

HAMMERSMITH FLYUNDER FEASIBILITY STUDY



HAMMERSMITH & FULHAM COUNCIL





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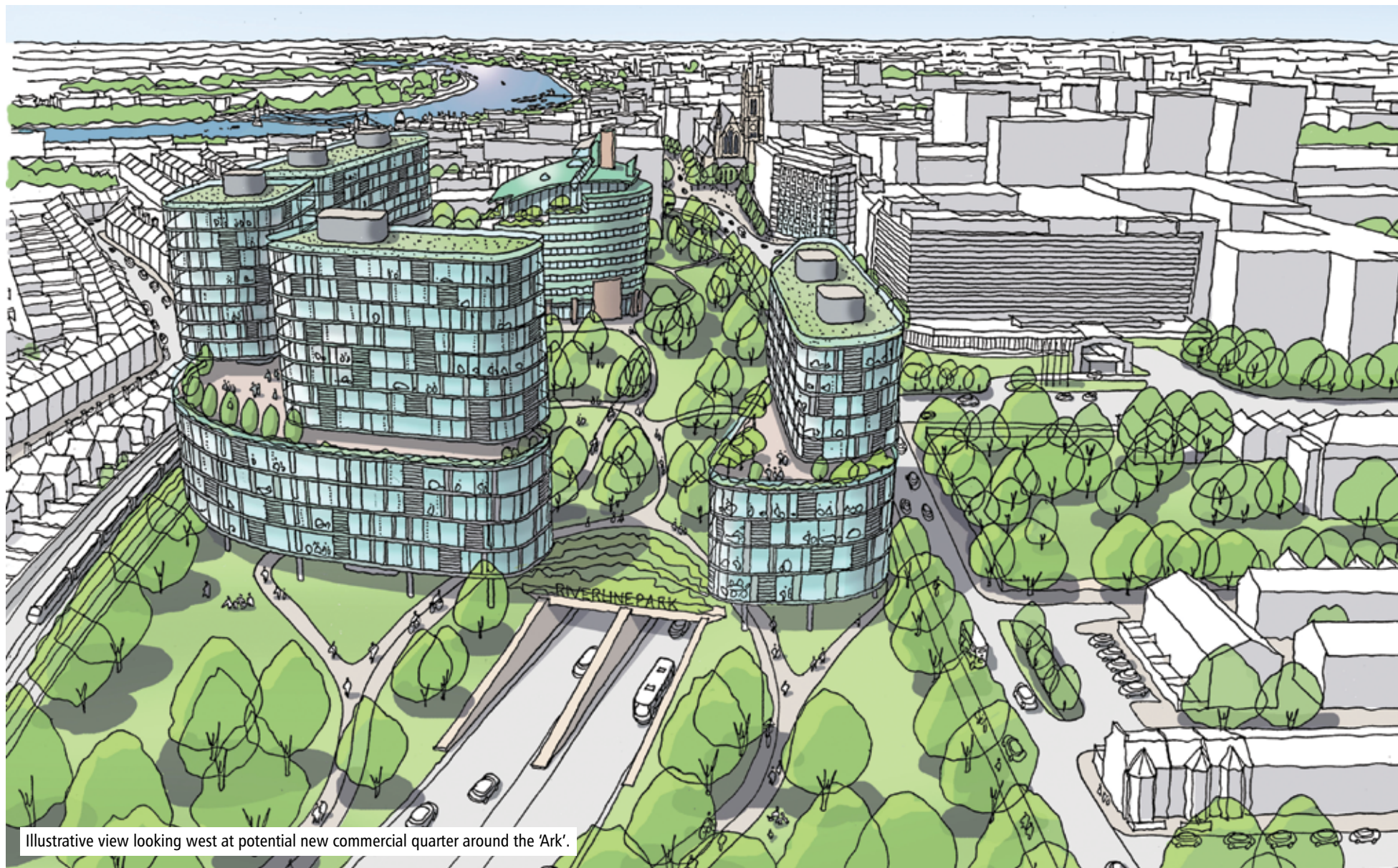
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Illustrative view looking west at potential new commercial quarter around the 'Ark'.

Going underground - a vision for an A4 'flyunder'



Since the emergency closure in December 2011, of Hammersmith's ugly concrete flyover and the ensuing traffic chaos which affected swathes of west London, serious questions have been asked about the viability of the flyover.

This elevated concrete monster has divided our town centre for decades, magnifying traffic noise and polluting our air in the process. It scythes through the heart of Hammersmith like our very own Berlin Wall, creating an imposing physical barrier that gobbles up space, blocks light and cuts residents and visitors off from the river while limiting business and trade.

However, the escalating costs of maintenance and increased risk of failure focused minds on the alternatives to this decaying 50-year-old structure and, bizarrely, this divisive structure has had a unifying effect on West Londoners.

Local architects West London Link Design presented their ideas for a replacement tunnel, which could unleash a 'chain of opportunities' along the A4. This tunnel combined with

overwhelming public support for a 'flyunder', led the council to commission this feasibility study.

The report explores the benefits and challenges related to various tunnel options. World-renowned tunnel experts Halcrow, who were involved in the Channel Tunnel, tested the ground conditions and council transport planners have worked closely with Transport for London (TfL) officials and neighbouring boroughs to start the process of examining the options.

An independent 'Flyunder Champion' - Neale Stevenson - was appointed to bring all of the various stakeholders, who are interested in burying the Hammersmith Flyover, together. Local residents were at the heart of the debate with a series of stakeholder meetings - including a major flyunder summit and transport select committee informing our thinking.

The key findings show a tunnel replacement could take just three years to construct and could release up to a £1 billion worth of former highway land and under-developed sites in the town centre to help pay for the works.

The alternatives vary from a one-mile tunnel to a 2.5-mile tunnel, which is likely to cost between £218 million and £1.7 billion. The shortest option

would involve digging a 'cut and cover' tunnel 15 metres beneath the surface, while the longer tunnel would involve using boring machines.

There is little doubt that some form of a tunnel would improve the quality of life for thousands of west Londoners and be a game changer for Hammersmith town centre. Meanwhile, traffic flows in and out of London would also be improved.

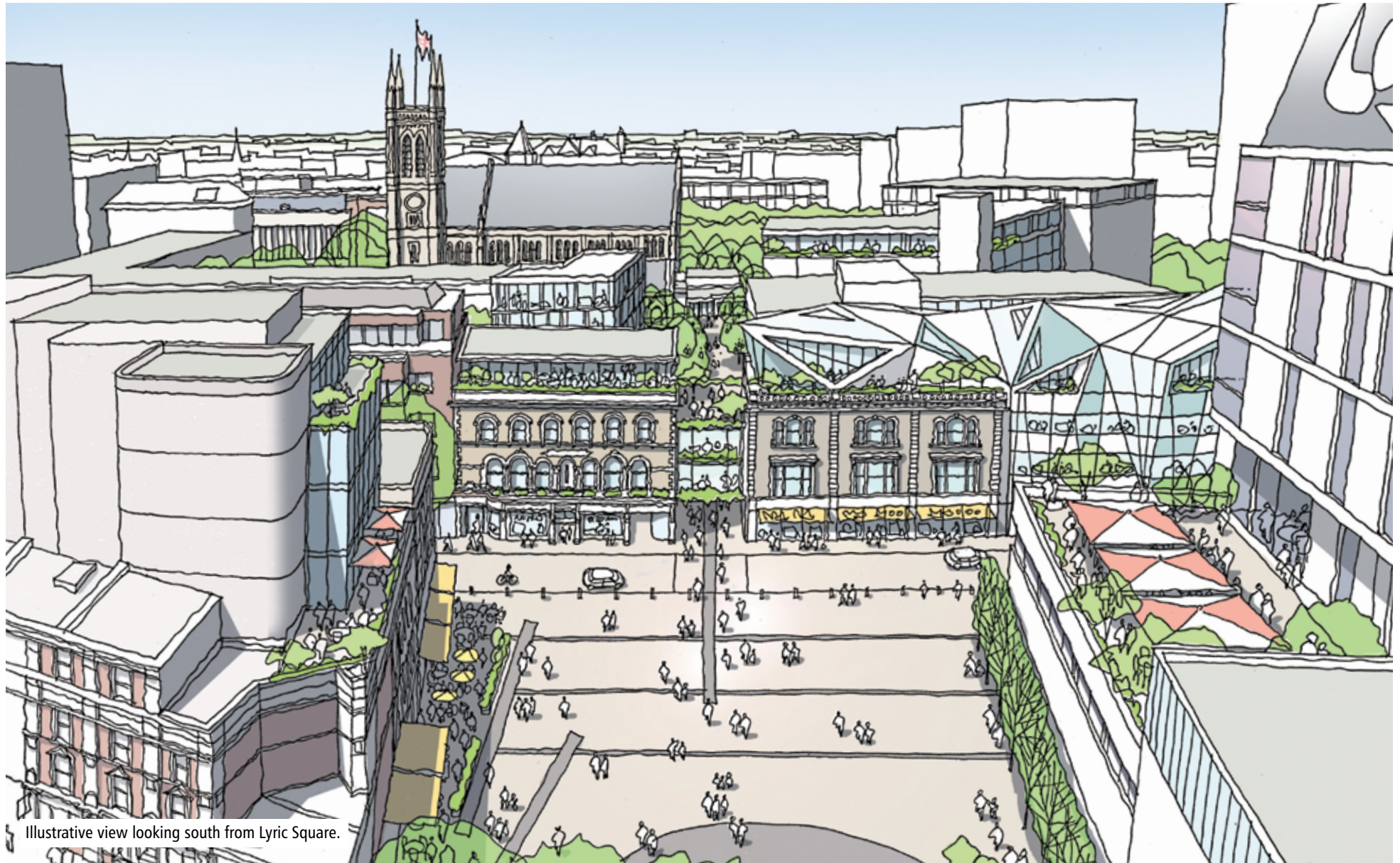
A new flyunder would enable Hammersmith's great divider to be torn down and reconnect our town centre with the river, making our once beautiful town an even more attractive place to visit or do business.

This report is not an end point. It is a beginning. This is the council's response to The Mayor of London's Roads Task Force and it is now mainly for TfL, who own and manage the A4, to decide how to take the project forward.

Cllr Nicholas Botterill

Leader

Hammersmith & Fulham Council



Illustrative view looking south from Lyric Square.

The bottom line is that there are feasible options to replace the flyover with a tunnel - long or short. We can prove to Transport for London that it can be done. Technical reports suggest these ideas can be executed, as planners outline a range of development options that could help finance the project. We look forward to hearing the Mayor of London's response. It is now down to the council, local residents and other stakeholders to work with TfL to establish the optimal solution - which will be the most acceptable trade-off between cost and disruption and improvements to the environmental and cultural life of the borough. I would suggest that all of the options significantly enhance Hammersmith Town Centre - while the most ambitious transforms it.



Background

At the request of H&F Council I have been overseeing a short study into the feasibility of replacing the Hammersmith Flyover with a tunnel. Professional leadership has come from Nicholas Ruxton-Boyle, the

H&F Transport and Development Manager, whose contribution has been superb.

The forced closure of the flyover for repair work in 2011 started a public debate on the options for replacement, which in turn excited the council's ambition for the potential environmental improvement of central Hammersmith. The debate is as lively as ever as we endure a second phase of repair work.

Public support for the idea in principle was stunning, with 89 per cent of those consulted in local forums voicing their support. Interest in a better quality environment and an improved town centre and river access were highlighted as positives outcomes. Clearly there were concerns - most importantly the disruption caused by the build - but also in ensuring that any associated development was balanced.

The options

Consultation with the public, stakeholders and technical experts steered us to looking at both a short like-for-like replacement for the flyover, and a longer, more ambitious route. We tested two longer versions, each extending from Sutton Court Road in the west to either North End Road or Earl's Court Road in the east. In each instance we also tested the impact of junctions allowing traffic to join or leave the A4 rather than continue for the whole length of the tunnel.

Costs

Costs range (depending on whether junctions are included) from approximately £200m for the short 'cut and cover' option to just under £2bn for the longer bored tunnels.

Impact on traffic flow

Data shows that half of the traffic travelling east on the A4 past the Hogarth roundabout in Chiswick, turns off before it reaches Earl's Court. This suggests that junctions at Shepherd's Bush Road/Fulham Palace Road and North End Road might be needed to ensure that the new tunnel attracts enough traffic and doesn't simply add to congestion on the existing local road network. Such junctions are, however, difficult to site in the

narrow network of the existing roads, and costs would be significantly higher.

A new Hammersmith

While earlier ideas of tunnelling the A4 through Hammersmith had focused on development opportunities along the Great West Road/Talgarth Road strip, master planning suggests that any redevelopment should be focused on the area currently in the shadow of the flyover. The master planning exercise suggests a radically improved town centre. The focal point would undoubtedly create a new cultural sector - with the Lyric Theatre linked to the Apollo, adjoining a new public space around St Paul's Church - all linked to the river. Removing the flyover would release approximately 360,000sqm of residential and commercial space.

Ranking the choices - questions to resolve

The disruption caused by a tunnel's construction is broadly similar for both the long and short tunnels. The only difference is that the disruption associated with the short route is heavily focused on the already busy Hammersmith town centre.

Therefore, decisions boil down to how well they each satisfy the primary objective of reinventing the town centre and how much they will cost.

As the long tunnel will only attract enough traffic if it has junctions - it is worth testing the public appetite to include junctions. However, we see the economic and environmental costs as considerable.

The short tunnel has the advantage of being a decision for Hammersmith & Fulham Council and TfL, without the need to consult with other boroughs.

However, the full realisation of a transformed town centre would need further detailed research on local traffic flows and a plan to ease the flow on the Hammersmith gyratory. Our work suggests a north-south tunnel would not be the most efficient way to achieve this solution.

There may be a case for taking both long and short tunnel options further, with H&F Council and TfL working together on the concept for a short route, and with TfL exploring the strategic potential of the longer route. The work we have done to date has been greatly helped by close co-operation with our neighbouring boroughs. It may well be that under TfL sponsorship, the long route can be assessed in terms of how it also affects Hounslow's ambitions for the A4 as it goes west, and how Kensington and Chelsea wish to resolve the north/south issues that affect the Earl's Court one-way system.

While it was not in the remit of this study to recommend a specific solution, we have shown through public engagement that all options are technically feasible and displayed the relative affordability of each. We have also indicated what further work is needed and recommend that H&F Council and TfL work together to explore how this can be achieved.

The lower cost estimates are likely to be seen as affordable when set against the value of the land, released through development. The public will, however, have to be comfortable with three years of disruption to the A4 and the local road network as the tunnel is built, and be satisfied that this is an acceptable reality for their substantial long term gain.

We can show a path to a transformed Hammersmith town centre, with new public areas, a stronger cultural identity, new residential space in the heart of the town and an enhanced business and commercial offering. The environmental benefit of tunnelling and removing the flyover is compelling. In addition the tunnel would leave TfL with a more valuable asset, offering greater control on repair and maintenance budgets.

I would like to thank Halcrow for their expert advice, the planners for their input, the neighbouring boroughs for their support and

engagement and for the very constructive support offered by TfL. Most impressive, however, has been the engagement of the public in Hammersmith, who have shown strong support, detailed knowledge and have offered constructive criticism.

Local residents clearly want rid of this 1960s eyesore and to be able to reclaim their town centre. I believe they hold the key to how quickly this idea is adopted. If the public continue with their strong vocal support, supporting the concept of a flyunder will be an essential part of every candidate's manifesto at the next Mayoral election, fast-tracking the adoption of the flyunder scheme. The future really is in the hands of Hammersmith residents and businesses.



Neale Stevenson

Independent Flyunder Champion



Illustrative view looking east from Furnivall Gardens.

KEY FINDINGS AND RECOMMENDATIONS

10 Key findings

These ten key findings are the result of the four elements of the feasibility study; engagement, traffic, geotechnical and masterplanning. It is recognised that further work is required to refine the estimates, approximations and assumptions made to allow the feasibility study to report:

- There is a very high level of local support for burying the flyover;
- There is sub-regional support for tunnelling the A4;
- There are no known subterranean showstoppers;
- The longer the tunnel, the more construction lorries will be needed. However, this can be significantly reduced if the river is used;
- The longer the tunnel, the higher the construction cost will be. With the shorter option, the possibility of self-financing the scheme through releasing developable land in Hammersmith town centre is attractive;
- The longer the tunnel, the more geographically spread out the 18 months of surface disruption would be during the three-year construction period;
- Achieving a new Hammersmith town centre benefits from both the removal of the flyover and steps to address the Hammersmith Gyratory;
- There is a high level of traffic dispersion along the A4 corridor between Chiswick and Earl's Court;
- Significant environmental and economic issues could arise by linking a main tunnel to north-south routes; and
- Both tunnel lengths have positive and negative issues meaning that further local and strategic work should be undertaken.

10 Recommendations

These ten recommendations are for TfL to consider as the road authority for the A4, the strategic traffic authority for London and the transport authority for London. They are also made to the membership of the flyunder taskforce recognising the sub-regional influence of the project and the wider implications beyond transport.

- TfL endorses the vision set out in this feasibility study;
- Terms of reference of a new strategic taskforce are established;
- Strategic aspirations and concerns are sought;
- A long term plan for the A4 corridor is developed;
- An appraisal framework is established to fully evaluate large scale road investment;
- River transport of tunnel dig spoil is investigated;
- Traffic modelling is undertaken to explore the opportunities offered by the longer tunnel alignments;
- The Hammersmith town centre masterplan is refined;
- A surface road network is developed and tested to support the masterplan; and
- Further geo-technical work is undertaken in order to improve confidence in the feasibility results.

Introduction

The Road Task Force (RTF) was set up by the Mayor of London in 2012 to consider the future challenges facing London's roads and streets. It is an independent body, which brought together a wide range of interests and expertise. Its report, published in July 2013, sets out a new vision for London's roads.

Transport for London (TfL) published their response to the RTF at the same time and sets out the approach TfL, as the strategic highway authority for London, will take to implement its recommendations.

This report is published as the London Borough of Hammersmith & Fulham's response to both the RTF and TfL's response to the RTF. The report concentrates on the opportunities identified in both documents for the A4 corridor in West London.

The RTF establishes a clear and compelling agenda for change in London. It identifies that while progress has been made in recent years, there are three pressing, and interrelated, challenges ahead:

- Tackling congestion by improving the efficient use of the network;
- Providing better and safer public spaces and streets; and
- Accommodating growing demands for more walking, cycling and public transport.

A4 corridor

The following text is taken directly from the RTF report of which the Great West Road (A4) was one of the case studies.

"The A4 is a major arterial road in west London carrying high volumes of traffic (more than 90,000 vehicles a day) between the M4 and central London.

Between Chiswick Roundabout and Hammersmith, the road causes severance and crossing opportunities are limited to subways. At Hammersmith, a flyover separates the arterial motorised traffic from the gyratory and town centre below. The flyover is visually intrusive and the high levels of motorised traffic generate noise and air pollution along the corridor. In the short term, further roll out of the split cycle offset optimisation technique (SCOOT) will improve journey time reliability, and improving subway conditions (the main crossing opportunities along the corridor) will help increase pedestrian safety and security.



However, to exploit the potential new surface developments and make greater use of Hammersmith's established transport hub, longer-term proposals for providing alternative tunnelled routes for through traffic should be explored. This would have transformative effects on the town centre, greatly improving the quality of life for its residents, and reducing severance of communities along the corridor.

Proposed street type: Arterial"

TfL, in its response to the RTF and in particular to the concept of tunnelling, states:

"London does not have the wide boulevards of Paris or the extensive grid system of New York at its disposal to reallocate capacity to or from. And it's clear that the public acceptability of any enhancements to the capability of London's road network - including the creation of new facilities such as tunnels or underpasses to reduce the social and environmental impact of road traffic - will depend on their being tangible community and business benefits from such enhancements.



The RTF asserts the need for more radical measures to better balance the competing functions of the road network and to ultimately contribute to its vision of world-class streets, fit for the future. These measures includes different forms of suitably located and designed new or substitute infrastructure, such as floating roundabouts for cyclists and pedestrians, high quality bridges over arterial roads and opportunities for roofing or tunnelling under existing infrastructure at particular locations.

TfL will establish a rolling research and development programme, the component studies of which will:

- Review by mid-2014 possible locations for roofing over major roads, to minimise traffic impact, enable development and reduce community severance, especially to reduce community impacts in growth areas;
- Assess the potential for relocating strategic traffic from the surface and free up space for other uses by the end of 2014; and
- Assess, by mid-2015, the potential for 'local' re-located space (such as flyunders of floating roundabouts for cyclists) at particular pinch point locations on the network."

Background

In 2012, prior to the RTF and TfL's response, a group of west London architects known as West London Link Design (WLLD), in association with Halcrow Group and Hammersmith BID, presented a report titled: 'A Tunnel to Replace the Hammersmith Flyover: A Chain of Opportunities'.



This document is published in its entirety alongside this report and sets out high-level and conceptual options to replace the A4 between Chiswick and Earl's Court with a tunnel. It states that this tunnel can transform the city by:

- Reuniting north and south;
- Reuniting Hammersmith and Chiswick with the river;
- Rejuvenating the centre of Hammersmith;
- Replacing traffic arteries with boulevards and avenues; and
- Creating development opportunities for workplaces and homes.

WLLD were inspired to explore these opportunities due to the emergency structural works that TfL were required to undertake in 2011 to make the ageing structure safe. The full, and unplanned, closure of Hammersmith Flyover caused significant traffic problems in Hammersmith town centre as the A4 traffic was diverted around Hammersmith Gyratory which struggles to cope with peak traffic at present.

The flyover is currently undergoing a multimillion pound, 18-month refurbishment, running until 2015 to extend the life of the 50-year-old structure. These works are planned and as such

have less of an impact on the surrounding road network. It is inevitable, however, that further works will be required which could take many forms, including its full replacement over the next 50 years. WLLD recognise that now is the time to start thinking more ambitiously about its eventual replacement and that a major infrastructure project, like a tunnel, in a high-density town centre, will take years to plan, procure and build. The time we have is long enough to plan the best solution or short enough to be forced into a quick and dirty fix.

Feasibility study

It is for these reasons that H&F Council decided to undertake a feasibility study into a flyunder, to respond to the RTF and TfL publications, and to build on the WLLD vision.

It was always recognised that TfL, as strategic highway authority for London, is ultimately responsible for the management and future planning of the A4. The feasibility project was designed in such a way that it would be prepared on TfL's behalf to fill the gap between the aspirational RTF recommendations and the realistic TfL research and development programme.



LOCAL OPINION

It was apparent from the events held by the WLLD group in 2012 that there was significant local interest and support for digging a tunnel for the A4. This feasibility study seeks to build on this support and explore how residents and businesses saw the potential benefits and disbenefits of a tunnel.

The feasibility study was designed with extensive community engagement forming the majority of the early work stages. This was in order to ensure that further local opinion is sought to establish how the technical work stages would be taken forward.

The below statement is taken directly from the feasibility study terms of reference:

To establish, at a preliminary level, the aspirations and any concerns of local residents and businesses.

This engagement was facilitated in a number of ways. First, a dedicated website was set up in order to provide a medium for communication with the wider community. This website received an unprecedented volume of traffic and received one of the highest number of posts the council has ever received. www.lbhf.gov.uk/flyunder

Second, a flyunder summit was held in Hammersmith Town Hall on 10 October 2013. This was an opportunity for the public to see and hear about the work done to date and the feasibility study on the flyunder concept. The flyunder champion hosted the summit and heard a number of presentations, including from WLLD and TfL.

The standing-room-only summit further confirmed the strong local interest, and saw a lively debate

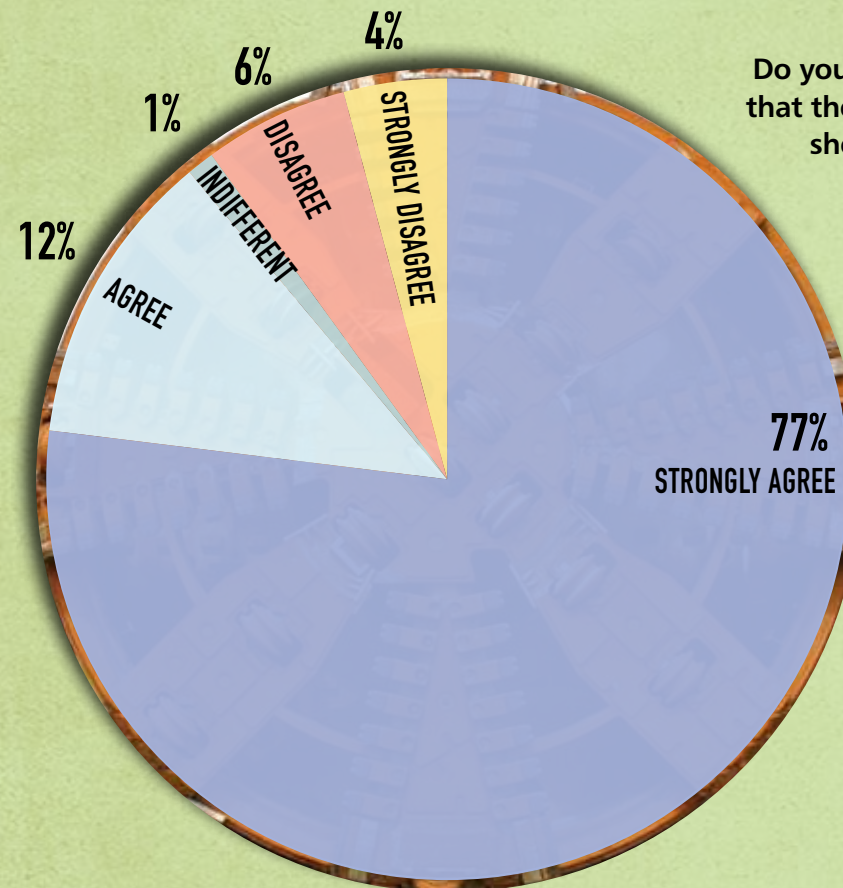


on the aspirations and concerns of residents and businesses. Those attending were asked to complete an eight question survey designed to help develop the feasibility study work streams. The results from this questionnaire, alongside the web comments, were combined to form the basis for the study.

The results again confirmed the high level of support for a tunnel. However, it also established that there was a range of aspiration with regards to how long the tunnel should be and which routes it should connect to, if at all.

Four main concerns emerged in regards to both construction and operation of a tunnel. The options that were tested as part of the study were appraised using these aspirations and concerns in order to allow a comparison against the options.

The following pages summarise the early study engagement and helped establish the primary level local aspirations and concerns.



QUESTION 1
Do you agree with the council that the Hammersmith Flyover should be replaced with a flyunder?

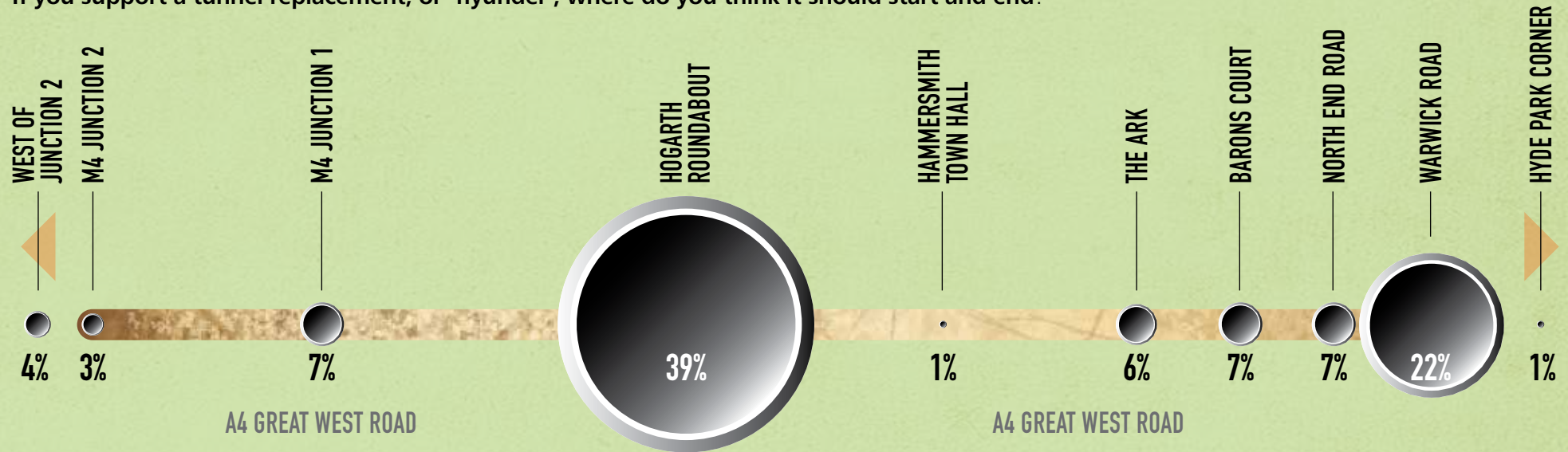
These results provided a suitable mandate for the feasibility study to proceed and validated the council's resolution to work towards a tunnel replacement.

There was a variety of reasons as to why 10 per cent of respondents did not agree with a tunnel replacement.

These ranged from people not having enough information at this stage of the study to make an informed decision, to the flyover being a 'beautiful structure', or those that said that the money would be better spent on public transport.

QUESTION 2

If you support a tunnel replacement, or 'flyunder', where do you think it should start and end?

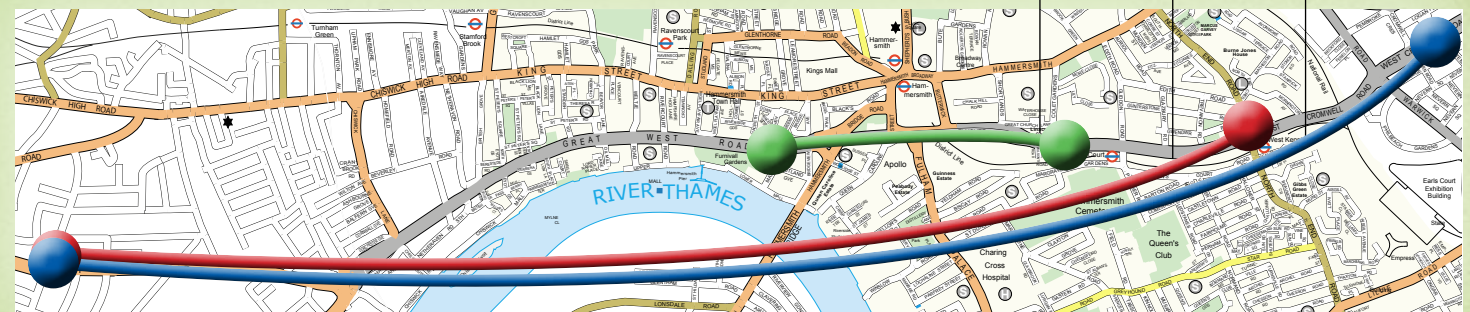


The start and end of a tunnel is known as a portal and it is at these portal locations that construction and operational matters are felt. Portals require a section of cutting, approximately 200m in length, followed by a structure to house ventilation equipment. This structure could be made integral to any redevelopment as has been the case in other tunnels.

There was a clear preference for the western portal at Hogarth roundabout and the eastern portal

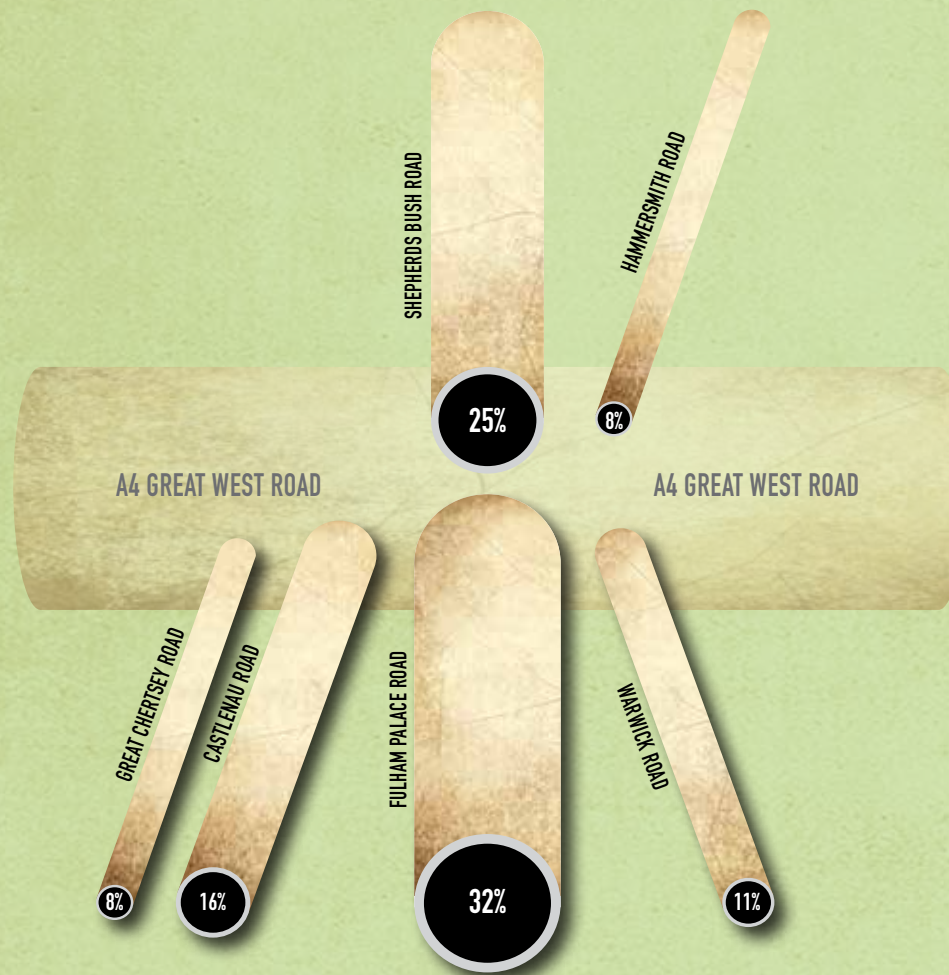
at Warwick Road. A tunnel linking these two sites would be over two miles long and bypass a number of north-south routes that currently link to the A4. There was relatively low support for a short tunnel starting

and ending in a similar manner to the current flyover. Despite this low support, a tunnel based on these start and end points was tested as it was likely to be the least expensive and disruptive.



QUESTION 3

Should the flyunder connect to any north-south links?



Very few tunnels have junctions with other routes. An example an exception is the Limehouse Link tunnel in East London that has a underground junction to allow eastbound traffic to turn off to Canary Wharf and for Canary Wharf traffic to join the westbound flow.

One of the feasibility study terms of reference was to examine the implications of linking the main A4 tunnel to north-south routes. Only a small selection of these were offered in the multiple choice question including those around Hammersmith Gyratory which would likely become the mid-point of the tunnel and north-south routes at both western and eastern portal locations.

Two different approaches were taken to junction testing as part of the feasibility study. This was based on both the feedback above and the subsequent traffic analysis that was carried out under another of the study's terms of reference.

QUESTION 4

Do you think opportunities should be exploited to return Hammersmith Gyratory to two-way working?

One of the WLLD objectives for creating a tunnel for the A4 is to improve the urban environment in Hammersmith town centre. Given that currently two traffic systems dominate the town centre - the flyover and the gyratory - this question sought to establish what importance they play in the degradation of the town centre.

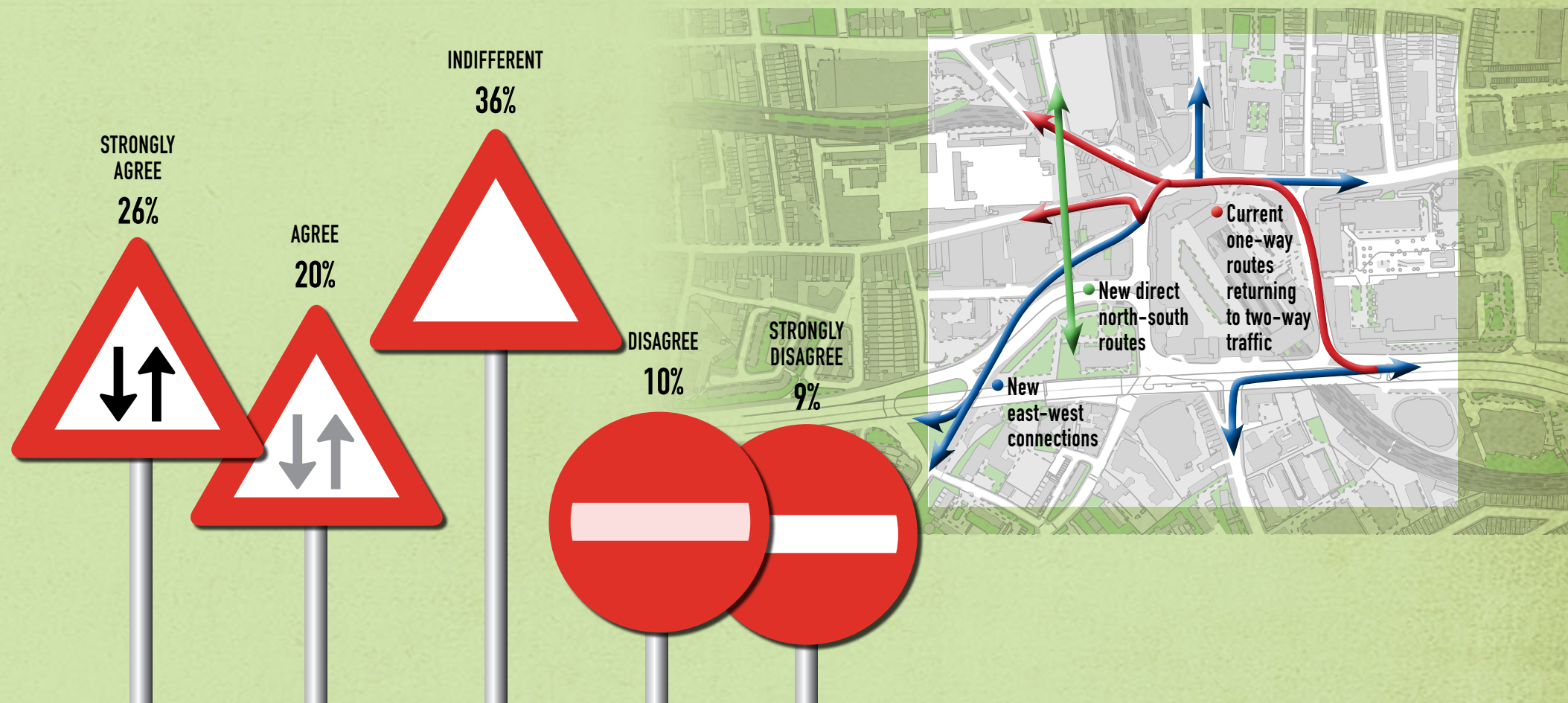
As can be seen from the results, almost half of respondents believed that the gyratory should work in two directions if possible. However, the remaining respondents did not consider this to be a priority.

The Hammersmith Gyratory performs a complex function in the local

and strategic road network and surrounds the key public transport interchange requiring a number of crossings which delay both traffic and pedestrian movement.

TfL, over the last few years, has removed similar gyratory systems to the benefit of all road users, returning

them to two-way working. Their current work programme includes gyratories in Wandsworth and Vauxhall Cross, as well as new studies for Stoke Newington, Swiss Cottage, Aldgate and Archway.



QUESTION 5

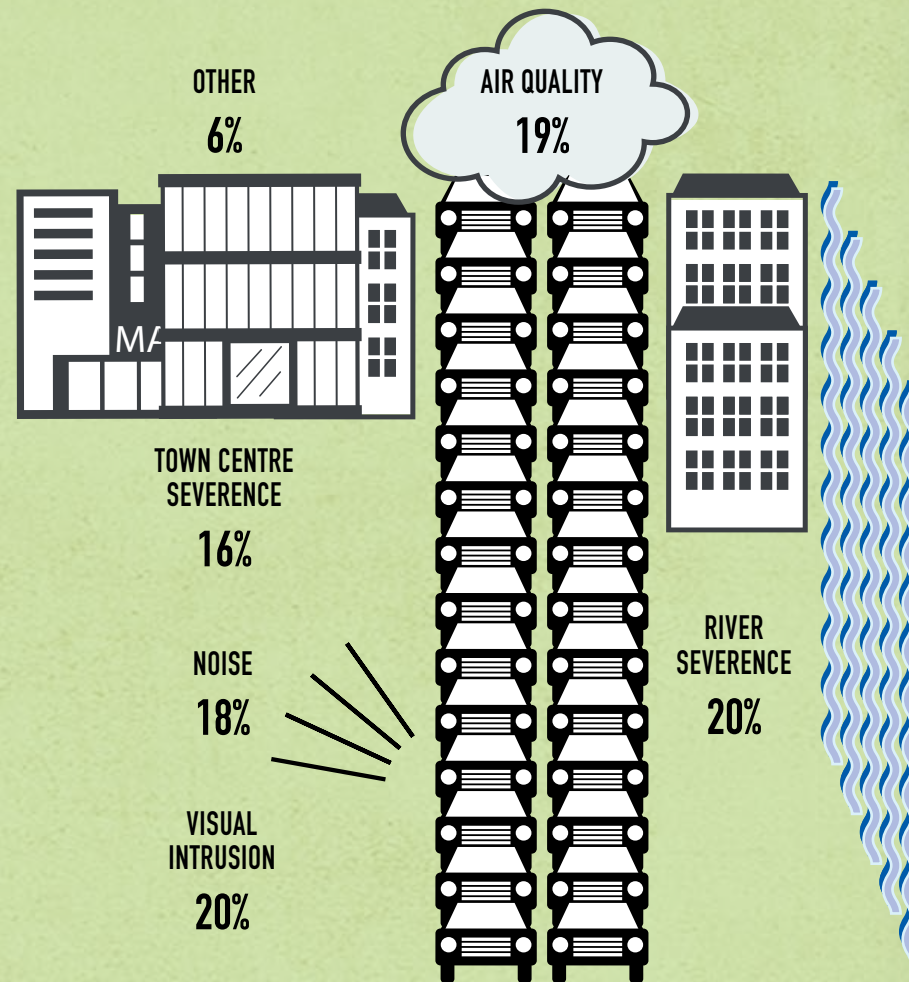
What are the current problems that you would like to see the flyunder overcome?

The five options provided as answers to this question were taken directly from the RTF and WLLD reports. It should be noted that network performance (i.e. congestion and subsequent delay) is not listed as one of the current problems. TfL data shows that this stretch of strategic road performs better than most.

Of the five options offered there was a balanced response with equal support for the resolution of the problems of air quality, noise, visual intrusion, town centre severance and river severance.

For the other responses a lack of housing was seen as a problem that a tunnel could overcome, as was neighbourhood connectivity and local road congestion.

The manner to which a number of tunnel alignments can address these problems is compared later in this report. It is apparent that some of these problems can be reduced, whereas others could be replaced or relocated.



QUESTION 6

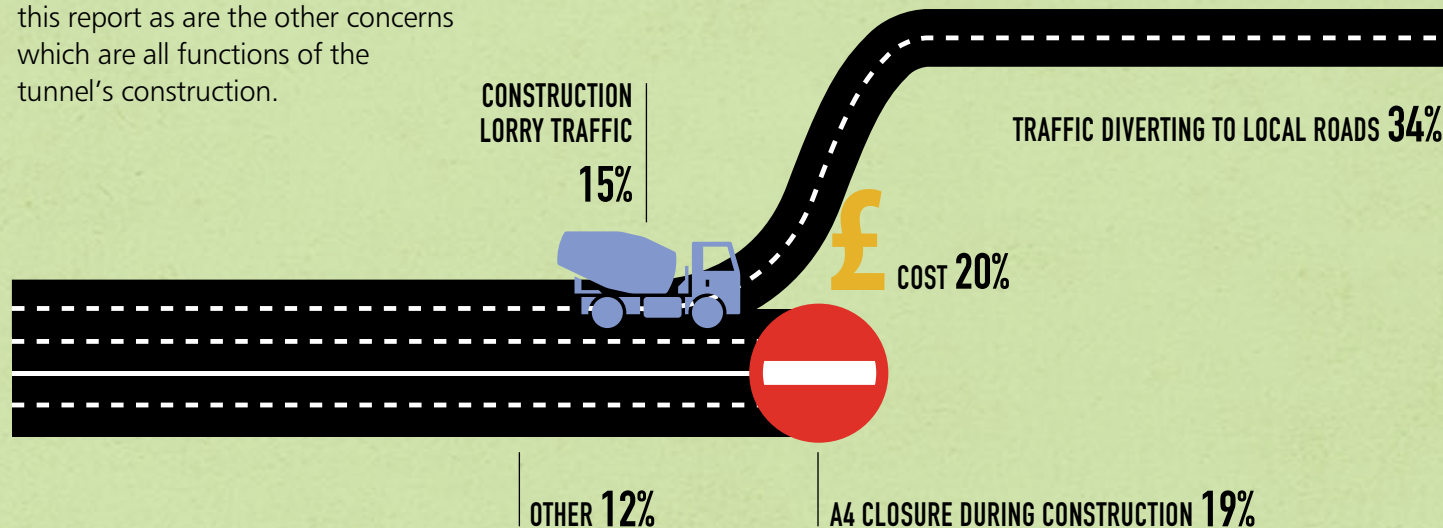
What are your main concerns for a flyunder?

Four major concerns, based on the experience of other major road and infrastructure projects, were considered to be relevant to a tunnel replacement along the A4. These related to both the construction period of the tunnel and its subsequent opening and operation.

The biggest concern was the issue of traffic not using a tunnel and diverting onto other routes. This is likely to have been due to the existing congestion and delay on the borough's local road network. This issue is explored in more detail in this report as are the other concerns which are all functions of the tunnel's construction.

Cost was the next biggest concern which is understandable given the figures quoted in the Evening Standard newspaper, which were reported as running into the 'hundreds of millions'. The disruption caused to the A4 itself during construction and the number of lorries required were as much of a concern and the study has attempted to assign scales of impact based on various tunnel lengths and construction methodologies.

Other concerns range from overrunning construction cost and time, the underground cutting, how to deal with car breakdowns and exhaust fumes, the perception that it will never happen and that's it is too ambitious as a scheme.



QUESTION 7

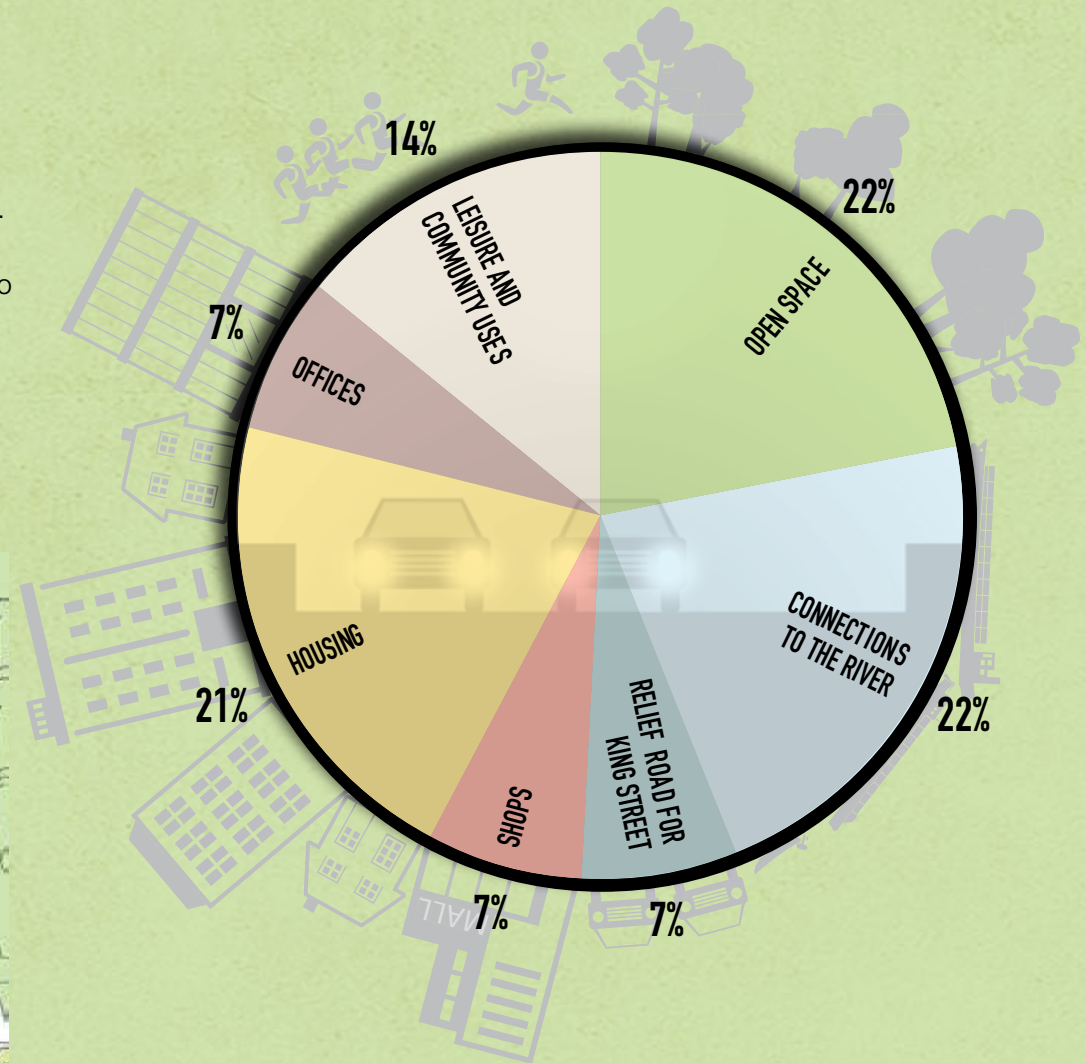
What should any land freed up by the removal of the flyover be used for?

One of the terms of reference for the study was

To consider the nature, extent and potential value of any released surface land, bearing in mind existing planning policies and any potential from varied planning policies.

With the flyover removed, land would be released for a variety of uses, some that would generate

value to possibly fund the construction of the tunnel. The stated preference to this question was for the land to be kept public, rather than to be developed, which formed the basis of the WLLD work. The masterplan work done as part of the study utilised the responses to this question to generate a suitable development scheme and therefore income balanced against the need and request for additional urban open space in Hammersmith town centre and along the A4 corridor.



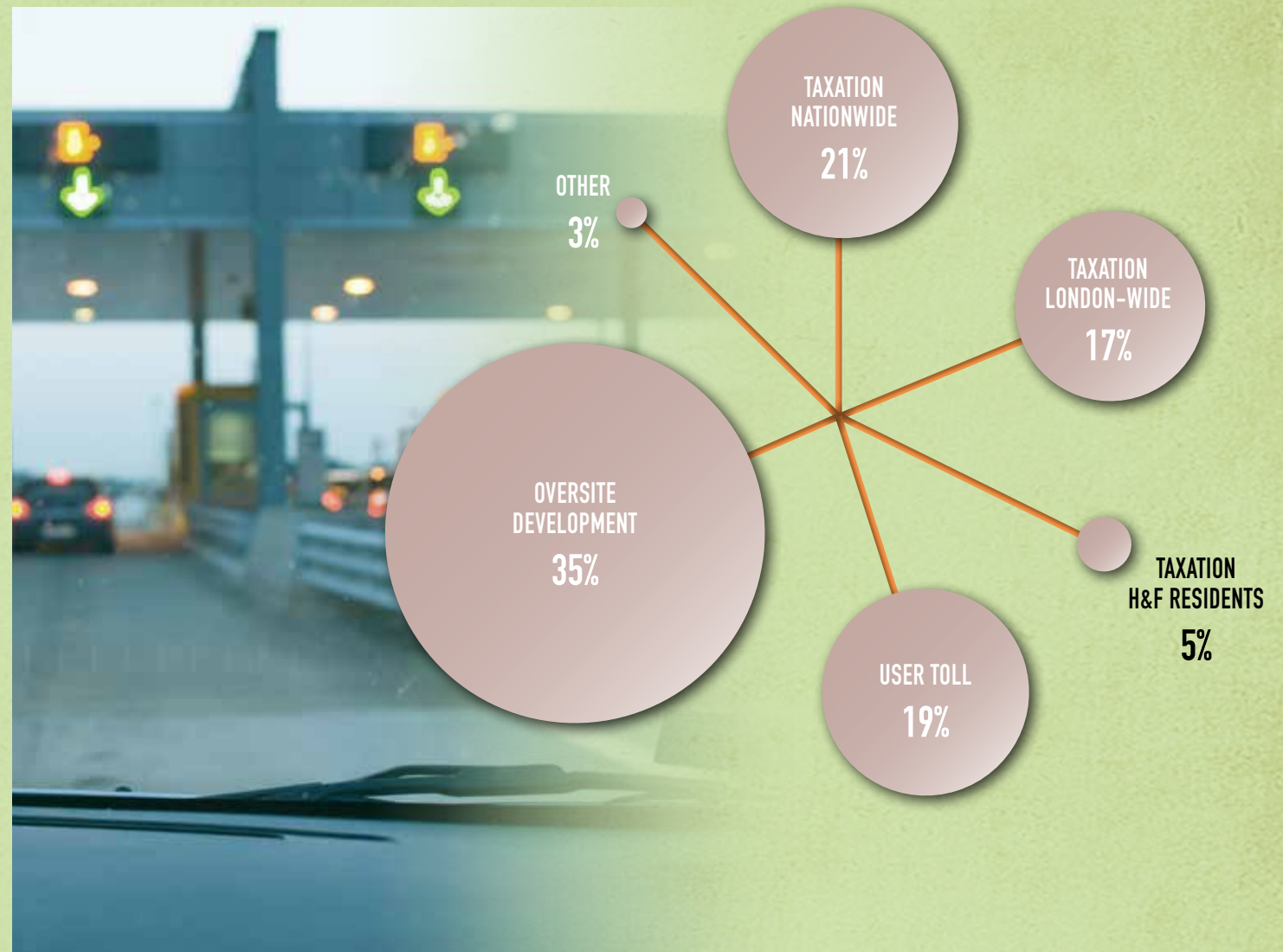
QUESTION 8

How should the flyunder be paid for?

Any tunnel project would require a substantial, innovative and multi-source financing model. This question was designed to tease out the local appetite for a number of financing methods. A third of respondents supported oversight development to fund the tunnel which supports the masterplan work done as part of the study.

Almost half of respondents supported taxation as a method for collecting funding, with half of those considering a national tax as the most suitable idea. This confirms the opinion of the strategic nature of this project and of the next stages of feasibility study.

Surprisingly 19 per cent of respondents supported a user toll on the tunnel to help finance the project. While this is a common feature in Europe, toll roads in the UK are limited to the central London congestion charge zone, the M6 and a few tunnels and bridges. There are a number of economic, environmental and political issues around toll roads which are touched upon in the funding section of this report.





Councillor Tim Coleridge
Cabinet Member for Planning Policy, Transport and the Arts
Royal Borough of Kensington and Chelsea
The Town Hall
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27 February 2014

Neale Stevenson
The 'Flyunder' Champion
London Borough of Hammersmith & Fulham
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Dear Neale,

Thank you for involving the Royal Borough of Kensington and Chelsea in developing the London Borough of Hammersmith and Fulham's 'Flyunder' proposals to replace the A4 viaduct with a tunnel. We support your objective to improve Hammersmith town centre. Hammersmith is a useful and valued destination for many of our residents. We are sympathetic to your desire to remove the flyover from Hammersmith town centre but recognise the challenges that this would involve and the potential impacts.

We are concerned that the longer bored tunnel options presented within the Feasibility Report, Options 2 and 3 would significantly change traffic patterns in West London and risk impacting negatively on traffic and environmental conditions in the Royal Borough. The risks associated with Option 3 appear greatest given that, of the options presented, it would remove the least traffic from existing streets and could change through traffic patterns most. Pending further investigative work to quantify potential impacts and possible mitigation measures, we feel that any potential benefits of Options 2 and 3 would be greatly outweighed by their disbenefits.

Option 3 would involve constructing a tunnel portal within our Borough on West Cromwell Road between Warwick Road and Earls Court Road. This would have considerable local impacts both during construction and following completion without any demonstrable benefits. While there might be scope to reduce the severance effect of the A4, it appears that these benefits would be marginal, given the land take of the portal itself and the remaining roads. It is unclear how such a tunnel would capture traffic on Warwick Road (the northbound branch of the Earls Court One Way system). None of the tunnel options would relieve traffic on the Earls Court One Way System and Options 2 and 3 could well exacerbate

existing traffic problems. Perhaps Transport for London could consider alternative portal locations that would remove long distance traffic from a wider area including Earls Court.

We consider Option 1 to be comfortably the strongest of the options presented. This option appears to have the greatest benefit for Hammersmith Town Centre in terms of removing traffic from the town centre whilst being the least costly to build and limiting the extent of the excavation. Nonetheless we recognise that there would be significant disruption during the construction period. Any acceptable construction arrangements must minimise road use and limit the diversion of traffic. I understand it would be possible to keep the viaduct operational while a tunnel is dug underneath. We would support this sensible approach.

The findings of the preliminary feasibility study are necessarily broad brush and lacking in detail. For all options, detailed analysis of traffic, noise and air quality impacts remains necessary. However based on the preliminary findings, Option 1 appears to have the most potential to be positive for West London if its construction can be managed satisfactorily.

The study report has certainly piqued our interest in the possibilities for road tunnels to enhance environmental conditions in Hammersmith town centre and more broadly. We would wholeheartedly support the further development of these or similar proposals. We hope that Transport for London can use their resources going forward to flesh out workable and ameliorative proposals that would benefit Hammersmith and rest of West London. We look forward to seeing the study develop and we would be pleased to continue our involvement with the project.

Yours sincerely

Councillor Tim Coleridge
Cabinet Member for Planning Policy, Transport and the Arts

Brendon Walsh Regeneration, Economic Development and Environment Department

Cllr Nicholas Botterill
London Borough of Hammersmith &
Fulham
Town Hall
King Street
London W6 9JU

**Regeneration, Economic Development and
Environment Department**
Civic Centre
Langton Road
Hounslow TW3 4DN

Your contact: Mark Frost
Direct Line: 020 8583 5037
E-Mail: mark.frost@hounslow.gov.uk

Our ref: Hammersmith Flyunder
Date: 28 February 2014

Dear Cllr Botterill,

London Borough of Hounslow (LBH) welcomes the London Borough of Hammersmith & Fulham's (LBH&F) bold and transformative vision for a 'flyunder' in order to remove the severance caused by the Transport for London (TfL) road network around Hammersmith and Chiswick. The part of the A4 considered forms a perceptual and physical barrier between Chiswick High Road and the important amenity and heritage sites of the Thames, Dukes Meadows and Chiswick House & Gardens. It is also responsible for significant noise and air pollution, reducing the quality of life for those living nearby and depressing property values; opportunity for investment and development; and the local economy.

We therefore whole-heartedly support the principle of taking the main east-west artery underground and replacing it at surface with a local network, using the space freed for enabling development which is both imaginative and sympathetic in style and scope to integrate with the existing built form.

We now discuss the technical solution and the enabling development issues in turn.

In regards to the technical solution, we note that you have investigated various options for achieving this outcome, from a straight 'cut & cover' replacement for the existing flyover in your borough and just into our borough east of Hogarth roundabout, to something more ambitious, involving a longer bored tunnel linking Chiswick to the vicinity of Earls Court. Clearly a longer bored tunnel helps spread the benefits of the project and it is tempting for us to push for such a tunnel to be taken even further west to replace the M4 elevated section through Brentford. However we understand that a large proportion of traffic using these roads is local. Without a series of complicated ramps and 'portals' providing access to a new underground highway - structures that would result in loss of property (some likely to be listed or of conservation value) and land area and act to simply displace severance - this traffic is likely to be re-diverted onto the existing network (or the proposed replacement streets). The benefits of the scheme, and indeed the total number of users, may therefore be insufficient to warrant the huge cost.

At this stage, and based on the assessments provided to date, we remain 'solution blind' as long as our objectives for reducing severance, improving amenity and protecting heritage in Chiswick are observed.

On the face of it would seem that a 'cut & cover' like for like replacement of the flyover extending to Hogarth roundabout may provide the best business case. Should this project be formally taken up by LBH&F or TfL to investigate further we would also like the assessment to give due consideration to whether such a structure could be extended as far as the Hogarth roundabout, or indeed further towards Sutton Court Road, assuming there was a technical solution to ensure appropriate connectivity with traffic coming from the A316 was retained. We note that if this connectivity is not provided, based on the current traffic data presented, it is likely that the replacement local network on the surface would still need to be of a relatively high capacity to deal with vehicles from the A316 which may negate the benefit of the whole scheme.

In regards to enabling development we are broadly speaking in favour of the quantum's you suggest within our borough, however much work would need to be done to ensure the design is of a high quality and complements the existing built form and urban grain. The Council has recently completed extensive Context and Character studies which will be useful in assisting the assessment of potential.

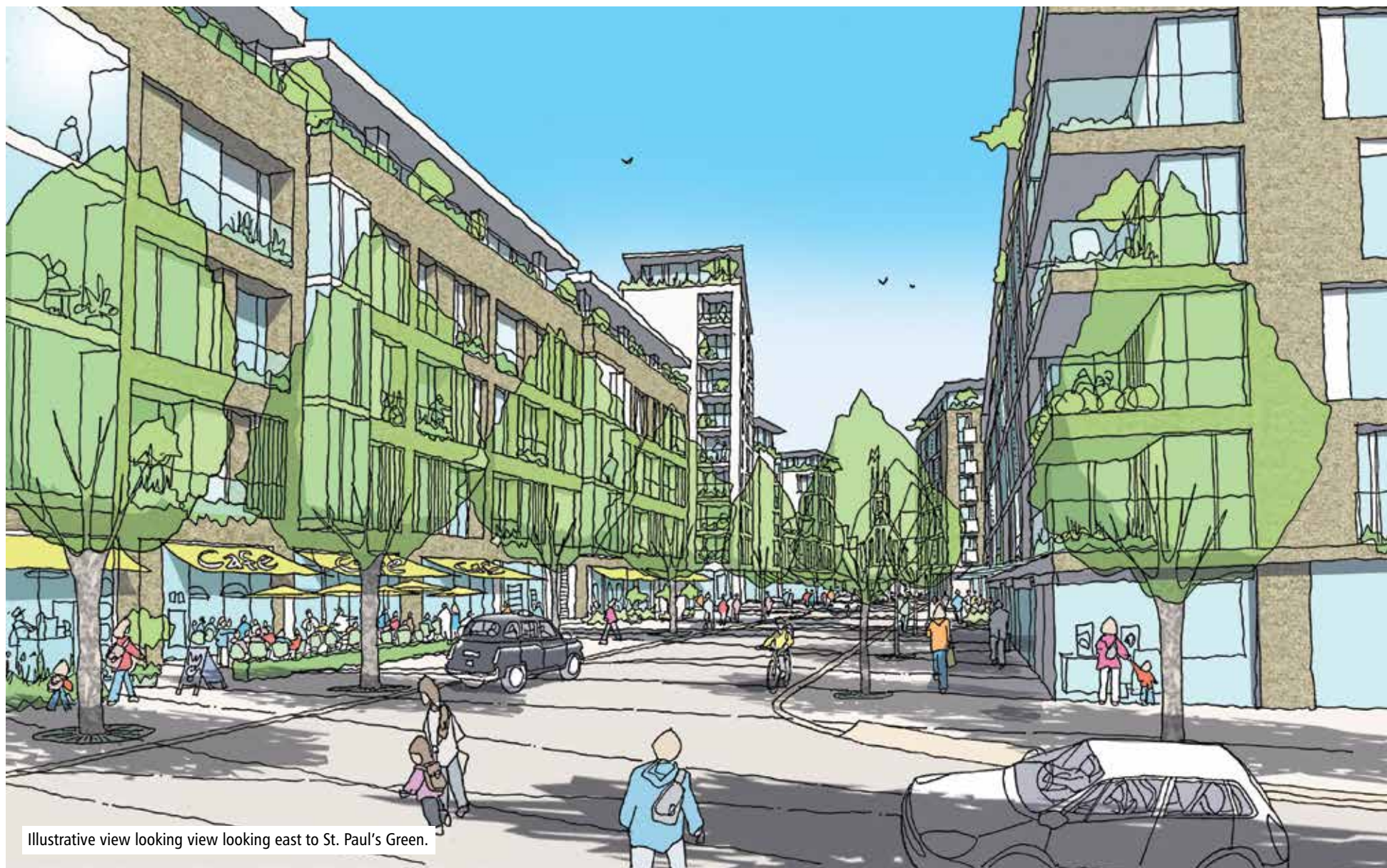
Yours sincerely,



Cllr Steve Curran
Lead Member for planning, property, regeneration and housing



Cllr Ed Mayne,
Lead Member Community Safety and Regulatory Services London Borough of Hounslow

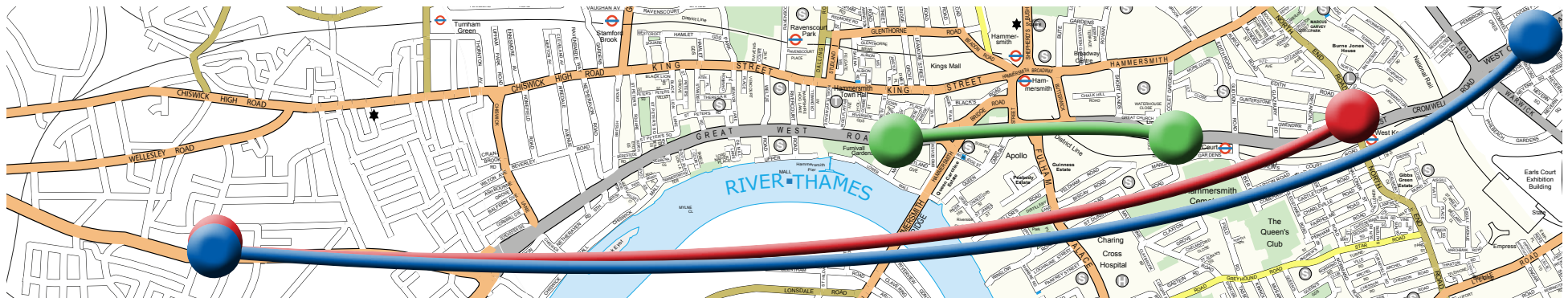


Illustrative view looking view looking east to St. Paul's Green.

OPTION COMPARISON

Two tunnel options have been appraised in this feasibility report, a short option and a long option. This was based on the extensive public engagement carried out, assumed economic and environmental factors and engineering judgement. Six options were tested through the geo-technical study, one short, two long and all three options with 'junctions'. The two options selected to be

compared and reported are a short option (1a in the Halcrow report) and a long option (3a in the Halcrow report). The image below shows the indicative portal locations and alignment of options 1a, 2a and 3a in the Halcrow report. For the purposes of this appraisal, the short option is 1, (the green line) and the long option is 3, (the blue line). The red line is a variation of the long option.

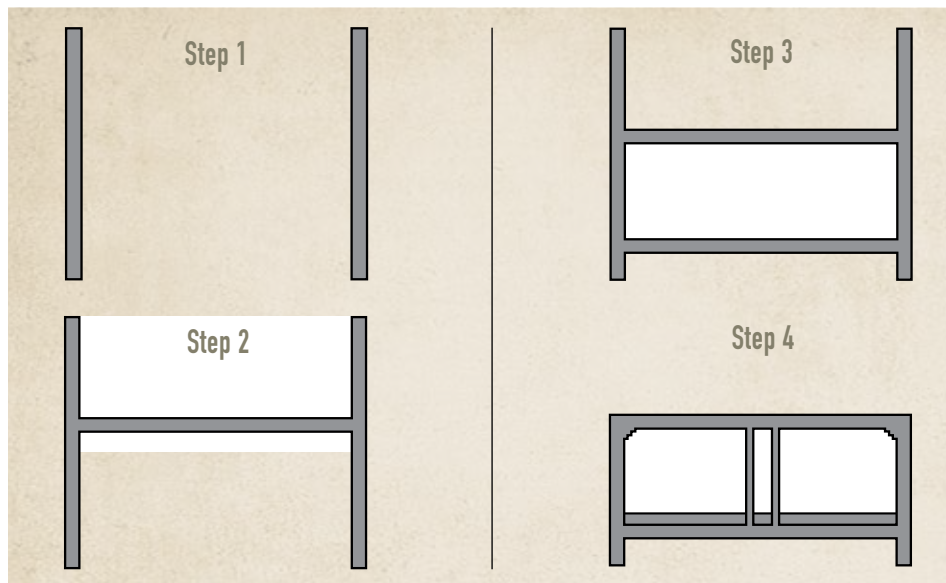


Short option

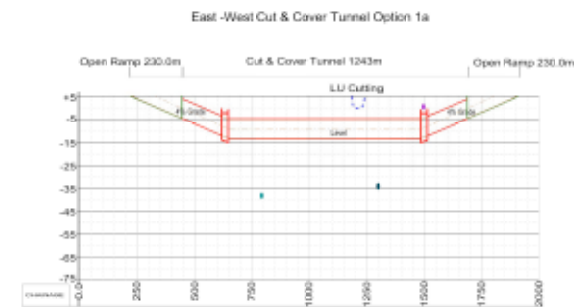
The short option is essentially a replacement of Hammersmith Flyover and follows the same alignment as the A4 and the flyover. The western portal starts at Hammersmith Town Hall and the eastern portal at Ealing, Hammersmith and West London College. The tunnel is approximately one mile in length and would be constructed

using a cut-and-cover method to a depth of approximately 15m in order to pass safely under the London Underground cutting. The figure (below left) shows the construction steps of the top down cut and cover method. Other similar cut and cover constructions have been completed in London and the flyover can be underpinned while excavation work is carried out below.

The figure on the page opposite shows the detailed alignment and longitudinal profile of the short option. It shows the 230m open cut sections at the portal sites, the gradient of the ramps and known subterranean obstructions, such as the London Underground cutting and existing/planned Thames Water utilities.



Plan View Scale 1:10000

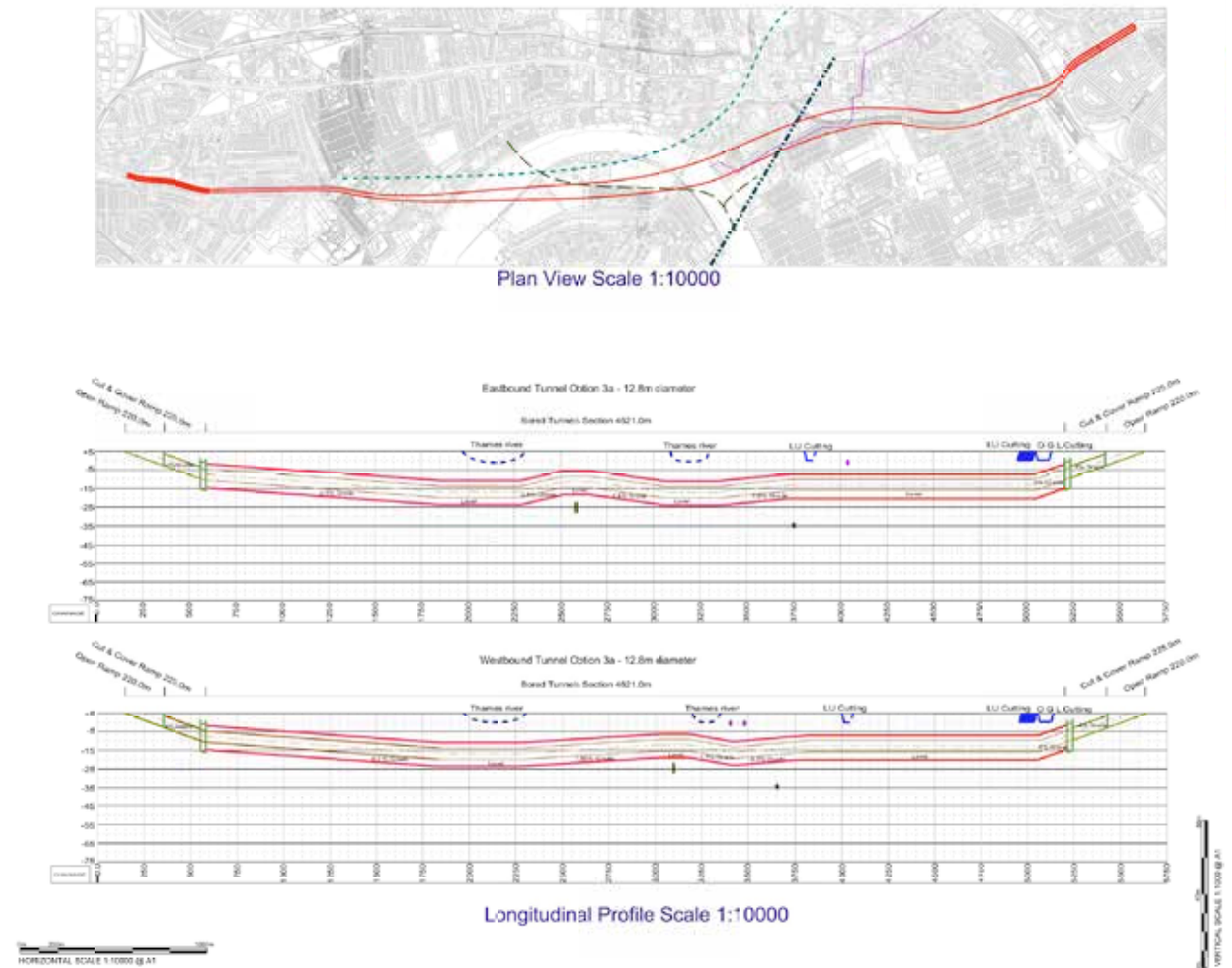


Longitudinal Profile Scale 1:10000

Long option

The long option is a two-and-a-half-mile twin tunnel between Chiswick and Earl's Court. The western portal is at the junction with Sutton Court Road in the London Borough of Hounslow, which is considerably further west than first anticipated due to the need for the tunnel to pass safely under the Thames. The eastern portal is between Warwick Road and Earl's Court Road in the Royal Borough of Kensington and Chelsea. Below is an indicative longitudinal section of a portal showing the open cut approach ramp which is a common feature to both types of construction. The main tunnel would be constructed using a tunnel boring machine (TBM) with an outer diameter of 12.8m - which is about 50 per cent bigger than the Crossrail tunnel. The portals would be constructed using the cut-and-cover method described earlier. The tunnel would be twin bore in that it would have a separate tunnel for each direction of traffic, which doubles the length of tunnel required to be excavated to approximately five miles.

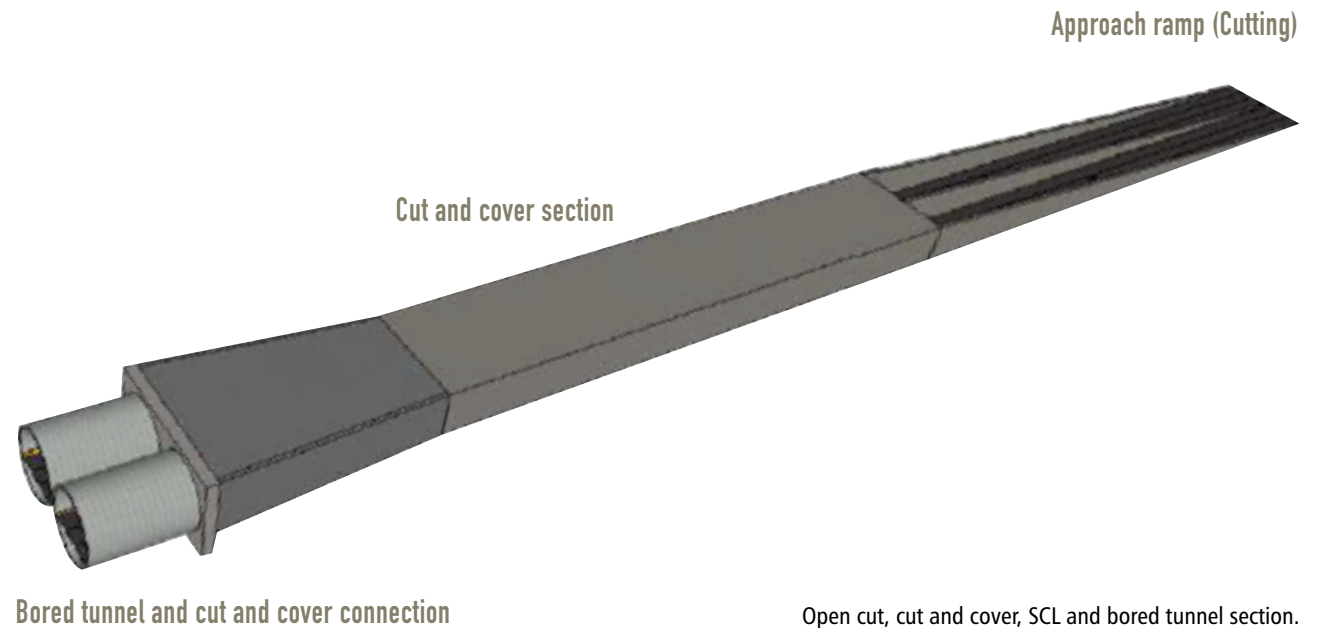
The figure below shows the different alignment of the two bores and the longitudinal profile as the bores pass below the Thames and two London Underground cuttings and above the proposed Thames Tideway Tunnel. The open ramp and



cut-and-cover ramp are similar in nature to those of the short tunnel.

Both tunnels have been designed to carry two lanes of traffic in each direction (based on forecast traffic flow and nature of the flyover). Ventilation and fire safety systems have been built into both options.

We recognise that these are only two options and a tunnel could take any number of alignments, depths, lengths and portal locations. These two options were designed to start the debate about the benefits and drawbacks of the principle of tunnelling and to be used as a baseline for assessing and appraising any future options.



CONSTRUCTION DRAWBACKS

Cost

The cost of the construction alone (not including land acquisition, governance or mitigation) is a function of the length of the tunnel and construction methods. The different construction methodologies between the long and short options affect their construction cost. The longer tunnel options are twin bore which increases total tunnel length cost. A single bore was considered, with traffic stacked inside, however the tunnel boring machine required to build such a tunnel would be the largest in the world at 20m in diameter.

Notwithstanding other influences, the longer the tunnel, the more expensive the construction cost.

To put these figures into context, the recently completed skyscraper, The Shard in London Bridge, cost £450m to construct.

These costs also do not include the removal of the flyover or any highway realignment required along the A4 or local road network. These costs will be comparable across both options and are at this stage unknown.

OPTION	CONSTRUCTION METHOD	TOTAL TUNNEL LENGTH	CONSTRUCTION COST* (2013 PRICES)
Short	Cut-and-cover	1.6km/ 1 mile	£218m
Long	Tunnel boring machine	8.2km/5.1 miles	£1,297m

*These cost estimates are based on a high level feasibility study and include a 30 per cent contingency uplift. TfL standards suggest a 45 per cent uplift and this range has been used in the financial appraisal in later chapters.

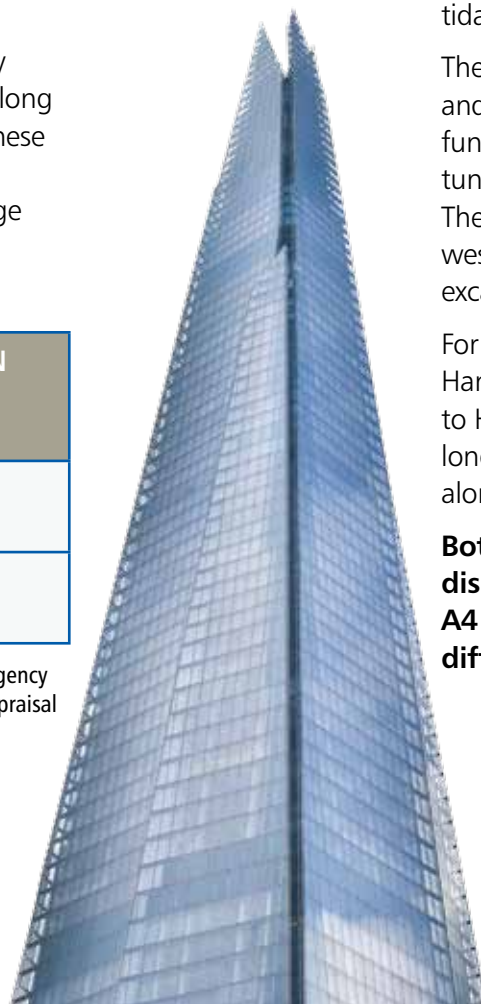
Traffic disruption

The two options considered as part of this study take broadly the same time to construct at three years. Again this is down to their length and different construction methodologies. Traffic flow along the A4 is assumed to be disrupted for approximately half the construction time. Disruption to the A4 is likely to entail lane closures, tidal flow and night-time and weekend closures.

The following table compares construction and disruption time. It also established another fundamental difference in the long and short tunnels, namely the location of the disruption. There are four areas of surface disruption: the western portal, the eastern portal, the main tunnel excavation and the flyover removal.

For the short option, the four sites will all be in Hammersmith, limiting the construction disruption to Hammersmith Town Centre. However, for the longer tunnel, the construction will be spread along the A4 corridor.

Both options have a broadly similar disruptive impact on the operation of the A4 however this disruption is located in different places.



Construction lorries

The amount of construction traffic created by any subterranean construction is a function of the material removed and the construction methodology.

The longer the tunnel, the more spoil removed and more construction material required, which therefore creates more construction traffic. This, however, does not take into account the opportunity for river transport of certain materials that a tunnel project adjacent to the river could explore. This could reduce lorry movements significantly.

Translating the volume of material created and required for a tunnelling project into likely lorry movements is not straightforward. In addition, the location of this traffic will be concentrated at different times and locations over the multi-year construction period. For the short option this is Hammersmith town centre as it is the location for the four main construction areas: the two portals, the main tunnel and the removal of the flyover.

The potential use of the river could reduce the number of surface lorry movements and would have different levels of reduction for the different construction locations, as above. At Hammersmith,

OPTION	CONSTRUCTION TIME	A4 DISRUPTION	LOCATION OF MAIN DISRUPTION
Short	3 years	18 months	Hammersmith town centre
Long	3 years	18 months	Portal locations, drive site and Hammersmith town centre

for example, the use of conveyor belts and catenary systems could potentially move spoil the short distance to the river without any significant use of road vehicles - although such a method would create its own environmental impact issues. It is also possible that the great majority of the necessary lorry movements, for all options, would be via the A4 itself, thereby minimising the wider environment of the impact.

The table below shows the total volume of spoil for each option that would need be removed and an approximation of the daily lorry equivalent movements this spoil, and incoming material, creates without using the river. Use of the river could greatly reduce these figures. Ninety per cent of the main tunnel's excavated material, tunnel lining precast segments and concrete aggregates could be transported by barge.



CONSTRUCTION BENEFITS

A wider appraisal of other benefits of construction has yet to be undertaken for either option. However, there are a number of environmental and economic benefits within this major construction project.

The number (and range) of jobs that would be created by this project would be significant. It is likely that many of these jobs would be made available to local residents, and opportunities for local businesses (such as Halcrow and WLLD) would also be significant.

There is a well-documented concept known as traffic evaporation that suggests that when highway capacity is reduced, traffic flow reduces accordingly - or it appears to evaporate. Most examples of this are based on permanent reductions in capacity. If the A4 was required to have its capacity reduced during construction for a substantially long time, the same concept is likely to apply. This reduction in traffic flow would likely result in reductions in traffic noise and improvements in air quality. However it would need to be considered alongside the air quality and noise implications of the construction activity itself.

OPTION	TOTAL TUNNEL LENGTH	VOLUME OF SPOIL TO BE DISPOSED (M ³)	AVERAGE DAILY LORRY EQUIVALENTS WITH NO RIVER USE	AVERAGE DAILY LORRY EQUIVALENTS ASSUMING USE OF RIVER
Short	1.6km/1 mile	430,000	150	28
Long	8.2km/5.1 miles	1,140,000	375	61



OPERATIONAL DRAWBACKS

Traffic redistribution

The traffic analysis that was carried out as part of this feasibility study is detailed below, along with its limitations and assumptions. Traffic redistribution varies based on the length of a tunnel and its start and end points. In this instance, the longer the tunnel, the less traffic would be generated. As such, opportunities to remove or reduce the existing surface road network diminish as tunnel length increases, primarily down to the current traffic distribution and proportion of through traffic.

Smaller side road junction tunnels can provide opportunities for the main tunnel to pick up and distribute more traffic. However this is one area in which much further and more detailed strategic analysis is required. Further traffic modelling could also forecast the wider sub-regional impact, such as local and strategic redistribution based on a new network.

Essentially the longer the tunnel, the less opportunity traffic has to turn on and off, and hence it will carry less traffic.

OPTION	PERCENTAGE OF EAST-WEST TRAFFIC LIKELY TO USE TUNNEL
Short	100%
Long	50%

The traffic analysis was carried out using TfL data including traffic counts and outputs from their strategic traffic model for West London. Both current, actual and modelled traffic flows were reviewed from this data alongside forecasts for 2031 traffic flows based on the growth in jobs and population in the current London Plan and the planned transport network (without factoring in a tunnel).

The traffic analysis was carried out to understand how much traffic would be likely to use the various tunnel options - which in turn, has influenced tunnel dimensions - and what surface network would be required. The traffic analysis was developed during the project to include investigating the Hammersmith Gyratory, the impacts on the various options and to explore opportunities to reduce the severance caused by the current one-way system. This could include returning the gyratory to two-way working, which has been achieved at other similar gyratory systems in London.

All quoted modelled data uses the rounded average evening peak traffic flow only. Flows in the inter-peak, weekend and morning peak periods are likely to be different.

In 2031, it is forecast that approximately 2,500 vehicles an hour will use the flyover in either

direction, an increase in 14 per cent on the current flow. Traffic flow to the east of the flyover is of a lesser magnitude and to the west is considerably higher at 3,500 per hour. There is a similar volume of traffic travelling around Hammersmith Gyratory which shows a similar increase over current flow. As the A4 travels into central London traffic flow generally decreases, which is representative of a radial traffic corridor. Likewise as the A4 travels out of central London, traffic flow increases.

As the A4 passes through Hounslow, Hammersmith & Fulham and Kensington and Chelsea it has junctions with a number of side roads. Vehicles both join and leave the A4 to continue their journeys. Over the length of option 3 (Sutton Court Road to Earl's Court) more than half of the traffic travelling east leaves the A4. A similar profile is found travelling westbound with traffic doubling in volume over the same stretch.

This is a fundamental finding as traffic that joins the A4 between the start and end points of a tunnel between Chiswick and Earl's Court will have to use a surface network. Should the flyover be removed, it would be diverted around the Hammersmith Gyratory.

The short tunnel is determined to have no impact on traffic flow as it is a straight replacement of the

flyover with a tunnel. All traffic that currently uses the flyover could use the tunnel and traffic leaving or joining the A4 via Hammersmith Gyratory would do so as it does currently. Traffic flow around the gyratory would be unaffected.

Both longer tunnels would require a surface road network to cater for up to 50 per cent of the current A4 flow. Option 2 would allow slightly more traffic to join and leave a long tunnel alignment, and hence a slightly higher percentage of traffic would use the tunnel than would be the case for the longer option 3. This could allow for a narrowing of the A4. However, if the flyover were to be removed (this being the primary objective of this study), this traffic would be diverted through the Hammersmith Gyratory. Any capacity increases that can be achieved at the Hammersmith Gyratory, even if possible, would not be consistent with the vision for the improved town centre.

Given the importance of the Hammersmith Gyratory, an additional tunnel scoping exercise was undertaken to see how traffic flow could be reduced. The main north-south route from Shepherd's Bush Road to Fulham Palace Road was considered as an additional route for a tunnel. It was found that, again, this could feasibly be constructed - but not without significant environmental and economic impacts. In addition, basic traffic analysis was undertaken and found



Plan View Scale 1:10000



Longitudinal Profile Scale 1:10000

that the beneficial impact on traffic flow around the gyratory would not be sufficient to reallocate capacity.

Further analysis of the operation of the gyratory would need to be undertaken to support both the regeneration of the town centre and any A4 tunnel solution.

The longer the tunnel, the less likely traffic would be to use it. If a tunnel only served a proportion of the corridor movement the remaining movement would be redistributed onto the surface network which would need sufficient capacity to function effectively.



Hammersmith Flyover traffic origin and destination.

OPERATIONAL BENEFITS

There are two areas of public benefit arising from the work proposed for the flyunder and the gyratory and a redesigned Hammersmith Town Centre. It would create a significant improvement to the environment, and unlock an economic boost to the land released by demolishing the flyover, and that surrounding it.



Illustrative view looking west along King Street.

A RE-IMAGINED HAMMERSMITH TOWN CENTRE

The public support for the flyunder is very much driven by the opportunity to rebuild public access across Hammersmith Broadway, and to reunite Hammersmith with the river. Relinking the centre, north-south, and east-west routes are also consistent with the Mayor of London's Roads Task Force criteria for the future of strategic road improvements.

In the most ambitious scenarios not only would the flyover be removed, but the road would also be removed from the western side of the gyratory with the eastern side reverting to two-way working. This is dependent on finding an answer to addressing the traffic flow through the gyratory.

The economic opportunity for redevelopment is dealt with in detail in the masterplan (published alongside this feasibility report) and summarised later in this chapter.

But there is much public interest in the benefits of new green spaces and new pedestrian access corridors linking the town centre's key cultural buildings. A new town green would be created to the west of St Paul's Church. This would also be the focal point of a new walkway linking the Lyric Theatre to the north, and the Eventim Apollo, and on to the river to the south.

It could be possible to increase the size of Furnivall Gardens, but most importantly create a landscaped pedestrian route from there to the town centre and new civic campus (the redeveloped town hall and adjacent site).

The commercial campus created around the Ark and possible portal location would start a long stretch of green space along the current flyover alignment, conceptually known as Riverline Park.

SIGNIFICANT ENVIRONMENTAL IMPROVEMENT

Another major public interest was improved noise and air quality issues in the central Hammersmith area. The Hammersmith BID (a not-for-profit organisation representing the interests of local business in the central Hammersmith area) has produced a Strategic Impact Assessment published alongside this study and covers these elements in greater detail.

Their report compares a tunnel carrying the traffic underground (almost silently) through the centre of Hammersmith with the current 90,000 vehicles per day, noting that a car travelling at 65mph at a distance of 25ft generates 77dB of noise - well above what is considered loud by many people.

They also note that Government targets for nitrogen dioxide have been missed at

Hammersmith Broadway for five years, with traffic on the flyover being a large contributor to this excess. While the tunnel would significantly improve the air quality in the town centre, the air quality implications around the tunnel portals would need to be investigated further. However, with adequate tunnel ventilation and existing technology, much can be done to mitigate these impacts.

The BID also sees the redevelopment of the town centre allowing for walking and cycling to be more of a choice for residents and workers in the area. This would allow for a significantly improved journey quality and is consistent with current local, regional and national transport and planning policies.



THE WAVE EFFECT

While it was not in the remit of this study to model the wider economic benefits of a flyunder, it is clear that the creation of thousands of badly needed new residential units will add economic dynamism to the town centre. It is easy to imagine that the new pedestrian access to established cultural landmarks is likely to attract an improved café and small restaurant offering. The removal of the flyover and the increased amount of public space must lift the value of the town centre and the adjoining areas.

The BID cites many examples of tunnel building or public realm improvements which foster a positive economic effect for their area. Tunnelling the A3 at Hindhead was cited by Knight Frank as a reason for a dramatic lift in the demand and price of houses in the area. Major improvements to the centre of Sheffield and its public spaces delivered an increased footfall of visitors, additional spending per visit, and increase in leisure-related spending, rental uplift and improved yield.



Illustrative view looking east of re-imagined St. Paul's Green.

MASTERPLAN AND DEVELOPMENT VALUE

Introduction

This Feasibility Study is supported by a Masterplan and Development Value Study, which is published alongside this report. The purpose of the study was:

1. To provide an illustrative masterplan, indicating how development could be brought forward on the land freed up by the A4 and flyover.
2. To generate an indicative floorspace from the masterplan to assess the potential value from redevelopment that could go towards funding the A4 tunnel.

Masterplan

The masterplan section of the study looks at approximately 14 hectares of land between Hogarth Roundabout in the west and Baron's Court Road in the east. Between Baron's Court Road and North End Road, the existing properties sit close to the A4, dramatically reducing the development potential and further east, Capital and Counties (Capco), have approval for a masterplan for the land which includes land up to the edge of the current A4. It is envisaged that any land freed up here could not provide any additional development potential. For these

reasons, the land to the east of Baron's Court Road has not been included within the illustrative masterplan.

The illustrative masterplan is informed by a number of overarching principles:

- Optimise development. The illustrative masterplan, as well as showing development on land freed up by the removal of the A4, also shows opportunities to bring forward development on neighbouring parcels of land. This includes Hammersmith Bus Station, part of the southern side of King Street, Landmark House and the West London Magistrates Court.
- Reconnect Hammersmith Town Centre to the River Thames. This could be facilitated by reconnecting the streets severed by the original construction of the A4 and through improvements to the public realm around Hammersmith Town Centre.
- Provide a new series of public and civic spaces connecting the south side of King Street, to St. Paul's Green, the Hammersmith Apollo, Furnivall Gardens and the River Thames. Critical to achieving this aspiration would be the design and landscaping of the connecting street between St. Paul's Green and Furnivall Gardens.

- Respect the form and scale of adjacent buildings. Where Victorian streets have been severed by the A4, the aspiration is that redevelopment should re-knit together these streets through design that is sensitive to the scale, massing and architecture of adjacent properties.
- Respect heritage assets. This is particularly the case for the Grade II* listed St. Paul's Church, St. Peter's Church and Hammersmith Apollo. Development adjacent to these buildings has been set back in order to give these structures prominence. It is proposed that the Hop Holes public house is retained when creating a new pedestrian connection between Lyric Square and St. Paul's Green.

The illustrative masterplan shows that redevelopment could generate approximately 350,000sqm of development floorspace. In addition, Hammersmith could be reconnected to the River Thames and Furnivall Gardens. St. Paul's Green could be expanded and enhanced and a new pedestrian and cycle-friendly boulevard could be created, connecting the two green spaces. Streets that were severed by the original construction of the A4 could be re-linked together, and almost 3,000 new homes could be delivered through redevelopment and new retail, leisure and community facilities could be provided.



Development Value

The development value section of the study takes the floorspace generated from the illustrative masterplan and tests what value could be generated from redevelopment and how this could help to finance the tunnelling of the A4. The illustrative masterplan covers both public and private land. For the private land, Section 106 receipts, Community Infrastructure Levy (CIL) receipts, council tax, business rates and New Homes Bonus are all considered as mechanisms for accessing finance for the tunnel. For the public land, three scenarios for developing the land are investigated:

1. A 50/50 joint venture. In this scenario, the public sector land is developed in partnership between the public sector and a private developer and profits are shared equally between both parties.
2. A 25/75 joint venture. This is the same as the first scenario but with a greater weighting of profits to the private developer. This option recognises the complexity of accessing finance for a project of this size, which might preclude the viability and deliverability of Scenario 1.
3. Sell the land. This scenario assumes that the public sector sell the land to a private developer. This option has the lowest risk but would not provide as great a return as Scenarios 1 and 2.



- LBHF/TfL freehold
- LBHF/TfL part-freehold part-private land
- Private land

The development value study is also split between the feasibility options. Option 1 only looks at the development potential from Baron's Court Road in the east to the eastern edge of Furnivall Gardens in the west, whereas options 2 and 3 look at the entire illustrative masterplan.

Option 1

For Option 1 (short cut-and-cover tunnel), the illustrative masterplan shows that redevelopment could create approximately 2,000 residential units and 106,000sqm of commercial floorspace. The table below indicates the sort of returns that development in this option could deliver. Development of the public land within a 50/50 joint venture would offer the greatest returns and could finance 129 per cent of the tunnel's costs.

Options 2 and 3

Options 2 and 3 are for a deep bore tunnel from Sutton Court Road (Chiswick, London Borough of Hounslow) to North End Road (Option 2) or a tunnel from Sutton Court Road (Chiswick, London Borough of Hounslow) to Earl's Court Road (Option 3). For both options, the illustrative masterplan shows that redevelopment could deliver approximately 2,800 residential units and 106,000sqm of commercial floorspace. The table below indicates the sort of returns that development in these options could deliver. Development of the public land within a 50/50 joint venture would offer the greatest returns. For Option 2 it could finance 44 per cent of the tunnel's costs. For Option 3 it could finance 41 per cent of the tunnel's costs.

TUNNEL OPTION	INITIAL DEVELOPMENT APPRAISAL - BASED ON OPTIONS 2 AND 3	1 (CUT AND COVER SHORT LENGTH TUNNEL)	2 (DEEP BORE MEDIUM LENGTH TUNNEL)	3 DEEP BORE MEDIUM LENGTH TUNNEL
Element/scenario - Development Vehicle	H&F Development	Joint Venture	Joint Venture	Joint Venture
Public Residential Units	2,187	788	1,484	1,484
Private Residential Units	2,653	1,306	1,306	1,306
Total Residential units	4,840	2,094	2,790	2,790
Public Commercial Floorspace	0 (Not Assumed)	30,000	30,000	30,000
Private Commercial Floorspace	0 (Not Assumed)	76,400	76,400	76,400
Total Commercial Floor Space SQM	0	106,400	106,400	106,400
Financial Appraisal	£m	£m	£m	£m
Public Development Receipt	1,000	250	454	454
Private Development Receipt	125	23	23	23
Other Receipts	0	51	52	52
Total Development Receipts	1,125	323	528	528

LESS

Tunnel cost range (30% - 45% contingency)	1,297-1,446	218-251	1,210*	1,297 *
Net Benefit/Cost	-172 to -321	72 -105	-682	-769

All assumptions in this table are based upon a 50% Joint Venture scenario

* These sums are based on the Halcrow 30% contingency only

FEASIBILITY PROJECT TERMS OF REFERENCE

This feasibility study was carried out in order to illustrate the council's ambition to replace Hammersmith flyover with a tunnel. The study terms of reference below recognise that as a local authority there were limits to what could be achieved with a study of this nature and that further work would be required by those best suited to undertake them, namely Transport for London.

To establish, at a preliminary level, the aspirations and any concerns of local residents and businesses.

Extensive local engagement revealed a high level of support from both local residents and businesses for a flyunder. Aspirations ranged from a simple flyover replacement to a longer tunnel linking Chiswick to Earls Court. A number of concerns were raised including cost, construction disruption and traffic redistribution.

To establish current traffic patterns to best understand this route in its wider traffic network context. This will mean liaising with other local traffic authorities in adjoining boroughs and with TfL.

Traffic counts and traffic modelling outputs were provided by TfL which helped to establish the fundamental finding of the project in that there is a high level of traffic dispersion along the A4 corridor between Chiswick and Earl's Court.

To establish the best available information including projections for future traffic volumes which are relevant to a new structure.

Traffic modelling data for 2031 was analysed to advise the size of the tunnel options tested, which showed an increase in traffic flow across the A4 corridor. This is despite traffic volumes in London decreasing over the last 10 years.

To establish the best available information including future projections of the cost of maintaining the current flyover structure over a suitably long period.

The current round of flyover repairs are costing £60m and have been reported to provide a number of decades worth of use to the flyover. This along with the multimillion pound emergency repairs in 2011 have been the only major maintenance expenditure on this structure during its 60-year existence. To rebuild the flyover, should it be necessary, would be likely to cost hundreds of millions of pounds.

To consider options for a replacement tunnel, considering the length, depth, width and start and end points, liaising with adjoining boroughs as appropriate. In particular to examine the implications of a flyunder with or without junctions to north-south routes.

Three tunnel options were tested, a short option and two variations of a long option. The longer the tunnel, the more environmental and economic issues would have to be overcome. Junctions to north-south routes exacerbated these economic and environmental factors.

To consider the nature, extent and potential value of any released surface land, considering existing planning policies and any potential threat from varied planning policies.

The land released was found to be located mostly in Hammersmith town centre. It was determined that to achieve the full re-creation of the town centre both the gyratory and flyover need to be removed. Estimations suggest that the value released from the blend of public and private land in the town centre could raise £1bn.

To establish very approximate costs for various tunnel options, noting the variables which will affect confidence in such estimates.

Construction costs, based on today's prices and feasibility stage estimations, reveal that a short cut-and-cover tunnel would cost approximately £250m (+/- 50 per cent) to build, and a longer bored tunnel construction would cost £1.2bn. The addition of junctions could add £500m to the longer tunnel estimate.

To review options for meeting the construction costs including, but not limited to:

- Future maintenance liability funding for the existing flyover redeployed
- Capital funding from TfL
- Capital funding from local councils
- Captured value from developable land released
- The possibility of modest user charges to contribute to any gap funding.

At this feasibility stage only limited work has been undertaken on a financing package. Captured

land value can raise £1bn and TfL maintenance liability has been assumed to be broadly similar for a tunnel as it is for the flyover. Given the scale of investment, a public-private arrangement is likely to be the most viable option. User charges were explored and other examples suggest that this would not be compatible with the project objectives by reducing the amount of traffic that would use the tunnel.

To report at interim stage by March 2014:

- On local aspirations and concerns
- On broad route options
- On whether the tunnel must have junctions with other routes
- On the preliminary views of neighbouring councils
- On the geo-technical feasibility of a tunnel (analysing other underground uses).

This report is one of three documents covering the above requirements. The second is a masterplan report and the third is a geo-technical report produced by Halcrow.

CONCLUSIONS

No matter how many expensive repairs are conducted, the flyover won't last forever. Over the next 20 years London will continue to grow with more jobs being created and houses built. Whether or not this results in significant increases in traffic on our road network is unclear. What is clear is that a plan for the future of the A4 corridor is required and that tunnelling under Hammersmith is possible. The council has taken the initiative in producing this feasibility report and now is the time for others to take this investigation forward. There are some significant environmental and economic challenges to overcome. However, as we have seen, the resulting reimagination of Hammersmith town centre could be momentous.



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