

LONDON'S TRANSPORT INFRASTRUCTURE



RESPONSE TO NIC CALL FOR EVIDENCE

JANUARY 2016

BuroHappold Engineering Response to NIC call for evidence

Large-scale transport infrastructure improvements in London

1. What are the major economic and social challenges facing London and its commuter hinterland over the next two to three decades?

Accommodating London's growth in order to maintain its competitive position as a leading global city is probably the greatest challenge faced today by London – both from an economic as well as a social perspective. It will require the provision of a far greater quantity of housing that is affordable to 'normal' employees whilst, at the same time, being readily accessible to jobs. Studies have highlighted that around 50,000 new homes per annum will have to be built to meet London's needs, year on year for the next 20 years. Although there are substantial **public sector assets** in London, and a programme of rationalisation is underway to release surplus assets for other uses and in particular housing, public sector budget constraints mean that central and local government departments and other public sector bodies are being directed to gain the full market value from any sales. This immediately constrains the opportunity to provide homes that are affordable.

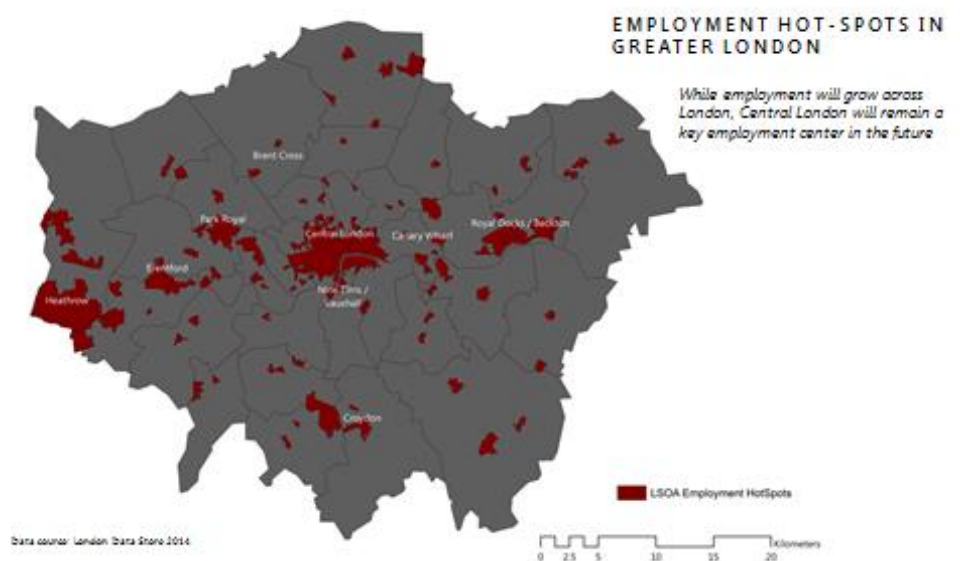
Many organisations based in the capital are struggling to attract and retain quality staff, driving wage inflation and reducing the competitiveness of London for employers. One of the key **Quality of Life** indices against which cities are measured is the ability to reach the workplace within 30 minutes of leaving home. London has numerous acknowledged attractions, including a thriving and dynamic employment 'engine' and many accept a daily commute of an hour or more. However, increasing accommodation costs and overcrowding and congestion on the transport network threaten to tip the balance in favour of other cities as more attractive places to live and work.

The historical 'terminus' model of London's Victorian railway network adds to the challenges of the capital, with rail services decanting huge numbers of rush hour passengers onto London's transport network, and London Underground in particular. The lack of cross-London lines removes the option of direct inter-regional or international rail services, forcing passengers to change modes at packed terminus stations, significantly lengthening travel times and negatively impacting the quality of life for many.

Crossrail will make a significant difference to East-West mobility across London from Essex to the Thames Valley when it opens in 2018. It will improve accessibility to a number of key employment 'hotspots'. (see below). However it is predicted that by 2030 it will be close to capacity, and additional rail capacity of this nature will be needed.

Employment Hotspots

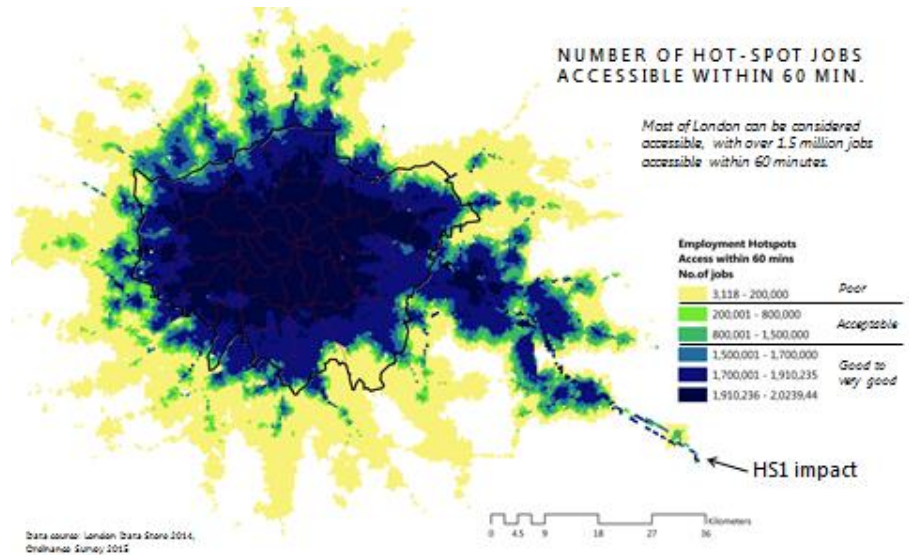
Unlike other cities, employment in London is concentrated in a relatively small number of areas. At BuroHappold, we have modelled these 'Hotspots' and planned developments (for example the area around Old Oak Common where around 65,000 jobs is forecast to be created by proposed development around a new Crossrail and HS2 station).



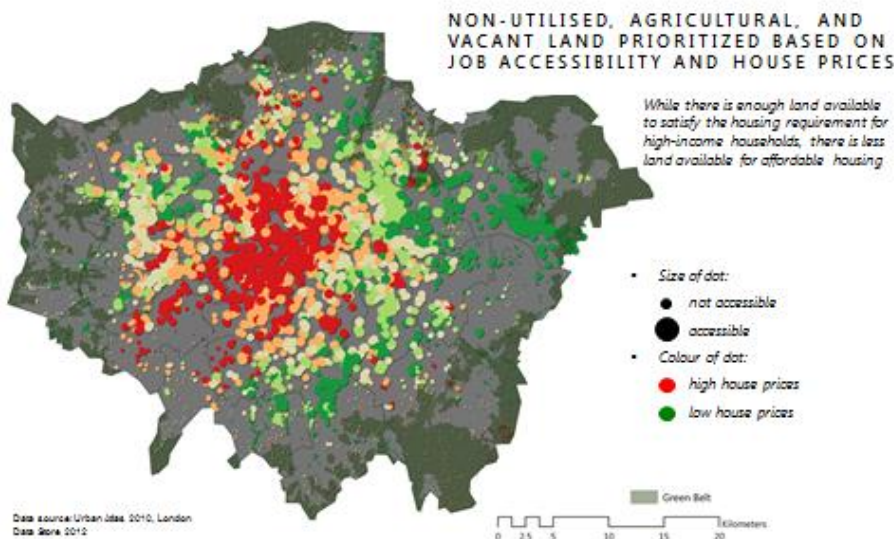
Accessibility to Employment

Current transport accessibility to London employment areas could be considered good for much of the capital, with most areas reachable by current and planned transport infrastructure within 60 minutes.

It should be noted on the diagram adjacent how HS1 and the Javelin services from Kent have had a strong impact on extending job accessibility.



Land Availability



London has a good supply of non-utilised, vacant and agricultural land that could be made available for housing. Much of it is blessed with reasonable (existing or planned) transport connectivity to employment.

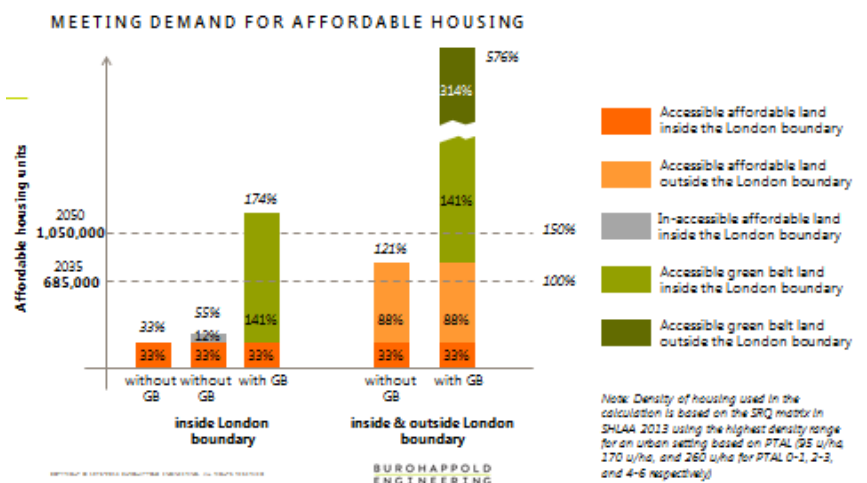
However, high land prices, particularly of sites close to the centre of the city, excludes many of these areas from being suitable for the development of housing that is affordable for those on anything other than

very high salaries or with significant funds to invest.

Meeting the Demand for Affordable Housing

Our modelling has identified the areas that are available for development, accessible to jobs via current and planned transport infrastructure (including Crossrail), and (crucially) affordable.

However, even if fully developed, this land will only meet 33% of the forecast needs for 2035. [NB Our calculations are based on the SRQ matrix in SHLAA 2013, using the highest density range for an urban setting].



Consequently, other options need to be considered if London's competitiveness and position as an economic powerhouse is not going to be compromised.

Examining other parcels of land within the London boundary, a further 12% of needs could be met - if they could be made more accessible to employment by improvements to the transport network.

We have also identified accessible affordable land outside London's boundary that, if made available for homes, could meet the housing needs of the City for the next 20 years. Looking further ahead to 2050, one could consider the transfer of a small amount of accessible greenbelt land for housing needs and this would enable London to accommodate, in an affordable fashion, all of its forecast population demands.

Although releasing greenbelt land is considered a tough political step to take, we believe it could be mitigated by creating equal or greater areas of amenity land within the London boundary (and elsewhere). This could be achieved either by remediating challenging brown-field sites or utilising sites which are likely to remain inaccessible through lack of good transport connectivity.

In summary, we see two key areas to focus on in order for London to continue as a world-leading city, namely:

1. Improvements to transport infrastructure particular linking affordable, available land with employment areas
2. Some future use of green belt land already accessible to major transport routes from central London, mitigated by land swaps to maintain areas of amenity.

We see Crossrail 2 and Cross City Connect – see later – falling into the first category.

2. What are the strategic options for future investment in large-scale transport infrastructure improvements in London – on road, rail and underground – including, but not limited to Crossrail 2?

BuroHappold Engineering has invested significant time and resources to the examination of infrastructure improvements for London in two key areas:

1. An alternative to the London end of HS2 that will deliver much greater benefit, in terms of inter-regional connectivity, economic regeneration, vital additional capacity and network resilience, whilst requiring **no additional investment cost** than that forecast for the full delivery of the current terminus at Euston.
2. The use of low level bridges to unlock key development sites in East London – with particular emphasis on the priority development area known as 'City in the East'

A. Cross City Connect

The current proposals for linking the planned HS2 rail route into London represent a missed opportunity. This could be the foundation of an effective and integrated modern railway network for the UK. What's more, the proposed terminus station development at Euston not only delivers poor economic returns, but will become ever-more costly and difficult to deliver.

Working with tunnelling experts OTB, BuroHappold Engineering is promoting an alternative route which links with HS2 in the west of London, crosses the city in tunnel and links with HS1 in the east of London. Our Cross City Connect proposal has a single major rail interchange at Waterloo/ Southwark/ Blackfriars with substantially better onward connections into London as well as providing seamless access to Europe.

We have sought to address all of the major issues facing the current proposals for the HS2 terminus at Euston, and fulfil the original intent of HS2 project.

It is important that HS2 hits its ambitious timetable. With the right level of support and decisive commitment, it will be possible to deliver Cross City Connect by 2026 – the current timetable for the partial terminal at Euston promoted by HS2 Ltd. It is certainly possible to deliver the full scheme in advance of HS2 Phase 2 in 2033. From a timing standpoint, this will also enable additional demand to be met at a point when the current Crossrail route nears capacity.

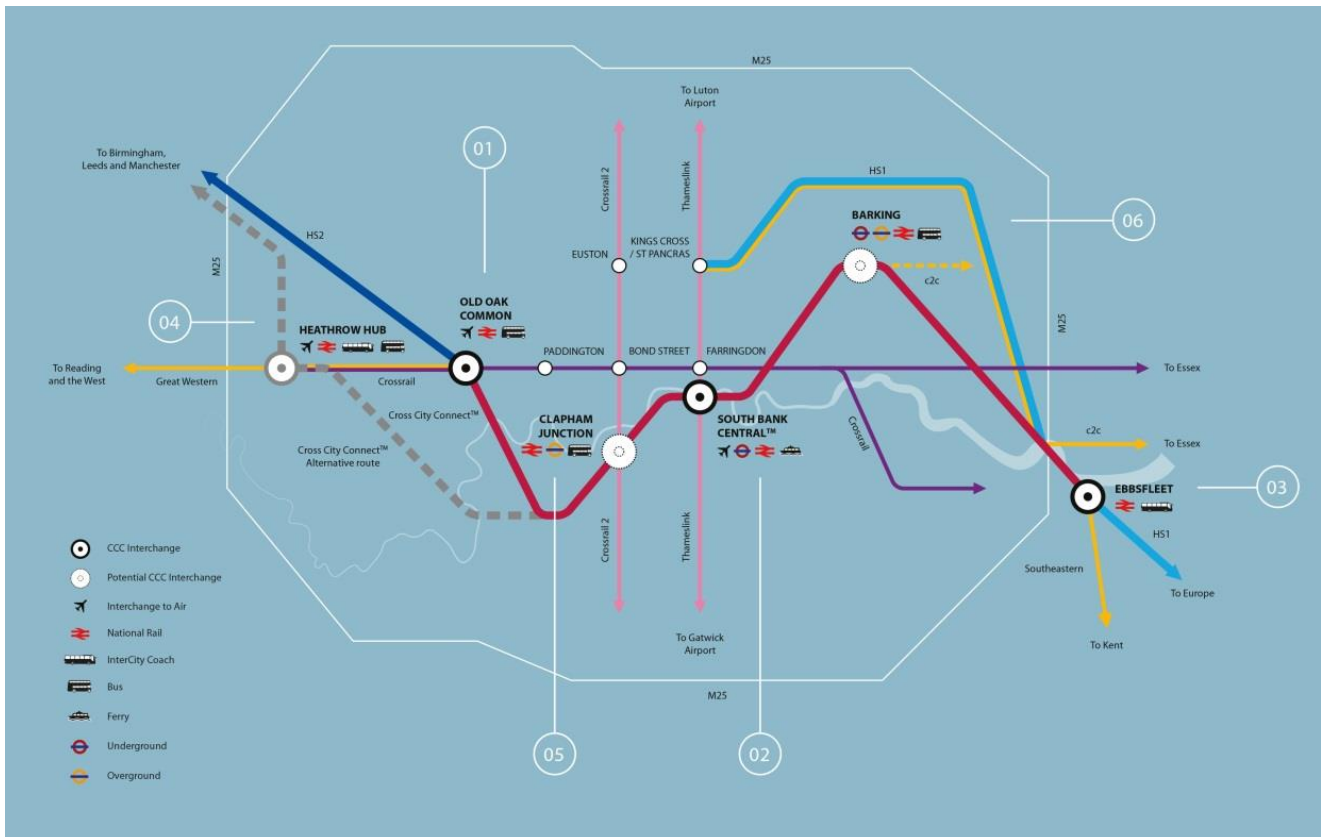
Euston HS2 major issues:

- **Delivery challenges:** Euston requires a massive land-take on a constrained and complex operational site. Adding eleven new HS2 platforms to the challenges of upgrading the underground station, delivering Crossrail 2, and regenerating the local area is a step too far.
- **Spiralling costs:** Land acquisition and construction estimates for the completion of the Euston terminal, from various sources, has risen from the original budget of £1bn to between £4bn and £7bn. Even the current partial build-out proposals tabled are acknowledged to cost well over £2bn –without including the costs of land acquisition nor the work required by others to complete the build-out.
- **London disruption:** Over two decades of misery for those living and working around the area and for commuters using the regional line into the existing station.
- **Connectivity:** Key link to HS1 has been dropped – removing the direct international link and also inter-regional connectivity.
- **Wasted regeneration boost:** To counter rising costs, significant over-site development is planned. Yet Euston is already benefitting from the regeneration around Kings Cross and may gain the benefit of a future Crossrail 2 station. The incremental value delivered by HS2 will be marginal.

The Cross City Connect Solution

We have taken a fresh look at some of the original aims of the HS2 project and drawn on our international experience and upon best-practice in urban infrastructure. Our solution, Cross City Connect (CCC), traverses London in tunnel construction from a link with HS2 in the West to Ebbfleet Station in the East. It links directly to Europe via HS1, and connects regional services from Essex and Kent to the Thames Valley, the West, Midlands and the North. There will be a new central London hub on the South Bank beneath and between Waterloo and Southwark. It has the capacity to include additional interchanges to enhance regional connectivity and unlock much-needed growth areas.

Working closely with tunnelling specialists OTB, we have defined a route that is **deliverable for no more than the cost of the full delivery of Euston, within current HS2 programme timeframes.**



01 Western Hub - OLD OAK COMMON Option

Our proposal sees Old Oak Common become the western station for the CCC underground rail route.

- Key London HS2 station with connections to Crossrail and Great Western Mainline.
- Further boost to the area's massive regeneration potential
- The opportunity to create an interim terminus for HS2 Phase 1, allowing time for the delivery of a better solution ahead of Phase 2.
- Options to provide additional connectivity to the Bakerloo Line and to overground services at Willesden Junction. (See later section for more information)

02 Central London Interchange - SOUTH BANK CENTRAL™

A new central station that sits beneath and between four existing stations in the heart of London. Initial investigations demonstrate that this is a viable and economically beneficial option.

- Significant benefits in terms of connectivity, network capacity and resilience.
- Provides walking access to Central London.
- Links to 5 underground lines, Thameslink and overground services to the southeast and southwest.
- More efficient dispersal at Waterloo, Southwark / Blackfriars.
- Regeneration boost to the South Bank, and to the Elephant & Castle and Vauxhall Nine Elms opportunity areas.

03 Eastern Hub - EBBSFLEET

Coming to the surface near Rainham, where there is space to service and turn around trains, our route travels to the existing HS1 station at Ebbsfleet as a gateway to both international and inter-regional services.

- Connection to existing HS1 services to Europe.
- Inter-regional trains linking the Thames Valley and the West to Kent (Javelin) and Essex (c2c).
- Boost to the embryonic Ebbsfleet Garden City.
- Ease of access to M25 and other regional motorways.

04-06 Potential CCC Interchanges

Cross City Connect has been designed to enable significant future connectivity and regeneration to be delivered cost-effectively:

- **West London linkage option at HEATHROW HUB:** Depending on the final decision on the location of the future southeast airport, there is also an option to link directly to a new transport hub and employment site at Heathrow. Heathrow Hub could provide a direct rail link to this major international gateway for the south-west, midlands, north and south-east via HS2, GWML, Crossrail and Cross City Connect, as well as easy access from the motorway network. This also has the advantage of space that is more easily developable than Old Oak Common, whose ambitious development plans are complicated by the large amount of live rail infrastructure, including the construction of a new Crossrail Depot.
- **CLAPHAM JUNCTION:** There is the option for an interchange with Crossrail 2 and the many overground services to South London and beyond.
- **BARKING:** There is the potential for a future station to provide impetus to The City in the East area to support London's projected growth.

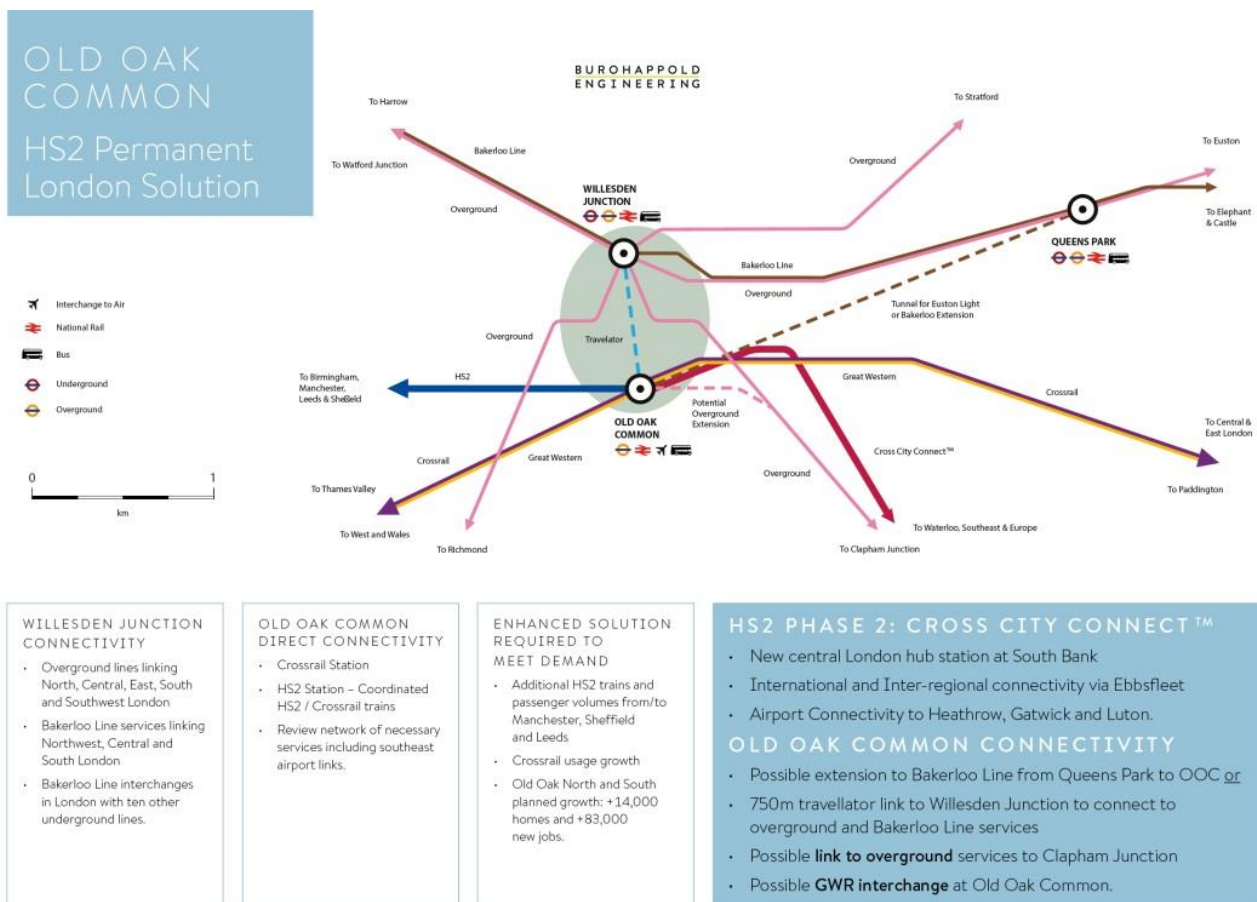
MEETING HS2 PROGRAMME TARGETS

It is important that HS2 hits its ambitious programme milestones. We are advocating a two-phase solution, that aligns exactly with the HS2 programme with an interim terminus at Old Oak Common for HS2 Phase1, with the full Cross City Connect route open in time ahead of the opening of HS2 Phase 2 in 2033.

A Temporary Terminus at Old Oak Common

Old Oak Common presents a viable *interim* solution for the first phase of HS2:

- HS2 passengers transfer to a waiting Crossrail train for onward transfer to central and eastern London. Passengers can also travel west on Crossrail to Heathrow and the Thames Valley
- Turnaround of HS2 trains using the six HS2 platforms, supplemented by the first section of the CCC tunnel
- Options for increased connectivity via a traveller link to Willesden Junction, or an extension to the Bakerloo Line at Queens Park



Why Old Oak Common won't work as a permanent HS2 Terminus

By the opening of HS2 Phase 2, a new solution will be required to cope with significant additional volumes:

- HS2 passengers travelling to and from Manchester, Sheffield and Leeds.
- Crossrail will experience increased usage from residential and job growth along its route.
- The development of Old Oak Common North and South is predicted to add up to 14,000 homes and bring 80,000 jobs to the area.
- London's population is forecast to increase by close to 2 million additional residents by 2030.

By 2030, Cross City Connect will be ready to carry passengers to its central London interchange and on to Ebbsfleet with connection to HS1 and regional services to Essex and Kent.

Potential impact of Cross City Connect on employment, productivity and housing supply in London and the southeast?

Connectivity, capacity and resilience:

- Greater UK **regional connectivity**, from the northwest, northeast and Midlands to London, and to the southeast and southwest, slashing travel times and giving direct access to new markets.
- **Reduced traffic** volumes on the M25 and the wider southeast motorway network, increasing the efficiency of many business trips and commercial logistics.
- Broader and more **efficient dispersal** at Waterloo / Southwark / Blackfriars with more **effective access** to other services.
- **Reduced pressure on Crossrail** long term via our additional east-west route.
- Direct rail links between our regional cities and key **international transport gateways** via CCC interchanges, providing more efficient access to overseas markets.

Development and regeneration:

- Access to a larger labour pool supports the **enlargement of the London Economic Area**.
- **Supports trends** for flexible working, access to affordable housing and quality of life drivers.
- South Bank Central will **unlock the potential economic value** of the area around **Waterloo and Blackfriars** - A possible southern extension to The City's business and financial services district.
- A significant boost to the key regeneration sites at **Elephant & Castle, Vauxhall and Nine Elms**.
- Possible future station in Barking to drive **regeneration in the Thames Gateway**, providing vital access to employment opportunities and unlocking wider housing plans to the east of London.
- Euston Station and surrounding area can **be redeveloped with nearby Kings Cross** in a structured way without HS2 complexity.

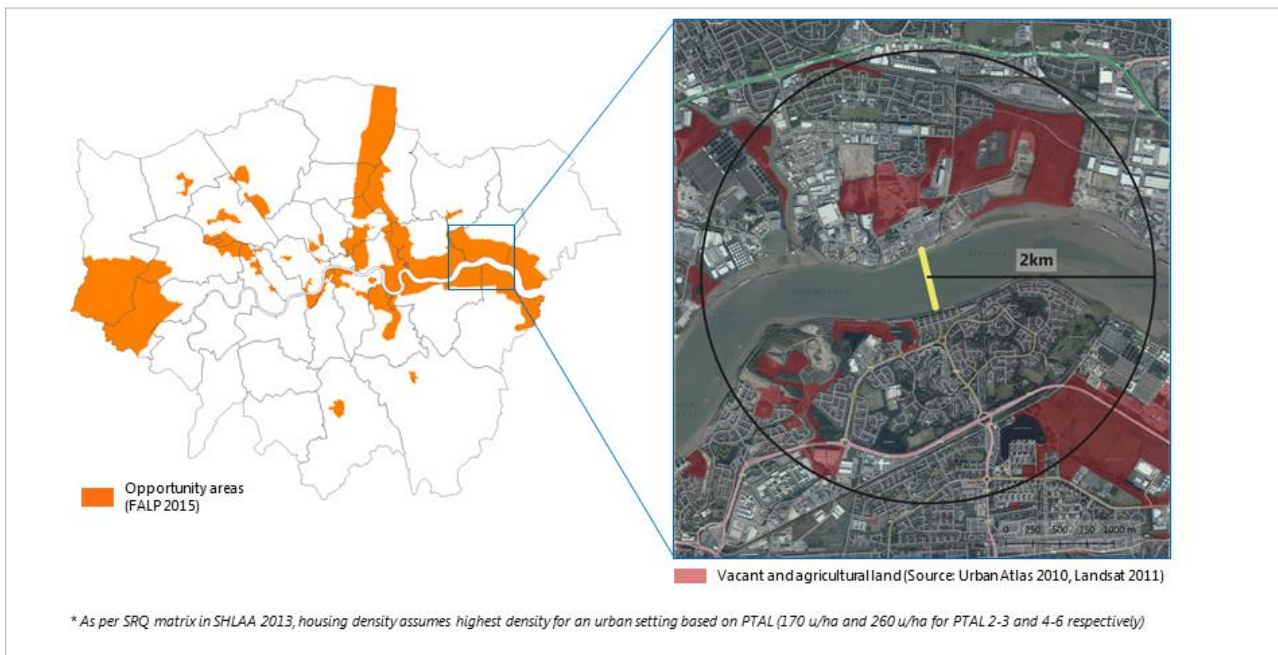
Cost Certainty and Minimal Disruption

- Tunnelling beneath London, following existing rail corridors **manages risk** more efficiently.
- **Through-running** at South Bank Central avoids the need for eleven platforms at Euston's terminus.
- Subterranean stations **minimise land-take** and provide greater opportunity for valuable Over-Site Development. And create significantly lower disruption to working London during construction.
- **Delayed expenditure** of significant public funds to the second phase of the HS2 programme.

B. Low Level Bridges in East London

Working with urban designers Farrells, we have identified how low level bridges will help unlock land for housing development and improve job accessibility for existing and future communities in East London.

As an example, our analysis has shown that within a 2km radius of a potential bridge connecting Thamesmead with Barking Riverside almost 50,000 new homes could be built. A bus connection over the bridge would link Abbey Wood Crossrail Station in the south with the future Barking Riverside overground station in the north and increase job accessibility. It will increase transport network resilience and also enhance access to London's waterfront for the benefit of local residents.



Initial findings have been shared with TfL and the Port of London Authority. More information on our recommendations can be found in a separate BuroHappold / Farrells NIC submission.

How should they be prioritised, taking account of their response to London's strategic transport challenges, including their impact on capacity, reliability, journey times and connectivity to jobs?

There is an absolute need for the current Green Book methodology for the evaluation of transport infrastructure to be thoroughly revised to take into account the full range of benefits – and also to recognise value-destroyers that major transport infrastructure can represent for an area.

As was highlighted by the HS2 Growth Taskforce, and referenced in the NIC Terms of Reference, a major transport infrastructure investment delivers far greater benefits than greater capacity, reliability and faster journey times; In addition to connecting organisations to new markets, connecting jobs and labour drives significant economic value, and the role of interchanges as anchors of local regeneration has been clearly demonstrated in the case of Kings Cross St Pancras. Full business cases need to be created for all major investments, that enable far greater transparency in prioritisation and decision-making.

3. What opportunities are there to increase the benefits and reduce the costs of the proposed Crossrail 2 scheme?

The currently proposed Crossrail 2 tunnel alignment focuses on locations where there is already substantial development (such as Chelsea and Victoria) and where regeneration is already in progress (such as the Euston Cross area). An alignment that runs further east in the city centre, both south and north of the river, would deliver far greater above station and area wide regeneration benefits. Furthermore, greater consideration should be given to locating underground stations for the tunnel section on alignments which give access to several existing stations. Assuming a route further South, an example might be a station between and linking Elephant and Castle Tube and Surface Rail stations.

To the east and north of the Thames one could consider something which links and integrates Tower Hill Tube, Tower Gateway DLR, and Fenchurch St stations. In this way, the new station can both enhance integration between existing services by creating mega hub stations, and spread over-station redevelopment opportunities over a much larger area. The benefits of such strategies would be considerable. Furthermore, whilst the costs of additional access and egress points might be slightly higher, these would be more than off-set by the reduced costs and disturbance at the existing interchange stations due to a more even distribution of interchange passenger loads, reducing the scale of works to increase local capacity.

4. What are the options for the funding, financing and delivery of large-scale infrastructure improvements in London, including Crossrail 2?

In terms of “Financing”, recent major tunnelling projects in London, including Crossrail and the Thames Tideway Tunnel, along with developments in infrastructure financing in Canada, have in our view shown the way forward. Crossrail shows that construction risk, when going underground, is not as great as thought. Indeed, it can now be argued that staying at the surface is far more risky than going underground. Expected return from investors directly correlates to risk. We have seen with Thames Tideway that cost of capital on large tunnelling projects need not be excessively high. What is more, we have a growing pool of funds held by pensions. In Canada this has been mobilised to deliver much needed infrastructure via the major pension investment funds. Pension funds are the perfect vehicle for infrastructure funding of this type, not only creating stable long term returns for those depending on the pensions, but ensuring that contributions made today are being mobilised for the benefit of those making those contributions. A rare win:win.

With such a privately financed structure, one can move to “Delivery” via a public private project company model. If correctly structured in terms of risk allocation, this can deliver significant benefits in terms of ongoing innovation and whole life costing disciplines, while ensuring appropriate controls are retained within the public sector, thus ensuring a company that focuses on its specific business, yet operates within a structure that considers wider social and economic issues.

- What is an appropriate local and regional contribution – given the potential distribution of benefits to business, residents, transport users and the wider economy – and how could this be achieved?

It is clear that investment in transport infrastructure has wide and decisive regional catalytic impacts, enabling residents of both London and the peripheral commuting counties in the South East and Eastern Regions to access employment opportunities in the Greater London area. For example, it is clear that Crossrail 1 will deliver significant economic benefit to the commuting residents of Berkshire, Essex. What’s more, if the proposed diversion of western Crossrail services to the WCML goes ahead, Bedfordshire, Hertfordshire and Buckinghamshire residents will also benefit, largely at the expense of London business ratepayers. One could also argue that as workers continue to move further out of London to find homes they can afford, such upfront match investment in transport infrastructure is essential if large employers in central London are to access one of the world’s most cosmopolitan, diverse and skilled workforces – due to the many reasons cited in the call for evidence.

Therefore, we recommend that the South East and Eastern Regions are given utmost consideration when contemplating further infrastructure investment in London. As co-beneficiaries, and potential co-funders, of such infrastructure it is

important that their role is recognised in helping London deliver its strategic goals of affordable family housing and a competitive labour supply.

While we understand that there are fora for such engagement in decision making already in place, we think that their role and powers will need to be reviewed given the challenges faced. For example, many of the newly announced City Regions designated as part of the 'Northern Hub' policy constitute an urban city plus the peripheral and commuter hinterland in which significant parts of the labour market reside. These City regions will be given significant powers over infrastructure investment and service level agreements that London does not have over activities in the South East and Eastern Region. This presents a potential comparative disadvantage for London in the planning and funding of such infrastructure.

What is clear is that existing funding models will be insufficient for continued investment of the scale London has witnessed in the last few years. While the Crossrail 1 funding model has been lauded as particularly successful in enabling government to recoup some of the costs from beneficiaries in central London (employers and developers), the next stage will require this pool of beneficiaries to be enlarged further, given the scale of investment required. So, who are these potential additional beneficiaries? The Crossrail 1 experience has shown that they include a far more varied and geographically wider group than initially assumed: residents and employers in outlying commuter counties; speculative buy to let landlords near proposed stations; developers both in London and in outlying commuter areas; and property in London near stations who have seen phenomenally capital gains since the project's route was first announced.

There is an ever-increasing suite of mechanisms available to local authorities to capture value generation from new development – s106, CIL, TIF, and Incremental Business Rates. However, these do not work well when dealing with intra-regional infrastructure developments, such as the proposed Crossrail 2 and other infrastructure benefiting the capital's economic hinterland, or in capturing any capital gains. We recommend that further research is commissioned to investigate the innovative options available to London to both capture some of this capital wealth generation (potentially building on the recently published work of the Centre for Cities "*Beyond Business Rates: Incentivising cities to grow*") and also ensuring enhanced contribution from beneficiary counties on London's periphery.

The new profusion of Local Enterprises Partnerships is, for example, one way that London could seek to ensure that the funding of infrastructure is fair to all beneficiaries – as shown recently by the Hertfordshire LEP's funding contribution to the Metropolitan Underground works at Watford. We should recognise, however, that such arrangements will lead to local calls from the counties for greater scrutiny over such spending decisions, with a widely held assumption that transport services are often skewed in favour of the capital's requirements over these commuting counties. Such discussion over service level agreements and operations is best at the regional level, potentially using the regional fora discussed earlier.

5. How have major metropolitan areas in other countries responded to similar challenges and priorities? Are there any lessons to be learned and applied in London?

- Construction of rail stations underground is now well-established – eg The recent underground Magenta station in Paris between Paris Nord and Paris Est stations.
- Terminus stations in cities have been rejected in favour of through stations in a number of major European cities including Berlin, Vienna, Stuttgart and Marseilles.....and historically in Brussels, the old north and south stations were connected to make a through line.
- The 7 Line Subway Extension in New York is being funded with NYC funds from bond sales to be repaid with property tax revenues from development in the area around the new station (the Hudson Yards). Other transport projects in the US are similarly financed (e.g. Atlanta's Belt Line)..
- Hong Kong's MTR are developing real estate and transport themselves.
- BRT as a potential 'cheaper' option to connect areas of London that are poorly served by public transport. New York serves as a good example of how they are trying to upgrade their bus network to areas that are less served.

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