- 2.156. Current development plans and aspirations for the area will benefit from, if not require, a step-change in local highway capacity and north-south connectivity.
- 2.157. Large land take required for the western tunnel portal. There would be a greater permanent landtake than Option 1, at 3,160m² and temporary landtake would be the same as Option 1 at 111,534m².

Possible costs and funding

- 2.158. The estimated total cost of option 2A would be £980m, which includes construction, land-take, traffic management and 66% Optimism Bias.
- 2.159. Operating costs should be limited to provide for only routine highway maintenance and repairs and structural inspections.
- 2.160. Potential funding could be sourced from Community Infrastructure Levy. Business rate and road charging high potential funding sources.
- 2.161. There is a significant funding gap of £311m to be filled under this option, which is greater than the funding gap under Option 1.

Delivery programme

- 2.162. It is estimated that the timescale of the design and construction programme would be a minimum of 5.5 years

Delivery risks and issues

- 2.163. As set out above, there significant land-take required for the western portal—this

would involve the removal of existing industrial units.

- 2.164. The eastern portal lies on the existing line of the A40 with potential traffic disruption during construction.
- 2.165. Severance would be caused by the open ramps at the portals.

Overall performance of Option 2A

- 2.166. Option 2A would provide improved strategic westbound highway connections. The plans to downgrade the existing A40 and improve the place functions are ambitious and result in significant increases in traffic delays on the surface, however.
- 2.167. There are more limited opportunities for introducing re-development under this option. There are limited benefits in relation to the significant cost (with a BCR of -5:1). Additionally, the consultant team have advised that there are safety concerns which could lead to additional costs.
- 2.168. However, given the potential traffic benefits this option was taken forward for shortlisting.



Tunnel Option 3: Westbound Only Tunnel from Park Royal to Savoy Circus with a spur tunnel to Old Oak Common

Description of Option 3

- 2.169. The out-bound A40 tunnel would have the same west and east portal locations as Options 1 and 2A; however the Option 3 alignment would go substantially off-line of the existing A40 corridor, as opposed to Options 1 and 2. This is due to the alignment of the additional Old Oak tunnels.
- 2.170. Heading east from the west portal, the Old Oak tunnels would curve slightly south before following a tight sweeping curve (500m radius) to the north and towards the Old Oak area, passing around the high rise buildings at Gypsy Corner and using this extra length to dive to the depth necessary to pass beneath the proposed HS2 tunnels.
- 2.171. The crossing would be located to pass below the HS2 tunnels between the HS2 Crossover Box and HS2 Old Oak Common Station. The depth and diameter of HS2, combined with the deep LU Central Line cutting near North Acton Station, means the Old Oak Tunnels must pass below and not above HS2.

Overall performance of Option 3

- 2.172. It was determined at an early stage that Option 3 had the same disadvantage of Option 2A in having a westbound only A40 route and the safety implications this introduced for evacuation scenarios. The solutions proposed to deal with this introduced additional costs and engineering challenges with no obvious benefit for eastbound traffic.
- 2.173. Ultimately, Option 3 was deemed unsuitable due to its conflict with the sustainability principles of the OPDC. Tunnels into Old Oak Common opposed the values of the development area. There were also significant issues arising from conflicts with the HS2 alignment and large land-take requirements. TfL reviewed the brief and decided to drop this option.
- 2.174. Option 3 was not taken forward for shortlisting.

Tunnel Option 4: Two-Way Tunnel from Park Royal to Edgware Road

Figure 34: Option 4 Eastern Portal



Figure 35: Option 4 Western Portal

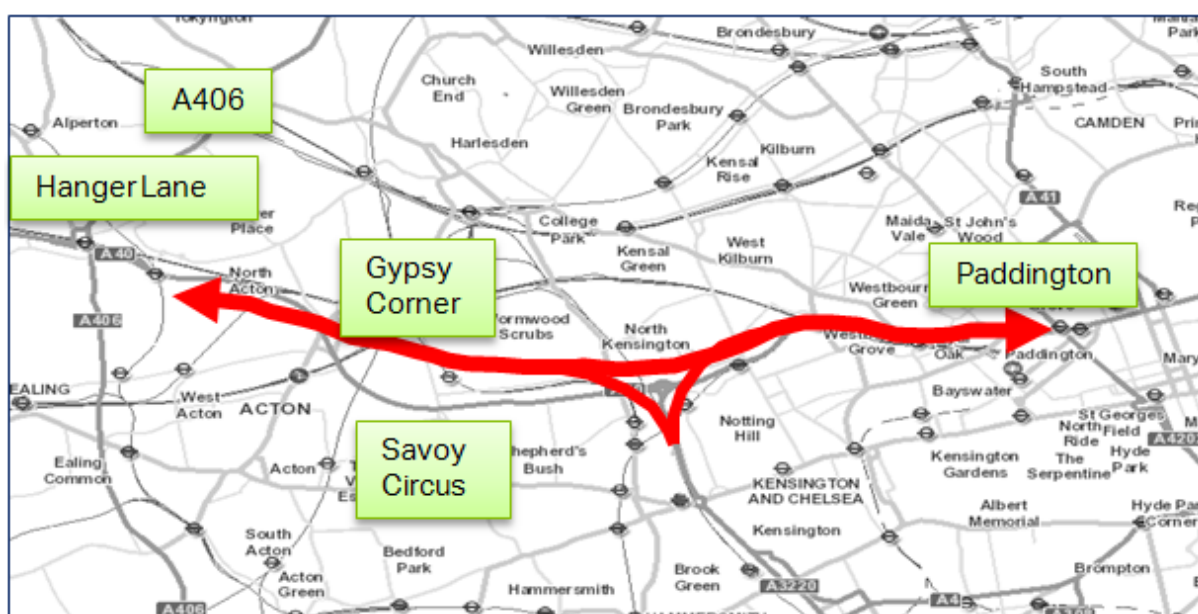


Description of Option 4

- 2.175. This option would introduce a bi-directional two-lane tunnel with a western portal in Park Royal South Leisure Complex and Western Avenue Business Park between Hanger Lane and Gypsy Corner. The eastern tunnel portal would be located at Edgware Road in the area of the Marylebone Flyover.

- 2.176. There would be a spur tunnel link to the West Cross Route with a portal located on West Cross Route south of the existing A40 roundabout. The spur tunnels would be one lane in each direction. The tunnel speed limit would be 40mph. The tunnel would allow a reduction in the westbound A40 through traffic on the surface-level route between the two portals and would also:
- Allow a step-change improvement in north-south connectivity over the A40 for other modes;
 - Free-up road space at-surface to improve the 'place' function of the surrounding environment including better pedestrian and cycle provisions.
- 2.177. The western portal would be located adjacent to the London Underground Central Line West Ruislip branch. Therefore it would be situated where there is already north-south severance. It is not possible for the west portal to be within the existing A40 corridor due to clashes with the safeguarded HS2 alignment.
- 2.178. The Option 4 tunnel includes a longer tunnel alignment than Options 1 and 2A and bypasses Gypsy Corner, Savoy Circus and the existing Westway Flyover, with an intermediate interchange and tunnels serving the A3220 West Cross Route.

Figure 36: Location of Option 4



- 2.179. The scheme would reduce the surface A40 to two lanes in each direction, with a speed limit reduction to 30mph. There would not be any surface changes at Hanger Lane.
- 2.180. The scheme would include the removal of the gyratory at Gypsy Corner and removal of the Old Oak Common Lane northbound approach at Savoy Circus.
- 2.181. The scheme would also include the removal of Wood Lane roundabout and West Cross Route roundabout. The A40 Westway and Marylebone Flyover would be demolished. The design incorporates the proposed A40 Cycle Superhighway.
- 2.182. TfL has a significant maintenance liability to the Westway as this piece of infrastructure requires significant remedial works. An opportunity exists to

replace the Westway viaduct in the form of a tunnel and unlock significant regeneration possibilities at the surface where it once stood.

Strategic Modelling Results

Table 9 Option 4 key modelling design inputs

Junction/Road	Scheme
Hanger Lane	No changes
Gypsy Corner	Removal of gyratory – Two way movements included and bus only link on Wales Farm Road. Lane reductions and all movements permitted at A40 junctions. Lengthened all red traffic signal timings to accommodate cycle crossings.
Savoy Circus	Removal of Old Oak Common Lane northbound approaching the A40. East Acton Lane bi-directional up to new junction with Old Oak Road. Lane reductions and all movements permitted at A40 junctions. Lengthened all red traffic signal timings to accommodate cycle crossings.
Wood Lane	Grade separated junction removed and replaced with signalised junction. Lengthened all red traffic signal timings to accommodate cycle crossings
West Cross Route	Grade separated roundabout removed and replaced with signalised junction at its junction with the A40. Lengthened all red traffic signal timings to accommodate cycle crossings. Spur tunnels provided which link from West Cross Route south of the A40 to the tunnel.
A40	2 lanes and 30mph in each direction. A40 elevated section removed between Wood Lane and Edgware Road. Replaced with at-grade local road network with signalised junctions
Tunnel	40mph 2 lane tunnel in each westbound and eastbound direction with free flowing portal entrances and exits. Spur tunnels to West Cross Route with one lane in each direction and free flowing portals and exits.

- 2.183. Strategic modelling indicates that the tunnel would be a popular route choice; it shows between 78% – 92% of A40 traffic would choose to use the tunnel in both directions across all peaks. Eastbound flows would be higher than westbound flows in all time periods. Journey times for traffic would improve through the tunnel in both directions. All figures highlight the tunnels are mainly used for journeys through West London which is to be expected. There is also a strong link to zones outside the M25.
- 2.184. From the 2031 journey time forecasts shown in Appendix B it can be seen that the main journey time benefits are experienced by traffic moving west out of the city using the tunnel. Westbound trips through the study area from Marylebone Road and West Cross Route to west of Hanger Lane show improvements (of 1 minute in the AM and 6 minutes in the PM). Eastbound movements through the tunnels to Marylebone Road are longer (by 7 minutes in the AM and 4 minutes in the PM), due to long delays for traffic trying to exit the tunnels. As eastbound traffic would be able to flow freely from the M25 to the Inner Ring Road along the A40 and new tunnel, delays are generated when it reaches the signalised corridor of Marylebone Road (refer to Figure 37). Journeys between West Cross Route and Marylebone Road experience the same delays.
- 2.185. The ambitious plans to improve the place function and the downgrading of the surface junctions on the A40 (refer to Table 9) will result in increases in vehicular congestion at these surface junctions (refer to Table 10). Traffic flows will increase at Hanger Lane due to the attractiveness of the tunnel, this creates delays to traffic. Long traffic delays are forecast at Gypsy Corner, Savoy Circus, Wood Lane and West Cross for East – West and North – South movements.

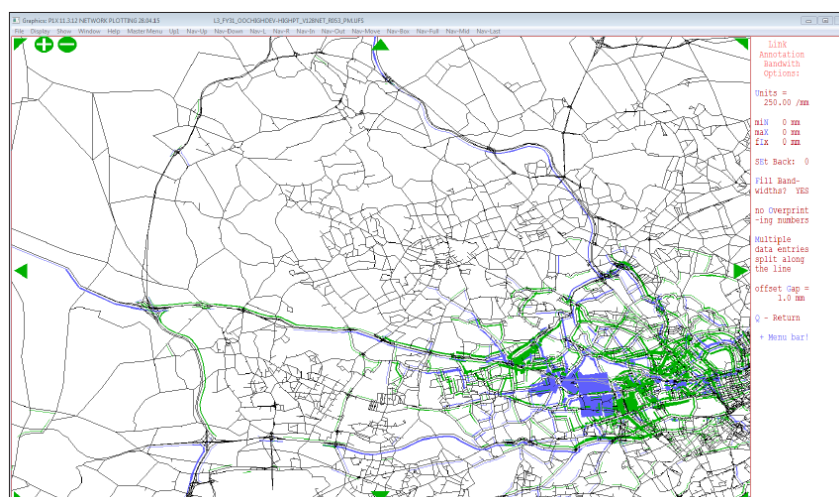


Figure 37 Tunnel Option 4 PM: Re-routing impacts compared to the base model

Table 10 Tunnel Option 4 Node Delays (in seconds) compared to the Base Model (2031)

Arm:	AM Base	Tunnel Option 4 AM	Difference (secs)	PM Base	Tunnel Option 4 PM	Difference (secs)
Hanger Lane Gyratory						
A4005	31	17	-14	36	14	-22
North Circular N	125	216	91	277	127	-150
N Circular S	82	191	109	170	270	100
A40 EB off slip	28	27	-1	32	11	-21
Gypsy Corner						
Horn Lane/A40/Victoria Road	58	505	447	28	452	424
A4000/A40/Leamington Park	31	42	11	53	33	-20
Horn Lane/Leamington Park	3	124	121	2	44	42
A4000/Victoria Road	16	48	32	28	206	178
Savoy Circus						
Old Oak Common Lane S/N/A40	83	735	652	249	830	581
Old Oak Common Lane N/Du Cane Rd	48	37	-11	140	182	42
Wood Lane /A40*	26	779	753	38	649	611
West Cross Route Roundabout*	11	323	312	9	245	236

Opportunities

- 2.186. Option 4 could open up opportunities to build 12,700 additional dwellings and 307,000m² of additional commercial floor space, taking into account the additional area impacted in relation to options 1,2 and 3. Journey time savings of 34% could be achieved for east to west traffic.
- 2.187. Major regeneration potential is also clearly a part of this option, with the area of the Westway opened up for re-development.

Challenges

- 2.188. While the regeneration benefits could be significant, it is also clear that the removal of Westway and Marylebone flyover would constitute a major undertaking; in addition there is the current internal uncertainty as to whether demolition or a refurbishment of the Westway (which is now urgent) is the best way to proceed.

- 2.189. The high cost of this option is general, with a £4.01 bn price tag and potential funding gap of more than £2.5bn would make it difficult to take this project forward on affordability grounds, notwithstanding the current uncertainty about the future of Westway.
- 2.190. As with each tunnel based option, the balance between tunnel and surface activity would need to form a key part of any further work if this option were to be taken forward.
- 2.191. Traffic delays at surface junctions and portals would continue to be an issue.

Synergies and dependencies

- 2.192. The large land-take required for the western tunnel portal, particularly given the relatively central location is a strong dependency in terms of development.
- 2.193. There would also be a need to coordinate with Crossrail to purchase the land required for the Westbound Diverge Box.

Possible costs and funding

- 2.194. The estimated total cost £4.01 billion would include construction, land-take, traffic management and 66% Optimism Bias.
- 2.195. Operating costs should be limited to provide for routine highway maintenance and repairs and structural inspections.
- 2.196. Reduced maintenance costs would be a benefit, in that Westway costs saved could be offset against the costs of the new tunnel infrastructure.
- 2.197. Potential funding could be sourced from Community Infrastructure Levy. Business rate and road charging high potential funding sources.
- 2.198. The funding gap – £2.540bn– would require resources stretching far beyond the TfL Business Plan, which is already challenged to save more than that figure over the five years to 2023.

Delivery programme

- 2.199. The implementation timescale, including design and construction would be likely to be a minimum of 10 years.

Delivery risks and issues

- 2.200. As noted above, the significant land-take required for the western portal, involves removal of existing industrial units. The eastern portal, while being developed within the footprint of the existing Westway would have implications for the development in this central London location.
- 2.201. Clearly there is a major challenge in the demolition and removal of the A40 Westway and Marylebone Flyover, and co-ordination with local and national traffic routes, along with severe traffic disruption during construction.
- 2.202. Severance would be caused by the open ramps at the portals.

Overall performance of Option 4

- 2.203. Option4 would provide improved strategic connections especially between the

A40 and the West Cross Route (A3220).

- 2.204. The plans to downgrade the existing A40 and improve the place functions in line with RTF philosophy are ambitious and result in significant increases in traffic delays.
- 2.205. Option 4 would support planned developments, and has a high level of potential to unlock significant further development opportunities.
- 2.206. Clearly, maintenance liabilities at the A40 Westway and Marylebone Flyover would be reduced or eliminated.
- 2.207. With a BCR of 12.48:1, there are limited benefits in relation to the significant cost, combined with the level of risk, make this option unfeasible.
- 2.208. Given the unlocking and regeneration potential, Option 4 went forward to shortlisting.

Tunnel Option 5: Two-Way Tunnel from Park Royal to Savoy Circus

Figure 38: Option 5 Eastern Portal



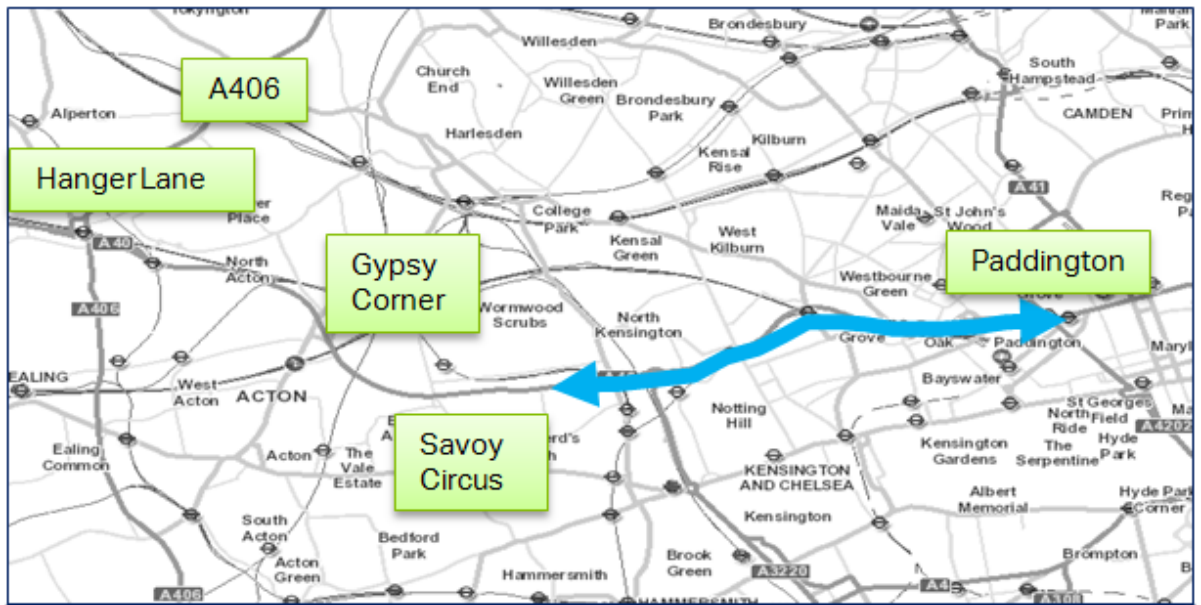
Figure 39: Option 5 Western Portal



Description of Option 5

- 2.209. This option was conceived by TfL as opposed to the consultants, but was assessed alongside the other options set out in this section.
- 2.210. This was of a more simple form than Option 4, with a bi-directional (ie westbound and eastbound) tunnel that would replace the full extent of the existing A40 Westway Flyover which is to be demolished, but without the connections to/from the A3220 West Cross Route.
- 2.211. Option 5 would have the same East Portal as Option 4, but accesses a new West Portal between Savoy Circus and Wood Lane. Option 5 would also be more straightforward to implement than Option 4.
- 2.212. Hence this option would introduce a bi-directional 2-lane tunnel that would replace the full extent of the existing A40 Westway and Marylebone Flyover, with portal locations at Edgware Road and between Savoy Circus and Wood Lane.
- 2.213. As with Option 1, this option scored highly in the VAF in the Moving, Unlocking, Protecting and Living sections as it will improve cycle and pedestrian provisions, enable improvements to the public realm and environment, help support planned developments, and reduce severance.

Figure 40: Location of Option 5



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- 2.214. This option would introduce a bi-directional two-lane tunnel with a staggered western portal between Savoy Circus and Wood Lane. The eastern tunnel portal would be located on-line immediately east of the A40/Edgware Road in the area of the Marylebone Flyover. The tunnel speed limit would be 40mph. The tunnel would allow a reduction in the A40 through traffic on the surface-level route between the two portals and will also:
- i. Allow a step-change improvement in north-south connectivity over the A40 for all modes;
 - ii. Free-up road space at-surface to improve the 'place' function of the highway environment including better pedestrian and cycle provision.
- 2.215. This option would reduce the surface A40 to two lanes in each direction, with a speed limit reduction to 30mph.
- 2.216. There would be no surface changes at Hanger Lane, Gypsy Corner or Savoy Circus apart from adjusted traffic signal timings to accommodate cycle crossings.
- 2.217. The scheme would include the removal of the Wood Lane roundabout and West Cross Route roundabout. The A40 Westway and Marylebone Flyover would be demolished. The design incorporates the proposed A40 Cycle Superhighway.
- 2.218. TfL has a significant maintenance liability to the Westway as this piece of infrastructure requires significant remedial works. An opportunity exists to replace the Westway viaduct in the form of a tunnel and unlock significant regeneration possibilities at the surface where it once stood.

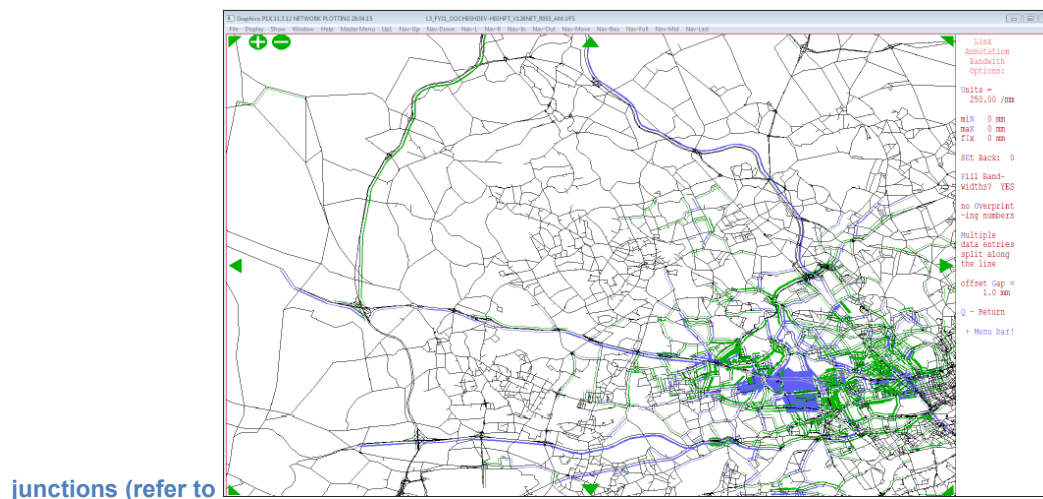
Strategic Modelling Results

Table 11 Option 5 key modelling design inputs

Junction/Road	Scheme
Hanger Lane	No changes
Gypsy Corner	Lengthened all red traffic signal timings to accommodate cycle crossings – no other changes.
Savoy Circus	Lengthened all red traffic signal timings to accommodate cycle crossings – no other changes.
Wood Lane	Grade separated junction removed and replaced with signalised junction. Lengthened all red traffic signal timings to accommodate cycle crossings.
West Cross Route	Grade separated roundabout removed and replaced with signalised junction at its junction with the A40. Lengthened all red traffic signal timings to accommodate cycle crossings.
A40	2 lanes and 30mph in each direction. A40 elevated section removed between Wood Lane and Edgware Road. Replaced with at-grade local road network with signalised junctions.
Tunnel	40mph 2 lane tunnel in westbound and eastbound directions with free flowing portal entrances and exits.

- 2.219. The tunnel would be a popular route choice; the strategic modelling shows between 79% - 82% of A40 traffic would choose to use the tunnel in both directions across all peaks. There would be minimal differences between the AM and PM peak usage. The tunnel flows would be relatively low. There would be only minimal changes in journey times as the tunnel would replace the free flowing elevated flyover. The tunnels are mainly used for journeys through West London which is to be expected. There is also a strong link to zones outside the M25.
- 2.220. Compared to the 2031 base, from the journey time forecasts it can be seen that trips through the study area from west of Hanger Lane to Savoy Circus on the A40 are much longer (e.g. in the westbound direction by 8 minutes in the AM and almost 13 minutes in the PM; and in the eastbound direction by 17 minutes in the AM and 16 minutes in the PM) (refer to Figure 41). This is due to the additional delays at Savoy Circus and Gypsy Corner generated by the inclusion of the Cycle Super Highway. It is also noticeable that journey times across Hanger Lane and Gypsy Corner show minimal changes and reductions in some cases. This would suggest that vehicles are re-routing away from the A40 corridor and these junctions due to the delays.

The ambitious plans to improve the place function and downgrade the surface junctions on the A40 (refer junctions on the A40 (refer to Table 10) will result in increased vehicular congestion at these surface



junctions (refer to

Figure 41 Tunnel Option 5 PM: Re-routing impacts compared to the base

- 2.221. Table 12). Hanger Lane Gyratory will operate well. Long traffic delays will occur at Gypsy Corner and Savoy Circus due to the increased cycle red crossing signal times for East-West and North-South movements. Long delays will also occur at Wood Lane and West Cross roundabouts for East-West and North-South movements. Delays are forecast at the eastern portal near Edgware Road where the eastbound A40 traffic merges with the traffic coming out from the tunnel.

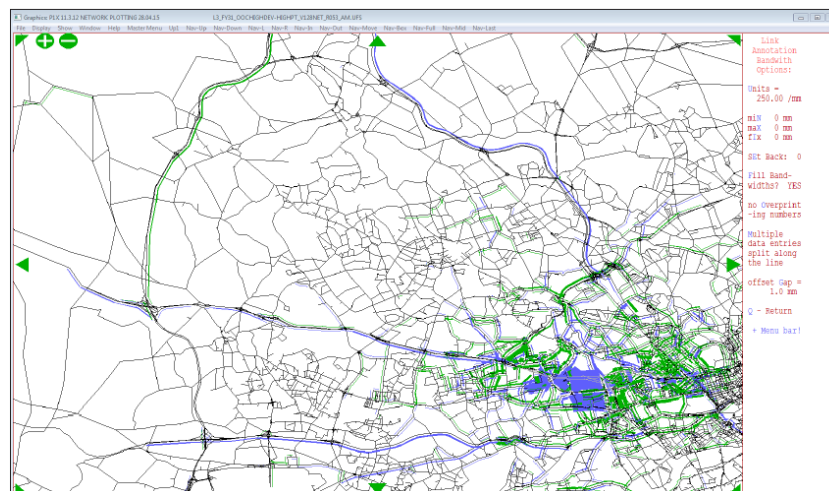


Figure 41 Tunnel Option 5 PM: Re-routing impacts compared to the base

Table 12 Tunnel Option 5 Node Delays (in seconds) compared to the Base Model (2031)

Arm:	AM Base	Tunnel Option 5 AM	Difference (secs)	PM Base	Tunnel Option 5 PM	Difference (secs)
Hanger Lane Gyratory						
A4005	31	13	-18	36	12	-24
North Circular N	125	16	-109	277	48	-229
N Circular S	82	133	51	170	197	27
A40 EB off slip	28	25	-3	32	23	-9
Gypsy Corner						
Horn Lane/A40/Victoria Road	58	30	-28	28	30	2
A4000/A40/Leamington Park	31	26	-5	53	26	-27
Horn Lane/Leamington Park	3	2	-1	2	2	0
A4000/Victoria Road	16	28	12	28	28	0
Savoy Circus						
Old Oak Common Lane S/N/A40	83	769	686	249	769	520
Old Oak Common Lane N/Du Cane Rd	48	147	99	140	147	7
Wood Lane /A40*	26	579	553	38	579	541
West Cross Route Roundabout*	11	245	234	9	245	236

Opportunities

- 2.222. Option 5 would enable 12,300 additional dwellings and 222,000m² of additional commercial Floor space
- 2.223. As with Option 4, there would be major regeneration potential in the vicinity of the Westway.

Challenges

- 2.224. The removal of the A40 Westway and Marylebone Flyover would throw up similar challenges to Option 4.
- 2.225. Traffic delays at surface junctions and portals would continue under this option.
- 2.226. This is a high cost option with a cost of £1.64bn. While much lower than that of Option 4, the funding gap is still of a figure of £834m, with a worse benefit to cost ratio of -3.95 : 1.

Synergies and dependencies

- 2.227. Current development plans and aspirations for the area would benefit from, if not require, a step-change in local highway capacity and north-south connectivity.

Possible costs and funding

- 2.228. The estimated total cost of this option is £1.64 billion which includes construction, land-take, traffic management and 66% Optimism Bias.
- 2.229. Operating costs should be limited to provide only routine highway maintenance and repairs and structural inspections.
- 2.230. There would, arguably, be reduced maintenance costs to TfL under this option, given the removal of the Westway and Marylebone Flyover.
- 2.231. Potential funding could be sought from Community Infrastructure Levy. Business rate and road charging high potential funding sources. However, the £934m funding gap referred to above would remain a key challenge for the project to address.

Delivery programme

- 2.232. The estimated timescale for design and construction of the project envisaged under option would be a minimum of 5 years

Delivery risks and issues

- 2.233. Eastern portal would cause severance to a local school and church. There would also be major challenges in the demolition and removal of the A40 Westway and Marylebone Flyover, along with severe traffic disruption during construction.
- 2.234. Severance would be caused by the open ramps at the portals.
- 2.235. Buried Crossrail infrastructure is a large constraint for this option, and the tunnel alignment is substantially located under residential areas.

Overall performance of Option 5

- 2.236. Option 5 would provide improved strategic highway connections although the tunnel is not heavily used.
- 2.237. The RTF-based plans to downgrade the existing A40 and improve the place functions are ambitious and result in significant increases in traffic delays.
- 2.238. Option 5 would support planned development, and has a high level of potential to unlock significant further development opportunities.
- 2.239. Maintenance liabilities at the A40 Westway and Marylebone Flyover to TfL would be reduced or eliminated if this option were pursued.
- 2.240. Option 5 would require further testing to establish the optimum level of surface intervention that would maximise the potential benefits as an infrastructure replacement scheme. It was decided to include Option 5 on the shortlist.

At-grade Option 6: At-Grade options at Hanger Lane, Gypsy Corner and Savoy Circus

Description of Option 6

- 2.241. The A40 junctions at Hanger Lane, Gypsy Corner and Savoy Circus were identified as potential locations for such improvements.
- 2.242. This option with at-grade junction improvements scored highly in the VAF in the Moving and Protecting sections as it will improve cycle provisions and reduce severance.

Hanger Lane: Gyratory removal

- 2.243. A large new structure with a revised alignment will be introduced to accommodate two-way traffic by replacing the western bridge and removing traffic from the south east corner. There will be improved at-grade access to the Station. Land to the west of the new structure (former gyratory footprint) will be made available to be redeveloped or become public space. A new eastern bridge structure will be constructed, with a reduced width in comparison to the current structure. The removal here of traffic from the A406 (N) to A40 (W) will allow for this reduction in width which in turn will enable the provision of enhanced controlled crossing facilities.

Figure 42: Hanger Lane Gyratory removal



Gypsy Corner: Close Wales Farm Road to general traffic

- 2.244. Wales Farm Road will be closed to general traffic. A new bus lane and cycling facilities will be implemented along Horn Lane. The design incorporates widened footpaths and improved pedestrian crossings. There is potential for land to be made available for development sites.

Figure 43: Gypsy Corner: Close Wales Farm Road to general traffic



Savoy Circus: A40 Lane Reduction and Pedestrian-Cyclist-Bus-Priority Scheme

- 2.245. The A40 will be reduced to three lanes in each direction to provide shorter crossing distances for pedestrians. Pedestrian crossings and bus priority measures will be enhanced. There is potential for development land to be made available - particularly on the SW corner of the junction (Homebase) which is further enhanced through the closure of Old Oak Common Lane (S). There is potential for the redevelopment of adjacent residential properties. Wider footways will be achieved on the A40 frontages which will offer opportunities for an enhanced public realm in the vicinity of the shopping parades.

Figure 44: A40 Lane Reduction and Pedestrian-Cyclist-Bus-Priority Scheme



Package performance

- 2.246. Trips on the A40 through the study area in both directions will experience very large increases in journey times. This will be caused primarily by increased delays through the major junctions. Journey times from west of Hanger Lane to Savoy Circus will take much longer (e.g. in the westbound direction by around 50 minutes in the AM and PM; and in the eastbound direction by 29 minutes in the AM and 24 in the PM).
- 2.247. Journey times at Hanger Lane Gyratory will generally remain similar to the 2031 base, although there will be increases/decreases of up to 6 minutes for some movements between the A406 arms. There will be large increases in AM and PM journey times for both northbound and southbound trips through Gypsy Corner (e.g. around 3 – 25 minutes in the AM; and 10 – 25 in the PM) and Savoy Circus (e.g. around 17 minutes in the AM; and 12 – 22 in the PM) as a result of changes to the signal timings to accommodate pedestrian and cycle movements.

Opportunities

- 2.248. The main opportunities that this option would introduce would be an enhanced public realm and improved facilities for pedestrians and cyclists at the at-grade junctions, along with some opportunities for development and improved links to Old Oak Common.

Challenges

- 2.249. As implied in the assessment of performance above, some challenges may

remain at the at-grade junctions under Option 6, including:

- i. The need to better enabling vehicle northbound and southbound movements respectively.
- ii. The need to reduce journey time delays at junctions
- iii. The need to improve traffic conditions that make bus lanes ineffectual on the approaches to the A40.

Synergies and dependencies

- 2.250. Current development plans and aspirations for the area will benefit from, if not require, a step-change in local highway capacity and north-south connectivity; the A40 may therefore be viewed as a constraint in achieving the development potential of the area.

Possible costs and funding

- 2.251. The estimated total cost for Option 6 is £47 million which includes construction, land-take, traffic management and 44-66% Optimism Bias.
- 2.252. The breakdown of costs across the three at-grade junctions is as follows:
 - i. Hanger Lane = £36m
 - ii. Gypsy Corner = £8m
 - iii. Savoy Circus = £3m
- 2.253. Potential funding could be sought from Community Infrastructure Levy and business rates.

Delivery programme

- 2.254. It is estimated that design and construction of Option 6 would take 5 to 10 years to implement at a minimum.

Delivery risks and issues

- 2.255. In delivering this Option, there are a number of risks and issues that need to be managed and mitigated to the greatest extent possible. These will include:
 - i. Possessions of railway lines and London Underground lines, which would be required at Hanger Lane.
 - ii. Land take at Gypsy Corner which would be required in order to install the new pedestrian/cycle highway.
 - iii. Delivery would need to be staggered and co-ordinated with HS2; the delivery programme for which is not yet finalised.

Overall performance of Option 6

- 2.256. In overall terms, the consultants have concluded this option removes too much highway capacity from the junctions. As a result, journey times and delays are expected to increase significantly across the majority of movements at junctions if Option 6 is implemented. Motorists would divert from the A40 corridor,

creating issues elsewhere on the strategic road network.

- 2.257. It has therefore been concluded that this option does not perform well as a package. However, specific interventions at individual junctions could provide positive aspects which should be considered further as part of a wider A40 Corridor Investment Programme.



Grade Separation Option 7: Grade separated options at Hanger Lane, Gypsy Corner and Savoy Circus

Description of Option 7

- 2.258. This option with grade separated junction improvements scored highly in the VAF as reductions in the journey times enabled high scores in the Moving section. This option will dramatically change the urban realm and improve cycle and pedestrian facilities. This resulted in high scores in the Living and Protection sections.

Hanger Lane: Full gyratory removal and tunnel

- 2.259. A bi-directional 2 lane tunnel will be constructed between A40 (W) off-slip and A406 (N) allowing the removal of the gyratory. The eastern bridge will be replaced with a new wider structure that carries all remaining surface movements between A406 (N) and A406 (S), providing a more direct route. The west bridge will be removed and the footprint becomes available for the public realm or redevelopment. Pedestrian crossings will be improved and the introduction of a segregated cycle way improves safety and connectivity for cyclists.

Figure 45: Option 7 Full gyratory removal and tunnel at Hanger Lane



Gypsy Corner: Fly-Under

- 2.260. A bi-directional 2 lane fly-under for A40 through traffic will be introduced to allow for a more compact surface junction. This down grading of the junction will provide for right turn movements while the land that becomes available as a result of the junction layout changes provides potential for mixed use residential developments. Wider footways, improved pedestrian crossings and segregated cycle-ways are also included in the new layout.

Figure 46: Option 7 Fly-under at Gypsy Corner



Savoy Circus: Fly-Under

- 2.261. The Savoy Circus grade separated scheme also includes a bi-directional 2 lane fly-under for A40 through traffic to allow a more compact junction at surface level. The compact junction is reduced to four arms through closure of Old Oak Common Lane (S) and potential realignment of Old Oak Lane. Bus stop relocation and priority bus lanes are employed to benefit users and interchange connections. Slips roads from A40 allow access to the local road network, however, greater priority is given to north-south movements. Old Oak Common Lane and Old Oak Road are combined into a single road. Wider footways, segregated cycle ways and potential for major redevelopment/regeneration (i.e. the current Homebase and residential site) are also included in the new junction layout.

Figure 47: Option 7 Fly-under at Savoy Circus



Package performance

- 2.262. Trips on the A40 through the study area in both directions will experience small changes in journey times. These will be caused primarily by changes to the delays through the major junctions. Journey times from west of Hanger Lane to Savoy Circus will experience small changes (e.g. in the westbound direction they are take marginally longer in the AM peak hour and shorter in the PM peak hour; and in the eastbound direction they will be shorter by 2 minutes in the AM and remain about the same in the PM).
- 2.263. Journey times at Hanger Lane Gyratory will generally be reduced. There will be increases in AM journey times for both northbound and southbound trips through Gypsy Corner (i.e. about 3 minutes) as a result of changes to the signal timings to accommodate pedestrian and cycle movements. Similarly, northbound and southbound journeys through Savoy Circus will experience larger increases in journey times (i.e. around 7 – 8 minutes in the AM; and 7 – 9 minutes in the PM).

Opportunities

- 2.264. The main opportunities that this option would introduce would be to improve facilities for pedestrians and cyclists, and enhancement of the public realm. Opportunities for development would be created, along with improved links to Old Oak Common.

Challenges

- 2.265. Several challenges would need to be overcome if Option 7 were taken forward for implementation. These would include:
- i. Enabling vehicle movements north and south across the junctions;
 - ii. The long and disruptive construction required;
 - iii. The costs of the scheme, which would fall into the medium/high cost category.

Synergies and dependencies

- 2.266. Current development plans and aspirations for the area will benefit from, if not require, a step-change in local highway capacity and north-south connectivity, and this forms a significant dependency from the development perspective, with the A40 being a constraint on the full potential of the area being achieved.

Possible costs and funding

- 2.267. The estimated total cost of implementing option 7 is £420 million, which includes construction, land-take, traffic management and 66% Optimism Bias.
- 2.268. The costs break down as follows:
- i. Hanger Lane = £310 m
 - ii. Gypsy Corner = £71 m
 - iii. Savoy Circus = £39 m
- 2.269. It should be noted that operating costs should be limited to routine highway maintenance and repairs and structural inspections.

- 2.270. Potential funding could come from Community Infrastructure Levy and business rates.

Delivery programme

- 2.271. The complexity of this option means that the design and construction timescale could be in the region of 10 to 20 years as a minimum for implementation.

Delivery risks and issues

- 2.272. Option 7, as a complex project requiring changes to grade, would generate substantial risks and issues to be overcome:
- i. Fly-unders would require cut and cover approach which will require large construction sites through each junction.
 - ii. A significant programme of diversion and protection of existing statutory undertakers' equipment would be required.
 - iii. Possessions of railway lines and London Underground lines would be required.
 - iv. Delivery would need to be staggered and co-ordinated with OPDC & HS2.

Overall performance of Option 7

- 2.273. The consultants concluded that option 7 would perform well in reducing delays for many users of the A40. The increased delays for traffic accessing the fly-unders and surface junctions outweigh the advantages other users may experience. Therefore it should be taken forward as an alternative to the other shortlisted options at this stage, but with no detailed work.

Hybrid Option 8: A combination of options at Hanger Lane, Gypsy Corner and Savoy Circus

Description of Option

- 2.274. This option includes a combination of grade separated and at-grade junction improvement schemes. This option scored highly in the VAF in the Moving and protecting sections as it will improve cycle provisions and reduce severance.

Hanger Lane: Full Gyratory removal

- 2.275. A bi-directional 2 lane tunnel will be constructed between A40 (W) off-slip and A406 (N) allowing the removal of the gyratory. The eastern bridge will be replaced with a new wider structure that carries all remaining surface movements between A406 (N) and A406 (S), providing a more direct route. The west bridge will be removed and the footprint becomes available for the public realm or redevelopment. Pedestrian crossings will be improved and the introduction of a segregated cycle way will improve safety and connectivity for cyclists.

Figure 48: Option 8 Full Gyratory removal at Hanger Lane



Gypsy Corner: Close Wales Farm Road to general traffic

- 2.276. Wales Farm Road will be closed to general traffic. A new bus lane and cycle facilities will be implemented along Horn Lane. Widened footpaths and improved pedestrian crossings will be provided for pedestrians. Land will become available for possible development sites and opportunities.

Figure 49: Option 8 Close Wales Farm Road to general traffic



Savoy Circus: Existing junction

- 2.277. There will be no significant changes to the existing junction other than providing links to the A40 Cycle Superhighway. Red traffic signal control timings will be lengthened to accommodate pedestrian and cycle facilities and crossings.

Package performance

- 2.278. Trips on the A40 through the study area in both directions will experience large increases in journey times. This will be caused primarily by increased delays through the major junctions. Journey times from west of Hanger Lane to Savoy Circus will take longer (e.g. around 10 - 11 minutes in the AM; and 12 - 13 in the PM).
- 2.279. Journey times at Hanger Lane Gyratory will be improved, with the exception of northbound journeys from the A40 eastbound to the A406 North where there will be small increases in journey times. There will be large increases in AM and PM journey times for both northbound and southbound trips through Gypsy Corner (e.g. around 6 - 19 minutes in the AM; and 11 - 16 in the PM) as a result of changes to the signal timings to accommodate pedestrian and cycle movements. Delays will increase northbound across Savoy Circus (e.g. 5 minutes in the AM; and 6 in the PM), but there will be small improvements southbound (e.g. up to 4 minutes).

Opportunities

- 2.280. The key opportunities arising from implementing Option 8 can be summarised as
- i. Improved facilities for pedestrians and cyclists;
 - ii. An enhanced public realm;
 - iii. Stimulation of development;
 - iv. Improved links to Old Oak Common

Challenges

- 2.281. Challenges that would need addressing were Option 8 to be implemented would include:
- i. Enabling vehicle movements from north and south
 - ii. Re-routing from the A40 in the AM peak
 - iii. Fewer development opportunities in relation to other options

Synergies and dependencies

- 2.282. Current development plans and aspirations for the area will benefit from, if not require, a step-change in local highway capacity and north-south connectivity. The A40 may be viewed as constraining the potential of the area, preventing it from achieving its maximum potential.

Possible costs and funding

- 2.283. The estimated total cost of implementing option 8 is £318 million which includes construction, land-take, traffic management and 44-66% Optimism Bias.
- 2.284. The breakdown of capital costs for the project would be as follows:
- i. Hanger Lane = £310m
 - ii. Gypsy Corner = £8m
 - iii. Savoy Circus = Nil
- 2.285. Operating costs should be limited to provide for only routine highway maintenance and repairs and structural inspections.
- 2.286. Potential funding could come from Community Infrastructure Levy and business rates.

Delivery programme

- 2.287. The delivery timescales for option 8, including design and construction could be between 5 and 20 years for full implementation.

Delivery risks and issues

- 2.288. The key risks to delivery, and issues to be addressed. For Option 8 would be as follows:
- i. Possessions of railway lines and London Underground lines would be required at Hanger Lane.
 - ii. Land-take would be required at Gypsy Corner in order to install the new pedestrian/cycle superhighway facilities.
 - iii. Delivery would need to be staggered and co-ordinated with HS2.

Overall performance of Option 8

- 2.289. The consultants concluded that a combination of the grade-separated and at-grade schemes could provide benefits to the A40 corridor if Option 8 were to be implemented. Motorists would divert away from the A40, with many choosing instead to use the M4.

- 2.290. The combining of elements of other options indicates the potential for a major grade separated solution at Hanger Lane that enables at-grade solutions to be developed at Gypsy Corner and Savoy Circus.

Conclusion: Shortlisting of the options for further assessment

- 2.291. Following discussions with stakeholders, a number of changes were made to the initial tunnelling options to be assessed in this study as described below.
- 2.292. The initial options that were considered included:
- i. Option 1: Review, assessment and optimisation of the bi-directional (i.e. westbound and eastbound) tunnel option explored in the initial feasibility work presented in CH2MHILL's Technical Note (TN) dated 18th August 2015;
 - ii. Option 2: An out-bound (i.e. westbound) only version of Option 1;
 - iii. Option 3: An out-bound (i.e. westbound) only tunnel as per Option 2, with additional bi-directional tunnels serving the Old Oak Common Development Area; and
 - iv. Option 4: A longer bi-directional (i.e. westbound and eastbound) tunnel option which would replace the full extent of the existing A40 Westway Flyover, assessing potential portal locations at Edgware Road and Hanger Lane and with consideration of an intermediate interchange with the A3220 West Cross Route.
- 2.293. Subsequently, after further assessment and review of the evacuation strategy for the outbound only tunnel, Option 2 evolved to become Option 2A and Option 2B with the key difference being:
- i. Option 2A provided a separate parallel emergency tunnel; and
 - ii. Option 2B accommodated an evacuation corridor within the main bore, separated from the main carriageway by an internal wall. This resulted in a 15.62m internal bore diameter for the tunnel, much larger than that of 10.86m for Option 2A.
- 2.294. A clear disadvantage of Option 2B was its westbound only A40 route and the safety implications this introduced for evacuation scenarios. The solutions proposed to deal with this introduced additional costs and engineering challenges with no obvious benefit for eastbound traffic. Option 2B was disregarded due to its very large size as upon further investigation, the tunnel and evacuation corridor combined would have required the third largest Tunnel Boring Machine (TBM) diameter in the world. It was felt that this would create issues in manufacture, resourcing and competition, as it would be at the upper limit of the current maximum diameter of TBMs in operation.
- 2.295. Option 3 had the same disadvantage of having a westbound only A40 route and the safety implications this introduced for evacuation scenarios. The solutions proposed to deal with this introduced additional costs and engineering challenges with no obvious benefit for eastbound traffic. Option 3 was deemed unsuitable due to its conflict with the sustainability principles of the OPDC. Tunnels into

Old Oak Common opposed the values of the development area. There were also significant issues arising from conflicts with the HS2 alignment and large land-take requirements. TfL reviewed the brief and decided to drop this option.

- 2.296. A fifth tunnelling option (i.e. Option 5) was conceived by TfL and assessed by this study. This was a more simple form of Option 4, with a bi-directional (i.e. westbound and eastbound) tunnel that would replace the full extent of the existing A40 Westway Flyover which is to be demolished, but without the connections to/from the A3220 West Cross Route. Option 5 has the same East Portal as Option 4, but accesses a new West Portal between Savoy Circus and Wood Lane. Option 5 would also be more straightforward to implement than Option 4.
- 2.297. The process of the shortlisting of the options is illustrated in Figure 5 I. Four tunnels were therefore taken forward to shortlisting (covered in Section G), these were Options 1, 2A, 4 and 5. As an alternative to tunnelling options, Option 7 was also taken forward.



PART G: HOW THE PREFERRED OPTIONS ADDRESS THE ISSUES AND CHALLENGES

Section Summary:

This section sets out how the shortlisted options address the objectives for an intervention on the A40 Western Avenue.

The Value Assessment Tool (VAF) tool developed by the consultants is used to help shortlist and rank each tunnel, and in assessing whether each option addressed the challenges as presented in the RTF.

Overall, despite costs, Options 1 and 5 were deemed to perform best against the project objectives.

It is also recommended that Option 7 (grade separated) is kept in play but no detailed work to be undertaken.

Detailed consideration of shortlisted Options 1, 2A, 4 and 5

- 2.298. Options 1, 2A, 4 and 5 were taken forward for final shortlisting within this Strategic Case before taking forward to the Economic Case. The key features of these options are summarised below in Figure 50.

Figure 50: Summary of the Tunnel Option Features

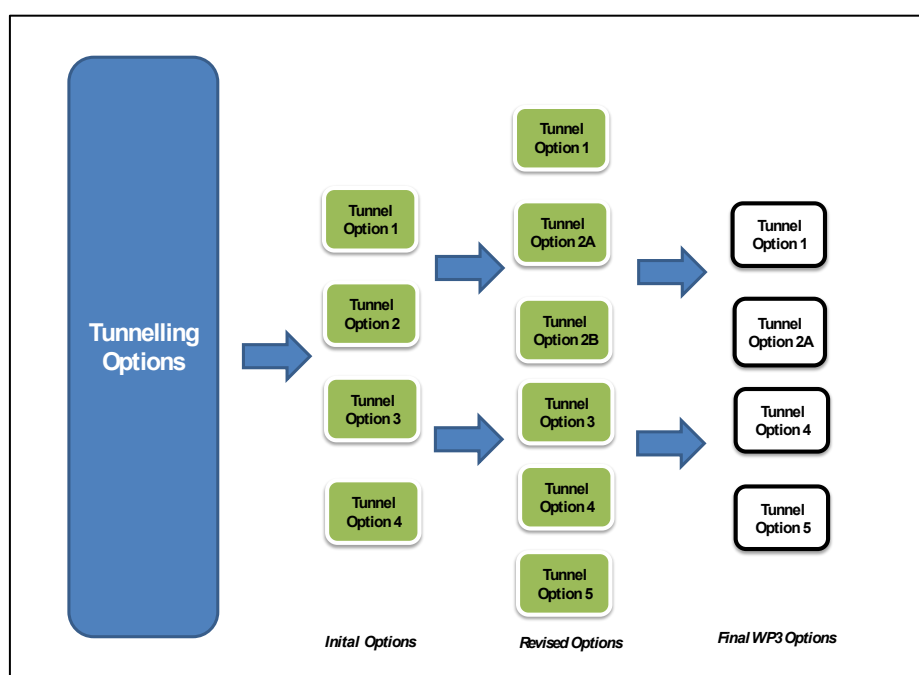
	Option 1	Option 2A	Option 4	Option 5
Design speed	70km/h (suitable for 40mph speed limit)	70km/h (suitable for 40mph speed limit)	70km/h (suitable for 40mph speed limit).	70km/h (suitable for 40mph speed limit).
A40 Tunnelled alignment	3.0km (westbound traffic) / 2.4km (eastbound traffic)	3.0km (westbound traffic)	7.1km (westbound traffic) / 7.1km (eastbound traffic)	4.1km (westbound traffic) / 4.8 km (eastbound traffic)
Permanent land-take	2,803m ²	3,160m ²	23,916m ²	557m ²
Temporary land-take:	111,534m ²	111,534m ²	141,572m ²	26,261m ²
Estimated Construction Cost	£503M	£449M	£1.89bn	£790M
Estimated Project Cost (at 2016 prices)	£1.08bn	£979M	£4.01bn	£1.64bn
Estimated Construction Programme	6.5 years	5.5 years	10.0 years	5.0 years

- 2.299. Option 3 had been ruled out early in the process as entirely incompatible with the sustainability principles of the Old oak Common OAPF. While Option 6,

surface interventions at Hanger Lane, Gypsy Corner and Savoy Circus has been retained as an interim/alternative option, options 7 and 8 were ruled out as not addressing the key traffic problems and not enabling sufficient development to make the case for a scheme compelling enough.

- 2.300. Specifically, this has included an assessment of the options providing qualitative and quantitative analyses on the benefits, costs, risks, constraints and deliverability issues and timescales. The shortlisting of options can be seen in Figure 5 I.
- 2.301. The four short-listed tunnel options have been analysed in more detail, refined and modelled.

Figure 5 I: Shortlisted Options 1, 2A, 4 and 5



Detailed consideration of constraints, risks and constructability for Options 1, 2A, 4 and 5

Option 1

Constraints

- 2.302. A number of constraints on the engineering design of Option 1 have been identified and taken into account in the design of the proposals, including:
- i. The HS2 alignment and protected zone that passes below existing A40 corridor between Mansfield Road and the LU Central Line overbridge.
 - ii. Local ground topography.
 - iii. LU Central Line Ealing Broadway Branch.
 - iv. LU Piccadilly Line Park Royal Station.

- v. Residential properties close to the east portal.
- vi. Ramps for the elevated Westway section of the existing A40.

Risks

- 2.303. A number of risks that could affect the engineering design of Option I have been identified and taken into account in the design of the proposals. These include:
- i. Permanent and temporary land-take required for West Portal within Park Royal South Leisure Complex, Western Avenue Business Park, Kendal Avenue, Concord Road, Alliance Road and Mansfield Road.
 - ii. Crossing with low cover (0.5 x diameter) below LU Central Line Ealing Broadway Branch.
 - iii. Tunnel below residential properties east of the LU Central Line Ealing Broadway Branch, Savoy Circus and the eastern portal.
 - iv. Crossings of Great Western Railway and London Overground.
 - v. Eastern portal on the line of existing A40 with potential traffic disruption during construction.
 - vi. Severance caused by the open ramps at the portal locations.
 - vii. Impact on traffic during construction of the portals, particularly at the East Portal.
 - viii. Buried services and utilities near portals will need to be diverted in enabling works.

Constructability

- 2.304. The West Portal will require land-take, demolition of several industrial units and re-profiling of land in the Park Royal South Leisure Complex and Western Avenue Business Park.
- 2.305. The East Portal will require a linear construction site in the centre of the existing A40 corridor, along what is currently the central reservation. The staggered portal approach makes it possible to construct the portal boxes within the corridor width without land-take, although it is likely that some temporary use of extra highway land will be required.
- 2.306. The TBM drive is expected to be driven from west to east, utilising the extra space at the western portal, preferable spoil removal location and the potential storage facilities in Park Royal Industrial Estate. The TBM retrieval at the eastern portal would be logistically challenging and require a mobile crane and wide-load lorries. Option I only has one tunnel profile, therefore only one TBM is necessary, although it may be desirable to use two TBMs to speed up the programme

Option 2A

Constraints

- 2.307. A number of constraints on the engineering design of Option 2A have been

identified and taken into account in the design of the proposals, including:

- i. HS2 alignment and protected zone passes below existing A40 corridor between Mansfield Road and the LU Central Line overbridge.
- ii. Local ground topography.
- iii. LU Central Line Ealing Broadway Branch.
- iv. LU Piccadilly Line Park Royal Station.
- v. Two tight reverse curves on the existing A40 east of Savoy Circus.
- vi. St Katherine's Church and Ark Conway Primary Academy near the eastern portal.
- vii. Ramps for the elevated Westway section of the existing A40.

Risks

- 2.308. A number of risks that could affect the engineering design of Option 2A have been identified and taken into account in the design of the proposals. These include:
- i. Permanent and temporary land-take required for West Portal within Park Royal South Leisure Complex, Western Avenue Business Park, Kendal Avenue, Concord Road, Alliance Road and Mansfield Road.
 - ii. Crossing with low cover (0.5 x diameter) below LU Central Line Ealing Broadway Branch.
 - iii. Tunnel below residential properties east of the LU Central Line Ealing Broadway Branch, Savoy Circus and eastern portal.
 - iv. Rail crossings of Great Western Railway and London Overground.
 - v. Requirement for a dedicated emergency vehicle lane must be coordinated with highway requirements.
 - vi. St Katherine's Church and Ark Conway Primary Academy near the eastern portals.
 - vii. Impact on traffic and likely severance during construction of the portals, particularly at the east portal.
 - viii. Buried services and utilities near portals.

Constructability

- 2.309. The west portal will require land-take, demolition of several industrial units and re-profiling of the land in Park Royal South Leisure Complex and Western Avenue Business Park.
- 2.310. The east portal will require a linear construction site in the centre of the existing A40 corridor, along what is currently the central reservation. There is little room for a main compound; hence it should be located at the west portal.
- 2.311. Similar to Option 1, the TBM launch is expected to be driven from west to east; however, Option 2A will have two different diameter tunnels and would therefore require two TBMs. The TBM launch below the LU Central Line Ealing Broadway Branch will be close to the surface railway (half a diameter) and may require advance ground treatment, speed restrictions or in the worst case a temporary closure of the line for several days while the TBM crosses. Only two stations

(West Acton and Ealing Broadway) are served beyond the crossing; the latter also served by the LU District Line, therefore a temporary closure with replacement bus service is not considered unfeasible.

Option 4

Constraints

- 2.312. A number of constraints on the engineering design of Option 4 have been identified and taken into account in the design of the proposals, including:
- i. HS2 alignment and protected zone passes below existing A40 corridor between Mansfield Road and the LU Central Line overbridge.
 - ii. Local ground topography.
 - iii. LU Central Line Ealing Broadway Branch, LU Piccadilly Line Park Royal Branch, Bakerloo, Circle and Hammersmith and the City lines.
 - iv. White City Development Area plans and the London Overground line west of the existing West Cross Route, combined with high retaining walls on the east side of the existing route.
 - v. The proposed location of the West Cross Interchange portal, its slight north-west to south-east alignment and minimum 500m radii of curvature on the entry/exit tunnels.
 - vi. 0.5 x diameter minimum vertical separation between tunnels which are required to cross over each other for the West Cross Interchange.
 - vii. The Westway and Marylebone Flyover and its foundations.
 - viii. High-rise buildings on all four corners of the Edgware Road/A40 junction and in Paddington Basin, plus Bakerloo Line Edgware Road Station.
 - ix. St Mary's Church on the north side of the existing A40.
 - x. Built-up residential areas.
 - xi. Thames Water shaft in Westbourne Green.

Risks

- 2.313. A number of risks that could affect the engineering design of Option 4 have been identified and taken into account in the proposals. These include:
- i. Permanent and temporary land-take required for West Portal within Park Royal South Leisure Complex, Western Avenue Business Park, Kendal Avenue, Concord Road, Alliance Road and Mansfield Road.
 - ii. Temporary land-take required for cut and cover section of West Cross Interchange Portal covering a caravan site and several industrial units.
 - iii. LU Central Line Ealing Broadway Branch and Bakerloo and London Overground Lines.
 - iv. Residential areas.
 - v. Unknown if further high-rise developments are planned around Gypsy Corner.
 - vi. Rail crossings of Great Western Railway, London Overground and of LU Central

- Line. The large diameter of the A40 tunnels leads to an increase in the portal length as the carriageway needs to rise from a lower level.
- vii. Potential opposition to temporary construction sites within Wormwood Scrubs Park for merge/diverge boxes.
- viii. The West Cross Interchange requires the tunnels of this project to cross under each other three times with possible settlement impacts.
- ix. Grand Union Canal.
- x. The temporary construction site compound for Crossrail Royal Oak Portal.
- xi. The need for ventilation fans.
- xii. The columns and foundations associated with the elevated Westway section and the need to demolish and remove Westway.
- xiii. Severance caused by the open ramps at the portal locations.
- xiv. Impact on traffic during construction of the portals, particularly at the East Portal which is likely to require temporary use of extra highway land within the highway boundary.
- xv. Buried services and utilities.

Constructability

- 2.314. The West Portal would require land-take, demolition of several industrial units and re-profiling of the land in Park Royal South Leisure Complex and Western Avenue Business Park. A benefit of the off-line portal is the extra land afforded which could be used to locate the main site compound and provide space to set up the larger diameter A40 TBM(s).
- 2.315. The East Portal presents a challenge in terms of construction due to the numerous constraints and risks discussed earlier. There is little room for a main compound or to service the TBM operation and it is recommended that this operation is located elsewhere. A major challenge for construction of the portal would be the removal of the A40 Westway and Marylebone Flyover. This would require phased closure of the existing A40 route over the flyover with suitable diversions in place. Diversions could be put in place with reconfiguration of the Harrow Road slip roads and an at-grade crossing of Edgware Road. Carefully coordinated traffic management will be put in place to reduce the impacts caused by the works.
- 2.316. It is envisaged that the TBM would be driven from west to east to utilise the extra space and associated logistical benefits of the western portal site. The TBM launch below the LU Central Line Ealing Broadway Branch will be close to the surface railway (half a diameter) and may require advance ground treatment, speed restrictions or in the worst case a temporary closure of the line for several days while the TBM crosses. Only two stations (West Acton and Ealing Broadway) are served beyond the crossing; the latter also served by the LU District Line, therefore a temporary closure with replacement bus service would not be considered unfeasible at this stage. Near the east, one of the risks with the TBM alignment is the crossing below the LU Bakerloo Line running tunnels near Harrow Road. Structural and geotechnical analysis of the LU tunnels should be undertaken so this risk can be more fully understood. TBM retrieval at the east

portal would be logistically challenging and require a mobile crane and wide-load lorries. It is envisaged that a temporary road closure of 1 to 2 days would be required on the A40 and/or Edgware Road during the retrieval operation. Given the extended lengths involved, it is envisaged that at least two TBMs would be used to reduce the construction programme.

- 2.317. The West Cross Interchange Portal would be constructed in the space between the existing A3220 elevated roundabout slip-roads. The open ramp section would be in the existing grassy area and the construction site could be accessed via the A3220 or alternatively via Stable Way. Land-take would be required on the existing caravan site, Stable Way and the adjacent stables to facilitate construction of the cut & cover section. The area around the West Cross Portal will also likely serve as the main construction site compound to service the smaller diameter entry/exit tunnel drives.
- 2.318. The West Cross Interchange will require 4 tunnel drives for the two entry and two exit tunnels. It is envisaged that the westbound entry TBM tunnel would be launched from the West Cross Portal and received at the already-constructed Westbound Merge Box in Wormwood Scrubs Park. From here, the TBM would be lifted out of the box and reassembled in the adjacent Eastbound Diverge Box, from where it would drive the eastbound exit tunnel back to the West Cross Portal. The drives for the westbound exit tunnel and eastbound entry tunnel will require more logistical planning because their corresponding merge and diverge boxes are spaced further apart and are separated either side of the existing A40 Westway Section. It is likely the third TBM drive would be launched from the West Cross Portal towards the Eastbound Merge Box where it will be lifted out and transported back to the West Cross Portal for the fourth and final drive towards the Westbound Diverge Box.
- 2.319. Further consideration of the vertical alignment is required to ensure the main A40 tunnels and the West Cross Interchange tunnels can safely cross over/under each other.
- 2.320. The merge and diverge boxes would be constructed using similar secant piling techniques to the portals but they would be excavated to full depth over their whole length, rather than the ramped approach of the portals. In order to reduce construction impacts, top-down construction methods could be used, where the piling work and roof is constructed first and the surface largely restored as soon as possible. Excavation downwards could then take place below the roof. This approach would be preferable in Wormwood Scrubs Park where it is understood there may be opposition to construction sites. The area of the box provided for launch/retrieval of the smaller entry/exit tunnel TBM could not be covered over until the TBM drive for that tunnel is completed.
- 2.321. The two boxes in Wormwood Scrubs Park would also need temporary site access roads to be constructed to a standard suitable for lorries carrying the heavy TBM parts. These would be removed following construction. At this stage, the two boxes in Wormwood Scrubs have been located to minimise the length of entry/exit tunnel; however this has located them in the middle of the park. The alignment could be revised to locate the boxes closer to the western or northern edges of the park, although this will increase the length of the tunnel drives.

- 2.322. The location identified for the Westbound Diverge Box has already been proven as a suitable construction site for Crossrail and it is not envisaged there would be any access problems. The box would be adjacent to the railway and special provisions would be required to ensure the railway is protected.
- 2.323. The Eastbound Merge Box is located in a park with good access provided by the roads in the residential area although there may be opposition to construction traffic and environmental impacts. A Thames Water shaft is located in the park and this will be sensitive to the adjacent construction work, therefore special protection measures will be required. Due to the existing shaft, the final position of the merge box may temporarily require possession of Harrow Road for up to a year to excavate from the surface.

Option 5

Constraints

- 2.324. A number of constraints on the engineering design of Option 5 have been identified and taken into account in the design of the proposals, including:
- i. LU Central Line surface railway.
 - ii. Planned high-rise developments at White City and residential properties close to the West Portal.
 - iii. Crossrail buried infrastructure.
 - iv. LU Bakerloo Line deep tube tunnels and sub surface tunnels on LU Circle/ Hammersmith & City Line.
 - v. High-rise buildings on all four corners of the Edgware Road/A40 junction (, Bakerloo Line Edgware Road Station, Paddington Basin and several blocks along the alignment.
 - vi. St Mary's Church on the north side of the existing A40.
 - vii. Thames Water shaft in Westbourne Green.
 - viii. At the West Portal, the two parts of the existing A40 immediately west and east of the reverse curves (where the two staggered portals are located).
 - ix. Ramps for the elevated Westway section of the existing A40.
 - x. The Westway and Marylebone Flyover and its foundations.

Risks

- 2.325. A number of risks that could affect the engineering design of Option 5 have been identified and taken into account in the proposals. These include:
- i. St Katherine's Church and Ark Conway Primary Academy immediately near the western portal.
 - ii. Rail crossings of LU Central Line, London Overground and Great Western.
 - iii. Columns and foundations for the Westway elevated section and the elevated roundabout.
 - iv. Residential areas.
 - v. Elevated Westway section and roundabout.

- vi. LU Bakerloo Line tunnels.
- vii. Thames Water shaft in Westbourne Green.
- viii. Rail crossing of LU Circle / Hammersmith & City Line.
- ix. Severance caused by the open ramps at the portal locations.
- x. Impacts on traffic during construction of the portals.
- xi. Eventual demolition of the Westway may overload the A40 tunnels if the demolition process is not managed appropriately.
- xii. Buried services and utilities.

Constructability

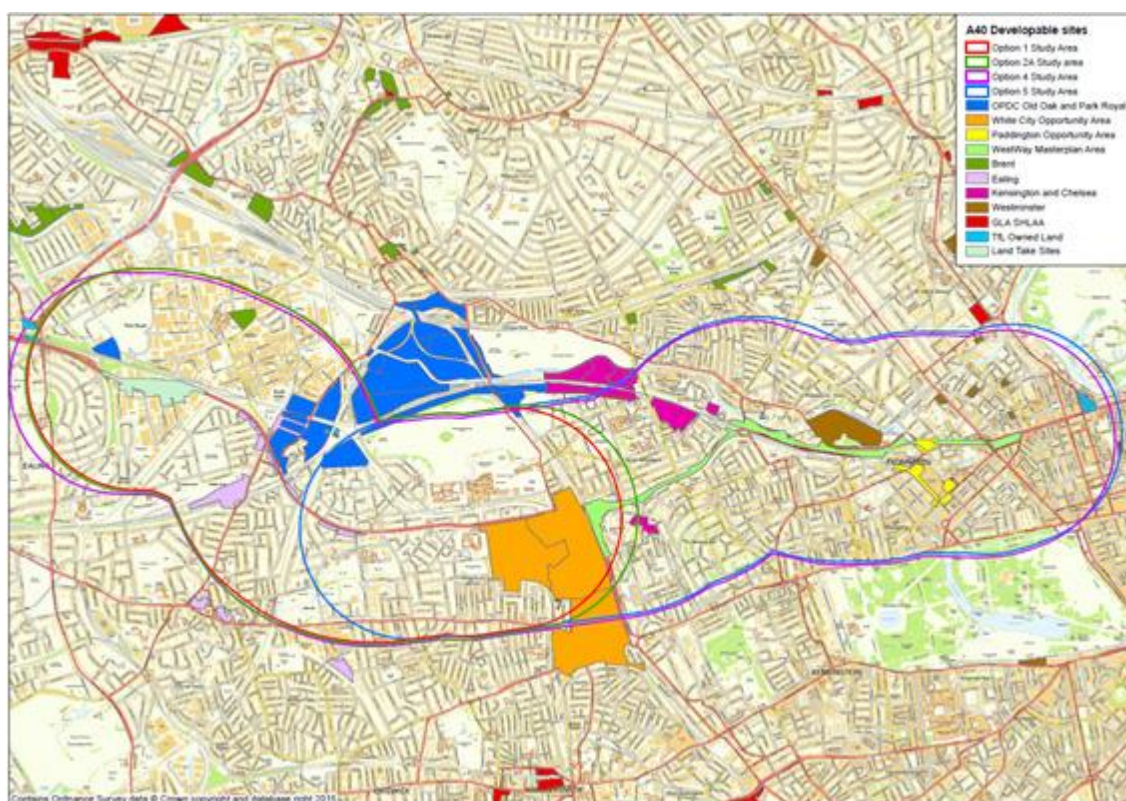
- 2.326. The West Portal will require a linear construction site in the centre of the existing A40 corridor, along what is currently the central reservation. The final highway solution requires land-take of the residential housing on the north side of the West Portal Entry. There is little room for a main compound or to service the TBM operation and it is recommended that this operation be located elsewhere. Logistics will need to be carefully coordinated for concrete delivery (for secant piled walls), reinforcement cages, and spoil removal from the box excavation. Due to the linear nature of the site, a one-way system may need to be enforced so that construction traffic can carefully merge back into the A40 from the central reservation.
- 2.327. The East Portal in Option 5 will be located at the same place as in Option 4 and will face the same challenges and require the same solutions for the phased demolition and removal of the Westway and Marylebone Flyover as described in Section 1.3 above. Logistics would need to be carefully coordinated for concrete delivery (for the secant piled walls), reinforcement cages, and spoil removal from the box excavation. Due to the linear nature of the site, a one-way system may need to be enforced so that construction traffic can carefully merge back into the A40 from the central reservation. This scheme will require a major construction site here. Space for development opportunities currently exists just north of Paddington Green Police Station and this may be a suitable location for a site compound. There are also numerous high-rise office buildings around the area that may provide premises for a temporary site office.
- 2.328. The locations of the two portals proposed for Option 5 are not ideal for launching TBMs or servicing the tunnelling operation. This is because the sites are narrowly constrained and located in areas sensitive to residents, as well as having requirements to maintain traffic movement during construction. As such, it would be disruptive to bring excavated spoil out of the tunnel and deliver pre-cast concrete segments into the tunnel via any of the portals due to the lack of surface space. There would also be a large increase in construction traffic as there is no railway or canal near the portals to offer alternative spoil removal routes.
- 2.329. To overcome these constraints, it is proposed that a temporary access shaft should be constructed mid-way along the tunnel alignment, from where the TBMs can be launched and the tunnelling operation be serviced. One possible location for the shaft would be in the centre of the existing elevated

Westway/A3220 roundabout. The TBM could then be driven both westwards and eastwards in four separate drives towards the portals, where the TBM would be retrieved and transported back to the shaft for the next drive section. This construction sequence would lengthen the construction programme compared with driving directly from the portals because of the need to dismantle the TBM at the portal, transport it overland back to the shaft and reassemble it again. Given the tunnel drive lengths involved, it is envisaged that two TBMs would be used to reduce the construction programme. It is unlikely to be cost effective to use more than two TBMs due to the relatively short drive lengths of the tunnels west of the temporary shaft. It should be noted that one large shaft may not be pragmatic and two smaller diameter shafts may be used instead; one each for the Westbound and Eastbound TBM tunnels. This should be investigated at the next design stage.

- 2.330. TBM retrieval at both the West and East Portal would be logistically challenging and require a mobile crane and wide-load lorries. It is envisaged that a temporary road closure of 1 to 2 days would be required on the A40 and/or Edgware Road during each retrieval operation.

Development capacity of options 1, 2A, 4 and 5: New homes and commercial floorspace

Figure 52: Development capacity unlocked by the shortlisted options



- 2.331. This section sets out the development capacity for each option. It presents the gross development gain and net gain for each option's study area as defined in Figure 52.

- 2.332. Table 13 presents the estimated gross development capacity of the reference and intervention case for each option. The difference between the reference and intervention case is the net additional development which can be attributed to the option.
- 2.333. All of the options are considered to generate additional development over and above the reference case (development arising without an option).
- 2.334. In comparison to Options 4 and 5, Options 1 and 2A have significantly lower amounts of net additional dwellings and commercial floorspace²¹ (refer to Table 13).
- 2.335. Net additional development associated with all options is as a result of the delivery and intensification of TfL owned land located within the study areas. Options 4 and 5 also include net additional development through the redevelopment of land (approximately 25 hectares of land) released by demolition of the A40 Westway Flyover, which forms a significant proportion of the total net effect.
- 2.336. The majority of development falls within the OPDC, Westminster and the White City and Paddington Opportunity Areas

Table 13: Gross and net number of new dwellings and commercial floorspace (this is the sum total of estimated office, retail, industrial and hotel development potential)

Development Capacity: Reference Case and Intervention Case and Net Effect (2026-2031)						
Gross: Reference Case			Gross: Intervention Case		Net Effect	
Option	No of Dwellings	Commercial Floorspace (m ²)	No of Dwellings	Commercial Floorspace (m ²)	No of Dwellings	Commercial Floorspace (m ²)
1	11,800	265,000	12,300	339,000	500	74,000
2A	11,900	265,000	12,300	339,000	400	74,000
4	14,400	296,000	27,100	603,000	12,700	307,000
5	7,200	124,000	19,500	346,000	12,300	222,000

Scoring against the Value Assessment Framework

- 2.337. The Value Assessment Tool (VAF) tool was developed by the consultants, based on RTF and MTS principles, and has been used to help shortlist and rank each remaining option, and in assessing whether each option addressed the challenges as presented in the RTF. Further details are also presented in Appendix E.

²¹ Commercial floorspace is the sum total of estimated office, retail, industrial and hotel development potential.

Figure 53: Option scores against Value Assessment Framework tool

Junction	Option Ref No.	Moving	Unlocki	Protecti	Living	Function	Sustaini	Total Score	Rank
Tunnel Options	Option 1	3	5	4	14	3	6	35	1
	Option 2A	4	4	4	10	3	6	31	4
	Option 4	-1	5	4	15	3	6	32	3
	Option 5	2	5	4	15	3	6	35	1

- 2.338. Figure 53 shows that Options 1 and 5 both possess overall scores of 35 and are ranked first as they best address the RTF objectives. Tunnel Option 4 has an overall score of 32 which places this option third. Option 2A is the lowest scoring option, with a score of 31.
- 2.339. All options have scored highly on the Unlocking, Protecting, Living and Sustaining sections. The tunnel options generate a clear improvement to the urban realm, unlocking development potential and enhancing place function. Removing surface traffic, improving pedestrian crossings and introducing a segregated cycle highway significantly reduces severance and improves safety for cyclists and pedestrians alike. These impacts may encourage a modal shift from vehicles.
- 2.340. In the current form, with significant downgrading of the A40 at the surface and without further work at the portals the tunnel options do not alleviate the issues of congestion throughout the corridor and in some cases cause significant re-routing from the A40, the Moving sections did not score highly. The general forecast of longer journey times and increased delays will also mean that access for deliveries will not be improved. These factors contribute to some of the low scores in both the Moving and Functioning sections of the VAF.
- 2.341. The VAF also took account of the objectives set out in part F of this report, and again Option 1 and 5 perform best against those.

Further assessment of shortlisted options

- 2.342. All the tunnelling options that have been assessed in this report come with a high level of risk and associated cost. It should also be noted that for the purposes of this study with all of the tunnel options we have significantly downgraded the existing A40 and promoted an ambitious junction improvement which would

improve the urban realm and improve connectivity for pedestrians, cyclists and buses. Even with a large amount of traffic using the tunnels these ambitious schemes have struggled from a modelling perspective, and this is reflected in the analysis of the options.

- 2.343. The introduction of the additional highways capacity provided by the tunnels provides opportunities to downgrade, i.e. to reduce the highways capacity provided at the A40 junctions. In line with the WPI objectives described above, the number of lanes on the A40 and the overall sizes of some of the junctions have been reduced and the resultant space used to provide improvements for buses, pedestrians and cyclists and to the surrounding urban realm.
- 2.344. There has been a strong desire to create a public realm that is at a human scale and which responds to the surrounding existing character, context and built form where possible as well as makes engaging spaces which provide for the needs of all users.
- 2.345. Different 'above ground' road layouts have been considered and the proposed layouts shown in are examples of the layouts that have been considered to best provide for local access and also maintain and provide links to the strategic road network. The main impact of the changes has been to reduce the capacity and impact of the at-grade A40 highway links and junctions, on the basis that some vehicle trips that would otherwise have passed through the surface junctions divert onto the new links and capacity provided
- 2.346. Option 1 reduces E-W journey times for users of the tunnel, however there are increased delays for traffic accessing the tunnels in their current form and delays at surface junctions currently negate the overall advantages traffic may experience. The surface plans to downgrade the A40 and improve the place functions are ambitious and result in significant increases in traffic delays. Option 1 does not provide significant development opportunities compared to other tunnel options. As a result, there is a significant funding gap for this high cost option.
- 2.347. Option 2A improves westbound strategic highway connections; however this is at the cost to all other movements throughout the corridor. The strategic modelling suggests that eastbound traffic is forecast to experience extensive delays along the corridor which leads to significant re-routing. Like option 1 the surface plans to downgrade the A40 and improve the place functions are ambitious and result in significant traffic delays. Option 2A does not provide significant development opportunities compared to other tunnel options and the limited benefits in relation to the significant cost make this option unfeasible.
- 2.348. Option 4 costs significantly more than all other options assessed and requires the longest amount of time to construct. The option improves strategic connections especially between A40 and West Cross Route. Surface plans to downgrade the A40 and improve the surrounding place functions are ambitious resulting in significant traffic delays. This option provides significant development opportunities. The removal of the A40 Westway and Marylebone Flyover provides an opportunity to significantly reduce future maintenance and cost liabilities. The level of risk associated with the engineering feasibility of this option doubled with the high cost and extreme funding gap make this option

unfeasible.

- 2.349. Option 5 provides improved strategic highway connections although the tunnel is not as heavily used as in other options partly because it does not have a sub surface interchange with the West Cross Route. This option provides significant development opportunities and importantly presents potential as an infrastructure replacement scheme. It should be noted that there are limited benefits in relation to the significant cost. The removal of the A40 Westway and Marylebone Flyover provides an opportunity to significantly reduce future maintenance and cost liabilities.
- 2.350. Option 5 requires further testing to establish the optimum level of surface intervention that will enable the Study objectives to be met whilst also reducing traffic congestion.

Fit with objectives and measures of success

- 2.351. Options 1 and 5 also best meet the objectives set out in part F of this document, and these are repeated below at Table 14 for completeness.

Table 14: Objectives and measures of success for the A40 corridor

Objective	Measures of success
<ul style="list-style-type: none">• Maintaining core movement function	<ul style="list-style-type: none">• Maintain as a key route for freight and construction based traffic.• Manage and regulate flow and capacity into central London.
<ul style="list-style-type: none">• Delivering connectivity and capacity enhancements to support existing and planned new homes and jobs in growth areas	<ul style="list-style-type: none">• Reduce severance across the A40 and support improved access from and across the A40 to planned growth areas, particularly for buses, cyclists and pedestrians.
<ul style="list-style-type: none">• Improving the environment, safety and asset quality	<ul style="list-style-type: none">• Reduce the impacts of noise and improving air quality along the A40.• Reduce collisions, particularly among <i>vulnerable road users</i>.• Maintain high quality assets.

On the basis of the two rounds of sifting, it is recommended that Options 1 and 5 are taken forward for further testing; while option 7 is retained as an alternative shorter-term/interim option but not subject to detailed work at this stage

- 2.352. On the basis of the above sifts. It is recommended that options 1 and 5 are taken forward for further work. It is also recommended that option 7 (grade separated improvements) is retained as a shorter term, interim option although further detailed work should not proceed until the other two options have been fully analysed and determined to be implementable or not.

PART H: SCHEME FIT AGAINST STRATEGIC AND LOCAL POLICY, STRATEGIES, FRAMEWORKS AND OBJECTIVES

Section Summary:

Overall, Tunnel Options 1 and 5 for the A40 conform to policy at all levels, helping to secure London and the UK's continued prosperity

National policy context

- The tunnel schemes would contribute towards DfT priorities 4, 5, and 6 for the transport network
- The tunnel schemes would contribute towards the overarching objectives of the NPPF in its promotion of sustainable economic growth
- The schemes would address a number of the nationally important challenges identified in the Networks NPS

Regional and sub-regional policy context

- The Mayor's Transport Strategy (MTS) seeks to better integrate land-use and transport planning in London, and this would be supported by the scheme
- The London Plan emphasises the importance of town centres such as Queensway/Westbourne Grove, Portobello Road, Edgware Road/Church Street, Harrow Road and Praed Street/Paddington in accommodating London's growth.
- The aims set out by the Roads Task Force (RTF) would all be supported by the tunnel schemes
- The schemes contribute to many of the outcomes of TfL's Surface Transport Plan 2015/16
- The schemes would address a number of challenges identified in the London 2050 Infrastructure Plan

The schemes would support a number of objectives of the west London SRTF

Local policy context

- Whilst there is no specific reference to the tunnelling of the A40 within local planning documents, a number of strategic objectives have been set out which are relevant to the scheme

Stakeholders, constraints and inter-dependencies

- There are a number of key stakeholders, constraints and inter-dependencies with other work streams that will need to be considered in developing the project

Overall, tunnel options 1 and 5 for the A40 conform to policy at all levels, helping to secure London and the UK's continued prosperity

92. Due to the role of tunnel options 1 and 5 for the A40 in addressing the challenges London faces, both make a significant contribution to policy at all levels. At a National level the options strongly supports the intended outcomes in the DfT's

priorities for the transport network. The tunnel schemes also support London-wide and local policy – in particular the Mayor’s Spatial Development Strategy (known as the London Plan), the Mayor’s Transport Strategy (MTS), and London 2050 Infrastructure Plan. It is also supportive of goals in local planning documents for the Old Oak and Park Royal Development Corporation and the London Boroughs of Kensington and Chelsea, Hammersmith and Fulham, Ealing and City of Westminster.

National policy context

Tunnelling the A40 as per options 1 and 5 would contribute towards DfT priorities 3, 4, 5, and 6 for the transport network.

2.353. The Department for Transport’s nine priorities for the transport network are:

1. continuing to develop and lead the preparations for a high speed rail network
2. improving the existing rail network and creating new capacity to improve services for passengers
3. tackling congestion on our roads
4. continuing to improve road safety
5. encouraging sustainable local travel
6. promoting lower carbon transport, such as walking and cycling as well as introducing more environmentally-friendly buses and trains
7. supporting the development of the market for electric and other ultra-low emission vehicles
8. supporting the development of aviation, improving passenger experience at airports
9. maintaining high standards of safety and security for passengers and freight

2.354. Both schemes would encourage sustainable local travel and promote low carbon travel both directly through the provision of better walking and cycling environments and indirectly by reducing severance caused by the A40 at the surface and improving connectivity between local centre and residential areas, particularly at designated growth areas such as the White City Opportunity Area and the Old Oak and Park Royal Opportunity Area.

2.355. Both tunnel options would also improve safety for pedestrians and cyclists by providing higher quality and better lit crossings along the surface of the A40 compared to the current, lack of crossing points.

2.356. The A40 tunnel options and the associated urban realm enhancements delivered at the surface will promote lower carbon transport modes by breaking down the barriers to movement for pedestrians, cyclists and buses, as well as improving accessibility to train stations within the corridor.

The A40 tunnelling schemes would contribute towards the overarching objectives of the NPPF in its promotion of sustainable economic growth

2.357. The National Planning Policy Framework (NPPF) published in 2010 sets out a policy framework for how the land-use planning system should function.

- 2.358. The NPPF seeks to secure sustainable economic growth to create jobs and prosperity. The Government is committed to ensuring that the planning system does everything it can to support sustainable economic growth and a competitive economy and so significant weight should be placed on the need to support economic growth through the planning system. The NPPF positively promotes competitive town centre environments and contains a ‘town centre first’ policy.
- 2.359. The NPPF states that the transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how they travel. Encouragement should be given to solutions which support reductions in greenhouse gas emissions and reduce congestion.
- 2.360. The NPPF states that planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure; whilst requiring the planning system to contribute to and enhance the natural, local and historic environment.
- 2.361. The proposed tunnel schemes would contribute towards the overarching objectives of the NPPF, notably their contribution to sustainable economic growth along the A40 corridor at key activity centres such as White City Opportunity Area, Old Oak and Park Royal Opportunity Area, Savoy Circus and Gypsy Corner, as well as supporting the wider economic growth and global competitiveness of London as a whole.

Key Finding:

Options 1 and 5 tunnelling schemes for the A40 demonstrate a close fit with national policy goals, including the DfT’s nine transport priorities and the NPPF. They both allow local challenges to be addressed whilst enhancing the strategic role of the A40 road corridor.

Regional and Sub-Regional policy context

The Mayor’s Transport Strategy (MTS) seeks to better integrate land-use and transport planning in London, and this would be supported by the scheme

- 2.362. The Mayor’s Transport Strategy (MTS), published in 2010 by the Greater London Authority, seeks to better integrate land-use and transport planning within London. The MTS sets out the following vision for travel and transport in London:

‘London’s transport system should excel among those of world cities, providing access to opportunities for all its people and enterprises, achieving the highest environmental standards and leading the world in its approach to tackling urban transport challenges of the 21st century.’

- 2.363. Alongside this vision, the MTS identifies six strategic objectives for London. Those of direct relevance to this business case are:

- Supporting economic development and population growth
- Enhancing the quality of life of all Londoners

- Improving the safety and security of all Londoners
- Improving transport opportunities for all Londoners
- Reducing transport's contribution to climate change and improving its resilience

- 2.364. London's road network acts as arteries for the movement of people and goods to help Londoners and those from surrounding areas to access employment, education, retail and other leisure opportunities. A well-functioning and efficient highway network is essential for the proper functioning of the London economy and to maintain the quality of life of the residents of the city. Improvements to streetscapes and the public realm will help to create safer, more walkable neighbourhoods, support place-making and regeneration and attract investment. Improvements to traffic management will help to make the TfL and Borough road network more resilient.
- 2.365. The proposed tunnel schemes would significantly improve the public realm and environmental quality within the vicinity of the scheme, making A40 corridor from Edgware Road to Hanger Lane a more walkable area, improving the connectivity for non-motorised transport users as well as supporting the wider regeneration and development opportunities along the A40 corridor. It would therefore contribute to objectives 1 – 5 of the MTS and would support the MTS policies set out in Table 15.

Key Finding:

Tunnel options 1 and 5 for the A40 each contribute significantly towards MTS objectives 1-5 .

Table 15: Project contribution to MTS policies

Policy no.	Policy description	How the proposed schemes will support MTS Policy
1	The Mayor, through TfL, and working with the DfT, Defra and other government agencies, regional development agencies, Network Rail, train operating companies, London boroughs and other stakeholders, will seek to develop London's transport system in order to accommodate sustainable population and employment growth.	Both of the proposed tunnel schemes will directly accommodate the increasing number of car and freight trips forecasted along the A40 corridor. In addition, by reducing the levels of severance currently created by the A40, the tunnel schemes will enhance connectivity for public transport routes and accessibility to stations between the two sides of the corridor at the surface. This in turn will facilitate the strong growth forecasted in other transport modes, such as cycling, public transport and walking.

3	<p>The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other stakeholders, will seek to improve public transport accessibility and conditions for cycling and walking in areas of lower PTAL, where there is an identified need for improving accessibility; and to improve access to economic and social opportunities and services for all Londoners.</p>	<p>It has been flagged by many stakeholders that the existing A40 corridor causes significant severance for local public transport accessibility and creates a generally poor environment for cycling and walking trips. In addition, the highly trafficked corridor restricts access to economic and social opportunities for trips that need to traverse the corridor.</p> <p>Tunnel Option 1: Tunnel option 1 would offer improved public transport accessibility and conditions for cycling and walking in existing areas of low PTAL, such as White City (west – south of the A40), West Acton (south of the A40), Park Royal (north and south of the A40). By reducing the physical severance caused by the existing A40 at the surface, tunnel option 1 will significantly improve walking and cycling accessibility to a variety of LU stations in the local areas, such as Park Royal. North Acton and East Acton. The reduction in physical severance will also significantly enhance access to economic and social opportunities (such as the Old Oak and Park Royal OA) and services for all Londoners.</p> <p>Tunnel Option 5: Tunnel option 5 would facilitate improved pedestrian and cycle routes at the surface that were once severed by the Westway (A40). Most of the area around the A40 was formerly an unpleasant environment for cycling and walking. The provision of a tunnel will ultimately improve pedestrian and cycle routes across the A40 and improve accessibility to LU stations in the area such as Latimer Road, Ladbroke Grove, Westbourne Park, Royal Oak, Paddington (including NR station) and Edgware Road. North/south bus connectivity across the Westway (A40) will also significantly improve. The above improvements will significantly enhance access to economic and social opportunities (such as the White City OA and Paddington OA) and services for all Londoners.</p>
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4	<p>The Mayor, through TfL, will seek to improve people's access to jobs, business' access to employment markets, business to business access, and freight access by seeking to ensure appropriate transport capacity and connectivity is provided on radial corridors into central London.</p>	<p>The A40 corridor is critical for both traffic and freight movement and operates close to and often above capacity during the peaks. The A40 corridor directly services Park Royal, London's largest industrial estate, and is in close proximity to Heathrow Airport and other key strategic routes. Consequently, freight activity was identified as a significant service function of the corridor and any delays for freight traffic will have a notable impact on both the local and regional economy.</p> <p>Both of the proposed tunnel options enhance the capacity of the A40 and in turn help facilitate free flowing freight movements to commercial premises and industrial estates, which are vital to the local and regional economy.</p> <p>The proposed tunnel schemes would also improve access to public transport stations in close proximity to the corridor. These accessibility improvements would ultimately enhance overall journey time for onward connections to major employment centres as well as improving local access into major employment hubs such as Paddington OA (Tunnel Option 5), White City OA (Tunnel Option 5), Acton (Tunnel Option 1) and Old Oak and Park Royal OA (Tunnel Option 1).</p>
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7	<p>The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other transport stakeholders, will seek to increase public awareness of existing and planned orbital public transport connectivity in Inner London; and seek to improve orbital connectivity in Outer London, particularly between adjacent metropolitan town centres, where shown to be value for money.</p>	<p>There are 3 bus routes that run along A40 and 21 that cross the A40 itself. A significant portion of the 21 bus routes that traverses the A40 corridor play a vital role in linking orbital public transport routes to major town centres and opportunity areas. However, congestion and delays on the A40 make it increasingly difficult for orbital bus routes to cross the A40, therefore impacting bus journey time reliability. As bus journey time reliability continues to worsen so do the levels of patronage as buses become a less favourable mode choice for local commuters due to excessive journey times and delays being experienced. Encouraging more people to use bus services to cross the A40 corridor is becoming increasingly challenging as bus journey time reliability continues to decline.</p> <p>Both of the proposed tunnel options aim to alleviate the congestion and delays currently experienced on the A40. In doing so, it is expected that bus journey time reliability will be improved and subsequently overall orbital connectivity will be enhanced between major town centres and opportunity areas such as Paddington OA (Tunnel Option 5), White City OA (Tunnel Option 5), Acton (Tunnel Option 1) and Old Oak and Park Royal OA (Tunnel Option 1).</p>
8	<p>The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other transport stakeholders, will support a range of transport improvements within metropolitan town centres for people and freight that help improve connectivity and promote the vitality and viability of town centres, and that provide enhanced travel facilities for pedestrians and cyclists.</p>	<p>Tunnel option 1 would facilitate a range of transport improvements to Acton, which is prescribed as district town centre. Such include improved pedestrian and cycling access and enhanced facilities and urban realm. This in turn would promote the vitality and viability of the district town centre.</p> <p>On the other hand, tunnel option 5 would promote transport improvements, particularly public transport accessibility, to the following town centres:</p> <ol style="list-style-type: none"> 1. Queensway/Westbourne Grove (Major) 2. Portobello Road (District) 3. Edgware Road/ Church Street (District) 4. Harrow Road (District) 5. Praed Street/Paddington (District) <p>Furthermore, new developments in the footprint of the former Westway viaduct could also enable new businesses to occupy space in and around the town centres mentioned above, increasing the schemes offering to the public.</p>

9	<p>The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other transport stakeholders, will use the local and strategic development control processes to seek to ensure that:</p> <ul style="list-style-type: none"> a) All high trip generating developments are located in areas of high public transport accessibility, connectivity and capacity (either currently or where new transport schemes are committed) b) The design and layout of development sites maximise access on foot, cycle and to public transport facilities, for example, via safe walking and cycling routes and provision of secure cycle parking c) Access for deliveries and servicing, maximise the opportunities for sustainable freight distribution where possible d) Land for transport use is safeguarded in line with London Plan policy and Supplementary Planning Guidance e) Planning contributions are sought for transport improvements where appropriate 	<p>Both tunnel options would create space for developments to be located in areas of high public transport accessibility, for example:</p> <p>Tunnel Option 1: Tunnel option 1 would create space for development in close proximity to both Park Royal and Hanger Lane station (at the western portal of the tunnel).</p> <p>Tunnel Option 5: Tunnel option 5 would create a significant amount of land for development with excellent public transport accessibility, which is currently locked by the Westway viaduct. The PTAL across the footprint of the Westway ranges from 4 to 6.</p> <p>Contributions from developers could also help to fund the improvements to the transport infrastructure planned under both scheme. Both scheme would also improve pedestrian and cycling accessibility by creating safer walking routes and secure cycle parking.</p>
10	<p>The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other stakeholders including the private sector, will seek to improve the efficiency and effectiveness of the operation of the transport system, bring transport assets to a good state of repair, and then maintain them in that condition.</p>	<p>The Westway structure is reaching the end of its life expectancy and the cost of maintaining the structure will become a significant burden for TfL. Tunnel Option 5 seeks to demolish the Westway and restore capacity below ground within the tunnel. In the long term, this scheme will generate significant savings for TfL as it eradicated the need for ongoing costly maintenance of the Westway. Overall the tunnel scheme represents a more efficient and effective means of operating the transport system, specifically that of the A40.</p>

11	The Mayor, through TfL, will seek to reduce the need to travel, encourage the use of more sustainable, less congesting modes of transport (public transport, cycling, walking and the Blue Ribbon Network), set appropriate parking standards, and through investment in infrastructure, service improvements, promotion of smarter travel initiatives and further demand management measures as appropriate, aim to increase public transport, walking and cycling mode share.	The proposed tunnel options will support an uptake in the use of sustainable modes of transport. The reduction in journey time delays for buses crossing the A40 corridor will improve the appeal of this transport mode for local trips. In addition, the proposed tunnel options will improve the conditions for walking and cycling along and across the A40 corridor by creating safer walking routes and a segregated cycle network.
12	The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other stakeholders including business and the freight industry, will seek to improve the distribution of freight through the provision of better access to/from Strategic Industrial Locations, delivery and servicing plans, and other efficiency measures across London.	The A40 corridor is critical for freight movement and operates close to and often above capacity during the peaks. The A40 corridor directly services Park Royal, London's largest industrial estate, and is in close proximity to Heathrow Airport and other key strategic routes. Both tunnel options provide sufficiently better access to/from Park Royal (Strategic Industrial Location).
14	The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other stakeholders, will seek to improve transport's contribution to the built and natural environment.	Both tunnel options will include public space in the vicinity of portal locations. Tunnel Option 5 will unlock a substantial amount of open space a portion of which will most likely be designated for public recreational use, improving the built environment in the local area.
16	The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, freight operators, London boroughs and other stakeholders, will seek to reduce noise impacts from transport.	The proposed tunnel options would reduce noise impacts from vehicles on the A40 by diverting traffic from the surface to below ground. Therefore, significantly reducing the A40's noise impact on local residents.
17	The Mayor, through TfL, and working with the DfT and other government agencies, the London boroughs, health authorities and other stakeholders, will promote healthy travel options such as walking and cycling.	The proposed tunnel schemes would both contribute significantly in reducing severance along the A40 and also provide new routes for pedestrians and cyclists, encouraging people to access local town centres via these active modes of travel.
19	The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other stakeholders including the police and road safety partnerships, will seek to improve road safety for all communities in London and implement measures that contribute to any targets that may be set by the Mayor from time to time.	The A40 tunnel options would enable a transformational change for the local area by tackling problems of road safety, particularly for vulnerable road users (VRU's). Hanger Lane, Gypsy Corner and Savoy Circus are all identified as priority 1 junctions for road safety intervention, due to their high number of collisions involving Vulnerable Road Users (VRUs). Tunnel Option 1 would remove a significant amount of vehicular from the surface at Gypsy Corner and Savoy Circus and in doing so reduce the risk of collisions and accidents for VRU's at this location.

21	The Mayor, through TfL, and working with the DfT, Network Rail, train operating companies, London boroughs and other stakeholders, will seek to increase accessibility for all Londoners by promoting measures to improve: a) The physical accessibility of the transport system, including streets, bus stops, stations and vehicles b) Information provision, staff service and the travelling environment	Tunnel Options 1 and 5 would contribute significantly to improving the physical accessibility of the transport system. Both options knock down barriers to accessibility, largely caused by the existing A40 corridor and the severance created at surface. Relocating traffic below ground and improving the environment of the A40 at the surface will significantly improve local accessibility.
22	The Mayor, through TfL, and working with the LDA, DfT, Network Rail, train operating companies, London boroughs and other stakeholders, will seek to enhance connectivity, reduce community severance, promote community safety, enhance the urban realm and improve access to jobs and services in deprived areas.	The proposed tunnel options would reduce community severance by reducing severance already caused by the existing A40 corridor. Both options would provide multiple safer and more pleasant crossings over the A40 compared to the existing junctions at Savoy Circus, Hanger Lane and Gypsy Corner.
23	The Mayor, through TfL, and working with the LDA, DfT, Network Rail, train operating companies, London boroughs and other stakeholders, will support regeneration of Opportunity Areas and Areas for Intensification as described in the London Plan.	The delivery of tunnel options 1 and 5 would directly support the regeneration of the following opportunity areas prescribed in the London Plan, Paddington OA (Tunnel Option 5), White City OA (Tunnel Option 5), Acton (Tunnel Option 1) and Old Oak and Park Royal OA (Tunnel Option 1).
30	The Mayor, and TfL, will make the case to Government for long-term investment in the transport network to secure the outcomes set out in this strategy.	This business case sets out the case for investment in improving part of the strategic road network.
31	The Mayor, and TfL, will maximise any available efficiencies, subsidise services at appropriate levels and ensure that value for money is otherwise achieved from the existing and planned transport network, while reviewing fares levels to provide, if required, a residual means of achieving the goals of this transport strategy. Innovative ways of financing investment and services, including making the most of the value of transport infrastructure, will be explored.	Both schemes offer the potential to develop a variety of TfL owned sites and more significantly the footprint of the Westway viaduct (Tunnel Option 5). The development of these sites would increase the value of and revenue derived from this TfL-owned property.
36	The Mayor, and TfL, will work with the London boroughs and other stakeholders, to seek to secure further investment from a variety of sources that help improve the quality and range of transport services available to Londoners.	The Financial Case for this project has considered a range of sources of funding that could be utilised to enable the delivery of the scheme.

The London Plan emphasises the importance of town centres such as Queensway/Westbourne Grove, Portobello Road, Edgware Road/Church Street, Harrow Road and Praed Street/Paddington in accommodating London's future growth

- 2.366. The London Plan consolidated and (updated in March 2015) sets out the strategic spatial planning framework for London as a whole. It articulates the following vision for London:

'Over the years to 2036 – and beyond, London should excel among global cities – expanding opportunities for all its people and enterprises, achieving the highest environmental standards and quality of life and leading the world in its approach to tackling the urban challenges of the 21st century, particularly that of climate change.'

- 2.367. This high level, over-arching vision is supported by six detailed objectives that will inform place-making and land-use planning for new development, all of which are in some way relevant to this business case:

- A city that meets the challenges of economic and population growth;
- An internationally competitive and successful city;
- A city of diverse, strong, secure and accessible neighbourhoods;
- A city that delights the senses;
- A city that becomes a world leader in improving the environment;
- A city where it is easy, safe and convenient for everyone to access jobs, opportunities and facilities.

Key Finding:

Tunnel options 1 and 5 for the A40 contribute towards London Plan objectives 1–6.

- 2.368. The London Plan states that town centres should provide a major focus for commercial and residential development outside the Central Activities Zone (CAZ). Queensway/Westbourne Grove, Portobello Road, Edgware Road/Church Street, Harrow Road and Praed Street/Paddington are all designated Town Centre's under the London Plan, with each of them directly or indirectly benefiting from the tunnel options proposed for the A40 corridor. The town centres vary from a low to medium potential for growth based on current levels of demand and transport capacity. However it is important to note that this projection is based on the assumption that the A40 remains as at present – the removal of the Westway (Tunnel Option 5) for example would create the potential for additional growth in jobs and homes, meaning that growth above these levels may be possible.
- 2.369. This project would help to support the wider London economy by acting as a catalyst for investment in improving the public realm, thereby opening up redevelopment opportunities for denser development. By enabling new housing and office development, this would help London to retain its status as a competitive global city. A better, more walkable public realm with reduced severance would improve safety for Londoners of all ages and backgrounds and

enhance the setting of landmark buildings. The project would result in environmental improvements through supporting an uptake in cycling and walking, with positive impacts on air quality, noise and townscape. As a result, the neighbourhood around the project would be more permeable and easier to navigate around for pedestrians and by bicycle.

The aims set out by the Roads Task Force (RTF) would all be supported by tunnel options 1 and 5 for the A40

2.370. The Roads Task Force (RTF), which was set up by the Mayor of London in 2012, brings together a wide range of interests and expertise, united in the belief that the Capital needs a long-term strategy for roads and a commitment to major investment in street management and urban design.

2.371. The RTF report, published in July 2013, focuses on three core aims:

- To enable people and vehicles to move more efficiently on London's streets and roads
- To transform the environment for cycling, walking and public transport
- To improve the public realm and provide better and safer places for all the activities that take place on the city's streets, and provide an enhanced quality of life

2.372. The RTF's highlights 'breathing life back into town centres across London' and 'unlocking major growth and regeneration' as key parts of its vision for the city. The report notes that the potential of many areas to deliver growth is constrained because of a lack of connectivity, and/or the impact of roads on 'place value', and cites mitigation of noise and severance as key to unlocking this potential growth.

Key Finding:

Tunnel options 1 and 5 for the A40 contribute to all 3 core aims of the RTF, and is a key area identified in the report

Tunnel options 1 and 5 contribute to many of the outcomes of TfL's Surface Transport Plan 2015/16

2.373. The TfL Surface Transport Plan 2015/16, published in June 2015, sets out the approach towards managing the bus, taxi, coach and river networks; freight deliveries; the Santander cycle hire scheme; Congestion Charge and Low Emission Zone schemes; and the TfL Road Network (TLRN).

2.374. The Plan sets out a goal: 'to keep London working, growing and to make life in London better'. Alongside this goal, the Plan has an ambition: 'to provide, manage and improve the services, streets and places, that connect London for all, sustaining its position as a world leading city'.

2.375. The Plan has identified ten outcomes for surface transport in London. Table 16 below summarises how this project supports several of these outcomes.

Table 16: Project contribution to TfL Surface Transport Plan outcomes

Surface Outcome	How this project contributes towards the outcome
Quality bus network: Maintaining and enhancing a reliable, safe, accessible bus network and supporting coach operations, across all of London.	<p>There are 3 bus routes that run along A40 and 21 that cross the A40 itself. A significant portion of the 21 bus routes that traverse the A40 corridor play a vital role in linking orbital public transport routes to major town centres and opportunity areas. However, congestion and delays on the A40 make it increasingly difficult for orbital bus routes to cross the A40, therefore impacting bus journey time reliability. As bus journey time reliability continues to worsen so to do the levels of patronage as buses become a less favourable mode choice for local commuters due to excessive journey times and delays being experienced. Encouraging more people to use bus services to cross the A40 corridor is becoming increasingly challenging as bus journey time reliability continues to decline.</p> <p>Both of the proposed tunnel options aim to alleviate the congestion and delays currently experienced on the A40. In doing so, it is expected that bus journey time reliability will be improved and subsequently overall orbital connectivity will be enhanced between major town centres and opportunity areas. In addition, the number of lanes on the A40 and the overall sizes of some of the junctions have been reduced and the resultant space used to provide improvements for buses.</p>
Reliable roads: Ensuring a reliable and resilient road network for all of London by managing congestion and improving connectivity.	<p>The A40 corridor is critical for both traffic and freight movement and operates close to and often above capacity during the peaks. Both of the proposed tunnel options enhance the capacity of the A40 and in turn help facilitate free flowing traffic movements.</p>

Improving the environment: Continuing to deliver environmental improvements, by reducing pollutants from ground based transport and enhancing the natural environment.	Tunnel options 1 and 5 would incorporate enhancements to the urban realm along the surface of the existing A40 which would be ultimately downgraded to create a better environment for those living adjacent to the road and non-motorised transport users travelling around the local area.
More and safer cycling: Enabling more people to cycle, more safely, more often.	Tunnel options 1 and 5 would reduce severance, helping to improve conditions for cyclists, generating more cycling trips.
Better places to walk: Creating and supporting safe attractive, accessible streets and places that people can use, enjoy and choose to walk more.	Tunnel options 1 and 5 would reduce severance and provide a significantly improved quality public realm, helping to improve the pedestrian environment, generating more walking trips.
Reduced casualties: Continuing the downward trend in casualties on London's roads and public transport networks	The A40 tunnel options would enable a transformational change in the local area by tackling problems of road safety, particularly for vulnerable road users (VRU's). Tunnel option 1 would significantly reduce the volume of traffic flowing through the at-grade priority 1 junctions for road safety intervention (Hanger Lane, Gypsy Corner, Savoy Circus). Which will significantly reduce the likelihood of collisions and accidents for VRU's at such locations.
Sustainable freight: Enabling safer, cleaner and more efficient delivery and servicing activity to support London's economy.	Tunnel options 1 and 5 will both help facilitate more efficient delivery and servicing activity by allowing express routes into and out of London for freight.
Quality door-to-door transport: Supporting provision of safe, reliable, accessible door-to-door services, including regulating London taxi and private hire services and operating Dial-a-Ride services.	Not applicable
Reduced crime: Continuing the downward trend in crime, antisocial behaviour and fear of crime on London's transport networks.	A more attractive public realm and higher pedestrian flows would help reduce the fear of crime, as would the replacement of the current, poor urban realm along the A40 and in locations such as the under croft of the Westway.
Realising rivers' potential: Harnessing the potential of London's rivers and waterways to carry people and goods.	Not applicable.

Key Finding:

Tunnel options 1 and 5 for the A40 contributes to Surface Outcomes 1-7 and 9.

The scheme would address a number of challenges identified in the London 2050 Infrastructure Plan

- 2.376. The London 2050 Infrastructure Plan sets out the Mayor's long-term aspirations for the infrastructure to support London's future growth. This plan recognises the importance of the transport system in supporting London's employment and population growth up to 2050. The key transport challenges identified within the Plan can be summarised as:
- i. ensuring the foundations for London's continued global city success;
 - ii. helping to house a growing London;
 - iii. supporting a better, not just bigger London.
- 2.377. In meeting these challenges, the plan identifies the need for a better and more efficient road system across London – particularly in Outer London, and recognises the importance of the strategic road network in achieving this. It also recognises the importance of transport schemes in supporting a step change in the proportion of journeys made by sustainable modes, maintaining a well functioning road network for efficient journeys as well as the role of transport schemes in helping to unlock and deliver the necessary housing.

Key Finding:

Tunnel options 1 and 5 would both address a number of challenges identified in the 2050 Infrastructure Plan, particularly in relation to increasing the proportion of journeys made by sustainable modes, while also supporting the vital role of the strategic road network.

The scheme would support a number of objectives of the West London Sub-Regional Transport Plan

- 2.378. The West London Sub-Regional Transport Plan (SRTP) identifies the transport challenges, opportunities and constraints within those boroughs represented by the west London partnership²², and helps TfL to develop the priorities for business planning in order to address the medium- to longer-term challenges for London and the sub-region.
- 2.379. A number of challenges have been identified in the sub-region, most notably:

1. Enhance east-west (rail) capacity and manage congestion
2. Improve access to, from and within key locations
3. Enhance the efficiency of freight movement
4. Improve north-south public transport connectivity
5. Improve land-based air quality

²² London Boroughs in the west London sub-region are Brent, Ealing, Hammersmith & Fulham, Harrow, Hillingdon and Hounslow.

- 2.380. This scheme would closely address a number of these challenges. Growth (refer to challenge 2) would be provided through more efficient access to and out of London. The efficiency of freight movement would also be enhanced through the provision of tunnel options 1 and 5 as they would each allow unobstructed flows along differing segments of the A40 (refer to challenge 3). The reduction of traffic at the surface of the A40 would facilitate improved north-south public transport connectivity (refer to challenge 4), particularly for buses as delays are reduced at key junctions. Finally, improvements in air quality along the corridor are likely to be witnessed as both tunnel options would divert vehicular traffic underground and also facilitate the uptake of more sustainable modes of transport at the surface.

Key Finding

Both tunnel schemes would support a number of objectives of the West London SRTP by providing new connectivity across the A40 for buses and other sustainable transport modes, facilitating more efficient freight movements to strategic industrial locations, improving access to jobs and services, and enhancing air quality conditions along the A40 corridor. As such, tunnel options 1 and 5 for the A40 offer benefits to the wider sub-region as well as to the local corridor itself.

Local policy context

A number of local strategic objectives have been set out in the Old Oak and Park Royal Development Corporation Draft Local Plan which would be supported by this scheme.

- 2.381. The OPDC's draft Local Plan includes thematic policies which identify key parameters the new development should seek to deliver or enhance. The provision of tunnel options 1 and 5 for the A40 corridor will greatly help facilitate the execution of such policies. The plan acknowledges that the existing A40 creates a significant barrier that prevents easy north and south movement for walking, cycling and buses which need to be addressed to help connect adjacent communities and enable access to services and employment.
- 2.382. Tunnel options 1 and 5 will reduce severance across the A40, improving wayfinding and connectivity for walking and cycling as well as local bus trips to and from Old Oak and Park Royal from surrounding areas and nearby local centres such as Harlesden, White City, Queens Park and Ladbroke Grove.
- 2.383. The OPDC's draft Local Plan urges for improvements to the A40 junctions and corridor, which are vital to the successful operation of Park Royal and Old Oak. Tunnel options 1 and 5 deliver junction improvements at the surface for Gypsy Corner and Savoy Circus, therefore improving the resilience and reliability of the strategic road network.

Key Finding

Both tunnel schemes would support a number of objectives of the OPDC's draft Local Plan. Particularly by providing better connectivity across the A40 for buses and other sustainable transport modes to/from Old Oak and Park Royal to surrounding

areas and communities.

Whilst there is no specific reference to an A40 tunnel scheme within local planning documents, a number of local strategic objectives have been set out which would be supported by this scheme.

- 2.384. Table 17 below sets out those aspects of strategic local policy framework for which the proposed project would make a positive and direct contribution.

Table 17: Local policy context summary

London Borough of Ealing	
Development (Core) Strategy	
Strategic Objectives	<p>The Adopted Development (Core) Strategy 2026 provides the spatial vision and policies to support the future development of the borough. This strategy also has to conform to both the context and policies of the London Plan. The vision is to harness opportunities for growth and development and promote improvement in appropriate locations. These locations are primarily along the Uxbridge Road / Crossrail and the A40 / Park Royal corridors. These two east-west corridors include Ealing's town centres, Park Royal Industrial Estate and the five Crossrail stations. These growth corridors and their residential hinterlands overlays a pattern of green and open spaces and this highly valued environment will be protected and enhanced. SO1 - Capitalise on redevelopment opportunities to secure physical, economic and environmental regeneration of the borough and ensure the delivery of key benefits for local people. Policies that are particularly relevant to this scheme include:</p> <ul style="list-style-type: none"> • Policy 1.1 Spatial Vision for Ealing 2026 <i>Development of new homes, business and retail space will be primarily concentrated in:</i> <i>The A40 / Park Royal corridor – particularly focused in Greenford town centre; Acton Main Line, Greenford and North Acton stations; Park Royal; and, other industrial estates.</i> • Policy 3.1 Realising the potential of the A40 corridor & Park Royal. • Policy 4.4 Promote North-South Links
A40 Tunnel Scheme	<p>The strategy notes the A40 as a key growth corridor within the LB of Ealing. A view which is supported by tunnel options 1 and 5, both unlock space for future development whilst also creating a "highly valued environment" at the surface along the A40. Policy 4.4 emphasises the need for better north-south links within the LB of Ealing. This is supported by the A40 tunnel options as both help reduce the severance caused by the existing A40 and facilitate improved journey times for north-south public transport trips as well as walking and cycling.</p>

Local Implementation Plan	
Transport objectives	<p>This document sets out the borough's plans for implementing the Mayor's Transport Strategy. It sets out 8 objectives, many of which would be strongly supported by Tunnel Options 1 and 5. These are set out below:</p> <ul style="list-style-type: none"> • Objective 1. Improve road safety and reduce road danger on the borough transport network for all users, in particular pedestrians, cyclists and motorcyclists • Objective 2. Increase sustainable travel capacity and key links in the borough • Objective 3. Smooth the flow of traffic and improve journey time reliability for all road-users, particularly bus passengers, cyclists and pedestrians • Objective 4. Improve quality of life for residents, businesses and visitors to the borough, protecting and enhancing the urban and natural environment • Objective 5. Promote healthy travel behaviour through a shift to more walking and cycling • Objective 6. Improve the quality of and access to Ealing's main town centres, neighbourhood centres and regeneration areas for all, including those with reduced mobility • Objective 7. Improve the condition of principal roads within the borough for the benefit of all road users • Objective 8. Reduce Ealing's contribution to climate change through transport related CO2 emissions [and improve resilience to climate change]
A40 Tunnel Scheme	<p>The objectives set out in the LB of Ealing's LIP strongly align with the benefits provided from a tunnel scheme on the A40. Specific benefits provided by Tunnel Options 1 and 5 for the A40 include improvements to road safety, increased sustainable travel, enhance traffic flows and journey times, improved quality of life for residents along the corridor and better accessibility to town centres within the LB of Ealing.</p>
London Borough of Hammersmith and Fulham	
Development (Core) Strategy	
Strategic Objectives	<p>The Core Strategy sets out a number of strategic objectives which seek to deliver the Borough's vision of a vibrant, sustainable and inclusive community by 2026, Objectives that are particularly relevant to this scheme include:</p> <ul style="list-style-type: none"> • 4.18: The council will have worked with partners to improve transport in the borough, particularly north south links, as well as the opportunities for cycling and walking, including completion of the riverside walk. Where there is major development the council will have improved access, particularly for pedestrians and cyclists.
A40 Tunnel Scheme	<p>The strategy notes the enhancements required for north south links as well as opportunities for walking and cycling. Tunnel options 1 and 5 support the provision of better north-south public transport links. This is achieved by reducing the severance caused by the existing A40 and reducing delays for buses. Opportunities for walking and cycling are also enhanced through improvements delivered at the surface.</p>

Local Implementation Plan	
Transport objectives	<p>This document sets out the borough's plans for implementing the Mayor's Transport Strategy. It sets out 7 objectives, many of which would be strongly supported by Tunnel Options 1 and 5. These are set out below:</p> <ul style="list-style-type: none"> • Objective 1. Support sustainable population and employment growth in the five regeneration areas - White City Opportunity Area, North Fulham Regeneration Area, Hammersmith Town and Riverside, South Fulham Riverside and Old Oak Common and Hythe Road area. • Objective 2. Improve the efficiency of our road network • Objective 3. Improve the quality of our streets • Objective 4. Improve air quality in the borough • Objective 5. Make it easier for everyone to gain access to transport opportunities • Objective 7. Reduce the number of people injured and killed on our streets
A40 Tunnel Scheme	<p>The objectives set out in the LB of Hammersmith & Fulham's LIP strongly align with the benefits provided from a tunnel scheme on the A40. Specifically, tunnel option 5 would support sustainable population and employment growth in the White City Opportunity Area by improved accessibility in light of the Westway being removed and surface restored. The tunnel schemes also support objectives 2-5 and 7.</p>
Westminster City Council	
Development (Core) Strategy	
Strategic Objectives	<p>The Core Strategy sets out a number of strategic objectives and policies which seek to deliver the Borough's vision of a vibrant, sustainable and inclusive community by 2026. The Core Strategy notes, "The North Westminster Economic Development Area as a whole suffers from the physical severance and environmental impacts of the major roads, railway lines and canals. The Westway, an elevated section of the A40, Harrow Road and the railway are significant barriers to enabling people to move between neighbourhoods to access work, services and open space. These transport routes are a source of significant noise and air pollution and have a negative impact on the health of residents and workers, and also on people's perceptions of the area. They restrict social and physical activity and inhibit the overall regeneration of the area".</p>
A40 Tunnel Scheme	<p>The physical severance caused by the Westway is a key concern for WCC. Tunnel option 5 would help knock down this barrier and restore accessibility to employment within the North Westminster Economic Development Area. In addition, the noise and air quality issues associated with the Westway would also be alleviated through the delivery of tunnel option 5 as vehicular traffic would be diverted below ground.</p>

Local Implementation Plan	
Transport objectives	<p>This document sets out the borough's plans for implementing the Mayor's Transport Strategy. It sets out 7 objectives, many of which would be strongly supported by Tunnel Options 1 and 5. These are set out below:</p> <ul style="list-style-type: none"> • Objective 1 - Supporting economic development and growth • Objective 2 - Improving safety and security for all road users • Objective 3 - Minimising impact of transport on the environment • Objective 4 - Prioritising pedestrians and effectively managing allocation of highway space • Objective 5 - Promoting healthier lifestyles and ensuring inclusivity • Objective 6 - Improving efficiency and attractiveness of sustainable transport • Objective 7 - Pay for your impact principle
A40 Tunnel Scheme	<p>An A40 tunnel scheme (Tunnel Option 5) would significantly help support economic development and growth. By removing the Westway, land would be opened up for residential and commercial sites. Furthermore, the impact that the Westway has on the environment with regards to noise and air quality issues would be eradicated. This would in turn facilitate healthier lifestyles as more sustainable modes of transport become more appealing for local trips.</p>
London Borough of Kensington and Chelsea	
Development (Core) Strategy	
Strategic Objectives	No comment
A40 Tunnel Scheme	No comment
Local Implementation Plan	
Transport objectives	<p>This document sets out the borough's plans for implementing the Mayor's Transport Strategy. It sets out 8 objectives, many of which would be strongly supported by Tunnel Options 1 and 5. These are set out below:</p> <ul style="list-style-type: none"> • Objective 1 - Improve accessibility to places and services, especially for those with special mobility needs • Objective 2 - Make it easier for residents to choose walking, cycling and public transport over private car ownership and use • Objective 3 - Improve the quality, reliability and inclusivity of public transport • Objective 4 - Reduce transport - related air pollution and carbon dioxide emissions • Objective 5 - Manage on-street parking and loading to achieve a better balance between the competing demands on kerb-side space • Objective 6 - Improve journey time reliability for all road users • Objective 7 - Improve the appearance and efficiency of our streets and places, and make them inclusive for all • Objective 8 - Reduce the number and severity of road accident casualties
A40 Tunnel Scheme	<p>Tunnel option 5 would deliver a variety of benefits, some of which align with the objectives set out above. Specifically, improved accessibility would be delivered, easier local trips would be facilitated and the quality of public transport trips would be improved.</p>

Key Finding:

The tunnel schemes would make a positive contribution to the majority of objectives set out in the relevant local planning documents of the various planning authorities.

Stakeholders

There are a number of key stakeholders who have an interest in the project

2.385. Table 18 outlines the main stakeholder groups that will be involved with or interested in the project.

Table 18: Summary of main stakeholder groups

Stakeholder	Description
Affected boroughs: LB Westminster LB Kensington & Chelsea LB Hammersmith & Fulham LB Ealing	<ul style="list-style-type: none"> Local authority, protecting interests of residents and local businesses Responsible for design review/approvals, and reviewing the impact on local residents Responsible for wider development activities.
Borough councillors and MPs	<ul style="list-style-type: none"> Protecting policy and constituent interests
Greater London Authority (GLA)	<ul style="list-style-type: none"> Statutory planning authority, protecting interests of Londoners and policy interest
Deputy Mayor for Transport	<ul style="list-style-type: none"> Providing policy advice and direction, setting priorities and taking decisions relating to transport issues on behalf of the Mayor
HM Treasury	<ul style="list-style-type: none"> Maintaining control over public spending, setting the direction of economic policy
Department for Transport (DfT)	<ul style="list-style-type: none"> Setting national policy for transport
Other TfL Projects	<ul style="list-style-type: none"> Interests with other TfL projects in the local area, ensuring that interdependencies are managed effectively and project delivery is not compromised.
Local Communities	<ul style="list-style-type: none"> Local interest in scheme benefits and impacts

2.386. To date, TfL has engaged the local Borough's of Ealing, Hammersmith & Fulham and other TfL project teams in the development of the scheme. There will be ongoing liaison with these stakeholders and others identified in the above table as the project progresses. As the programme advances, the stakeholders engaged are likely to expand considerably, including the public. Accordingly, the Stakeholder Management Plan is subject to ongoing review.

STRATEGIC CASE SUMMARY

2.387. The key points arising from the Strategic Case can be summarised as:

- London is a key driver of the UK's economic growth. Its success benefits the UK as a whole, but this cannot be taken for granted
- Central London's future employment growth depends on having an increased labour supply, but the city faces significant housing and space pressures, exacerbated by a growing population,
- London must unlock more development opportunities to support delivery of new housing and jobs
- There has been extensive recent investment in rail public transport, but similar levels of investment have not been made to the road network in London
- The A40 supports west London, a key area of London's future growth with the Old oak Common development
- But the A40 causes severance, noise, air pollution, is regularly congested and is being asked to perform too many functions – arterial and community – within the Hanger lane cordon
- There is an urgent need to upgrade the urban environment, but in a way that does not compromise the A40's ability to support London's economy
- Of the eight options examined, options 1 and 5 offer the best performance against the objectives and policy framework at all levels; but affordability is a factor and will need to be worked in later versions of this business case.

3. The Economic Case

Section summary:

This section outlines the economic analysis regarding the decking scheme. In line with WebTAG guidance, cost-benefit analysis has been undertaken to assess the scheme's value for money in transport terms. This has been carried out with TUBA, a DfT modelling appraisal tool.

Over the appraisal period using the DfT's national Values of Time (VoT), the present value of benefits (PVB) relating to the provision of the A40 tunnel options are - £37,181,000 for Tunnel Option 1, -£133,363,000 for Tunnel Option 4 and - £145,958,000 for Option 5. The PVB for the Grade-separated option is -£3.153m.

The BCRs for the A40 tunnel options are -0.061 for Tunnel Option 1, -0.059 for Tunnel Option 4, -0.158 for tunnel Option 5 and -0.013 for the grade separated option.

Based on these values of time, the scheme would represent "poor" value for money. However this doesn't account for the wider regeneration and strategic benefits that this development would unlock for London. The BCR is therefore not sufficient on its own to judge the merits of the scheme.

Options Appraised

- 3.1. A number of options were modelled using the 2031 London Highway Assignment Model (LoHAM).
- 3.2. The three incremental improvement options that have been modelled (as part of Work Package 2) are:
 - At-Grade Option – amendments to the existing junction layouts;
 - Grade Separated Option – amendments to the existing junction layouts and the provision of underpasses for traffic on the A40; and
 - Hybrid Option – Grade separated option at Hanger Lane, at-grade at Gypsy Corner and minor amendments to accommodate a cycle network at Savoy Circus.
- 3.3. The four tunnel options that have been modelled (as part of Work Package 3) are:
 - Tunnel Option 1 – a bi-directional tunnel with a western portal between Hanger Lane and Gypsy Corner and eastern portals between Savoy Circus and Wood Lane;
 - Tunnel Option 2A – a westbound tunnel only with a western portal between Hanger Lane and Gypsy Corner and an eastern portal between Savoy Circus and Wood Lane;
 - Tunnel Option 4 – a bi-directional tunnel with a western portal between Hanger Lane and Gypsy Corner and an eastern portal at Edgware Road. Spur tunnels link to West Cross Route. Portal located on West Cross Route south of the existing

roundabout with the A40; and

- Tunnel Option 5 – a bi-directional tunnel with a western portal between Savoy Circus and Wood Lane and an eastern portal at Edgware Road.
- 3.4. As this business case is focussed on appraisal of the more strongly performing tunnel options, the results of economic appraisal of Tunnel Options 1 and 5 are presented here. [Scheme Costs](#)
- 3.5. The scheme costs for tunnel options 1 and 5 and have been defined below in Table 19. All option costs are introduced in 2031 in a single year. The costs have been uplifted to a 2031 implementation year, then discounted to 2010 prices as required by TUBA and prescribed in the WebTAG Green Book.
- 3.6. Option costs for the Grade separated option represent the combined costings for works at each of the junctions and include a 44% optimism bias for at-grade works, and 66% optimism bias for new fly-unders.
- 3.7. Option costs for Tunnel Options 1, 4 and 5 include a 66% optimism bias.

Table 19: Option Costs used in TUBA assessments

Option	2016 Cost (£m)	2010 Cost (£m)
Tunnel Option 1	£1,080	£875
Tunnel Option 5	£1,636	£1,326
Grade Separated Option	£420	£340

- 3.8. No costs of amending the layouts at surface junctions have been included in the scheme costs as some would rely on the removal of the elevated section of the A40 the cost of which cannot be quantified at this stage. It is acknowledged that excluding these costs from the assessments may impact the results slightly, but as these costs would be a small percentage of the total costs of Options 4 and 5, it is believed the results would only vary slightly. Option 4 and 5 costs have also not included any costs associated with the proposed East West Cycle Superhighway running parallel to, and on, sections of the A40 Westway, which at the time of writing, is not being pursued by the current Mayor.
- 3.9. All scheme costs do not include costs associated with the compulsory purchase of land and property (temporary and permanent) or any costs associated with relocating businesses or residents along the A40 corridor. Costs of surface works on the A40 to complement the introduction of tunnels in WP3 are also excluded.

Modelling approach and assumptions

DfT transport appraisal guidance (WebTAG) has been followed for all sections of this report

- 3.10. A cost-benefit analysis has been undertaken to assess the value for money of the A40 tunnel options 1 and 5 and also of the WP2 Grade Separated Option (as this represents a potential alternative to tunnel option 1). For each of these options,

the monetised benefits are weighed against the costs of the scheme to form a Benefit to Cost ratio which quantifies the benefit received to the economy for every £1 invested in the scheme.

- 3.11. TUBA is a DfT modelling appraisal tool used to compute an appraisal of road transport schemes. Comparing the base (or do nothing scenario) to the scheme, TUBA assesses the difference in costs and travel time by journey purpose as well as change in fuel costs and CO₂ emissions. The demand matrices used for this analysis are consistent with the LTS forecasts of transport growth, which assumes zero percentage growth in traffic.
- 3.12. LoHAM is a very large highway only assignment model with 5,194 zones. The model outputs are too large to be included directly in a TUBA analysis.
- 3.13. Therefore, there was a need to cordon out the model to the core area of influence, using Option 4 (which out of all the options is assumed would generate the widest impacts).
- 3.14. To provide consistency across the economic assessments, one area was used for all economic assessments. Due to the size of LoHAM, the impacts were assessed on a proportionate scale and sense checks undertaken on the results to determine if the impacts seen were a result of Tunnel Option 4, or simply “model noise”.
- 3.15. The cordon area encompasses the A40 from its junction with the M40/M25, all the way into Marylebone Road. The cordon area is broadly defined by the River Thames, A316, M3, M25 and M1. All of these major routes are included within the cordon to ensure any wider strategic impacts of the A40 tunnel options are included.
- 3.16. Following cordon definition, zones outside the cordon area were amalgamated to ensure all trips were correctly assessed. Using a standard process within SATURN, a cordon file was created which reduced the very large matrix in SATURN into a smaller matrix which reflected journeys through the cordon area. The main matrix was also skimmed, which produced route, time and cost outputs which are compatible with TUBA.
- 3.17. WebTAG also outlines approaches to the social and environmental aspects of an appraisal. This includes aspects such as severance, journey quality noise and air quality. This economic analysis focuses on severance as this impact is deemed to be the most important.

TUBA Analysis

- 3.18. This section explores both road user and non-road user benefits of four of the seven options (tunnel options 1, 4 and 5, and the grade separated option) in terms of travel time savings. TUBA is the main economic appraisal software for transport schemes. It is compliant with DfT’s WebTAG by implementing a willingness-to-pay approach to economic appraisal for multi-modal schemes with a fixed or variable demand. The TUBA analysis does not take into consideration the wider, non-transport related benefits of the scheme. The BCRs resulting from the analysis does not reflect housing delivery or commercial development benefits, which are the scheme’s primary objectives.

3.19. Assumptions for the A40 tunnel scheme are as follows:

- Scheme opening year: 2031
- 60 year appraisal period
- Model year: 2031
- Modelled periods: AM, IP and PM peaks
- Price base and base year for discounting: 2010
- Discount rate 3.5% for 30 years from current year, then 3% thereafter
- Road demand growth: 0% in line with TfL LTS low-car scenario

Tunnel Option 1: TUBA Results

3.20. The Results of the TUBA analysis for tunnel option 1 are shown in Table 20.

3.21. This TUBA assessment focuses on journey time benefits which are predominantly negative in Tunnel Option 1. However It should be acknowledged that a full economic assessment would consider other factors, such as accident savings, which may impact positively on the BCR.

3.22. DfT WebTAG Values of Time (VoT) have been used to calculate the monetary benefits of time savings.

3.23. A BCR of one to one (1:1) shows a project 'break-even' point where for every £1 invested in the scheme, there are £1 benefits received from the scheme. Therefore any BCR above one shows value for money in terms of receiving higher benefit for every £1 of invested cost.

Table 20: TUBA headline results of appraisal of tunnel Option 1

	2010 prices and values (£'000s) DfT VoT
Economic Efficiency: Consumer Users (Commuting)	-6,673
Economic Efficiency: Consumer Users (Other)	-13,959
Economic Efficiency: Business Users and Providers	-17,730
Wider Public Finances (Indirect Taxation Revenues)	1589
Greenhouse Gases	-408
Present Value Benefits (PVB) ²³	-37,181
Present Value Costs (PVC)	612,342
Net Present Value (NPV)	-649,523
Benefit Cost Ratio (BCR)	-0.061

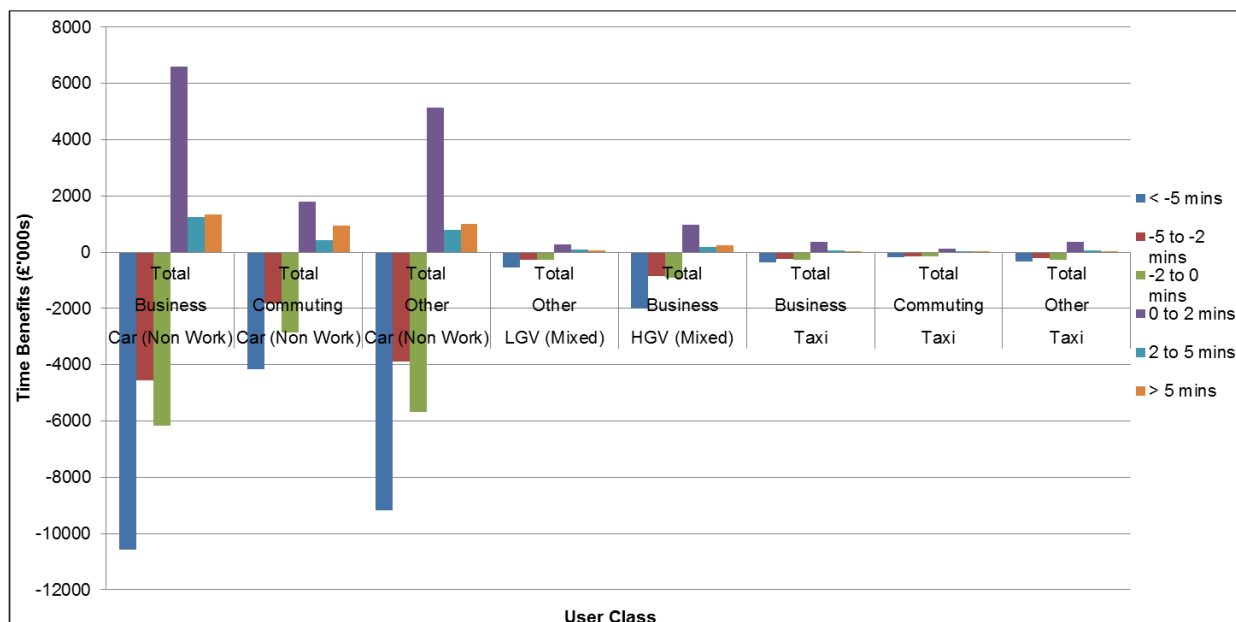
- 3.24. The Present value of benefits (PVB) is estimated to be -£37m in 2010 prices and the Present value costs (PVC) is expected to be £612m.
- 3.25. Breaking down the PVB for Option 1 by trip purpose, the main dis-benefits of the option are experienced by business users (46%) then other (36%). Breaking down the PVB by time period indicates a higher disbenefit for the PM peak period which represents 40% of the total dis-benefits by time period. This is followed by the IP (36%) and AM peak (24%). The majority of dis-benefits (84%) are accrued to cars followed by HGVs (9%).
- 3.26. Option 1 has a BCR of -0.06 : 1 (using DfT VoT) which suggests that this tunnel option is “poor” value for money. Tunnel Option 1 introduces a lot of re-routing and increased delays at surface junctions, the negative BCR is to be expected as the benefits of the tunnel are offset by the delays at surface junctions.
- 3.27. This BCR excludes wider benefits such as the addition of new homes and commercial floorspace, which are an important part of the A40 corridor tunnel proposals. Therefore the scheme should not be judged on the BCR alone.
- 3.28. The TUBA results for Option 1 can be analysed in terms of the distribution of time saved. The distribution of monetised benefits/ disbenefits from changes in journey time per trip is displayed in Figure 54.

²³ Greenhouse gas emission benefits and costs have been excluded from the PVB as WEBTAG Unit A3. Environmental Impact Appraisal requires that all 8760 hours of the year are represented in the analysis. The traffic modelling undertaken models a one hour time slice in each of the AM, IP and PM weekday peak periods.



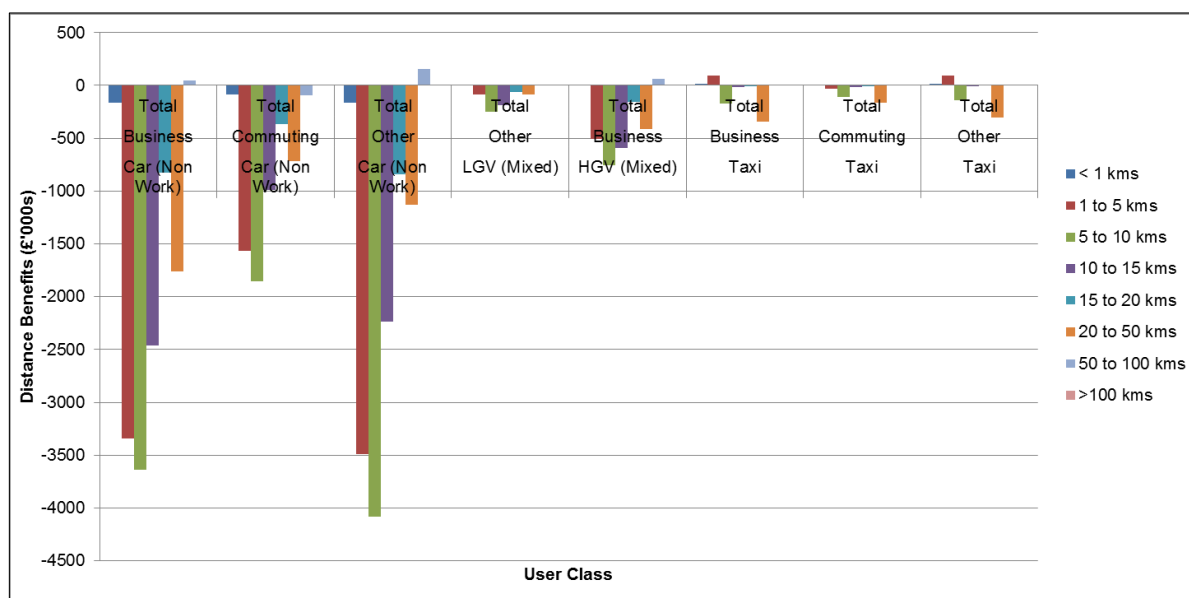
- 3.29. It shows that that the largest dis-benefits are experienced by business car trips and other car trips, which would experience journeys that were over 5 minutes longer. Positive time benefits are experienced mostly by business car trips and other car trips with the majority of these being for journeys where up to two minutes are saved. For each user class, the value of the disbenefits of longer journey times outweighs the value of reduced journey times.

Figure 54: Distribution of monetised time benefits/ disbenefits by user class - tunnel Option I



- 3.30. Figure 55 shows the distribution of monetised time savings by distance travelled and user class.

Figure 55: Distribution of monetised distance benefits/ disbenefits for each user class - tunnel Option I



- 3.31. Figure 55 highlights that there are strong disbenefits for journeys between 1 and

50 kilometres. The only benefits are modest experienced by cars on longer journeys over 50 kilometres. There are some small benefits for taxis on shorter journeys up to 5 kilometres.

Tunnel Option 5: TUBA Results

3.32. The results of the TUBA analysis for the tunnel option 5 are shown in Table 21.

Table 21: TUBA headline results of tunnel Option 5

	2010 prices and values (£'000s) DfT VoT
Economic Efficiency: Consumer Users (Commuting)	-24,308
Economic Efficiency: Consumer Users (Other)	-50,514
Economic Efficiency: Business Users and Providers	-75,025
Wider Public Finances (Indirect Taxation Revenues)	5,285
Greenhouse Gases	-1,396
Present Value Benefits (PVB) ²⁴	-145,958
Present Value Costs (PVC)	-924,172
Net Present Value (NPV)	-1,070,130
Benefit Cost Ratio (BCR)	-0.158

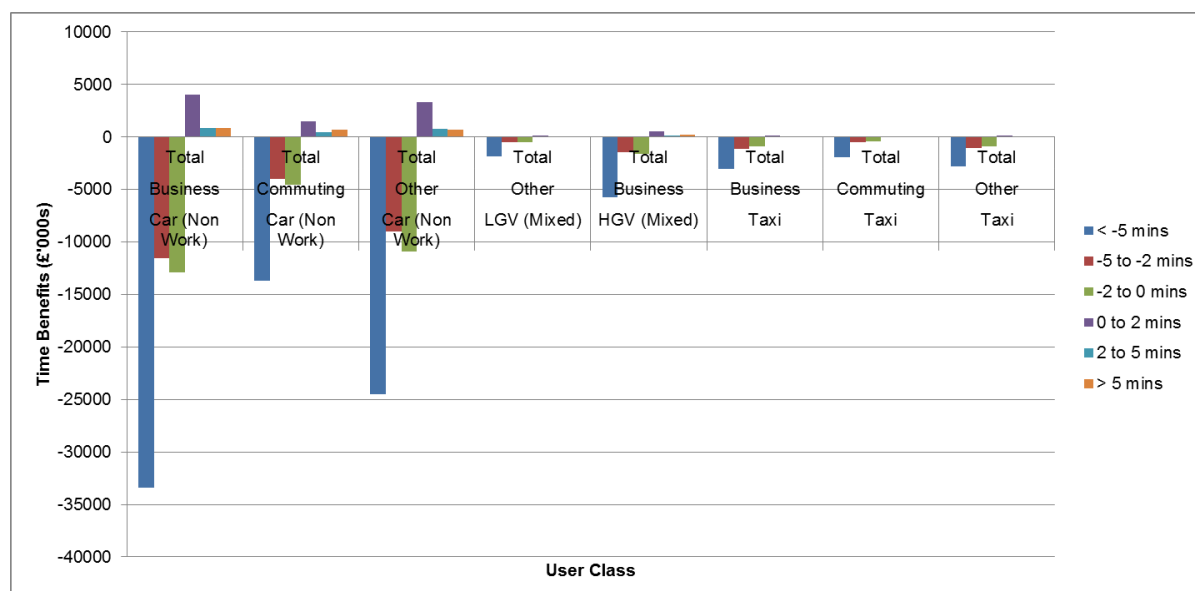
- 3.33. As with the other options, DfT WebTAG Values of Time (VoT) have been used to calculate the monetary benefits of time savings.
- 3.34. The Present value of benefits (PVB) for Option 5 is estimated to be -£146m in 2010 prices and the Present value costs (PVC) is expected to be -£924m.
- 3.35. Breaking down the PVB for Option 5 by trip purpose, the main dis-benefits of the option are experienced by business users (50%) then other (34%). Breaking down the PVB by time period indicates a higher disbenefit for the IP period which represents 43% of the total dis-benefits by time period. This is followed by the AM (29%) and AM peak (28%). The majority of dis-benefits (81%) are accrued to cars followed by Taxis (8%).
- 3.36. Option 5 has a BCR of -0.16 which suggests that the scheme is “poor” value for money. As Tunnel Option 5 introduces a lot of re-routeing and increased delays at surface junctions, the negative BCR is to be expected as the benefits of the tunnel are offset by the delays at surface junctions.

²⁴ Greenhouse gas emission benefits and costs have been excluded from the PVB as WEBTAG Unit A3. Environmental Impact Appraisal requires that all 8760 hours of the year are represented in the analysis. The traffic modelling undertaken models a one hour time slice in each of the AM, IP and PM weekday peak periods.



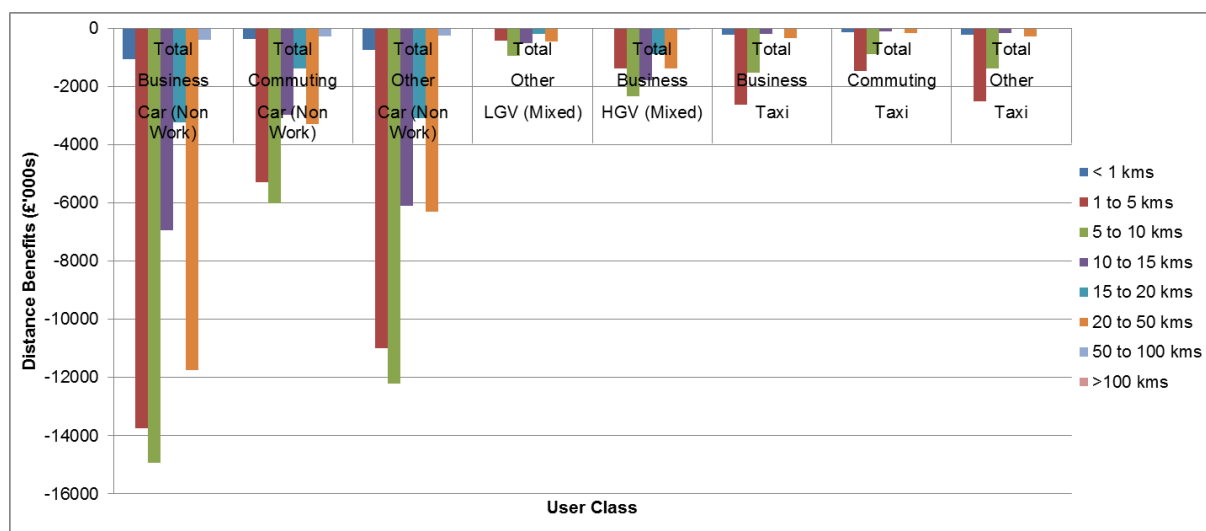
- 3.37. As per Options 1 and 4, this BCR excludes wider benefits such as the addition of new homes and commercial floorspace, which are an important part of the A40 corridor tunnel proposals. Therefore the scheme should not be judged on the BCR alone.
- 3.38. The TUBA results can be analysed in terms of the distribution of time saved. The distribution of time savings by time saved per trip is displayed in Figure 56.

Figure 56: Distribution of monetised time benefits/ disbenefits by user class - tunnel Option 5



- 3.39. Figure 56 shows that that the largest dis-benefits for Option 5 are experienced by business car trips and other car trips, which would experience journeys that were over 5 minutes longer. Some benefits are experienced by car and HGV user classes, with the majority coming for journeys where up to two minutes are saved. For each user class, the value of disbenefits of longer journey times significantly outweigh any time benefits from reduced journey times.
- 3.40. Figure 57 shows the distribution of benefits and disbenefits by journey distance for all user classes. It highlights that there are no journey distances where benefits are delivered, with shorter journeys (between 1 and 10km) experiencing the greatest dis-benefits.

Figure 57: Distribution of monetised distance benefits/ disbenefits for each user class - tunnel Option 5



Grade Separated Option: TUBA Results

3.41. The grade separated option from WP2 represents an alternative option to Tunnel Option 1. Therefore it has been assessed in TUBA and the results set out below. Results of the TUBA analysis for the tunnel option 5 are shown in Table 22.

Table 22: TUBA headline results of Grade Separated Option

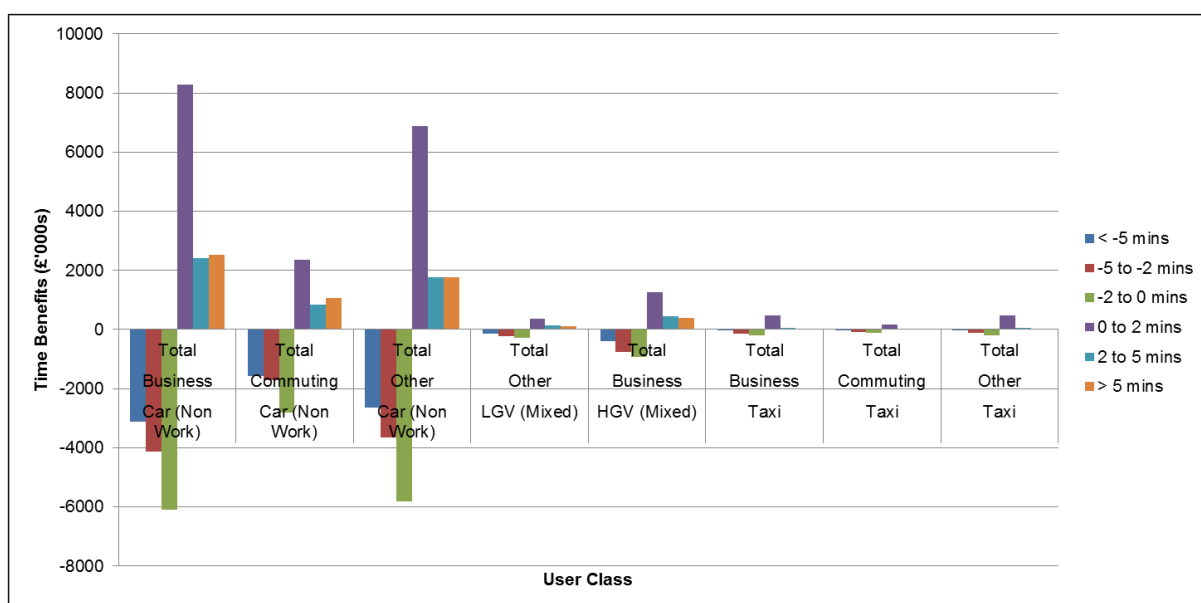
	2010 prices and values (£'000s) DfT VoT
Economic Efficiency: Consumer Users (Commuting)	-1,954
Economic Efficiency: Consumer Users (Other)	-1,735
Economic Efficiency: Business Users and Providers	327
Wider Public Finances (Indirect Taxation Revenues)	272
Greenhouse Gases	-63
Present Value Benefits (PVB) ²⁵	-3,153
Present Value Costs (PVC)	238,465
Net Present Value (NPV)	-241,618
Benefit Cost Ratio (BCR)	-0.013

²⁵ Greenhouse gas emission benefits and costs have been excluded from the PVB as WEBTAG Unit A3. Environmental Impact Appraisal requires that all 8760 hours of the year are represented in the analysis. The traffic modelling undertaken models a one hour time slice in each of the AM, IP and PM weekday peak periods.



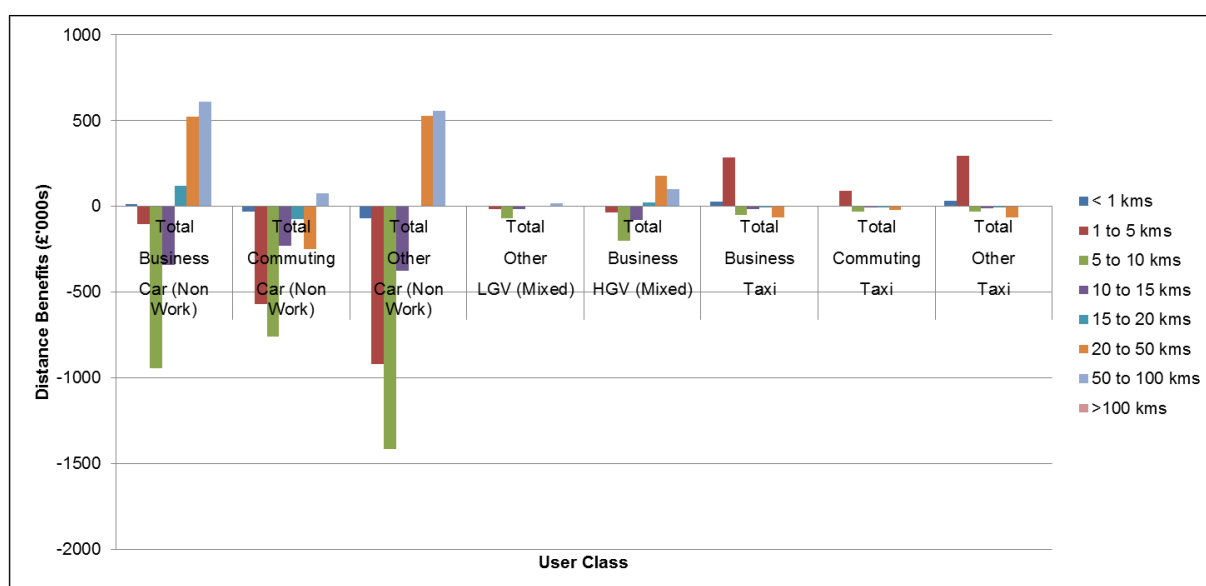
- 3.42. The grade separated option introduces a reduction in delays for users of the A40, however the delays accessing the fly-unders and delays at surface junctions appear to negate any advantages traffic may experience. The positive Wider Public Finances (Indirect Taxation Revenues) figure relates to the additional taxation the government would receive through fuel duty caused by the increase journey times and re-routing.
- 3.43. Breaking down the PVB by trip purpose, there are benefits for business users totalling £327,000, while there are dis-benefits to other users of £1,954,000 and commuters of £1,735,000. Breaking down the PVB by time period indicates that this option generates benefits in the IP periods, but these are offset by the negative impacts in the AM and PM peaks. There is a benefit for the IP period of £3,254,000 and a large disbenefit for the AM period of £6,190,000 and £426,000 in the PM peak. Dis-benefits of £3,964,000 would accrue to cars whereas benefits of £33,000 would accrue to LGVs, £135,000 to HGVs and £435,000 to taxis.
- 3.44. It can be recognized from this and Table 5 that the Grade Separated Option is the closest option to generating overall transport user benefits, as unlike the tunnel options assessed, there are some benefits recorded for business users, LGV, HGV and Taxi users, especially in the inter peak period. This indicates the options may work well outside the pressures of peak times.
- 3.45. The TUBA results can be analysed in terms of the distribution of time saved. The distribution of time savings by time saved per trip is displayed in Figure 58.
- 3.46. It details the time benefits experienced by the user classes in the model. It highlights that the main dis-benefits are experienced by cars that experience journeys measuring up to 2 additional minutes. Benefits are experienced by all user classes, with the majority coming for journeys where up to two minutes are saved. It can be observed these journey time benefits are more positive than any of the tunnel options appraised in this chapter.

Figure 58: Distribution of monetised time benefits/ disbenefits by user class – grade separated option



3.47. Figure 59 shows the distribution of benefits and disbenefits by journey distance for all user classes.

Figure 59: Distribution of monetised distance benefits/ disbenefits for each user class – grade separated option



3.48. It highlights that there are strong disbenefits for car journeys for all user classes between 1 and 15 kilometres and for commuters up to 20 kilometres. The only benefits are modest experienced by car business users and car other users on longer journeys over 20 kilometres. There are some small benefits for taxis on shorter journeys between 1 and 5 kilometres and to HGVs on longer journeys of over 20 kilometres.

Summary of TUBA benefit analyses

- 3.49. Table 23 below summarises the Present Value of Benefits and BCRs for Tunnel Options 1 and 5 and the Grade-separated option.

Table 23: Summary of PVB and BCR for Options 1, 5 and the grade separated option

Option	PVB (in £000) Discounted to 2010 prices	BCR
Tunnel Option 1	-37,181	-0.061
Tunnel Option 5	-145,958	-0.158
Grade Separated Option	-3,153	-0.013

- 3.50. The Present Value of Benefits (PVB) relating to the provision of the A40 tunnel options are -£37,181,000 for Tunnel Option 1, -£133,363,000 for Tunnel Option 4 and -£145,958,000 for Option 5. The PVB for the Grade-separated option is -£3,153,000. The BCRs for the A40 tunnel options are -0.061 for Tunnel Option 1, -0.059 for Tunnel Option 4, -0.158 for tunnel Option 5 and -0.013 for the grade separated option.
- 3.51. On this basis, the grade-separated option delivers the smallest disbenefit and least negative BCR and the Tunnel Option 5 offers the largest disbenefit and the poorest BCR.
- 3.52. However, this BCR does not include the regeneration and wider impacts of changes in land use and mixed use development brought forward by the scheme. Indeed these positive impacts and objectives of the scheme 'count against' it in this traditional transport user benefits approach to appraisal.
- 3.53. In the next section following the Appraisal Summary Tables, the housing, employment and GVA impacts of Tunnel Options 1, 4 and 5 are considered, reflecting the significant regeneration benefits and land use change brought forward by each of these options.

Appraisal Summary Tables

- 3.54. Reflecting the option assessment process which concluded that Options 1 and 5 offered the largest levels of benefits, Appraisal Summary Tables (AST) for these two options are set out overleaf.
- 3.55. The AST highlights that both options perform relatively well in qualitative assessments for Economy, Environmental and Social criteria. Specifically, the AST show that both options have largely adverse benefits with regards to economical transport user benefits, however, both options can also be regarded as a regeneration scheme and have therefore scored fairly positively in both Social and Environmental criteria.

Table 24 - Appraisal Summary Tables for A40 Tunnel Option 1

Appraisal Summary Table			Date produced:		28-Sep	2016	Contact:			
Name of scheme:		A40 RTFTunnel Option 1					Name	Geoffrey Hobbs		
Description of scheme:		This option would see delivery of twin-bore tunnels (one for each direction) with a western portal between Hanger Lane and Gypsy Corner and eastern portals between Savoy Circus and Wood Lane.					Organisation	TfL		
							Role	Business Case & Appraisal Advisor		
Impacts		Summary of key impacts		Assessment						
				Quantitative		Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp		
Economy	Business users & transport providers	The tunnel would result in significant volumes of strategic traffic re-routing onto the A40, which would increase journey times. Additional housing and employment enabled in the vicinity of the A40 will generate additional road traffic, however it is the intention that public transport improvements including the new Crossrail station at Old Oak Common will provide a sustainable alternative which will offer an attractive alternative to the private car. This will mitigate congestion impacts from the new development on journey times for existing business trips that are made on the A40 corridor and access routes to it from employment areas adjacent to the new development.	Value of journey time changes (£)		-17.7m		Large adverse	-17.7m		
			Net journey time changes (£)							
			0 to 2min	2 to 5min	> 5min					
			-12.5m	-4.2m	-1m					
	Reliability impact on Business users	The A40 tunnel scheme itself would be expected to deliver improved journey time reliability for strategic traffic using the tunnel. Through traffic using the A40 would no longer need to wait at signal controlled junctions. Additional development related highway trips would affect journey times for existing business trips that are made on the A40 corridor. The additional trips would be mitigated through public transport and highway measures funded by developers of sites along the corridor. Journey time reliability for traffic accessing the Park Royal employment area may see a more modest improvement.				Slight beneficial	N/A			
	Regeneration	The delivery of the A40 tunnel scheme would enable development along the existing A40 alignment and in the surrounding area.	The scheme will enable development of 143 new dwellings along the A40 corridor and surrounding area and support up to 193 FTE jobs in the local area.			Moderate beneficial	N/A			
	Wider Impacts	The delivery of the A40 tunnel (Option 1) would enable new development along the existing A40 corridor of 143 additional new dwellings and new commercial development. This will help to address London's housing need and the problem of housing costs increasing faster than wage rises.				Moderate beneficial	N/A			
Environmental	Noise	A reduction in both traffic volumes and congestion levels at junctions on the existing A40 alignment would result in a reduction in traffic noise levels. This would be offset by increased noise for receptors in the vicinity of both tunnel portal locations.				Neutral/ Slight adverse	tbc			
	Air Quality	A reduction in both traffic volumes and congestion levels at junctions on the existing A40 alignment would result in improvements in air quality levels.				Slight beneficial	N/A			
	Greenhouse gases	The planned additional housing and employment within Old Oak Common/ Park Royal, and on sites along the existing A40 alignment will generate additional road traffic, however it is the intention that Old Oak Common station will become a public transport interchange hub, with bus services connecting with National Rail and Crossrail services, and new development on the Westway corridor will be high density (low car) development well served by public transport. This should enable a higher mode share for public transport.	Change in non-traded carbon over 60y (CO2e)		tbc	tbc	N/A			
			Change in traded carbon over 60y (CO2e)		tbc					
	Landscape	The new A40 tunnel alignment will be in twin deep-bore tunnels, so strategic traffic removed from the surface would enable reductions in the width of the current A40 so it would have less adverse visual impacts				Neutral/ Slight beneficial	N/A			
	Townscape	The removal of strategic traffic from the A40 between Hanger Lane and Savoy Circus would encourage regeneration along the existing road corridor, which over time would enhance the townscape of this area.				Slight beneficial	N/A			
	Historic Environment	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A			
	Biodiversity	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A			
Water Environment	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A				
Social	Commuting and Other users	The A40 tunnel (option 1) would result in significant volumes of strategic traffic re-routing onto the A40, which would increase journey times. The additional housing and employment enabled at sites in the area around the corridor will generate additional road traffic, affecting journey times for existing commuter trips that are made on the A40 corridor or from existing residential areas near the A40.	Value of journey time changes (£)		-20.6m		Large adverse	-20.6m		
			Net journey time changes (£)							
			0 to 2min	2 to 5min	> 5min					
			-13.5m	-5m	-2.1m					
	Reliability impact on Commuting and Other users	The A40 tunnel (option 1) would attract significant volumes of strategic traffic from other routes, and when there is disruption or incidents affecting other routes such as the A4. This could adversely affect journey time reliability for commuters.				Slight adverse	N/A			
	Physical activity	The delivery of the A40 tunnel (option 1) would reduce the severance impact of the existing road, which may encourage higher levels of walking and cycling for local journeys in the surrounding area, for example to access the planned railway station at Old Oak Common for onward journeys by Crossrail or Overground.				Slight beneficial	N/A			
	Journey quality	The A40 tunnel scheme is estimated to have a slight beneficial impact on journey quality, as the existing A40 alignment would see older buildings and SIL land regenerated, and enable investment in the public realm along the corridor.				Slight beneficial	N/A			
	Accidents	Impacts not assessed - would be considered at later stage of scheme development.				tbc	tbc			
	Security	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A			
	Access to services	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A			
	Affordability	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A			
Severance	The A40 tunnel would enable reduction in the capacity of the existing A40 road corridor, which would enable severance to be reduced.				Neutral/ Slight beneficial	N/A				
Option and non-use values	The scheme is not expected to have option and non-use impacts.				Neutral	N/A				
Public Accounts	Cost to Broad Transport Budget						tbc			
	Indirect Tax Revenues						tbc			

Table 25 - Appraisal Summary Tables for A40 Tunnel Option 5

Appraisal Summary Table			Date produced:		28-Sep	2016	Contact:		
Name of scheme:		A40 RTF Tunnel Option 5					Name	Geoffrey Hobbs	
Description of scheme:		Deliver a bi-directional tunnel with a western portal between Savoy Circus and Wood Lane and an eastern portal at Edgware Road. This would enable the demolition of the elevated Westway section and comprehensive redevelopment of the land on this corridor and reducing the capacity on the remainder of the existing A40 alignment, which would be downgraded.					Organisation	TfL	
							Role	Business Case & Appraisal Advisor	
Impacts		Summary of key impacts		Assessment					
				Quantitative		Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp	
Economy	Business users & transport providers	The tunnel would result in significant volumes of strategic traffic re-routing onto the A40, which would increase journey times. Additional housing and employment enabled in the vicinity of the A40 will generate additional road traffic, however it is the intention that public transport improvements including the new Crossrail station at Old Oak Common will provide a sustainable alternative which will offer an attractive alternative to the private car. This will mitigate congestion impacts from the new development on journey times for existing business trips that are made on the A40 corridor and access routes to it from employment areas adjacent to the new development.		Value of journey time changes (£)		-75m	Large adverse	-75m	
				Net journey time changes (£)					
				0 to 2min	2 to 5min	> 5min			
				-45m	-17m	-13m			
	Reliability impact on Business users	The A40 tunnel scheme itself would be expected to deliver improved journey time reliability for strategic traffic using the tunnel. Through traffic using the A40 would no longer need to wait at signal controlled junctions. Additional development related highway trips would affect journey times for existing business trips that are made on the A40 corridor. The additional trips would be mitigated through public transport and highway measures funded by developers of sites along the corridor. Journey time reliability for traffic accessing the Park Royal employment area may see a more modest improvement.				Slight beneficial	N/A		
Regeneration	The delivery of the A40 tunnel (option 5) would enable development along the existing A40 alignment, and would enable significant amounts of redevelopment of land on and around the Westway elevated section in particular - once this section was demolished.	The scheme will enable development of 333 new dwellings along the A40 corridor and surrounding area and support up to 386 FTE jobs in the local area.			Moderate beneficial	N/A			
Wider Impacts	The delivery of the A40 tunnel (Option 5) would enable new development along the existing A40 corridor of 333 additional new dwellings and new commercial development. This will help to address London's housing need and the problem of housing costs increasing faster than wage rises.				Moderate beneficial	N/A			
Environmental	Noise	A reduction in both traffic volumes and congestion levels at junctions on the existing A40 alignment would result in a reduction in traffic noise levels. This would be offset by increased noise for receptors in the vicinity of both tunnel portal locations.				Neutral/ Slight adverse	tbc		
	Air Quality	A reduction in both traffic volumes and congestion levels at junctions on the existing A40 alignment would result in improvements in air quality levels.				Slight beneficial	N/A		
	Greenhouse gases	The planned additional housing and employment within Old Oak Common/ Park Royal, and on sites along the existing A40 alignment will generate additional road traffic, however it is the intention that Old Oak Common station will become a public transport interchange hub, with bus services connecting with National Rail and Crossrail services, and new development on the Westway corridor will be high density (low car) development well served by public transport. This should enable a higher mode share for public transport.		Change in non-traded carbon over 60y (CO2e)		tbc	Slight beneficial	N/A	
				Change in traded carbon over 60y (CO2e)		tbc			
	Landscape	The proposed new A40 option 5 tunnel alignment will be in twin deep-bore tunnels, so strategic traffic removed from the surface would enable reductions in the width of the current A40 so it would have less adverse visual impacts, and the demolition of the elevated Westway section reducing its' impact on the landscape.				Neutral/ Slight beneficial	N/A		
	Townscape	In the vicinity of the Westway, the demolition of the elevated section would significantly enhance the townscape of this area. The current townscape along much of the A40 west of Savoy Circus is not of high quality. Over time, regeneration activity would result in an improved visual impact.				Slight beneficial	N/A		
	Historic Environment	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A		
	Biodiversity	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A		
Water Environment	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A			
Social	Commuting and Other users	The tunnel (Option 5) would result in significant volumes of strategic traffic re-routing onto the A40, which would increase journey times. The additional housing and employment enabled at sites in the area around the corridor will generate additional road traffic, affecting journey times for existing commuter trips that are made on the A40 corridor or from existing residential areas near the A40.		Value of journey time changes (£)		-74.8m	Large adverse	-74.8m	
				Net journey time changes (£)					
				0 to 2min	2 to 5min	> 5min			
				-48m	-15.3m	-11.5m			
	Reliability impact on Commuting and Other users	The A40 tunnel would attract significant volumes of strategic traffic from other routes, and when there is disruption or incidents affecting other routes such as the A4. This could adversely affect journey time reliability for commuters.				Slight adverse	N/A		
	Physical activity	The delivery of the A40 tunnel would reduce the severance impact of the existing road, which may encourage higher levels of walking and cycling for local journeys in the surrounding area, for example to access the planned railway station at Old Oak Common for onward journeys by Crossrail or Overground.				Slight beneficial	N/A		
	Journey quality	The A40 tunnel (option 5) is estimated to have a slight beneficial impact on journey quality, as the existing A40 alignment would see older buildings and SIL land regenerated, and enable investment in the public realm along the corridor.				Slight beneficial	N/A		
	Accidents	Impacts not assessed - would be considered at later stage of scheme development.				tbc	tbc		
	Security	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A		
	Access to services	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A		
	Affordability	Impacts not assessed - would be considered at later stage of scheme development.				tbc	N/A		
Severance	The A40 tunnel would enable reduction in the capacity of the existing A40 road corridor, which would enable severance to be reduced, particularly at the former Westway section				Neutral/ Slight beneficial	N/A			
Option and non-use values	The scheme is not expected to have option and non-use impacts.				Neutral	N/A			
Public Accounts	Cost to Broad Transport Budget						tbc		
	Indirect Tax Revenues						tbc		

Supplementary Analysis – Net Additional Homes, Jobs and GVA unlocked

- 3.56. This section sets out the methodology and results of an approach which has been developed by TfL to assess the value of the additional jobs and houses that would be unlocked by the tunnel scheme which covers the length of the A40 – from Hangar Lane Gyratory to the Edgware Road junction.
- 3.57. This section presents an overview of the additionality approach and its results. In order to maintain clarity, technical details are omitted here.

This approach has been developed to address a number of recommendations made in the TIEP report

- 3.58. This approach has been developed in light of emerging research, advice and discussion on the economic impacts of transport schemes, and in particular to fulfil some of the recommendations of the “Transport investment and economic performance” (TIEP)²⁶ report, commissioned by the Department for Transport (DfT) and published in October 2014.
- 3.59. The authors of the TIEP report sought to examine the “impacts of transport investments on economic performance with a view to informing the appraisal techniques that are used in project selection.”²⁷ Their final recommendations will inform revisions of the DfT WebTAG appraisal guidelines on Wider Impacts and Dependent Development (Tag Units A2.1 and A2.3) set to be released in May 2016²⁸.
- 3.60. TfL has developed this approach to specifically address 3 of the 7 recommendations of the TIEP report²⁹:

- i. Appraisal of larger projects should direct more attention to impacts on private sector investment decisions and associated changes in employment and economic activity.
- ii. Land-use change (and more general changes in the level and spatial distribution of private investment) should be estimated and reported in a wider range of projects.
- iii. In some circumstances it will be appropriate to produce estimates for a range of different scenarios concerning private sector responses and related government policies.

²⁶ ‘Transport investment and economic performance’, Venables, Laird & Overman (2014). URL: <https://www.gov.uk/government/publications/transport-investment-and-economic-performance-tiep-report>

²⁷ Ibid, p. 9

²⁸ As outlined in ‘Understanding and valuing the impacts of transport investment: progress report (Dec 2014)’, Department for Transport (2014). URL: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/389960/understanding-and-valuing-the-impacts-of-transport-investment-progress-report-2014.pdf

²⁹ Venables et al. (2014): pp. 62-63



The approach to calculation of net additional homes and jobs and GVA impacts is in line with Government guidance.

- 3.61. As a framework, this approach follows published guidance³⁰ from the Homes and Communities Agency (HCA), and is consistent with both the HM Treasury 'Green Book'³¹ and the '3Rs'³² guidance published by the Department for Communities and Local Government (DCLG). In addition, Professor Peter Tyler, lead author of research into additionality for DCLG³³ and the Department of Business, Innovation and Skills (BIS)³⁴, has advised TfL throughout the development process.
- 3.62. '**Additionality**' is defined as "the net changes that are brought about over and above what would take place anyway."³⁵
- 3.63. This approach has been developed to estimate:
- i. **Jobs**: the number of additional jobs unlocked by the scheme
 - ii. **Homes**: the number of additional homes unlocked by the scheme
 - iii. **GVA**: the value of the additional jobs unlocked by the scheme, in Gross Value Added (GVA) to London
- 3.64. It is important to note that the estimates presented in this section are assessments of additional impact at the regional (London) level. They represent the additional impact of the scheme across London; although it is important to consider possible scheme impacts outside London, they have not been included in the additionality results.
- 3.65. Draft Wider Economic Impact (WEI) guidance published in September 2016 (Unit A2.2 of WebTag) suggests that net national calculations be undertaken alongside regional calculations of additionality. This would be carried out at a later stage of scheme development. The methodology for calculation used here differs from that recommended in the draft guidance as the guidance had not been produced when this was assessed. The recommended approach will be followed at the next stage of the scheme appraisal.

³⁰ 'Additionality Guide' 4th ed., Homes and Communities Agency (2014). URL:

https://cfg.homesandcommunities.co.uk/sites/default/files/aboutus/additionality_guide_2014_full.pdf

³¹ 'The Green Book: appraisal and evaluation in central government', HM Treasury (2003, updated 2013). URL:

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

³² 'Assessing the impacts of spatial interventions: regeneration, renewal and regional development', Office of the Deputy Prime Minister (2004). URL:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191509/Regeneration_renewal_and_regional_development.pdf

³³ 'Valuing the benefits of regeneration', Tyler et al. (2010). URL:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6382/1795633.pdf

³⁴ 'Research to improve the assessment of additionality', Tyler et al. (2009). URL:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191512/Research_to_improve_the_assessment_of_additionality.pdf

³⁵ HCA (2014): p. 3

3.66. The key components of the methodology include the following:

Direct effects – an estimate of the overall impact of implementing a scheme, including immediate, consequential, and induced effects

Leakage effects – an estimate of the effects on those outside of the target area. These should be deducted from the direct effects at the assumed proportion of leakage for each case.

Displacement effects – an estimate of those impacts that are transferred from elsewhere within the target area. These should be deducted from the direct effects at the assumed proportion of displacement for each case.

Multiplier effects – activity associated with additional local income, local supplier purchases and longer term development, such as through supply chains and expenditure on other activity. These need to be added to the direct effects.

3.67. For the A40 tunnel scheme, the following options were assessed for additional impact:

- i. **Reference case (or ‘deadweight’)** – anticipated development arising across the area of study in absence of an A40 tunnel option. Assumes that certain other key infrastructure projects are delivered, for example HS2 Old Oak Common station and Acton Mainline station upgrade for Crossrail;
- ii. **Intervention Case: Tunnel Option 1** – a bi-directional tunnel with a western portal between Hanger Lane and Gypsy Corner and eastern portals between Savoy Circus and Wood Lane;
- iii. **Intervention Case: Tunnel Option 5** – a bi-directional tunnel with a western portal between Savoy Circus and Wood Lane and an eastern portal at Edgware Road.
- iv. These intervention options assume a scheme opening year of 2031. (AECOM figures have phased commercial and residential development from 2021 to after 2036. Therefore the additionality model assumes this phasing. An appraisal period of 5 years is used in line with new WebTAG guidance – Section A2; Wider Economic Impacts, 2016.)

3.68. The employment impacts of a scheme are the sum of direct and indirect effects. Indirect employment effects, a product of the additional housing unlocked by the scheme, can be identified through two separate effects:

Enhanced connectivity

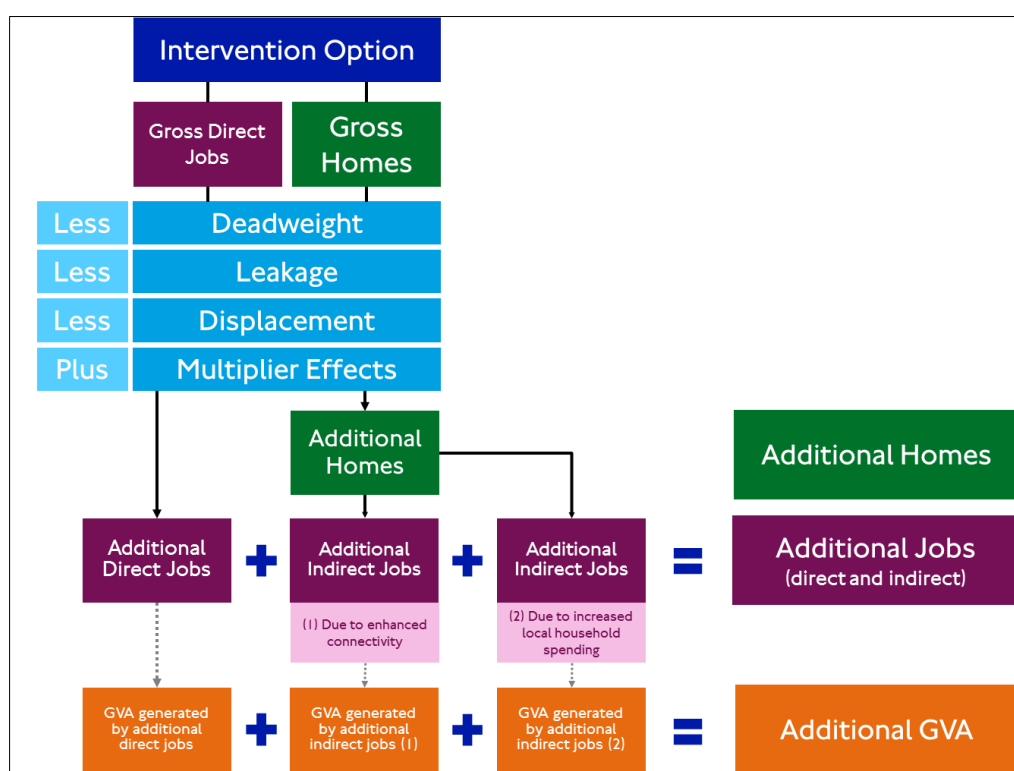
- i. In areas where there is a relatively high demand for housing – e.g. most of London – the lack of new housing constrains the ability to generate higher employment densities than currently available. Therefore additional housing unlocked by a transport scheme provides dynamic benefits by enabling households to relocate closer to employment centres, or to enhanced transport links to access jobs. In line with research undertaken for DCLG36, it is assumed that 25% of additional

housing generates additional indirect employment. For London, this is probably a conservative assumption.

Increased local household spending

- i. Additional housing generates indirect jobs as a result of new households' spending on community, leisure and retail services in the local economy. A GLA Economics working paper³⁷ suggests that in areas of poor transport connectivity 171 jobs are created for every 1,000 additional homes provided.
- 3.69. The value of the additional jobs unlocked by the scheme is assessed individually for each type of employment effect:
- i. GVA generated by additional direct jobs;
 - ii. GVA generated by additional indirect jobs sustained by additional housing (due to enhanced connectivity); and
 - iii. GVA generated by additional indirect jobs sustained by additional housing (due to increased local household spending).
- 3.70. The overall methodology of the approach is summarised in Figure 60:

Figure 60: Summary of TfL Additionality Approach



The A40 tunnel scheme would help to deliver new housing, jobs and GVA in the area

³⁷ More residents, more jobs? 2015 update The relationship between population, employment and accessibility in London - <https://www.london.gov.uk/sites/default/files/working-paper-71.pdf>

3.71. The results of the additionality approach, presented for each assessed intervention option, are summarised in

3.72. Table 26, below:

Table 26: Summary of additional impacts of the A40 scheme (at London level)

Development and regeneration benefits of the tunnel option ³⁸	Option 1	Option 5
Net Additional homes – London level	209	5,845
Net Additional jobs (direct and indirect) – London level	1,148	5,810
GVA generated by additional jobs (direct and indirect) (£m PV)	41	72

3.73. When deadweight, leakage and displacement effects are considered, Option 1 would enable delivery of 209 net additional dwellings at the London-level, then Option 4 would enable 6,056 additional dwellings and Option 5 would enable 5,845 additional dwellings. When deadweight, displacement and multiplier effects are considered, the net additional employment that Option 1 would enable 1,148 additional jobs to be created, Option 4 would enable 7,103 additional jobs to be created and Option 5 would enable 5,810 jobs to be created (direct and indirect). Alongside the indirect employment associated with this housing, this would generate a net additional GVA of £41m (Option 1), or £113m (Option 4) or £72m (Option 5) at the London level.

3.74. However, given that housing market constraints in London are very different to other parts of the UK, following the additionality guidance and assuming that 50% of housing displaces housing delivery elsewhere is a conservative assumption. This is not reflective of reality in the London context, where there is an acute shortage of homes in part due to limited numbers of viable development sites, so it could reasonably be argued that the full 209 to 5,845 new housing units that would be enabled in the vicinity of the A40 corridor and surrounding area are genuinely net additional.

Next stages of development

3.75. The core aims of the Road Task Force (RTF) include improving the quality of the city's public realm and transforming the environment for cycling, walking and public transport. In recent years, exciting new places for city life have been created that deliver high quality cycling networks and re-imagined streets with a

³⁸ These figures are developed by looking at the individual residential and commercial development in each of the surrounding boroughs; Brent, Ealing, Hammersmith and Fulham, Kensington and Chelsea, and The City of Westminster. Some of the development sites cross borough boundaries. Therefore there is likely to be double counting of the development figures. If the business case is progressed, further analysis will be done to provide more accurate development figures.



safer, cleaner and greener walking environment. Public realm investments can enhance connectivity, attract more tourism and reduce severance amongst communities. Making cities more walkable reduces reliance on car, contributes to better health and stimulates more spending in district town centres. It is also an increasingly important strategic factor determining the competitiveness of cities.

- 3.76. Severance is defined in WebTAG unit A4.1 Section 5 as ‘the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows’. Severance is an issue where traffic flows impede pedestrian movement or when infrastructure presents a physical barrier to movement.
- 3.77. The effects on the public realm, severance and noise are not included in the current study, however, their impacts should be investigated at future stages of development.

ECONOMIC CASE SUMMARY

The key points arising from the Economic Case can therefore be summarised as:

- i. The grade-separated option delivers the smallest disbenefit and least negative BCR and the Tunnel Option 5 offers the largest disbenefit and the poorest BCR.
- ii. However, this BCR does not include the regeneration and wider impacts of changes in land use and mixed use development brought forward by the scheme. Indeed these positive impacts and objectives of the scheme ‘count against’ it in this traditional transport user benefits approach to appraisal.
- iii. The net additional homes, net additional jobs and GVA generated through both schemes are significant and shouldn’t be under looked. Option 5 for example has the potential to deliver 5,845 new homes in an area which has significantly high land value. In addition both schemes could each generate over 1,000 jobs and over £40m GVA.

4. The Financial Case

Section summary:

The Financial Case sets out the project construction and ongoing operating costs, together with sources of possible financing and funding.

- 4.1. The scheme costs for each of the options have been defined in Table 18. These are shown at 2016 prices, and also prices discounted back to the 2010 basis used in the analysis. All schemes costs have been assumed to be incurred in 2031, in a single year. The costs have been uplifted to this 2031 implementation year, and then discounted back to 2010 prices as required by TUBA. The option costs include a 66% optimism bias.
- 4.2. The option costs have also not included any costs associated with the proposed East West Cycle Super Highway running parallel to, and on, sections of the A40.
- 4.3. The option costs do not include any costs associated with land acquisition, the compulsory purchase of land and property (temporary and permanent) or any costs associated with relocating businesses or residents along the A40 corridor.

Potential sources of funding

- 4.4. An assessment has been undertaken of the potential funding sources which could support the delivery of an option and the potential scale of that funding.
- 4.5. Funding sources were identified and assessed in terms of their potential to support the capital costs associated with the construction of each option. The review considered:
 - i. Developer funding such as Community Infrastructure Levy (CIL) and Section 106 (S106); and
 - ii. Other funding sources such as business rates, road charging and stamp duty land tax (SDLT), New Homes Bonus, Road Investment Strategy, TfL Growth Fund and prudential borrowing to support Tax Incremental Finance (TIF) or Revolving Infrastructure Fund (RIF).
- 4.6. From this assessment a shortlist of funding sources which have the greatest potential to be used to fund each option was identified and the total potential gross and net funding contribution was estimated based on the development capacity determined.
 - i. Land and property value uplift were also factored into the calculation of potential funding for each option.
 - ii. The potential funding contribution was compared against the capital costs of the options, to illustrate the potential proportion of capital costs which could be met.

Construction costs and potential funding

- 4.7. A comparison of the total estimated capital cost of each option with the maximum potential funding from business rates, SDLT and road charging is set

out in Table 18 and Table 19 below. The potential revenue from CIL has not been presented here given the limited likelihood of this funding being secured to support the scheme.

- 4.8. Assuming gross funding was available to support the construction of an option, the funding shortfall would be somewhere between those of £235m and £2,540m for Options 1 and 4 respectively, as shown in Table 15.
- 4.9. Assuming net funding was available the funding shortfall would be somewhere between £682m and £3,089m for those of Options 1, as shown in.

Table 27: Option Costs used in TUBA assessments

Price Basis	Cost			
	Option 1	Option 2A	Option 4	Option 5
2016	£1,080,440,000	£978,750,000	£4,007,740,000	£1,636,985,000
2010	£875,590,000	£793,180,000	£3,247,890,000	£1,326,590,000

				5. Transport for London AECOM
A40 Area Outcome Definition and Option Development Study (Work Package 3)				

Table 28: Construction Costs of Options and Potential Level of Gross Funding³

Option	Construction Capital Cost ¹³ (£m)	Business Rates (£m)	Road Charging (£m)	SDLT (£m)	Total Funding (£m)	Difference (£m)
1	1,080	208	342	295	845	235
5	1,640	234	167	405	806	834

Summary of the Development and Funding Assessment

- 5.1. The key findings from this assessment are:
 - iv. Each of the tunnel options would impact positively upon the development opportunities of sites within their study areas. Though there are many development sites across the study areas, the majority of development opportunities fall within the area overseen by the OPDC, in White City and Paddington Opportunity Areas and Westminster.
 - v. In comparison to Option 1, Option 5 has the potential to support significantly larger amounts of dwellings and commercial floorspace, and generate larger net additional effect. The release of land associated with the A40 Westway Flyover demolition is key to this outcome.
 - vi. The gross intervention case for Option 5, is 19,500 homes and 346,000m² commercial space; Option 1, 12,300 homes and 339,000m² of commercial

space.

- 5.2. Though construction could generate adverse environmental impacts, development is likely to come forward earlier as landowners and developers seek financial returns earlier and house buyers and businesses act in anticipation of the benefits that could arise following the opening of new / improved infrastructure. This could see Option 1 deliver an additional 300 homes and 8,000m².
- 5.3. Funding sources considered to be highly suitable for supporting the delivery of a scheme were identified to be business rates, road charging and stamp duty land tax (SDLT). CIL which is paid by developers to mitigate against any adverse impacts on infrastructure, including social and community infrastructure (such as education and health) is not considered to be a likely funding source.

FINANCIAL CASE SUMMARY

- 5.4. The key points arising from the Financial Case can therefore be summarised as:

- i. Each of the tunnel options would impact positively upon the development opportunities of sites within their study areas.
- ii. The gross intervention case for Option 5, is 19,500 homes and 346,000m² commercial space; Option 1, 12,300 homes and 339,000m² of commercial space.

6. The Commercial Case

Section summary:

The Commercial Case provides details on the commercial structure, procurement approach, and accounting implications of the project.

TfL will apply its substantial experience of delivering complex highway projects to the procurement, funding and financing of the Leytonstone decking scheme. TfL will also achieve efficiencies by delivering the Leytonstone scheme within a wider programme of decking/tunnel projects. The project would support many jobs outside of London.

Procurement strategy and sourcing options

- 6.1. The scheme is being promoted by TfL and will be developed through close working with the local Boroughs which are closely engaged with the project.
- 6.2. TfL is responsible for the Transport for London Road Network (TLRN), which the A40 is part of. Changes to this key part of the road network could have an impact on the surrounding road network for which the local borough is the Highway Authority.
- 6.3. It is expected that the construction stage of the project would be led by TfL and, where involving infrastructure owned by other parties, such as the local boroughs will be delivered in partnership with these other organisations.

TfL has substantial experience of delivery of complex highway projects, which will be applied to the procurement, funding and financing of the Leytonstone decking scheme

- 6.4. TfL is an experienced organisation, with a successful track record on procuring and managing highways improvement works (such as the recent completion of life extension works to the Hammersmith fly-over, the Cycle Superhighways programme, and the Chiswick Bridge refurbishment).
- 6.5. The procurement and construction of major infrastructure projects is also an area TfL has extensive experience in, with sub-surface construction works having been undertaken across a multitude of projects in constrained and heavily populated areas of London, such as Crossrail, DLR extensions, major station schemes such as King's Cross St Pancras and Green Park. All potential suppliers will be required to consider the Mayor of London's Responsible Procurement Policy in their bid as part of any Invitation to Tender (ITT) for the design and build contract.

TfL can achieve efficiencies by delivering the Leytonstone scheme within a wider programme of decking/tunnel projects and linked into a wider highway capital investment programme

- 6.6. TfL is undertaking and proposing a range of large capital infrastructure projects that involve procurement of skills and services that will all be highly relevant to the A3 decking. For example, the Cycle Superhighways and Better Junctions programmes have led to an increase in skills associated with large-scale highway engineering and construction traffic management.

- 6.7. The A40 interventions are being proposed as part of a wider programme of Roads Task Force (RTF) tunnels and decking at a range of locations throughout London, arising from the 2013 recommendations published by the RTF. If these projects are progressed, some significant economies and efficiencies could be achieved through co-ordination of delivery with the decking at Leytonstone.
- 6.8. TfL will also seek to incorporate best practice from Highways England's own highways works and approaches to procurement given the larger volume of capital infrastructure works the agency undertakes across the country.

In addition to internal staff, consultancy support will be required to support future scheme development and consents process

- 6.9. It is anticipated that consultancy support will be required in the following areas:
- i. Legal
 - ii. Environmental Impact Assessment
 - iii. Engineering
 - iv. Transport Planning
 - v. Planning and Socio Economics
 - vi. Architecture and Urban Design
 - vii. Cost Estimating
 - viii. Property Surveyors/Land referencing

Construction and operations

- 6.10. As the scheme progresses and further details concerning the design of the deck are determined, a procurement strategy will be developed which can incorporate the necessary design aspects, the operation and management approach, and the funding and financing approach to the scheme given the potential sources of funding as covered in the Financial Case. The risks associated with each element will be a consideration in the approach taken to procuring both construction and maintenance work on the deck.
- 6.11. Dependent on the form of contract, an assessment of the likely accounting treatment of any commercial structure under ESA95/10 would need to be undertaken to determine whether the project is likely to be treated as "off budget" and therefore whether liabilities would score towards TfL's borrowing.

Methods for the mitigation of construction impacts will be investigated

- 6.12. TfL has extensive experience of developing and delivering Traffic Management Plans. As part of the TLRN, the A40 will continue to ultimately be managed by TfL, acting as the client on any subsequent procurement of operations and maintenance contracts that could be let.
- 6.13. An EU-compliant procurement route following the Competitive Dialogue procedure, under the Public Contracts Regulations 2006, can be adopted to enable TfL to obtain certainty that the Contractor is capable of developing a

compliant design.

- 6.14. Throughout a procurement process for both construction, and operations / maintenance, TfL would undertake bi-lateral discussions with selected Contractors to seek views on the proposed procurement route, contract form and risk allocation. In addition, legal resource would be procured to provide commercial advice and contract drafting support, whilst Insurance advice would enable determination of the most cost-effective means of insuring risk during construction and operations.
- 6.15. As a public body, TfL has to meet the requirements of the Mayor of London's Responsible Procurement Policy consisting of the following themes:
- i. Environmental Sustainability
 - ii. Supplier Diversity
 - iii. Community Benefits
 - iv. Skills and Employment
 - v. Sustainable Freight
 - vi. Fair Employment
 - vii. Ethical Sourcing
- 6.16. In compliance with the Mayor's responsible procurement policy, all potential suppliers will be asked to consider these elements in their bid as part of the Invitation to Tender (ITT) for any future project support or the design and build contract. Each appointed consultant or contractor will be subject to a supplier performance plan.

TfL utilises supply chains from across the UK – work on this scheme would support jobs outside of London

- 6.17. Although TfL undertakes procurement for projects implemented in the capital, the wider benefits to the UK are extensive, with over 60,000 jobs estimated to be supported by services TfL procures from outside of London. The construction of the Leytonstone deck would add to the pipeline of capital investment that supports jobs across the UK.
- 6.18. The procurement strategy for this stage of the project will be refined and improved as the scheme is further developed.

COMMERCIAL CASE SUMMARY

6.19. The key points arising from the Commercial Case can therefore be summarised as:

- i. TfL has substantial experience of delivery of complex highway projects, which will be applied to the procurement, funding and financing of the Leytonstone deck
- ii. TfL can achieve efficiencies by delivering this scheme within a wider programme of decking and tunnel projects and linked into a wider highway capital investment programme
- iii. TfL utilises supply chains from across the UK – work for this scheme would support many jobs outside of London



7. The Management Case

Section summary:

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

TfL will make full use of best practice within the company and from industry

- 7.1. TfL has extensive experience in developing, promoting and implementing significant infrastructure projects and securing necessary consents required.
- 7.2. This ranges from modifications to existing infrastructure (such as repairs to the A4 Hammersmith flyover, modernisation of the London Underground, extensions to Tramlink and DLR) to major schemes such as Crossrail. TfL also has demonstrable experience in delivering major road junction improvements, pedestrian and cycle schemes, and wider public realm improvements. These projects share similarities to the A40 interventions, involving processes and aspects of design and construction which would be faced by this scheme. TfL will continue to actively incorporate best practice and experience from these schemes into the development of this project.
- 7.3. With a range of highway and public realm improvements identified within the current Business Plan, this experience will have been furthered by the time consent stage for this project is reached and will be transferrable to this scheme. If necessary, additional support and advice from experienced promoters of major highway schemes and operators of similar projects can be sought. This could include for example Highways England and other urban transport agencies.
- 7.4. The Leytonstone decking project is part of the wider Roads Task Force programme sponsored by the Managing Director of TfL Planning. There are a number of programme linkages with other schemes being taken forward as part of the RTF Key Corridor Interventions Programme, which will present opportunities to share best practice as these schemes progress.

Key project assumptions

- 7.5. It is currently assumed that sufficient funding is available to support the planning and development stages of the project up to securing the necessary powers. TfL does not have a budget for the main design and build costs, but as identified in Section 4, there are a number of potential funding sources. Further work is ongoing to identify the optimal funding solution for the scheme.
- 7.6. It is assumed that the land for the proposed route can be acquired through the Planning and Compulsory Purchase Act (2004).

Project risk

- 7.7. As the scheme is further developed, more detailed plans will be developed and will be subject to further assurance and project controls, including a Quantified Risk Assessment to further improve forecast costs and the economic appraisal.
- 7.8. At this early stage of design, some aspects carry a high risk and hence the optimism bias of 66% for a non-standard civil engineering project has been applied. A quantified risk assessment (QRA) will be undertaken should the scheme be progressed, in order to provide more certainty on costs. Following submission of this business case, TfL will liaise with the Treasury / DfT to update the forecast costs following the completion of the QRA, and to agree a new working assumption on the level of optimism bias to continue to apply in future scheme appraisal.

In general, TfL considers the scheme relatively standard given the company's extensive experience

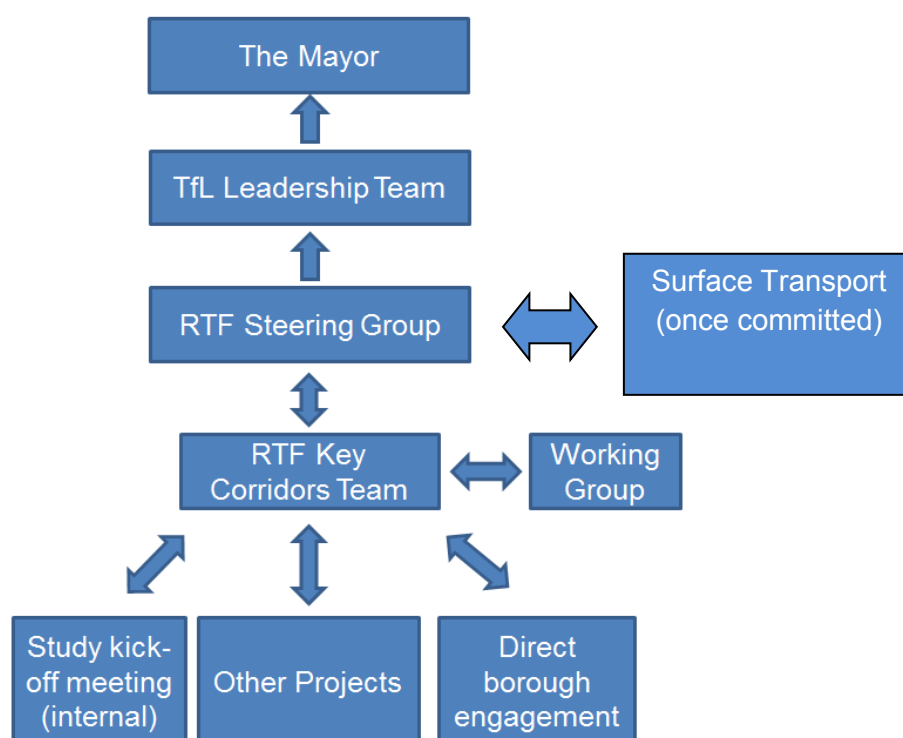
- 7.9. This experience includes planning, procuring and constructing large-scale infrastructure projects, such as the Cycle Superhighways, the Northern line extension and Crossrail. The design and construction of these schemes has provided a wealth of contemporary and relevant comparators against which to benchmark, helping to guide proposed construction approaches for this scheme.

Governance, organisational structure and roles

Internal governance

- 7.10. The proposed A40 inter part of the Roads Task Force Key Corridor Intervention Programme (Figure 22). The programme is overseen by the RTF Steering Group, which is made up of representatives from across the organisation and the TfL Leadership Team. Once the scheme is finalised and becomes committed, responsibility for its delivery will be overseen by TfL Surface Transport.
- 7.11. As part of future scheme development, an Independent Peer Review Group (IPRG) may be established to provide independent expert scrutiny of the Leytonstone project. An IPRG would remain in place to undertake reviews on technical and engineering matters at key stages during the design, procurement and delivery of the project.

Figure 61: RTF internal governance structure



Programme/Project Plan

7.12. Some key future milestones for the project are shown in Table 17 below.

Table 29: Key project development milestones

Milestone Description	Date
Further feasibility – scheme development, modelling, construction methodology, finance and funding options	2017
Planning, Design, Approval and Procurement	2019
Construction and Testing	2014-2029 (depending on option)
Operation	2030

Assurance and approvals plan

A comprehensive and robust project management framework will be applied, helping to ensure scope, cost and benefits are controlled

7.13. 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.

7.14. TfL uses a number of mechanisms to improve the management of its major

projects in order to help ensure the objectives and benefits of a scheme at inception are realised following implementation. TfL's project management framework, known as 'Pathway', provides consistency in approach and the tools required for planning and delivery teams, whilst retaining flexibility in its application to manage and control a project. Embedded into Pathway is a delivery assurance process using stage gates, upon which TfL utilises industry-leading external expertise to review and challenge all aspects of the project.

- 7.15. 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.
- 7.16. 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
- 7.17. 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.

Rigorous assurance processes will provide close scrutiny and challenge of risk management and decision-making throughout the project

- 7.18. 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.
- 7.19. 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 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.
- 7.20. 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.
- 7.21. 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.
- 7.22. IARs are conducted at key stages of the project:

- i. initiation;
 - ii. option selection;
 - iii. pre-tender;
 - iv. contract award;
 - v. project close out;
 - vi. benefits delivery; and
 - vii. annual review (where no other IAR would happen within 12 months).
- 7.23. TfL also receives project review and assurance from the Independent Investment Programme Advisory Group (IIPAG), which report to the Mayor of London concerning TfL's Investment Programme. This includes all maintenance, renewal, upgrades and major projects (excluding Crossrail).
- 7.24. 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.
- 7.25. TfL has the option of establishing an Independent Peer Review Group (IPRG). This approach has been followed for other major TfL projects, so given the scale of the Leytonstone decking project, this could warrant a similar approach. If appropriate, an IPRG can be set up for the scheme if further development of the project is approved. Initially it could oversee the refinement of delivery sub-options and review engineering feasibility studies and scheme appraisal undertaken.

Communications and stakeholder management

- 7.26. The RTF Key Corridors Team is responsible for keeping internal and external stakeholders appropriately engaged and informed. In accordance, formal, minuted meetings with set agendas and actions have been arranged with all stakeholders. There are a number of internal working groups and external stakeholder meetings are held on a regular basis.

A Stakeholder Management Plan has been prepared for the project

- 7.27. This Stakeholder Management Plan provides a brief on the objectives of the stakeholder engagement, target audience and methodology. This plan is under ongoing review and will be updated and expanded as necessary.
- 7.28. Stakeholder engagement has already been undertaken and there is strong support for the scheme from the local boroughs. A future programme of stakeholder engagement as the scheme progresses has been developed.
- 7.29. The external stakeholders identified are summarised below:
- i. Boroughs

- ii. Political Stakeholders
- iii. Statutory Stakeholders
- iv. Local Communities

Programme/Project Reporting

TfL will develop programme controls supported by robust reporting processes

- 7.30. These will 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.
- 7.31. The project management model will be designed to deliver a robust reporting regime, including:
 - i. 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
 - ii. Project reporting requirements will be fully defined, together with content requirements, target audience and timing.

MANAGEMENT CASE SUMMARY

- 7.32. The key points arising from the Management Case can therefore be summarised as:

- iv. TfL will make full use of best practice within the company and from industry
- v. A comprehensive and robust project management framework will be applied, helping to ensure scope, cost and benefits are controlled
- vi. Rigorous assurance processes will provide close scrutiny and challenge of risk management and decision-making throughout the project



8. Conclusions

There are strong non-WebTAG benefits of an intervention on the A40, and TfL should continue to consider this scheme

- 8.1. The proposed options for the A40 would unlock development in an area of high housing need. It would improve connectivity, encourage sustainable transport, improve the urban realm and better link communities in west London. Both tunnel options would protect the key role of transport infrastructure in this area, while reducing its dominance over the local landscape.
- 8.2. The SOBC for the proposed interventions on the A40 demonstrates that across the Five Case Model:
 - i. There is a clear robust case for change (based on wider regeneration impacts and addressing of urgent housing issues) for an intervention to address existing issues of severance, poor connectivity and environmental problems caused by the A40. This 'strategic case' is closely related to national, London-wide and local policy objectives, with particular reference to the London Plan, the Mayor's Transport Strategy and the Roads Task Force Vision document.
 - ii. The scheme assists in the economic regeneration of Old Oak Common, two further OA's and supports the delivery of additional housing and employment. It would enable an increase in economic activity. If looked at only in terms of the transport benefits and traditional BCR measure, the 'economic case' suggests the scheme is poor value for money. However, this is not the appropriate measure by which to judge the scheme given its focus is on regeneration and improving the urban realm.
 - iii. The scheme is commercially viable – the 'commercial case' demonstrates that although project development is at an early stage, the report sets out the procurement, commercial structure, and proposed allocation of risk and funding.
 - iv. The scheme is not currently affordable within the current TfL Business plan horizon. The total estimated cost of Option 1 is £1.08bn and £1.64bn for Option 5. The 'financial case' analysis sets out that the project team will need to explore all the funding mechanisms available to deliver the scheme and the proposed financing arrangements.
 - v. The proposed tunnel is deliverable – 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.

Further stages

- 8.3. As may be required for each option in particular, the following steps are recommended in further developing the initial engineering feasibility design for any of the options that are taken forward:

- i. Optimise alignments based on the findings of traffic modelling and development studies.
- ii. Confirm based on traffic modelling results if a reduced/increased number of surface lanes at some portals can be accommodated.
- iii. Undertake a formal Risk Appraisal and Assessment to compile a Project Risk Register in conjunction with TfL.
- iv. Identify further Risks and Constraints, including an assessment of the provision for transportation of hazardous goods.
- v. Develop vertical alignments for the preferred route(s).
- vi. Agree and confirm design standards to be applied and any deviations if necessary.
- vii. Undertake outline design calculations to size structural elements more accurately.
- viii. Undertake preliminary discussions with TBM manufacturers regarding size, cost, feasibility, radius of curvature, lead-in time etc., particularly for the larger diameters tunnels currently proposed.
- ix. Undertake a Geotechnical Desk study and Preliminary Ground Investigation.
- x. Undertake a Topographical Survey to confirm ground levels.
- xi. Confirm Third Party approval procedures where structures and infrastructure are affected.
- xii. Undertake a Phase I Settlement Analysis to determine buildings and infrastructure at risk from tunnelling induced settlement.
- xiii. Approach Building Owners and Statutory Undertakers for details of their underground assets for the whole alignments and optimise route if required.
- xiv. Undertake utilities searches.
- xv. Confirm foundation details and depths for the A40 Westway Flyover.
- xvi. Work with a Bridge Engineer to determine the potential impact on the Westway and develop outline solutions e.g. temporary support.
- xvii. Confirm if areas identified for land-take are feasible.
- xviii. Identify potential compensation grouting shaft locations.
- xix. Outline construction sequencing and traffic modelling for construction stage.
- xx. Identify potential spoil removal routes in greater detail and confirm the feasibility of connecting to the existing railway infrastructure as proposed in this study to reduce traffic impact during construction.
- xxi. Develop an initial Sustainability Plan, particularly considering the quantity of excavated material generated by the project.
- xxii. Carry out an Environmental Impact Assessment.
- xxiii. Develop Fire and Evacuation Strategies in conjunction with the Emergency



Services.

- xxiv. Develop Ventilation Strategies potentially including Computational Fluid Dynamics Modelling. This includes approaching jet fan manufacturers where the diameter of the fan is critical in determining tunnel sizes.
- xxv. Consider Architectural requirements within the tunnel and assess impact, if any, on tunnel sizing.
- xxvi. Develop Drainage and Water Management Strategies.
- xxvii. Refine the current Cost Estimates.
- xxviii. Update economic case with supplementary analysis in light of recent WebTag guidance on WEI (A2.2 of WebTag) or additionality.

Development funding and capacity

- 8.4. The initial work has considered the development capacity within the study area and to what degree the A40 schemes could enable development. Bringing vacant sites back into use and intensifying development on sites has been considered as part of this work. For the next stage it is recommended that this is taken further and that site specific assessments are undertaken for developments along the route. This could also consider potential individual site intensification as a result of the A40. There should also be further consideration of assessing different policy scenarios which will impact on the potential scale of developments. For example, a relaxed planning policy scenario could be assessed which reduces the amount of SIL in a particular area and replaces it with a high value added employment use which would increase the amount of development. This could also include liaison with local planning authorities.
- 8.5. As a result of the above, it would also be necessary to consider the funding implications particularly in terms of the increased net funding which could be secured due to the A40 schemes.

Transport modelling

- 8.6. All the strategic modelling has been carried out without the inclusion in the modelling of any tolls. The introduction of some form of road charging should be investigated in the future, as appropriate, to determine the impacts on traffic volumes and hence revenues.
- 8.7. The modelling has shown that the ambitious junction and surface interventions have significantly downgraded the A40 corridor at surface. Further modelling work is required to establish what the optimum level of surface junction interventions are that would enable the study objectives to be met whilst also reducing traffic congestion.
- 8.8. Modelling of further years should be undertaken so the economic analysis will more robustly represent the 60 year appraisal.

Summary of conclusions and recommendations

- 8.9. The Roads Task Force (RTF) was set up by the Mayor of London in 2012 to tackle the challenges facing London's streets and roads. The RTF was published in July 2013 and addresses what is needed in the short, medium and long term to enable London as a city to be able to accommodate its growing population. In relation to this, the RTF identified different constraints related to traffic and congestion problems that would affect the development of the city.
- 8.10. As a response to this report, TfL stated they would undertake different strategic studies with the main aim of finding corridors where measures can be applied with the objective of not only relieving congestion and connecting the city in a more effective way, but also increasing the space for living, alongside with improving the facilities for cyclist and pedestrians.
- 8.11. The A40 corridor has been identified by TfL as a suitable location for such improvements, as increased capacity is required here to ease the existing congestion. The local area is affected by the negative impact of the A40 where the severe congestion limits planned and potential development in the wider area. These issues affect not only people living in the area, but also vehicles on the roads, public transport, cyclists and pedestrians.
- 8.12. This business case has identified and assessed opportunities to relieve congestion and transport problems on the A40 corridor, ease severance issues and provide opportunities to stimulate and unlock growth potential in the area.
- 8.13. All the tunnel options assessed have been considered feasible in engineering terms although Option 3 was ruled out early as incompatible with OODC objectives. Options 1 and 5 were found to perform best against the project objectives
- 8.14. All the options come with a high level of risk and associated cost. It should also be noted that for the purposes of this study, in all options, the A40 has been significantly downgraded and ambitious junction improvements have been promoted that would improve the urban realm and improve connectivity for pedestrians, cyclists and buses. However, even with a large amount of traffic using the tunnels, these ambitious schemes have struggled from a transport capacity perspective, and this is reflected in the modelling and analysis of the options.

