

SILVERTOWN TUNNEL

Volume 8

# 8.103 Buses Minimum Opening Year Scenario Analysis

TR010021

March 2017

THIS PAGE HAS INTENTIONALLY BEEN LEFT BLANK

## Silvertown Tunnel

---

# Buses Minimum Opening Year Scenario Analysis

---

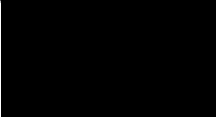
Planning Act 2008

Infrastructure Planning

The Infrastructure Planning (Applications: Prescribed Forms and Procedure)  
Regulations 2009

*Document Reference:* 8.103

*Author:* Transport for London

Rev.	Date	Approved By	Signature	Description
0	20/03/2017	David Rowe (TfL Lead Sponsor)		For Deadline 5 Submission

## Contents

<b>1.</b>	<b>INTRODUCTION .....</b>	<b>6</b>
1.1	The Assessed Case and the Committed Minimum Opening Year Scenario .	6
1.2	Committed minimum service level.....	9
1.3	Alternative bus tests.....	15
1.4	Bus test results – impact on cross-river bus travel.....	18
1.5	Impact of different bus tests on the economic case for the scheme.....	21
1.6	Conclusion .....	23
<b>Appendix A.</b>	<b>Bus test indicative routings .....</b>	<b>25</b>

**List of Figures**

Figure 1-1: 2021 AM Change in Bus usage: Assessed Case – Reference Case..... 10

Figure 1-2: 2021 PM Change in Bus usage: Assessed Case – Reference Case..... 11

# 1. INTRODUCTION

## 1.1 The Assessed Case and the Committed Minimum Opening Year Scenario

- 1.1.1 The Assessed Case consists of assumptions about growth, transport networks, and future travel behaviour, in the context of which the Scheme is implemented – the Scheme itself consists of a new highway tunnel, a user charge, and bus network changes.
- 1.1.2 It is acknowledged by all parties that uncertainty exists over future forecasts and therefore it is not appropriate to set the initial user charges, decide the mitigation measures or specify the bus network in advance of Scheme opening. Instead, the Applicant has outlined in the Charging Policies and Procedures (REP4-039), the Monitoring and Mitigation Strategy (REP4-046) and the Bus Strategy the process it will undertake to determine these elements, including a refreshment of its assessment of Scheme impacts (see for example section 1.5 of the Bus Strategy (REP4-044)). These documents also set out how STIG members will be involved in these processes.
- 1.1.3 The Applicant has shown that the Assessed Case highway impacts can be broadly replicated within a relatively wide envelope of alternative conditions (as set out in the Applicant's answer to SWQ TT2.3), by adapting the user charge if required, and the same principles would apply to changes to the bus network.
- 1.1.4 The Applicant also made it clear that the Assessed Case bus network assumed was preliminary and would be subject to final bus planning decisions. There are likely to be a variety of ways that changes can be made to routes and frequencies in response to different circumstances (such as general growth and specific developments like Crossrail) that will still deliver the key bus-related outcomes of the scheme. The Assessed Case bus network was assumed to apply (without change) over a 60-year period, but for the opening year of the Scheme, it is likely to be appropriate to start with fewer or less frequent services, monitor these, and add to this initial network, with the Assessed Case bus network outcomes achieved over time (as described in the Bus Strategy).
- 1.1.5 Reflecting their relatively modest infrastructure requirements, buses are typically planned over a relatively short time horizon, enabling an agile response to emerging needs. The Applicant has always proposed that this would equally be the case for the buses using the Silvertown Tunnel – both

in terms of individual routings, and in terms of the overall quantum – such that the services brought forward in response to the new opportunities created by the Scheme are best calibrated in response to identified transport needs. Indeed the Applicant has proposed that bus network planning, setting of user charges, and development of localised mitigation measures should be undertaken at the same time, and be subject to review in order that all three take account both of one another, and of the latest available information on transport needs.

- 1.1.6 The Applicant considers that this approach is most likely to deliver the best outcomes.
- 1.1.7 Nevertheless, having regard to the comments of the ExA and IPs in support of a commitment to the provision of bus services, the Applicant submitted an updated dDCO at DL4 (REP4-025) with a new requirement for TfL to provide a minimum of 20 buses per hour through the Blackwall and Silvertown tunnels on opening. The same requirement also obliges the Applicant to implement the Bus Strategy (a revision of which was also submitted at DL4 as REP4-044). The relevant extract from Requirement 13 is as follows:

*TfL must secure the provision of not less than 20 buses per hour during peak periods in each direction through the tunnels from the date on which the Silvertown Tunnel opens for public use and thereafter must keep under review and secure the provision of bus services through the tunnels in accordance with the bus strategy.*

- 1.1.8 This requirement (which is Commitment 5 of the Bus Strategy) is described below as the ‘Committed Minimum Opening Year Service Level’.
- 1.1.9 It is important to emphasise that this is a committed *minimum* level of service and the actual opening provision will depend on actual growth and other factors prior to scheme opening. However, as set out in detail in its response to SWQ TT2.9, the Applicant is concerned that to commit very substantial public resources to guarantee even higher levels of service, in the context of widely acknowledged uncertainty, would risk impinging upon its statutory duty (as defined in the 1999 GLA Act) to bring forward an efficient network of bus services across London as a whole. For example, should growth fail to match the Applicant’s central assumptions, TfL would expect to run fewer buses than are assumed in the Assessed Case as the business case for these services would be poorer.

1.1.10 In its response to TT2.9, the Applicant also stated that it would provide further information on this committed minimum bus service level at DL5. To facilitate consideration by the ExA and IPs of its position, this submission therefore sets out further analysis of the derivation of this committed minimum service level, and an initial assessment of the likely implications for the Scheme's business case if only this level of bus service were in fact to be provided on opening.

1.1.11 In addition to this minimum opening year bus level, this submission also provides information on other bus tests that have been undertaken that show how alternative bus solutions perform – they highlight the fact that it is simplistic to focus on bus numbers, with the configuration of services playing a major part in delivering benefits as well.

1.1.12 This document sets out that information, as follows:

- Describes the Assessed Case bus results and the individual service components
- Shows alternative possible networks, including tests that deliver 20 buses per hour (the 'Committed Minimum Opening Year Service Level')
- Compares the benefits of these bus tests to the relevant Assessed Case tests

1.1.13 It is important to emphasise that the scenarios presented in this note are only illustrative. This reflects two key points. The first, noted above, is that the committed minimum service level does not define an upper bound for potential provision in the opening year, or for its growth beyond opening.

1.1.14 The second is that whatever total level of service is implemented upon opening, there is a wide variety of ways (different route permutations, frequencies, interchange and stops) in which this could in practice be constituted and it would be premature to attempt to specify this at this stage, for the reasons set out above.

1.1.15 The Bus Strategy (REP4-044) sets out the Applicant's proposals for how the opening year services will in practice be developed, how the network will be continue to be developed beyond the opening year, and how stakeholders will be involved in this process.



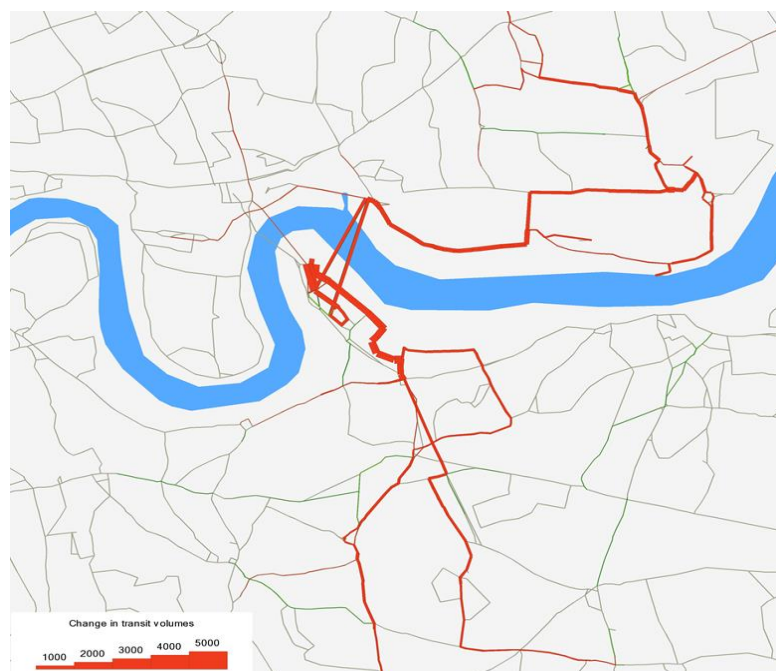
## 1.2 Committed minimum service level

- 1.2.1 To develop its committed minimum service level for the Silvertown Tunnel, the Applicant considered in detail the results of the Assessed Case forecasting, including the indicative Assessed Case bus network, in the context of its Bus Service Planning Guidelines.
- 1.2.2 Modelling for the Assessed Case indicated that the service levels assumed across the indicative bus network would easily accommodate likely demand in 2021, with excess capacity on most routes, whilst in the Low Growth scenario, there was more spare capacity.
- 1.2.3 The modelling also showed that the total demand and/or cross-river demand varied substantially between routes, with some of the indicative routes experiencing low demand in 2021, and gave indications of where adjustments to services could offer greater benefit. (This reflects the indicative nature of the routes, which – in view of the time horizon – have not been subject to optimisation through full implementation of TfL’s standard bus planning guidelines.)
- 1.2.4 The indicative Assessed Case bus network had some duplication of provision between different routes, particularly in the Royal Docks area, as different routes ‘doubled-up’ on certain links, offering potential for different service frequency permutations over time while still serving the core passenger demand. The existence of two key bus/rail interchange hubs north and south of the river at Canning Town and North Greenwich also offers flexibility in bus provision, with passengers being able to interchange at these locations.
- 1.2.5 Together these findings indicate that the benefits of the assumed Assessed Case bus network could be delivered in different ways, some of which offer opportunities for efficiencies.
- 1.2.6 The key requirements for cross-river bus network proposals are to ensure that cross-river connectivity is improved for areas either side of the river, and that suitable frequencies are maintained for the anticipated demand. Buses are a highly flexible mode and it is important – for reasons of value for money, environmental impact and to optimise benefits for users – that they are appropriately adapted to the prevailing circumstances. At the same time value for money and efficiency needs to be achieved for the benefit of all Londoners

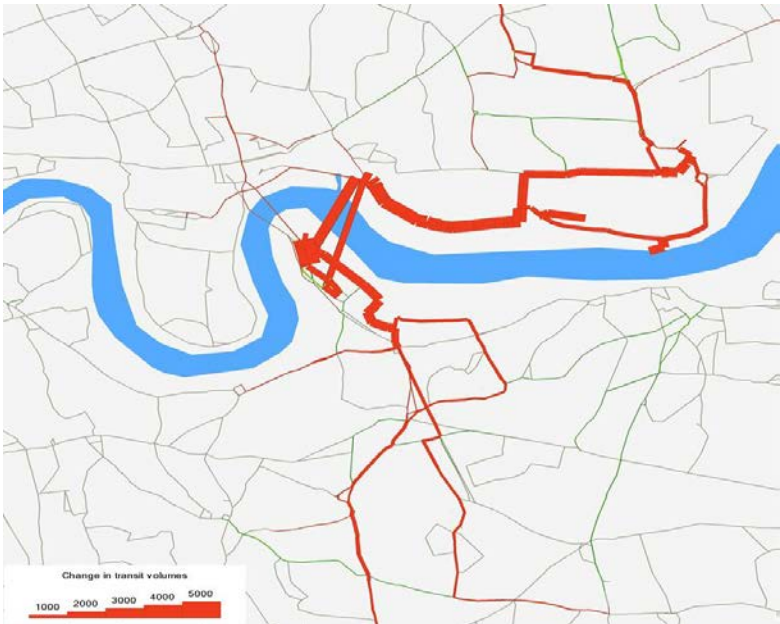
1.2.7 The Assessed Case demand for buses is shown in Figure 1-1 and Figure 1-2 below, which compare the Assessed Case (2021 with the Silvertown Tunnel) to the Reference Case (2021 without the Silvertown Tunnel). Where the red line is thinner, forecast demand is lower (a map showing the service routeings is included in Appendix A). The key conclusions are that:

- There is strong demand in 2021 for the new bus services from south of the river towards the Royal Docks and Beckton on the north side.
- There are lower levels of demand in 2021 on the indicative extended service 309 (Bethnal Green to North Greenwich), the 129 between Greenwich and North Greenwich and on the Grove Park to Canary Wharf service north between North Greenwich and Canary Wharf

**Figure 1-1: 2021 AM Change in Bus usage: Assessed Case – Reference Case**



**Figure 1-2:** 2021 PM Change in Bus usage: Assessed Case – Reference Case



1.2.8 Table 1 briefly describes each service included in the Assessed Case, the 2021 modelling results, and how alternative bus tests have considered potential changes. More information on these alternative tests is set out in section 1.3 below.

**Table 1: Description of bus services and commentary on Assessed Case 2021 results**

Route	Description	Comment
108	Lewisham Town Centre to Stratford Bus Station	Existing service via Blackwall Tunnel. Demand estimates for the Assessed Case (AC) indicate the existing frequency of 6 bph would provide sufficient cross-river capacity. Growth can be monitored and proposed frequency confirmed as development and demand changes are more fully understood.
129	Greenwich Town Centre to North Greenwich Station	The AC modelling indicates relatively low demand between Greenwich town centre and North Greenwich. Demand was much stronger between North Greenwich and Beckton, although other routes also serve these links (Eltham to Beckton, 129 and 104A in the AC). Some bus tests have omitted this route from the opening year network to gauge the effect on demand.
104	From Stratford to Manor Park	Existing service does not currently cross the river, replaced in AC by 104A and 104B, (see below) – all tests also include these changes.

Route	Description	Comment
104A	Stratford to Beckton via Lonsdale road	Extended in AC to North Greenwich via Silvertown Tunnel. AC 2021 modelling indicates strong demand to Beckton and West Silvertown. Maintained in all bus tests, in one test ('Minimum Bus 2', see section 1.3 below) this was extended only as far as Canary Wharf rather than crossing the river, with interchange allowing links to/from south of the river.
104B	Manor Park to Custom house via Lonsdale Road	Planned to be implemented by TfL in 2017/18, will not cross river. Assumed in all tests.
309	London Chest Hospital Bethnal Green to Canning Town	Extension to existing service modelled from Canning Town to North Greenwich Station in AC. Very low cross-river patronage in AC in 2021. Some tests exclude this extension, retaining the existing service north of the river only.
Eltham to Beckton	New route proposed in AC	AC 2021 results show higher demand for this service, particularly to Royal Docks/Beckton. All tests include this route as per the Assessed Case
Grove Park to Canary	New route proposed in AC	2021 AC demand shows lower demand for some sections of this route, particularly that between North Greenwich and Canary Wharf. Most tests include this route but some amend it to run to Beckton rather than Canary Wharf, given the strong demand on this

Silvertown Tunnel

Buses Minimum Opening Year Scenario Analysis

Document Reference: 8.103

---

Route	Description	Comment
Wharf		axis shown in the AC 2021 test.

### 1.3 Alternative bus tests

1.3.1 To aid understanding of the effect of different bus scenarios, TfL has run a number of alternative bus tests. These use different frequencies and in some cases adjusted routings to the Assessed Case, but are all aimed at serving broadly the same travel markets.

1.3.2 Each test is described briefly in Table 2, below. (Tests which have been previously reported upon through the DCO Examination are shown in bold text). The minimum opening bus networks 1 and 2 with 20 buses per hour (bph) use slightly different service permutations, and are based on the low growth scenario to show the minimum level of buses that will be provided even if the rate of growth was slower than that assumed in the Assessed Case.

**Table 2: Description of bus tests undertaken**

<b>Bus test</b>	<b>Growth assumed</b>	<b>Total cross-river buses per hour</b>
<b>Reference</b>	<b>Assessed Case (central)</b>	<b>6</b>
<b>Assessed Case</b>	<b>Assessed Case (central)</b>	<b>37.5</b>
Bus 1	Assessed Case (central)	28.5
Bus 2	Assessed Case (central)	23.5
<b>Low growth test</b>	<b>Low</b>	<b>37.5</b>
Min Opening Bus 1	Low	20
Min Opening Bus 2	Low	20

1.3.3 Table 3 sets out the cross-river bus frequencies used in each test for each individual service. Figures A1-A5 in Appendix A show the routeing assumed for the Assessed Case and each variant test.

1.3.4 These alternative tests indicate the variety of options that the Applicant will be required to consider carefully prior to Scheme opening, together with more up to date growth and demand figures and any final user charge proposed. They also give indications of how the network could be developed differently in response to different levels of demand over time.

**Table 3: Alternative bus tests cross-river frequencies**

Route	Description	Existing / Reference Assessed Case	Bus Test 1	Bus Test 2	Min Opening Bus 1	Min Opening Bus 2	Notes
-------	-------------	---	------------	------------	----------------------	----------------------	-------

Note: Only cross river buses are included here. Some routes (eg the existing 309 north of the river) exist in all tests but only cross the river in some.



Route	Description	Existing / Reference Assessed Case	Bus Test 1	Bus Test 2	Min Opening Bus 1	Min Opening Bus 2	Notes
108	Lewisham Town Centre to Stratford Bus Station	6	7.5	6	6	6	
129 Extension	Greenwich Town Centre to North Greenwich Station	n/a	10	n/a	5	5	
309 Extension	London Chest Hospital Bethnal Green to Canning Town	n/a	5	n/a	n/a	n/a	
104a	Stratford to Beckton and North Greenwich	n/a	6	7.5	5	n/a	In Min Bus 2, the 104a was extended from Beckton to Canary Wharf, but does not cross the river.
Eltham to Beckton	New route proposed	n/a	5	5		5	
Grove Park to Canary Wharf	New route proposed	n/a	4	n/a	4	n/a	
Grove Park to Beckton	New route proposed (alternative to Grove Park to Canary Wharf above)	n/a	n/a	5	n/a	4	
<b>Total Cross-river</b>		<b>6</b>	<b>37.5</b>	<b>28.5</b>	<b>23.5</b>	<b>20</b>	<b>20</b>

## **1.4 Bus test results – impact on cross-river bus travel**

- 1.4.1 Table 4 below shows a comparison between the cross-river bus flows in each of the tests. While there is variation in the performance of the different tested bus networks in relation to cross-river passenger demand, the overall level of change in relation to total Scheme impacts is regarded as low, and there is clearly scope for further refinement of the networks to meet the Scheme objectives.
- 1.4.2 Table 5 shows a comparison of the AM peak hour cross-river demand per bus, and shows that in all cases the bus flows modelled can easily accommodate the peak hour demand for the 2021 assessment year. Approximate per bus capacity is 87 for a double-decker and 70 for a single-decker.

**Table 4: Total cross-river passengers for different bus tests in 2021 (AM peak hour)**

Scenario	108	129	309	104A	Eltham-Beckton	Grove Park-Canary Wharf	Grove Park-Beckton
Ref Case	162	n/a	n/a	n/a	n/a	n/a	n/a
Assessed Case	216	420	36	102	164	87	n/a
Bus Test 1	223	402	n/a	91	164	n/a	n/a
Bus Test 2	165	n/a	n/a	117	166	n/a	280
Low Growth RC	142	n/a	n/a	n/a	n/a	n/a	n/a
Low Growth AC	195	360	33	78	139	76	n/a
Minimum Bus 1	147	170	n/a	n/a	173	80	n/a
Minimum Bus 2	147	173	n/a	n/a	146	0	204

**Table 5: Cross-river passengers per bus in different tests in 2021 (AM peak hour)<sup>2</sup>**

Scenario	108	129	309	104A	Eltham-Beckton	Grove Park-Canary Wharf	Grove Park-Beckton
Ref Case	27	n/a	n/a	n/a	n/a	n/a	n/a
Assessed Case	29	42	7	17	33	22	n/a
Bus Test 1	30	41	n/a	15	33	n/a	n/a

<sup>2</sup> Approximate per bus capacity is 87 for a double-decker and 70 for a single-decker.

Silvertown Tunnel

Buses Minimum Opening Year Scenario Analysis

Document Reference: 8.103

Scenario	108	129	309	104A	Eltham-Beckton	Grove Park-Canary Wharf	Grove Park-Beckton
Bus Test 2	28	n/a	n/a	16	33	n/a	n/a
Low Growth RC	24	n/a	n/a	n/a	n/a	n/a	n/a
Low Growth AC	26	36	6	13	28	19	n/a
Minimum Opening Bus 1	24	34	n/a	n/a	n/a	20	n/a
Minimum Opening Bus 2	24	35	n/a	n/a	29	n/a	51

## **1.5 Impact of different bus tests on the economic case for the scheme**

- 1.5.1 The tests described in this note indicate that the difference in highway user benefits and user charges in 2021 between the Assessed Case and Bus Tests 1 and 2 is less than 1%, while the difference between highway user benefits between the Lower Growth test and the Minimum Bus Tests 1 and 2 is some 6% and 3% respectively. These levels of change are small in relation to total scheme benefits, and are even lower when the significant level of added reliability benefits are taken into account.
- 1.5.2 Table 6 compares the Assessed Case public transport benefits in 2021 with Bus Test 1 and Bus Test 2. This shows that, while the public transport user benefits reduce with the lower provision of buses in the tests shown, they remain substantial, and are not likely to affect the conclusion that the Scheme has a good economic case.
- 1.5.3 The results also demonstrate that the bus network can be fine-tuned to deliver greater benefit. For example Bus Test 2, with lower cross-river bus numbers (23.5 bph) than Bus Test 1 (28.5 bph), actually delivers higher benefits. This is based on the use of slightly different networks in each test, which cater for the demand in different ways, and highlights that it is not bus numbers that is the critical factor, but more the arrangement of services in relation to demand.
- 1.5.4 The relatively limited impact of the tests with lower bus numbers also reflects the way in which the packages of routes in the different tests have been assembled by reference to the performance of the illustrative routes in the Assessed Case – those routes with greater patronage were generally retained and enhanced, while those with lower patronage were more likely to be taken into the reduced bus tests. Accordingly, the removal of lesser-used bus routes is likely to have a proportionately limited impact on overall benefit.

**Table 6: Public transport user benefits in 2021 - Assessed Case and Lower Bus scenarios, £m, PV 2010<sup>3</sup>**

	<b>Assessed Case (37.5 bph)</b>	<b>Bus Test 1 (28.5 bph)</b>	<b>Bus Test 2 (23.5 bph)</b>
Business	£0.57	£0.40	£0.44
Commuting	£1.12	£0.81	£1.00
Other	£3.64	£2.68	£3.04
<b>Total</b>	<b>£5.33</b>	<b>£3.89</b>	<b>£4.48</b>

1.5.5 Table 7 compares the Assessed Case Low Growth public transport benefits in 2021 with the results of the Minimum Opening Bus Tests 1 and 2 – these are also based on the Low Growth scenario, and both have 20 cross-river buses per hour, but in different service patterns. The table highlights again that it is the arrangement of services rather than numbers of buses that deliver benefits. Minimum Opening Bus Test 2 performs strongest compared to the Assessed Case cross-river bus levels, and gives public transport benefits close in magnitude to this case (only some 10% lower).

**Table 7: Public transport user benefits<sup>4</sup> in 2021 - low growth and lower bus tests scenarios, £m, PV 2010**

	<b>Low Growth (£m) (37.5 bph)</b>	<b>Minimum Opening Bus 1 (20 bph)</b>	<b>Minimum Opening Bus 2 (20 bph)</b>
Business	£0.18	£0.12	£0.16
Commuting	£0.88	£0.57	£0.82
Other	£2.95	£1.99	£2.63
<b>Total</b>	<b>£4.01</b>	<b>£2.68</b>	<b>£3.61</b>

<sup>3</sup> Highway user journey time and vehicle operating cost benefits

<sup>4</sup> Highway user journey time and vehicle operating cost benefits

1.5.6 These tests indicate the benefits applicable for the minimum opening year levels, but as demand for bus services increases and more cross-river services are put in over time, benefits will increase. For example, should the Assessed Case level of provision only be fully implemented in year 5, there would be 5 years of slightly lower benefit and 55 years of benefit similar to the Assessed Case. The tests reported on in this note also show that there are many ways of delivering these benefits, and the potential to increase the value for money of the bus service proposition.

## 1.6 Conclusion

1.6.1 The Applicant has explained why the opening year bus network needs to take into account uncertainty in demand and how, due to the nature of bus network planning, this opening year bus network should be decided closer to the Scheme's opening year along with the initial user charge and any pre-opening mitigation measures. The processes for determining these elements are set out in the Bus Strategy, the Charging Policies and Procedures and the Monitoring and Mitigation Strategy.

1.6.2 This note has set out more detail of the Assessed Case bus results, and discussed how the different services performed in that scenario. It shows that there are a variety of bus proposals that can help deliver the key bus-related outcomes of the Assessed Case, all of which need to be considered further in the bus planning for the scheme opening year.

1.6.3 In the TA, an Assessed Case network of 37.5 bph was presented. In accordance with the other elements of the Assessed Case, this is over a 60-year period. For the opening year of the Scheme, it is likely to be appropriate to start with fewer or less frequent services, monitor these, and add to this initial network to achieve the Assessed Case bus network outcomes over time (as described in the Bus Strategy).

1.6.4 The note also illustrates what a service based on the 20bph minimum commitment for the opening year could look like, and how it can accommodate the predicted cross-river bus flows and also deliver significant benefits. As set out in the Bus Strategy (section 1.5), prior to the Scheme opening for public use, TfL will undertake a refreshed assessment of the Scheme impacts in order to:

- Set the opening user charges
- Define the requirement for and form of localised mitigation for residual effects; and

- Specify the bus network through the Silvertown Tunnel that will operate on opening.

1.6.5 The provision of bus services is one of TfL's statutory duties (including a duty regarding consultation on new bus services) and also requires the provision of the necessary infrastructure such as bus stands and stops in conjunction with the boroughs. TfL has a strong track record in developing and optimising the bus network in London as part of these statutory duties, and will apply its network planning principles in line with the Bus Strategy for the development of the bus services using the Silvertown Tunnel.



## Appendix A. Bus test indicative routings

Figure A1: Assessed Case indicative bus network

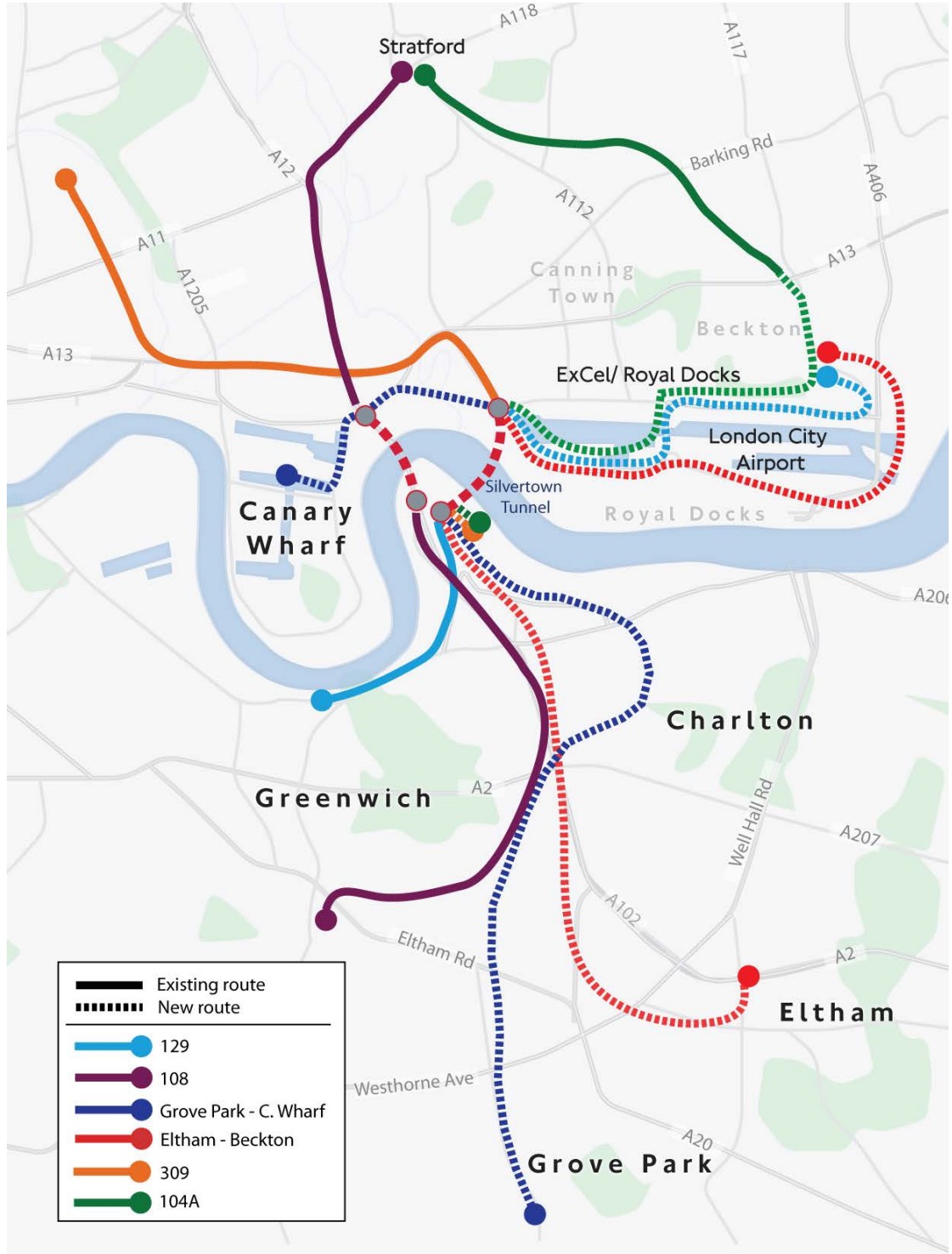
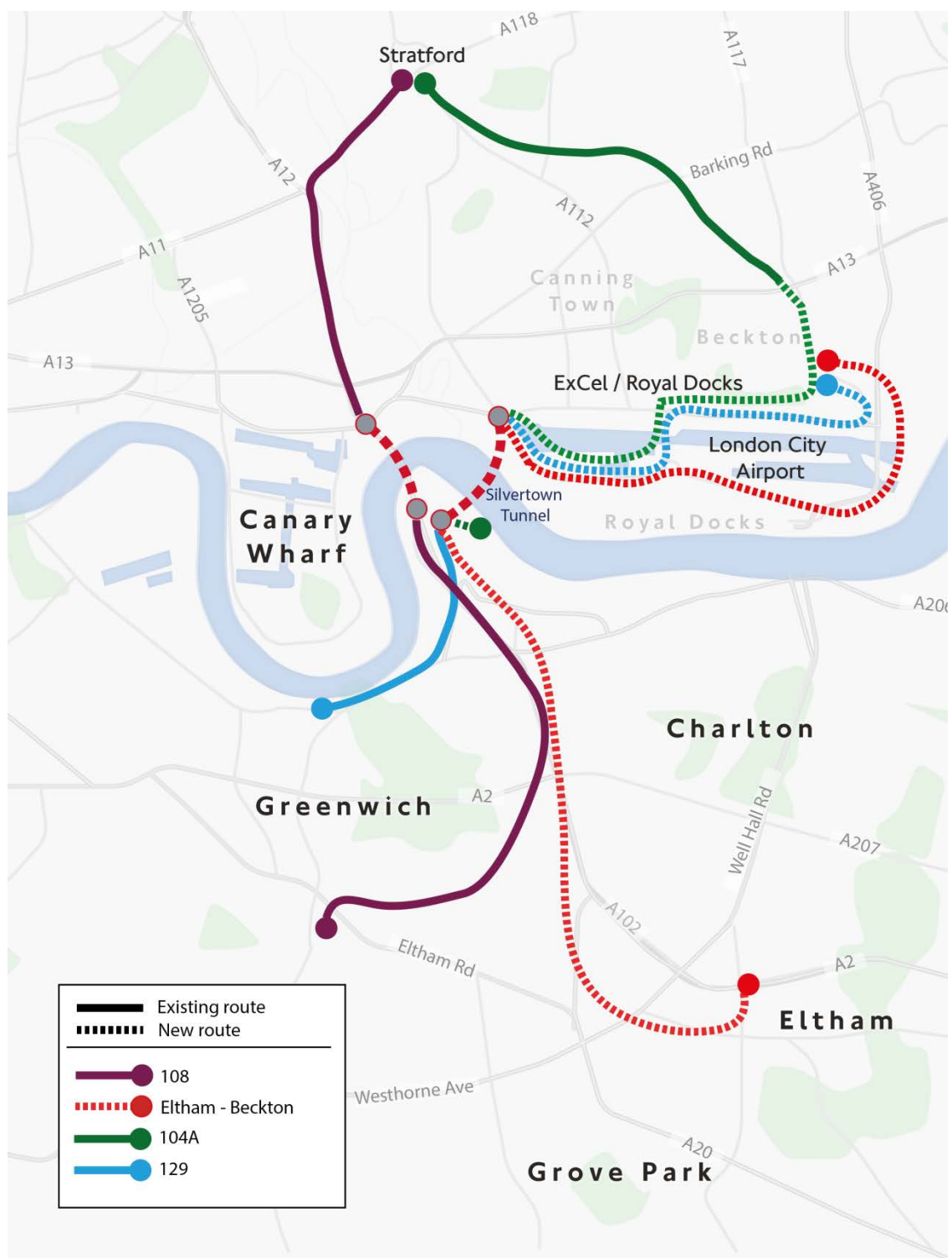


Figure A2: Bus Test 1 indicative bus network



1.6.6

Figure A3: Bus Test 2 indicative bus network

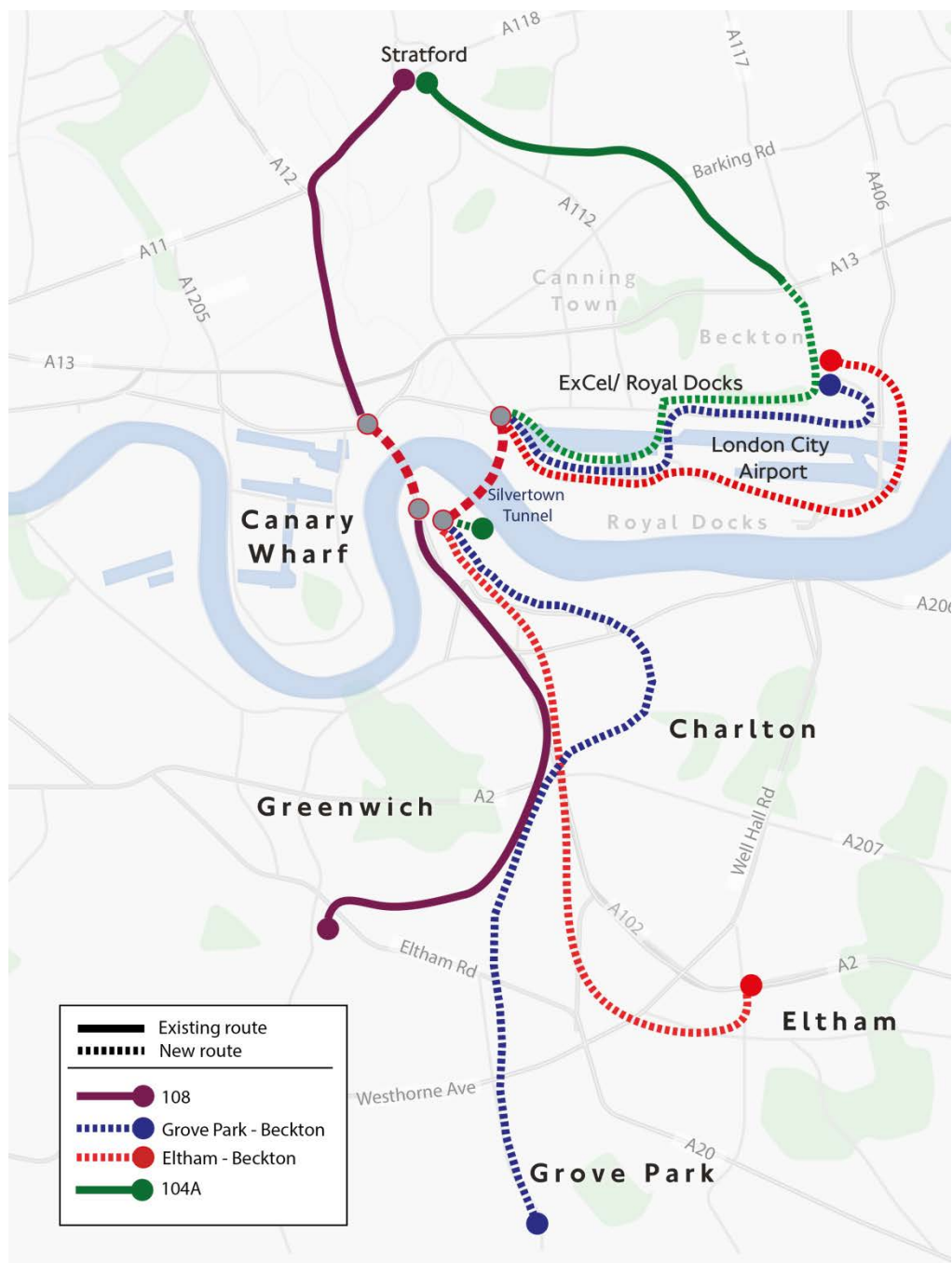


Figure A4: Minimum Bus Test 1 indicative bus network

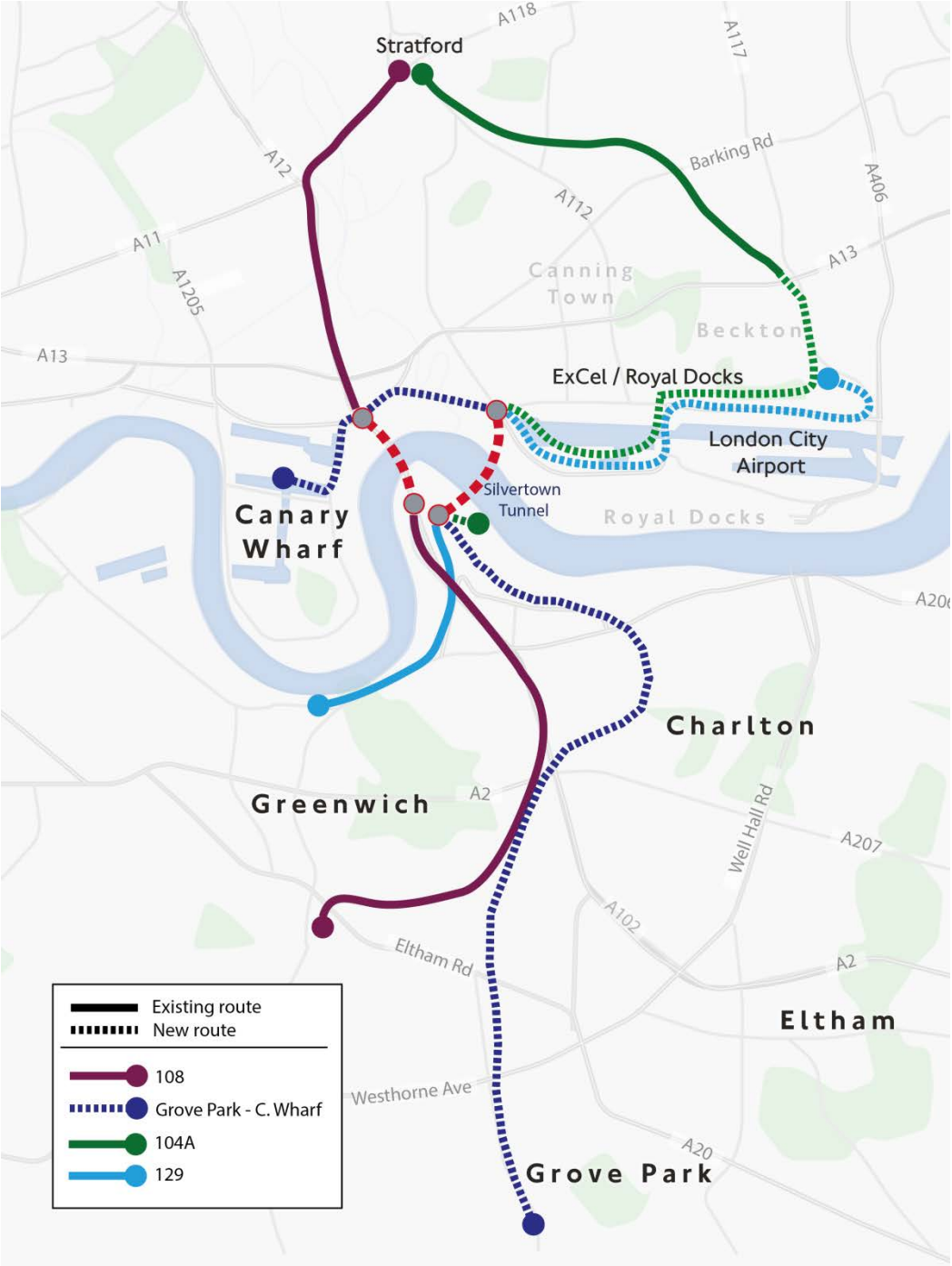


Figure A5: Minimum Bus 2 indicative bus network

