

London's strategic infrastructure requirements – an evidence base to help deliver the Mayoral strategies

Final report

18th July 2017

London's strategic infrastructure requirements – an evidence base for the London Plan Disclaimer

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Much of the analysis in this report is based on stakeholder consultation. We have satisfied ourselves, so far as possible, that the information presented in our report is consistent with published information and the information provided to us, however, we have not sought to establish the reliability of the sources by reference to other specific evidence.

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Findings are time-sensitive and relevant only to current conditions at the time of writing. We will not be under any obligation to update the report to address changes in facts or circumstances that occur after the date of our report that might materially affect the contents of the report or any of the conclusions set forth within.

Ove Arup & Partners 18 July 2017

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London's strategic infrastructure requirements – an evidence base for the London Plan

Section 1

Executive summary

1 Executive summary

1.1 Introduction and report structure

Introduction

Arup was commissioned by the Greater London Authority in late 2016 to deliver the first phase of “London’s strategic infrastructure requirements – an evidence base for the London Plan,” hereafter known as the LSIR.

The project has been designed to be delivered in an iterative process in order for the deliverables to incorporate data, analysis, comments and insights from a wide range of stakeholders. A list of meetings and consultation is included on Page 7.

The overall objective of the project is to link explicitly the strategic infrastructure London needs with the places where it is planned to be delivered. In this way, the LSIR provides a spatial dimension to the London Infrastructure Plan to 2050. In addition, it also presents in some detail the strategic infrastructure that is planned to be delivered across London, and the opportunities and challenges related to its delivery.

The LSIR focuses specifically on “strategic” infrastructure. It defines “strategic” both in terms of cost and impact. It predominantly includes those projects in the existing pipeline which are over £100m in value (2017 prices). However, it was identified early on in the project that this may omit the considerable opportunities created by lower cost projects which may have small impacts individually but when considered together are likely to both drive and enable much of the growth that is planned in London. For example, the largest project in the pipeline in terms of cost and scope – Crossrail 2 – is projected to deliver some 200,000 homes across London by 2060. However, London needs to deliver some 1.6

million units by 2050 (based on the London Infrastructure Plan to 2050). Therefore, over 85 per cent of housing growth will need to be enabled and supported by other infrastructure projects, many of which will take the form of incremental improvements and smaller schemes. We have therefore identified two types of projects: what we call “growth drivers” which are the major infrastructure projects (mainly rail) which can be considered as facilitators of growth, and what we call “growth enablers” which tend to be smaller projects and incremental improvements without which growth would not be viable.

Value drivers of the LSIR

The LSIR creates two main sources of value:

1. It helps to guide the development of the key Mayoral strategies – the London Plan, the Transport Strategy and the Environment Strategy – by identifying the interrelationships between them and clarifying early the key issues and challenges related to infrastructure and growth that London will need to tackle. In this way it enables the Mayor to direct policy more clearly in order to support sustainable growth across London.
2. It integrates a significant amount of technical knowledge from around the GLA family and elsewhere into one, high-level strategic document which can be accessed by a wide range of stakeholders.

Limitations of the LSIR

It is by its nature a strategic document. It does not seek to include every issue related to infrastructure and growth across London.

1 Executive summary

1.1 Introduction and report structure

However, it does aim to include some of the main strategic issues, opportunities and challenges related to infrastructure across London. This makes it somewhat subjective in nature. In addition, it is policy-driven in that it addresses issues to the extent that they support or contradict policy priorities. If policy priorities change – which they do regularly – then the content of the LSIR will also need to reflect this. As such, it can be considered a “point-in-time” analysis that will need to be updated as and when political and economic circumstances change.

Lastly, the LSIR is only as good as the data that it uses. One clear finding of the LSIR is that London government requires a better understanding of its infrastructure supply and demand. This could be better facilitated through open sharing of data between the private and public sectors.

Report structure

Section 1: Executive Summary

This section provides an Executive Summary to the report and contains headline analysis and emerging findings that have been raised during the course of our work. This includes a “sector” focus which includes cross-London priorities, opportunities and challenges by sector as well as the sector-specific assessment framework across growth corridors.

Section 2: The spatial view of London's growth

In Section 2, we identify the priority growth corridors across London and the scale of the opportunity that is presented including projected population, housing and jobs growth to 2031.

Section 3: A spatial view of infrastructure needs across London

In Section 3, we apply a RAG assessment framework to identify the extent of strategic cross-sector infrastructure needs by growth corridor.

Section 4: The sectoral view of London's infrastructure: strategic opportunities and challenges

In Section 4, we analyse the strategic opportunities and challenges for infrastructure, specifically related to its capacity to drive and enable growth, across London.

This has been undertaken on a sectoral basis. We have analysed rail, highways, healthy streets, electricity and heat, waste, water supply, water management and flood risk, digital and open space. N.B. We have included housing in the spatial view of infrastructure needs analysis however analysis on strategic opportunities and challenges in the housing sector will be added to this study at a later date.

Within each sector we have identified:

- The key cross-London strategic infrastructure projects in the pipeline
- Mayoral sector-specific priorities
- Challenges for the delivery of growth
- Opportunities for innovation

Appendix 1: Strategic infrastructure projects and current programme

Appendix 1 provides an overview of the strategic infrastructure projects we have identified from existing project pipelines.

Appendix 2: Strategic infrastructure needs assessment approach

Appendix 2 provides our detailed strategic infrastructure needs assessment approach by sector.

Appendix 3: References

Appendix 3 contains references for all sources used in the preparation of the LSIR.

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1.1 Introduction and report structure

Table 1: List of stakeholder meetings for LSIR from November 2016-March 2017

Stakeholder consultation	Formal Meetings	Date
Project Inception meetings	LSIR Transport Inception Meeting	29 th November 2016
	LSIR Environment Inception Meeting	1 st December 2016
	LSIR Planning Inception Meeting	2 nd December 2016
	LSIR Growth Board Inception Meeting	20 th December 2016
Advisory Group	LSIR Advisory Group Meeting 2	5 th December 2016
	LSIR Advisory Group Meeting 3	23 rd January 2017
	LSIR Advisory Group Meeting 4	17 th March 2017
Utilities Group	LSIR Water Sector meeting	2 nd March 2017
	LSIR Energy Sector meeting	2 nd March 2017
	LSIR Digital Sector meeting	15 th March 2017
	LSIR Water and Waste Sector meeting	29 th March 2017
Transport for London	TfL Area Manager meetings with:	
	• West Area	17 th February 2017
	• South Area	17 th February 2017
	• North Area	15 th February 2017
	• East Area	15 th February 2017
Others	GLA Open Space	8 th March 2017

Note: We have also engaged throughout the project with GLA Transport, GLA Planning, GLA Digital and GLA Environment officers to provide comments on our draft reports and other deliverables and are very grateful for the help and support that they and all participants have been able to provide.

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1.2 London's growth corridors and the scale of the opportunity

The LSIR identifies 10 key growth corridors across London (within GLA boundaries). These encompass all Opportunity Areas with the exception of Earl's Court and Kidbrooke. A growth corridor is a coherent spatial area of London which is defined by one or more major transport schemes as well as major land use development. As illustrated, there are overlaps between growth corridors, particularly in east London as these areas are tightly interlinked through infrastructure and economic development.

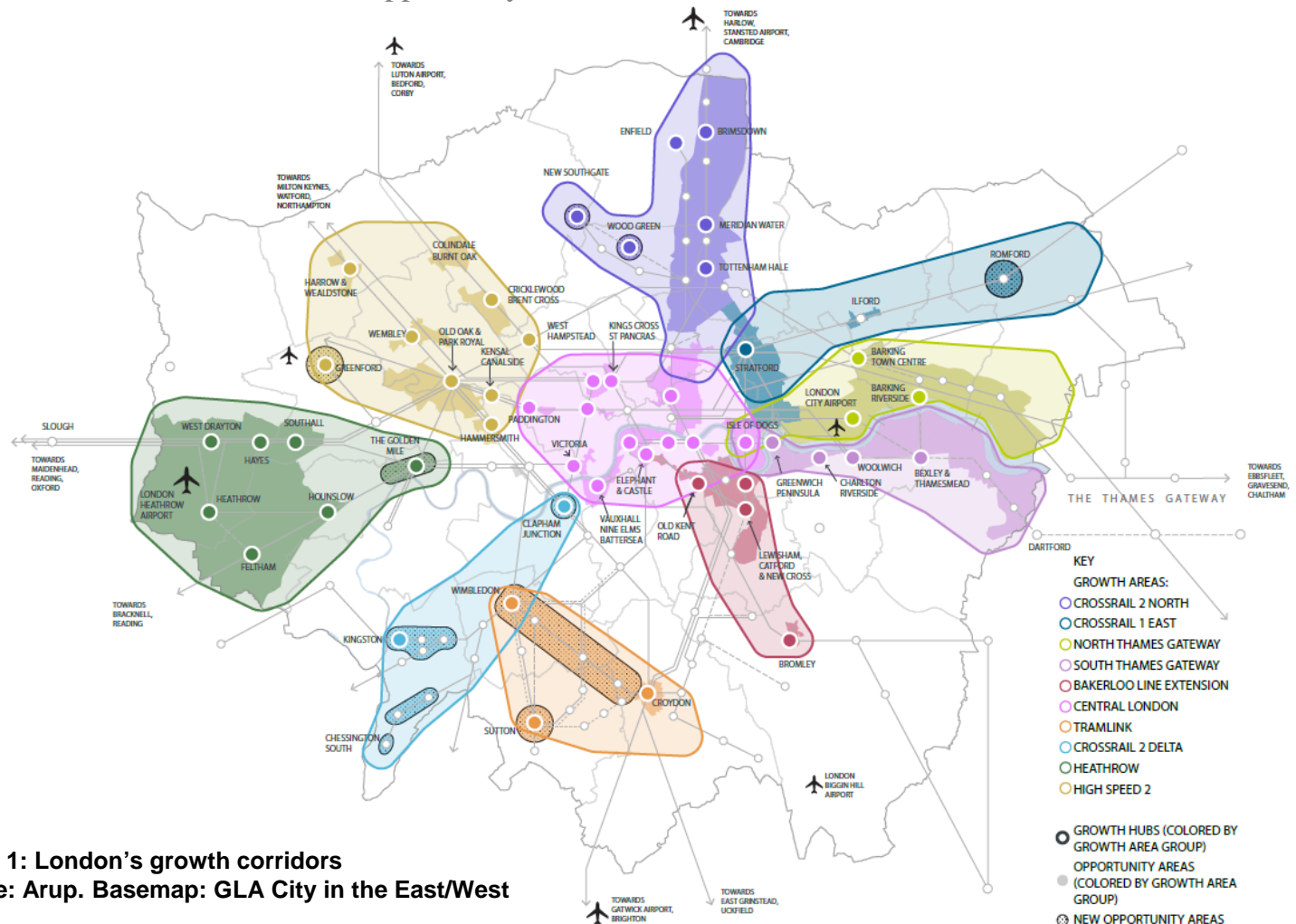


Figure 1: London's growth corridors
Source: Arup. Basemap: GLA City in the East/West

1 Executive summary

1.2 London's growth corridors and the scale of the opportunity

The LSIR also looks at the scale of housing developments in the pipeline across London. The chart opposite shows the major housing projects currently in the pipeline (over £100m in value, outturn prices, data from Barbour) mapped across the growth corridors.

Major housing projects (>£100m);

Number of units

- 0 - 250
- 251 - 500
- 501 - 1000
- 1001 - 2000
- 2001 - 3500

Growth corridors

- Bakerloo Line Extension
- Tramlink
- Crossrail 2 Delta
- Crossrail 1 East
- Crossrail 2 North
- High Speed 2
- Heathrow
- Central London
- South Thames Gateway
- North Thames Gateway

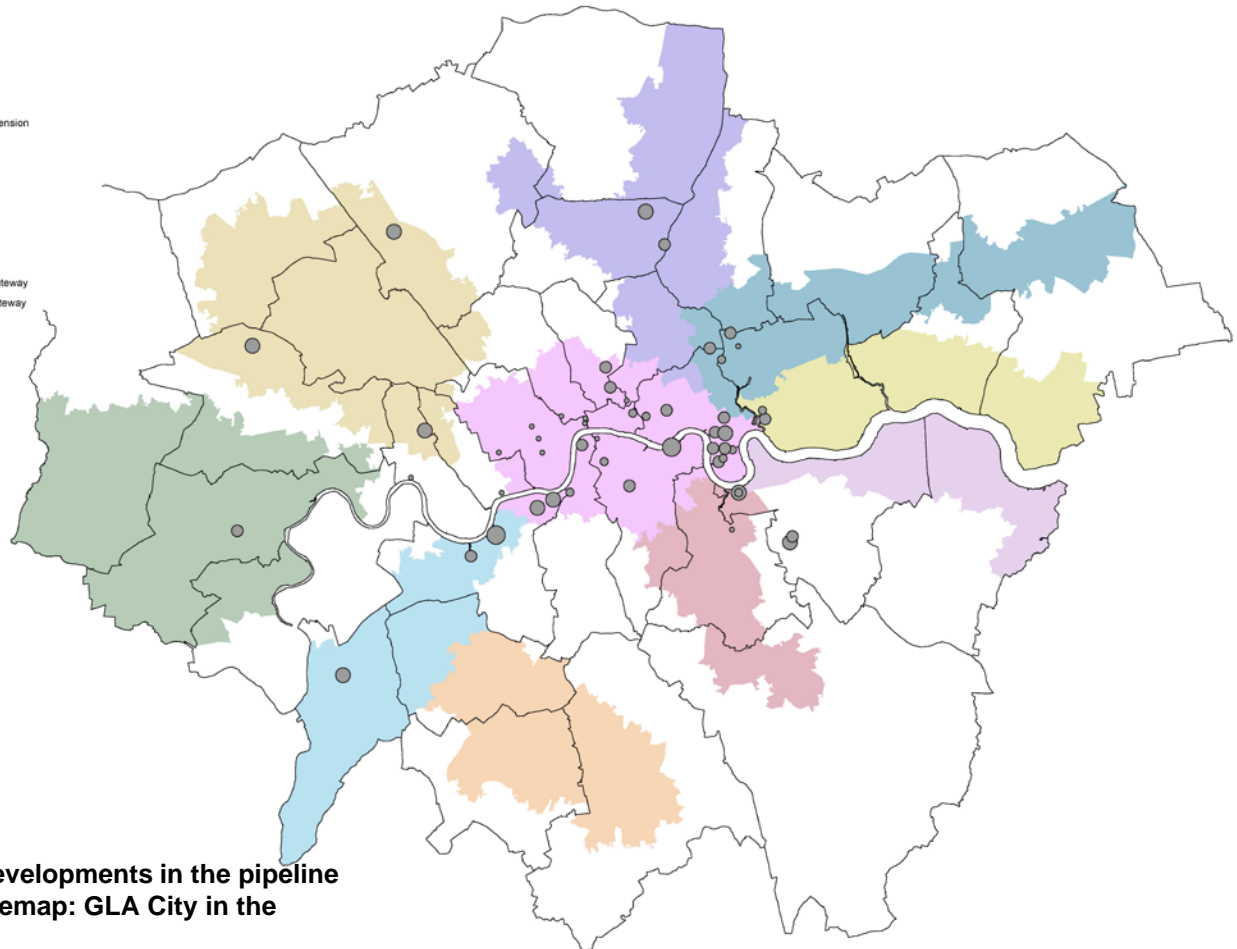


Figure 2: London's major housing developments in the pipeline
Source: Barbour, Arup analysis. Basemap: GLA City in the East/West

1 Executive summary

1.2 London's growth corridors and the scale of the opportunity

Population projections for growth corridors from 2017-2031

Table 2: Growth corridors data on population growth to 2031

Growth corridor	Population (2017)	additional population to 2031	Population growth (%)	Total	Rank. by % growth	Rank. by absolute growth
CR2 North	772,251	101,588	13%	873,839	7	4
Heathrow	587,854	65,774	11%	653,628	9	7
HS2	883,883	137,165	16%	1,021,048	5	2
Tramlink	430,441	51,382	12%	481,823	8	9
Central London	1,035,843	230,445	22%	1,266,288	3	1
NTG	296,614	72,613	24%	369,227	1	5
STG	220,738	53,028	24%	273,766	2	8
Bakerloo	463,432	67,562	15%	530,994	6	6
Crossrail1 East	608,192	118,464	19%	726,656	4	3
CR2 Delta	370,663	36,193	10%	406,856	10	10
London	8,883,839	1,147,584	13%	10,031,423	-	-

Analysis on the proportional increase (%) of population by growth corridor demonstrates the extent of infrastructure that is likely to be required within growth corridors i.e. how transformational the impact may be, and which areas may need extra support or structures in place in terms of the governance and institutional capacity to deliver and/or facilitate the delivery of this infrastructure.

Analysis on the absolute increase (quantum) of population by growth corridor could help the Mayor prioritise between growth corridors by defining which areas will contribute the most towards London's growth.

In terms of the proportional increase, North and South Thames Gateway, and Central London growth corridors have the highest growth projections to 2031. In term of the quantum of increase, Central London, HS2, Crossrail 1 East growth corridors have the highest growth projections to 2031. The Crossrail 2 Delta growth corridor is projected to deliver the lowest growth both in terms of proportional increase and quantum of increase. Overall, it is estimated that these growth corridors will account for 78% of London's population growth to 2031.

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1.2 London's growth corridors and the scale of the opportunity

Employment projections for growth corridors from 2016-2031

Table 3: Growth corridors data on employment growth to 2031

Growth corridor	No. of jobs (2016)	Additional jobs to 2031	Employment growth (%)	Total	Ranking by % growth	Ranking by absolute growth
Crossrail 2 North	210,332	34,483	16%	244,815	5	6
Heathrow	313,110	38,603	12%	351,713	9	5
HS2	333,949	119,495	36%	453,444	=2	2
Tramlink	182,504	14,990	8%	197,494	10	10
Central London	2,268,308	319,136	14%	2,587,443	=6	1
North Thames Gateway	86,143	64,312	75%	150,455	1	3
South Thames Gateway	70,422	25,494	36%	95,916	=2	7
Bakerloo Line Extension	129,243	18,544	14%	147,787	=6	9
Crossrail 1 East	176,624	62,873	36%	239,498	=2	4
Crossrail 2 Delta	158,969	20,180	13%	179,149	8	8

Employment projections demonstrate an increase in the density of existing commercial development as well as increase in new commercial developments. As with population, analysis on the proportional increase in employment demonstrates the projected change in employment density within growth corridors, and analysis on the absolute growth demonstrates the growth in quantum of jobs supported within the growth corridors.

In terms of the proportional increase, South and North Thames Gateway, Crossrail 1 East and HS2 growth corridors have the highest growth projections to 2031. In terms of the quantum of increase, Central London, HS2, North Thames Gateway and Crossrail 1 East growth corridors have the highest growth projections to 2031.

The Tramlink, Crossrail 2 Delta and Bakerloo Line Extension growth corridors are projected to deliver the lowest growth both in terms of proportional increase and quantum of increase.

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1.2 London's growth corridors and the scale of the opportunity

Housing projections for growth corridors from 2011-2031

Table 4: Growth corridors data on housing projections to 2031

Growth corridor	No. of households (2011)	Additional homes to 2031	Homes growth (%)	Total	Ranking by % growth	Ranking by absolute growth
Crossrail 2 North	274,602	44,362	16%	318,964	7	4
Heathrow	198,617	28,722	14%	227,339	8	7
HS2	304,649	59,897	20%	364,546	5	2
Tramlink	162,833	22,438	14%	185,271	9	9
Central London	399,009	100,631	25%	499,640	4	1
North Thames Gateway	94,228	31,709	34%	125,937	1	5
South Thames Gateway	77,390	23,156	30%	100,546	2	8
Bakerloo Line Extension	174,724	29,503	17%	204,227	6	6
Crossrail 1 East	189,906	51,731	27%	241,637	3	3
Crossrail 2 Delta	142,148	15,805	11%	157,953	10	10

In terms of the proportional increase, North and South Thames Gateway, Crossrail 1 East and Central London growth corridors have the highest growth projections to 2031. In terms of the quantum of increase, Central London, HS2, Crossrail 1 East and Crossrail 2 North growth corridors have the highest growth projections to 2031.

The Crossrail 2 Delta and Tramlink growth corridors are projected to deliver the lowest growth both in terms of proportional increase and quantum of increase.

1 Executive summary

1.2 London's growth corridors and the scale of the opportunity

Emerging findings

Cross-growth corridor issues

1. Projections are a “point-in-time” analysis. For this reason, additional potential for growth could still be identified in “emerging corridors” such as CR1 East.
2. Projections are predominantly supply rather than demand-based. Significant growth is projected in growth corridors such as the North and South Thames Gateway. However, historically the growth rates in these corridors have been much slower than anticipated. This illustrates their dependencies on infrastructure investment and its importance in driving and enabling growth. Many of the growth corridors which project the highest growth in both proportional and absolute terms also have considerable amounts of brownfield land including challenging sites that require corresponding investment in infrastructure.
3. Some corridors (Crossrail 2 Delta, South Thames Gateway) have a clear bias towards residential development and others (North Thames Gateway, Crossrail 1 East) that will facilitate more commercial development. This raises the issue of whether residential-focused and commercial-focused corridors need to be considered differently when planning for strategic infrastructure requirements.

Within growth corridor issues

1. Central London growth corridor (which contains central London, Isle of Dogs and Canada Water) is projected to deliver the most absolute growth in population and employment terms, indicating it might require most attention.
2. The HS2 growth corridor is second to Central London in terms of absolute growth in employment and population. Much of this growth is planned around Old Oak Common which will have an interchange between Crossrail, HS2, the London Underground and Overground. However, there are some challenges with the Old Oak Common development which will need to be resolved in order to enable projected growth.
3. Crossrail 2 North is mid-ranked in both the population and employment growth tables. This is mainly because much of the population and housing growth expected to be realised as a result of Crossrail 2 will happen post-2031. These figures will be updated once the new 2017 Strategic Housing and Land Availability Assessment (SHLAA) is published which will provide projections to 2046. This also raises the issue of whether more growth could be facilitated before 2031 on the back of incremental infrastructure improvements.
4. The Bakerloo Line Extension growth corridor currently ranks relatively modestly in terms of both population and employment growth. However, it will contain one of the most costly major projects in the pipeline (also not proposed to complete until the early 2030s). This may represent a missed opportunity both in terms of delivering incremental growth before 2031, but also in terms of the full potential that could be delivered if the BLE proceeds.
5. The Tramlink is projected to deliver the least in terms of employment growth and close to the bottom in population growth. This partly indicates the lack of regeneration potential of the Tramlink scheme, but could also represent a missed opportunity relating to densification of existing town centres within the growth corridor.

1 Executive summary

1.3 Project focus

Emerging findings

There are currently 138 “strategic projects” in the LSIR pipeline. As discussed in the introduction, these have been partly defined by cost (over £100m) but also by criticality in terms of the potential to deliver or enable growth. The projects have been taken from the London Infrastructure Plan to 2050 database, the Transport for London business plan, utility company business plans (where publicly available) and relevant Opportunity Area Planning Framework and Development Infrastructure Funding Studies.

We have categorised the projects into indicative cost to allow for cost fluctuations. As Figure 3 shows, 26 strategic projects (19%) are expected to cost more than £1 billion, while 34 projects (49%) fall within the bottom two cost bands (below £250 million).

If we consider the estimated phasing dates of these projects, most of them are expected to start and complete construction before 2030 (figure 4). However, project clashes could have an impact on delivery due potential constraints on the supply chain and construction industry. In particular, this could be the case in the 2021-2025 period, when 38 projects with costs between £0.5 and £5 billion are expected to be under construction.

The full LSIR project list and programme is included in Appendix 1.

Figure 3: Number of strategic projects by cost band

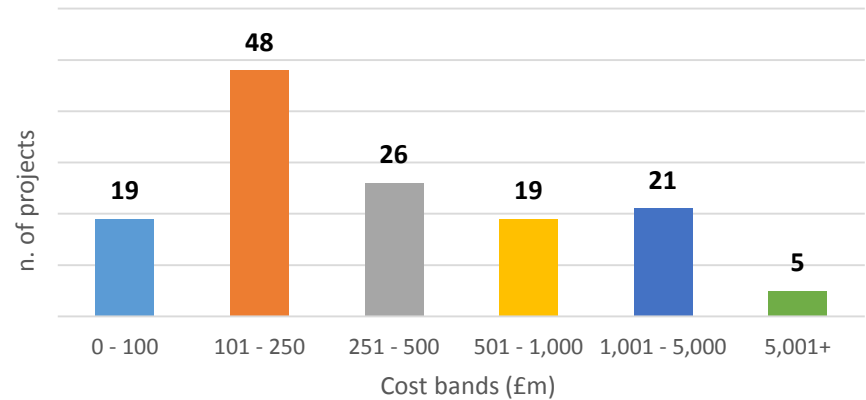
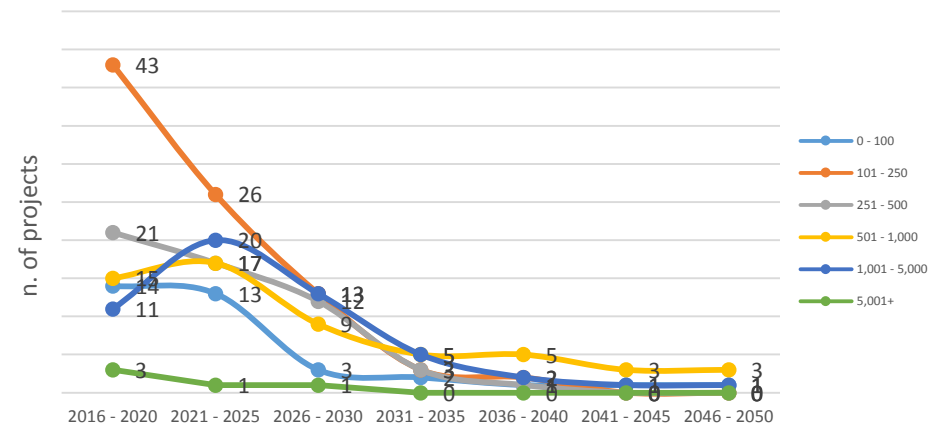


Figure 4: Number of strategic projects per 5 year period, by cost bands (£m)



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1.3 Project focus

Emerging findings

At present, the majority of strategic projects in the pipeline are rail infrastructure upgrades, extensions or new lines. This is primarily due to long lead times for planning, financing and delivering rail infrastructure. The GLA and TfL are considering long-term rail infrastructure needs at a much earlier date than they would typically look at bus infrastructure, or utility companies would look at energy or water infrastructure. As figure 5 highlights, while 29 of the identified projects have got planning approval, the planning status for almost half of the pipeline remain 'uncertain'.

We have categorised strategic infrastructure projects into two main categories:

- Growth drivers
- Growth enablers

Growth drivers are projects that directly stimulate growth and are considered to be the primary pieces of infrastructure necessary to facilitate housing and/or commercial property delivery.

Growth enablers are projects that support or enable growth and without which housing and/or commercial property delivery would not be viable.

The full LSIR project list and programme is included in Appendix 1.

Figure 5: Number of strategic projects by sector

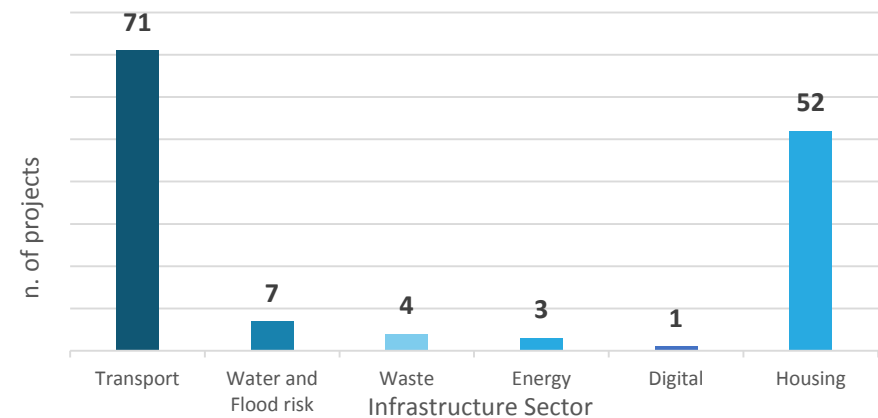
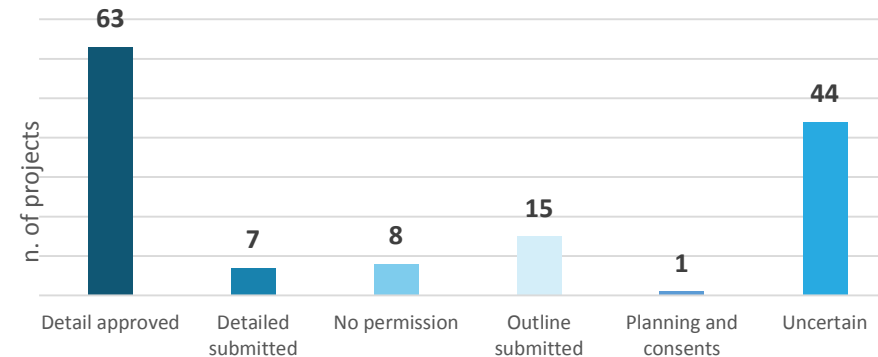


Figure 6: Planning status of strategic projects



1 Executive summary

1.4 Infrastructure needs by growth corridor

LSIR Approach

The LSIR is based on a detailed assessment framework to identify infrastructure needs and deliverability of those needs within each of the growth corridors.

This has been done on a collaborative basis between Arup, the GLA, Transport for London, the LSIR Advisory and Utilities Groups.

The analysis focuses on the core question – “How ready are each of the growth corridors for development?” It breaks down this question into three sub-questions:

1. Is there a significant need for infrastructure based on projected demand?
2. Are needs planned for (i.e. are projects included in relevant pipelines)?
3. Are projects deliverable (i.e. is there a project sponsor in place and funding secured)?

We then perform a RAG assessment on each of the sub-questions, using defined, sector-specific criteria. These criteria are included in Appendix 2, in addition to the data sources used to perform the analysis. It should be noted that timeframe of the needs assessment is – in general – to the early 2030s, however for some sectors data analysis has been undertaken to 2050 (electricity) and in others data analysis is based on current provision vs. demand (digital, flood risk). However, in all sectors the central question about readiness for the delivery of growth is the focus of the assessment.

The summary RAG assessment table is presented on Page 16.

Emerging findings

1. Many of the growth corridors face similar challenges in terms of a lack of capacity of certain utilities and strategic issues around funding for rail projects
2. For some sectors it is challenging to look too far in advance as technologies and policies are developing quickly and fundamentally change how we look at capacity and demand (particularly energy, waste and digital)
3. The lack of comprehensive data in the public domain on capacity and projected supply (particularly of utilities infrastructure) makes it very challenging to undertake the cross-sector analysis at a strategic level. This type of analysis is undertaken regularly for individual Development Infrastructure Funding studies (DIFS) but these are detailed studies involved a significant amount of stakeholder consultation. For the Mayor to obtain a better understanding of strategic infrastructure needs it would be advisable for the GLA to build a more strategic database compiling data from various sources.
4. The LSIR aims at making infrastructure provision more efficient. However, particularly in the utilities sectors there is potential to future-proof developments by undertaking integrated infrastructure projects (i.e. a “dig-once” approach) but there appear to be regulatory constraints. However, some major developments have been able to take this approach including the Queen Elizabeth Olympic Park, Canary Wharf and Nine Elms.

1 Executive summary

1.4 Infrastructure needs by growth corridor

RAG Status	RAG Criteria		
	1	2	3
	Is there a significant need?	Are needs planned for?	Are projects deliverable?
	Low to none	Well Identified	In Progress
	Medium	Incomplete Assessment	Under Conditions
High	Uncertain	Uncertain	

Summary cross-growth corridor analysis

The table below presents a summary of our cross-growth corridor infrastructure needs assessment as explained on Page 12. The following pages summarise the approach and criteria we have used for each of the sectors.

Table 5: Summary infrastructure needs assessment by growth corridor

Sector	Crossrail 2 North			Heathrow			Tramlink			Crossrail 1 East			HS2			North Thames Gateway			South Thames Gateway			Bakerloo Line Extension			Crossrail 2 Delta			Central London		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Rail	Red	Green	Red	Red	Green	Red	Red	Green	Yellow	Red	Green	Red	Red	Green	Red	Red	Green	Red	Red	Green	Yellow	Red	Green	Red	Red	Green	Red	Red	Green	Red
Bus	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Green	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red
Highways	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red
Electricity	Red	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Green	Green	Yellow
Heat	Red	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Water supply	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Water management	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Flood risk*	Yellow	Green	Red	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Waste	Yellow	Green	Green	Yellow	Green	Yellow	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Green	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Digital – NGA*	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey	Green	Grey	Grey
Digital – SFBB*	Green	Grey	Grey	Green	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey
Digital – UFBB*	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey	Red	Grey	Grey
Open space*	Green	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Housing	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey	Yellow	Grey	Grey

Note: a "grey" status represents a lack of data in this criteria/category

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

1 Executive summary

1.5 Sector focus

1.5.1 Rail

Mayoral priorities for the rail sector include:

- A need for rail infrastructure to support “good growth” i.e. concentrating density in places that are already well connected by public transport and integrating active transport
- A focus on incremental improvements to the existing network, including maximising capacity and efficiency

Rail infrastructure challenges that relate to the delivery of growth include:

- **Funding** - all growth corridors have a significant need for rail infrastructure but – at present – none of the strategic rail infrastructure projects within growth corridors have secured funding (outside of the projects that are currently in progress such as Crossrail 1 and London Underground upgrades).
- **Infrastructure gap** – many of the large rail projects planned for London, including Crossrail 2, are not planned to open until the early to mid 2030s. This means that interim projects are required to support growth and avoid car dependency in new developments
- **Capacity constraint** - It is already anticipated by Transport for London that - on the day Crossrail 1 opens – its additional capacity will already be largely serving existing/latent demand. Public transport use is expected to increase from 9.5 million trips a day in 2014 to 12.3 million a day by 2041 which will outstrip planned and proposed capacity increases. Crossrail 2, Bakerloo Line Extension and DLR Extensions and incremental Tube capacity upgrades will deliver additional capacity, however it is unclear whether these will be sufficient to meet increases in demand predicted for the 2030s, particularly in inner London. Due to the extended project development and planning process required for transformational transport investment, should we be considering the next major capacity upgrade sooner rather than later (i.e. now)?

Opportunities for innovation include:

- **Funding** – new value capture mechanisms to link infrastructure investment with property development and value increases. Fiscal devolution, as proposed by the London Finance Commission’s recent report “Devolution: A Capital Idea” (January 2017) is required to support London’s infrastructure ambitions
- **Dual-use infrastructure** – rail corridors that also contain electricity networks, digital infrastructure or act as flood defences could be a way of increasing synergies and reducing the cost of infrastructure
- **Automation** – trains controlled by digital signalling systems are likely to be normal by the 2030s, which makes possible closer headways between trains, enabling extra capacity to be provided when compared to the last 30 or so years.

1 Executive summary

1.5 Sector focus

1.5.1 Rail

Growth corridor analysis demonstrates that all corridors have similar issues in terms of:

- Having a significant quantum of need for rail infrastructure (over £500m based on rail sector criteria)
- Well-defined needs in terms of projects being identified in OAPFs, DIFS and/or Local Plans
- Deliverability issues mainly related to unsecured funding for a significant proportion of the specified needs. In the case of Tramlink and Bakerloo Line Extension, funding has been secured for some critical schemes (e.g. Thameslink) but there is still considerable uncertainty around major drivers of growth for both areas – the potential Tramlink extension to Sutton and Bakerloo Line extension (to Lewisham), respectively.

1 Executive summary

1.5 Sector focus

1.5.2 Roads

Mayoral priorities for the road sector include:

- A focus on optimising the use of existing capacity – a core message of the new MTS is that the capacity of the road network will not grow
- Reducing congestion and improving air quality

Road infrastructure challenges that relate to the delivery of growth include:

- **Congestion** – London is the most congested city in Europe. It is a significant economic issue for London having first order impacts in terms of lost time, and second order impacts on productivity. However, car traffic (including taxis and private hire vehicles) has been experiencing long term decline. The main contributors are road works and an increase in delivery vehicles in central London.
- **Capacity** – local road capacity in West London has been identified as a potential challenge for the delivery of major projects including Heathrow 3rd runway and HS2 however in line with the MTS it is unlikely that any major increase in capacity will be prioritised by the GLA.
- **Air quality** – this is a significant issue for quality of life in London and could impede growth. Much of the challenge will be tackled through new policies such as the ULEZ and a general move to hybrid and electric vehicles.

Opportunities for innovation include:

- **Tunnelling of major roads** – this has been identified as an opportunity to release land, reduce severance effects and improve air quality particularly within the North and South Thames Gateway
- **Improving the efficiency of roadwork implementation** using the Surface Intelligent Transport System (SITS) a programme
- **Improving the efficiency of road usage** through systems upgrades, construction logistics innovations and connected and autonomous vehicles (platooning).

Growth corridor analysis raises the following issues:

- Medium to high levels of need (£100-500m or £500m+ respectively) are found across all growth corridors
- Some growth corridors – HS2, North and South Thames Gateway - have detailed plans for road infrastructure within OAPFs, DIFs and/or Local Plans. However the others have either not fully assessed needs or identified projects across the corridor, for example in the Crossrail 2 North corridor.
- Deliverability issues are mainly related to unsecured funding for a significant proportion of the specified needs which are particularly acute in some growth corridors. In addition, some corridors with critical congestion issues have not secured sponsors to deliver road infrastructure – Crossrail 2 North, Heathrow, Tramlink, Crossrail 2 Delta.

1 Executive summary

1.5 Sector focus

1.5.3 Healthy Streets

Mayoral priorities

- The Mayor recently released a “Healthy Streets for London” strategy (February 2017) which places an emphasis on the importance of active transport in improving Londoners’ health outcomes. It makes the social and economic case for better pavement design, better designed public realm and open space, major investments in prioritising walking and cycling such as transformation of Oxford Street, and a new governance structure in the Healthy Streets Portfolio Board which will oversee investment and strategy.
- For the purposes of the LSIR we have also included bus infrastructure within the “Healthy Streets” sector.

Infrastructure challenges that relate to the delivery of growth include:

- Consolidation of bus routes – particularly in central London to reduce congestion and the under-utilisation of the bus network.
- **Safety and security** – currently modal shares of active transport are low, and depressed due to perceived lack of safety and security, particularly in relation to cycling
- **Road capacity** – segregated cycling projects such as cycle superhighways can constrain road capacity.

Opportunities for innovation that relate to the delivery of growth include:

- **Zero emissions networks** which are being trialled in Shoreditch and include free trials of electric cars and cargo bikes
- **Using bus infrastructure** to support incremental development, particularly before the delivery of major rail infrastructure
- The Mayor’s recent consultation on a “**Direct Vision**” standard for HGVs in London could improve perceptions of safety and therefore support the growth of trips by cycling and walking

Growth corridor analysis raises the following issues:

- Medium levels of need (£100-500m) are found across all growth corridors with the exception of Central London which has over £500m of investment in bus infrastructure identified.
- Only the South Thames Gateway has detailed plans for bus infrastructure within OAPFs, DIFs and/or Local Plans, however the others have either not identified projects or assessed needs
- Deliverability issues are mainly related to unsecured funding for a significant proportion of the specified needs which are particularly acute in some growth corridors (Crossrail 2 North, Heathrow, Tramlink, North Thames Gateway and the Crossrail 2 Delta).

1 Executive summary

1.5 Sector focus

1.5.4 Electricity and heat

Mayoral priorities for the electricity and heat sectors include:

- London becoming a **net zero carbon emission** city by 2050, including de-carbonisation of heating by 2050 (displacing gas).
- Using energy for buildings and transport more effectively including retrofitting homes and workplaces and more efficient public transport
- Facilitating an affordable, sustainable and secure energy system based on local energy sustainable generation by 2050
- Generating a significant proportion of London's energy supply within the city, to generate more heat supply from electricity, a Solar Action Plan for London, exploring the use of a DevCo and LicenceLite models

Infrastructure challenges that relate to the delivery of growth include:

- **Electricity grid capacity** – there is a significant challenge related to whether the existing grid will be able to cope with new electricity demand and what reinforcement and mitigation strategies will be needed in the network. London is currently heavily reliant upon the national grid for electricity and for gas, and its supply is inextricably linked to national energy infrastructure and national energy policy. Therefore costs and security of supply challenges at the national level will directly affect London's resilience and its customers, potentially exposing them to risks that are beyond the direct control of London's authorities.
- **Generating more energy locally** will be a significant challenge, in particular identifying and delivering district heat networks which will provide most decentralised resources
- **Trade-offs between zero carbon policies and supply capacity** are found in relation to proposed technologies such as electric heat pumps which are prioritised to replace gas boilers to deliver zero-carbon heat
- In general a **paradigm shift** is needed in both infrastructure availability and policy and regulation.

Opportunities for innovation include:

- **The DevCO model** or alternative fit-for-purpose model which could provide and manage investment in electricity distribution infrastructure and reducing developer and investor risk in investing ahead of demand
- **The LicenceLite model** which involves the GLA obtaining a junior electricity supply licence whereby it can purchase output from low and zero carbon electricity generators and supply the electricity produced to public and commercial electricity users in London.
- Supporting the development of **Integrated Energy Strategies** in all new developments and major refurbishment projects in order to reduce grid demand
- Move towards a **zero carbon and "smart" electricity grid**
- **Integrated provision of infrastructure** for growth corridors – agglomeration of schemes and infrastructure solutions could help DNOs and suppliers to efficiently reinforce an area rather than following a development-by-development approach (i.e. as has been done at Nine Elms).

1 Executive summary

1.5 Sector focus

1.5.4 Electricity and heat

Growth corridor analysis raises the following issues:

- Significant estimated requirements for Crossrail 2 North, HS2, Bakerloo Line Extension and Crossrail 2 Delta corridors. Only Heathrow and Central London will have fewer than 50% of their substations at overcapacity by 2050.
- Decentralised energy strategies and heat networks have been planned, particularly in Central London area. Crossrail 2 Delta is one of the corridors with highest projected electricity demand to 2050, but infrastructure needs and costs are not fully defined – particularly for a Crossrail 2 growth scenario. Only the South and North Thames Gateway corridors have detailed plans for gas infrastructure across the corridor within OAPFs, DIFs and/or Local Plans.
- Deliverability issues are mainly related to unsecured funding across corridors – Crossrail 2 North is the exception with the new Edmonton Ecopark .

1 Executive summary

1.5 Sector focus

1.5.5 Waste management

Mayoral priorities for the waste sector include:

- Ensure all waste management activities contribute to the delivery of a **zero carbon city by 2050**.
- Increase the amount of **avoidable waste** that is collected for recycling so that London achieves a target of 65% of municipal waste by 2030
- Move London towards **circular economy principles**.
- Updated London Plan waste model estimates **4 million tonnes extra capacity** needed for London. GLA to list priorities around capacity gap.

Infrastructure challenges that relate to the delivery of growth include:

- Challenge to deliver **waste management capacity** to cope with projected growth – 4 million additional tonnes.
- **Waste management uncertainties** – barriers to investment with increasing land costs, planning constraints, and waste commodity price fluctuations.
- Increasing pressure on **waste sites** to accommodate London's population growth – 65% of London's waste goes through OAs and 100% of incineration plants within OAs boundaries. This is a major issue for growth as waste facilities are traditionally not popular with residential communities.
- **Transition to a Circular Economy** will require several sectors to coordinate, from finance to manufacturing.

Opportunities for innovation include:

- **Circular Economy** – opportunities for waste reduction through accelerating a circular economy approach in London; work with waste infrastructure providers on how they will contribute to a more circular economy; engage financial institutions on circular economy investment opportunities; contribute to the delivery of LWARB's circular economy route map.
- **Capacity gap** – GLA to identify measures from ES to address the capacity gap.
- Identify corridors with significant **waste facility capacity and land availability**: Lee Valley, Tramlink, Thames Gateway, Old Kent Road, and Heathrow.
- Implement **integrated waste collection** approaches to realise efficiency.
- Opportunities for waste to deliver more heat and electricity.

1 Executive summary

1.5 Sector focus

1.5.5 Waste management

Growth corridor analysis raises the following issues:

- Different levels of capacity constraints are found across all growth corridors based on the planned growth. South Thames Gateway, Bakerloo Line Extension and Central London projected sufficient capacity to respond to estimated demand, while a significant capacity gap has been estimated in the Tramlink, HS2 and Crossrail 2 Delta corridors.
- All growth corridors have assessed needs and identified high-level investments. Some of them – Crossrail 2 North, Heathrow and South Thames Gateway – have identified sites and/or detailed waste management plans, some under implementation.
- Deliverability issues are mainly related to unsecured funding for identified waste infrastructure. The exceptions are Crossrail 2 North – new capacity through the Edmonton Ecopark (secured) – and North Thames Gateway – only needs have been identified, no projects or new facilities.

1 Executive summary

1.5 Sector focus

1.5.6 Water

Mayoral priorities for the water sector include:

- The **Draft London Environment Strategy** aim is for water to be managed in an integrated way, to manage the impacts of water pollution, flooding and resource pressures to the benefit of Londoners and the environment. This may lead to explicit support of Integrated Water Management Strategies for major new developments.
- London's **Sustainable Drainage Action Plan** aimed at increasing delivery of sustainable drainage systems through retrofitting. Strategic implementation of SuDs over a wider catchment and link this infrastructure into the London Action Plan.
- **Tidal and fluvial flooding – TE2100 (Thames Estuary 2100)** plan to maintain protection along the Thames Estuary and EA to prioritise fluvial flood risk measures across London.

Infrastructure challenges that relate to the delivery of growth include:

- **Water demand and supply capacity** – Population growth and a reduction in average household sizes means growth in water supply will be required unless demand management activity is significantly increased. Thames Water projects a 6% capacity deficit by 2020 (could be up to 30% by 2050).
- **London-wide resiliency** – ageing infrastructure (more than 100 years old), high leakage rates and considerable challenges in retrofitting meters.
- **GLA boundaries interaction** – difficulty in separating demand and supply within GLA boundaries and boroughs immediately outside. The Environment Agency and the GLA are working together in relation to water management, flood risk interventions, and land/sites safeguarding.
- **Funding mechanisms** – difficulties in funding and delivering long-term supply while water companies concentrate expenditures on short term cycles (5-year). Also, there are challenges around securing funding for fluvial and surface water infrastructure – potential of partnership contributions as a funding mechanism.
- **Network capacity** – drainage and sewerage will be highly constrained across London and in some growth corridors to 2050 (Thames Water Flow capacity model).

Opportunities for innovation include:

- Implement **integrated water management strategies** at major developments to ensure integrated water supply and management.
- **Water management and resources** – actively promote demand management measures to reduce leakages and improve efficiency across London. Water companies should coordinate to guarantee efficient utilisation of resources and plan future supply schemes.
- Opportunities around delivering **cost-effective and more innovative solutions** through a resilience approach, cross-sector utilities coordination and retail sector competition.
- Develop **long-term flooding plans** looking at challenges, solutions and high-level costs; while identifying **cross-sector synergies** to optimise investments and improve capacity and performance.

1 Executive summary

1.5 Sector focus

1.5.6 Water

Growth corridor analysis raises the following issues:

- Thames Water and OAPF/DIFs identified severe water stress towards 2050 in the HS2, South Thames Gateway, Central London and Crossrail 2 Delta corridors. In terms of flow capacity, major constraints are projected for Crossrail 1 East, HS2 and North Thames Gateway corridors.
- Needs are identified in most of the corridors, with major supply reinforcements identified in Tramlin, and North and South Thames Gateway and sufficient sewerage and drainage capacity in Crossrail 2 Delta and Tramlin Triangle towards 2050.
- High funding uncertainty to deliver water management infrastructure across corridors with increasing capacity constraints – HS2, North Thames Gateway and Crossrail 1 East.

1 Executive summary

1.5 Sector focus

1.5.7 Digital

Mayoral priorities for the digital sector (specifically related to connectivity as opposed to particular use cases) include:

- Getting “the basics right” for household and businesses across London and ensuring that all households and businesses should have available to them the right products to meet their particular needs
- Supporting future access by households and businesses by considering key opportunities and challenges to the delivery of infrastructure i.e. access to ultrafast broadband, next generation “5G” mobile connectivity for close to 100 per cent of London (indoor and outdoor)

Infrastructure challenges that relate to the delivery of growth include:

- **Planning for the long term** – the digital sector is very challenging to plan for in the long term due to the fast pace of its development. It is likely we could have two or more new generations after 5G to the mid 2030s, yet definitive standards for 5G are not set to be agreed until 2019.
- **London currently ranks low on the European Digital City Index 2016** in terms of its digital connectivity (#42). Many of its competitors are ranked more highly including Paris, Barcelona, Madrid, Amsterdam and Stockholm. In terms of individual indicators, London ranks 60th (last) on the availability of fibre internet, relatively high (15/60) for mobile internet download/upload speed, low (45/60) for cost of broadband and low for internet download/upload speed (42/60).
- **Access to data on connectivity** – for the LSIR we have used OFCOM data on availability of super fast broadband (SFBB) and next-generation access (NGA) across London however we understand this data is not perfect and the data on access to ultra-fast broadband (UFBB) is incomplete. We understand that better data on broadband availability may be available from thinkbroadband and may be used for further iterations of the LSIR.
- **Supporting future access** – many of the future “use cases” identified for 5G will involve a significant amount of street-furniture including small cells, sensors, charging points being installed on London’s streets. The main issue will be how to facilitate the densification of this infrastructure across London, working with Boroughs.

Opportunities for innovation include:

- **Making it as transparent as possible for the private sector to invest in London** for example. having information on which assets are available for the private sector to install infrastructure within.
- **Innovative approaches to planning for street works and street furniture** including mapping out small cell planning availability
- **Installing shared ducts** on new developments which enables fibre to be installed by various providers at a later date

1 Executive summary

1.5 Sector focus

1.5.7 Digital

Growth corridor analysis raises the following issues:

- For digital sector analysis we have not been able to identify whether these needs are being planned for in relation to SFBB or UFBB since data on planned projects and upgrades is not available in the public domain
- For SFBB many growth corridors have good access to SFBB with four only having “medium” access with between 80-90% of properties enabled with access to SFBB.
- For UFBB the data is unreliable since OFCOM data does not include smaller providers (only BT and Virgin) who provide much of the UFBB fibre in London. On the basis of OFCOM data all growth corridors have very low access to UFBB (less than 10%).

1 Executive summary

1.5 Sector focus

1.5.8 Open space and green space

Mayoral priorities for open space and green space include:

- A general priority on maximising the benefits of green and open space in London and recognition that they offer important environmental, physical, mental, social and economic benefits for Londoners. London is one of the greenest cities in the world and this contributes significantly to its global reputation.
- Promoting green infrastructure thinking across London including emphasising its role in supporting biodiversity
- Encouraging multifunctional use of green space (currently used and un-used) such as through installing Sustainable Drainage Systems (SUDs) and thereby alleviating flood risk.
- Development of the All London Green Grid

Infrastructure challenges that relate to the delivery of growth include:

- Parks and open space having non-statutory designations i.e. they are not statutorily protected through the planning system. This means that as local authority budgets get increasingly constrained, parks funding is one of the first items to suffer. In recent years, London boroughs' spending on open spaces has decreased by 18 per cent (London Councils, 2016, The future of London's parks)

Opportunities for innovation include:

- **Developing new revenue models** through encouraging multifunctional uses of green space for flood risk alleviation, community uses, healthcare, sports, food and beverage etc.
- **Strengthening protections** for open spaces within the London Plan? (Note – needs to be tested with London Plan team).

Growth corridor analysis raises the following issues:

- Corridors can rank highly in terms of the access to open space when it is defined by straight-line distance (differential distances based on the size of the park/open space) but have significant issues with severance such as the Crossrail 2 North growth corridor.
- Growth corridors that rank low using this criterion include Heathrow, Tramlink and HS2. This provides some justification for prioritising access to open and green space in new developments within these corridors.

London's strategic infrastructure requirements – an evidence base for the London Plan

Section 2

The spatial view of London's growth

2. The spatial view of London's growth

2.1 Introduction

Overview

We have worked with GLA Planning and the London Plan team to identify the key growth corridors across London. These are primarily defined by the extent of housing and jobs growth in the area and focused around new or major upgrades to, or extensions of, strategic transport infrastructure. These growth areas are illustrated on p33. These account for over 90 per cent of London's existing opportunity areas (OAs).

They are:

1. Crossrail 2 North
2. Crossrail 2 Delta
3. Crossrail 1 East
4. North Thames Gateway
5. South Thames Gateway
6. Bakerloo Line Extension
7. Central London
8. Tramlink
9. Heathrow
10. High Speed 2

2. The spatial view of London's growth

2.2 Overview of growth corridors

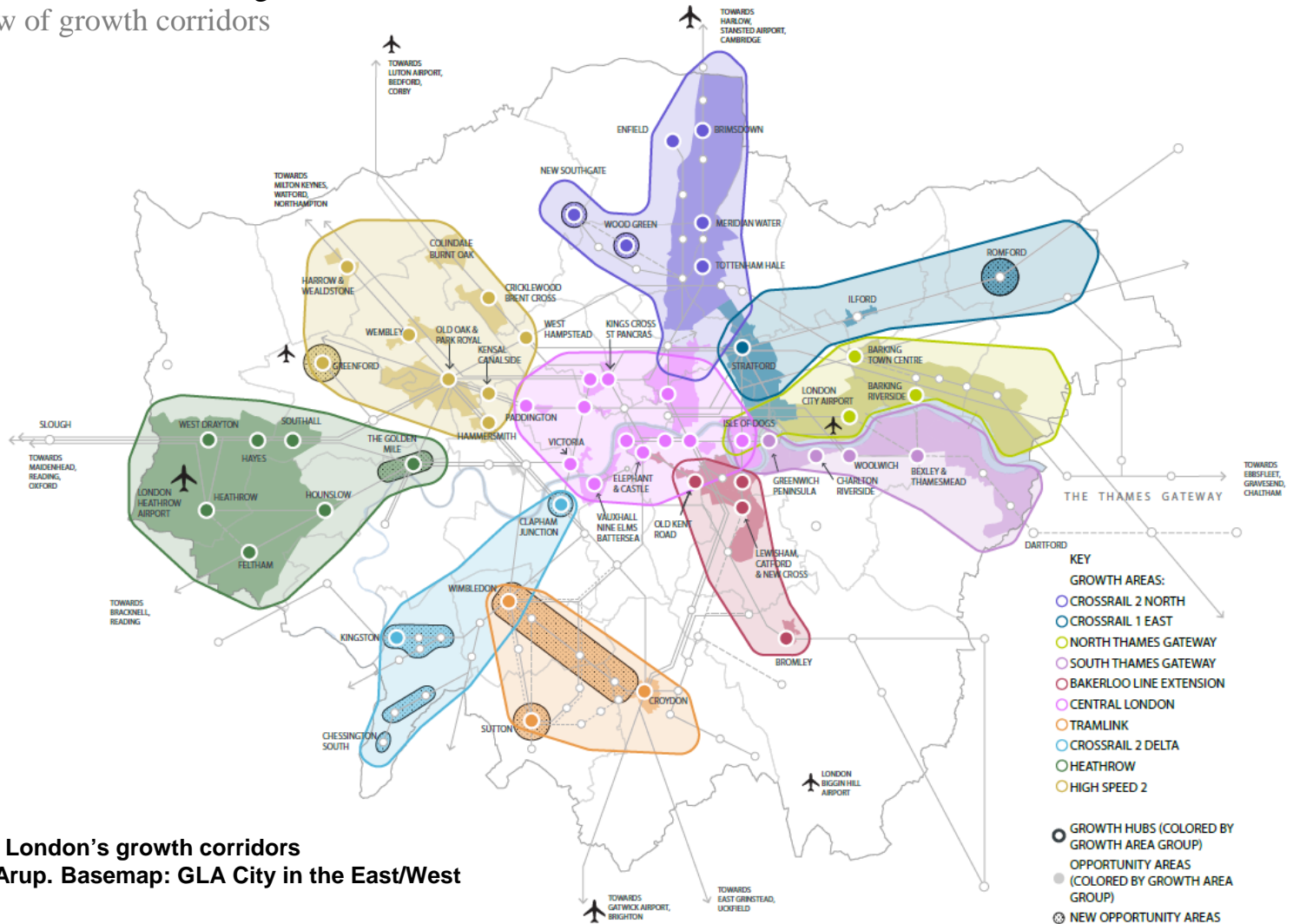


Figure 7: London's growth corridors
Source: Arup. Basemap: GLA City in the East/West

2. The spatial view of London's growth

2.3 Population, housing and employment growth projections

Population

Table 6: Growth corridors data on population growth to 2031

Growth corridor	Population (2017)	additional population to 2031	Population growth (%)	Total	Rank. by % growth	Rank. by absolute growth
CR2 North	772,251	101,588	13%	873,839	7	4
Heathrow	587,854	65,774	11%	653,628	9	7
HS2	883,883	137,165	16%	1,021,048	5	2
Tramlink	430,441	51,382	12%	481,823	8	9
Central London	1,035,843	230,445	22%	1,266,288	3	1
NTG	296,614	72,613	24%	369,227	1	5
STG	220,738	53,028	24%	273,766	2	8
Bakerloo	463,432	67,562	15%	530,994	6	6
Crossrail1 East	608,192	118,464	19%	726,656	4	3
CR2 Delta	370,663	36,193	10%	406,856	10	10
London	8,883,839	1,147,584	13%	10,031,423	-	-

Source: GLA population 2015-based projections by MSOAs

N.B. There is some double-counting between Central London and Bakerloo Line Extension, and Central London and Crossrail 2 North, and between Tramlink and Crossrail 2 Delta (19 MSOAs in total overlap between these corridors).

2. The spatial view of London's growth

2.3 Population, housing and employment growth projections

Employment

Table 7: Growth corridors data on employment growth to 2031

Growth corridor	No. of jobs (2016)	Additional jobs to 2031	Employment growth (%)	Total	Ranking by % growth	Ranking by absolute growth
Crossrail 2 North	210,332	34,483	16%	244,815	5	6
Heathrow	313,110	38,603	12%	351,713	9	5
HS2	333,949	119,495	36%	453,444	=2	2
Tramlink	182,504	14,990	8%	197,494	10	10
Central London	2,268,308	319,136	14%	2,587,443	=6	1
North Thames Gateway	86,143	64,312	75%	150,455	1	3
South Thames Gateway	70,422	25,494	36%	95,916	=2	7
Bakerloo Line Extension	129,243	18,544	14%	147,787	=6	9
Crossrail 1 East	176,624	62,873	36%	239,498	=2	4
Crossrail 2 Delta	158,969	20,180	13%	179,149	8	8

Source: GLA employment projections for MSOAs not in Opportunity Areas, and Opportunity Area projections for other MSOAs

N.B. There is some double-counting between Central London and Bakerloo Line Extension, and Central London and Crossrail 2 North, and between Tramlink and Crossrail 2 Delta (19 MSOAs in total overlap between these corridors).

2. The spatial view of London's growth

2.3 Population, housing and employment growth projections

Housing

Table 8: Growth corridors data on housing projections to 2031

Growth corridor	No. of households (2011)	Additional homes to 2031	Homes growth (%)	Total	Ranking by % growth	Ranking by absolute growth
Crossrail 2 North	274,602	44,362	16%	318,964	7	4
Heathrow	198,617	28,722	14%	227,339	8	7
HS2	304,649	59,897	20%	364,546	5	2
Tramlink	162,833	22,438	14%	185,271	9	9
Central London	399,009	100,631	25%	499,640	4	1
North Thames Gateway	94,228	31,709	34%	125,937	1	5
South Thames Gateway	77,390	23,156	30%	100,546	2	8
Bakerloo Line Extension	174,724	29,503	17%	204,227	6	6
Crossrail 1 East	189,906	51,731	27%	241,637	3	3
Crossrail 2 Delta	142,148	15,805	11%	157,953	10	10

Source: Census 2011 and 2015-based GLA population projections (central estimate). We have calculated housing growth by assuming 2.29 residents per dwelling (GLA Population calculator). For further details see Appendix 2.

N.B. There is some double-counting between Central London and Bakerloo Line Extension, and Central London and Crossrail 2 North, and between Tramlink and Crossrail 2 Delta (19 MSOAs in total overlap between these corridors).

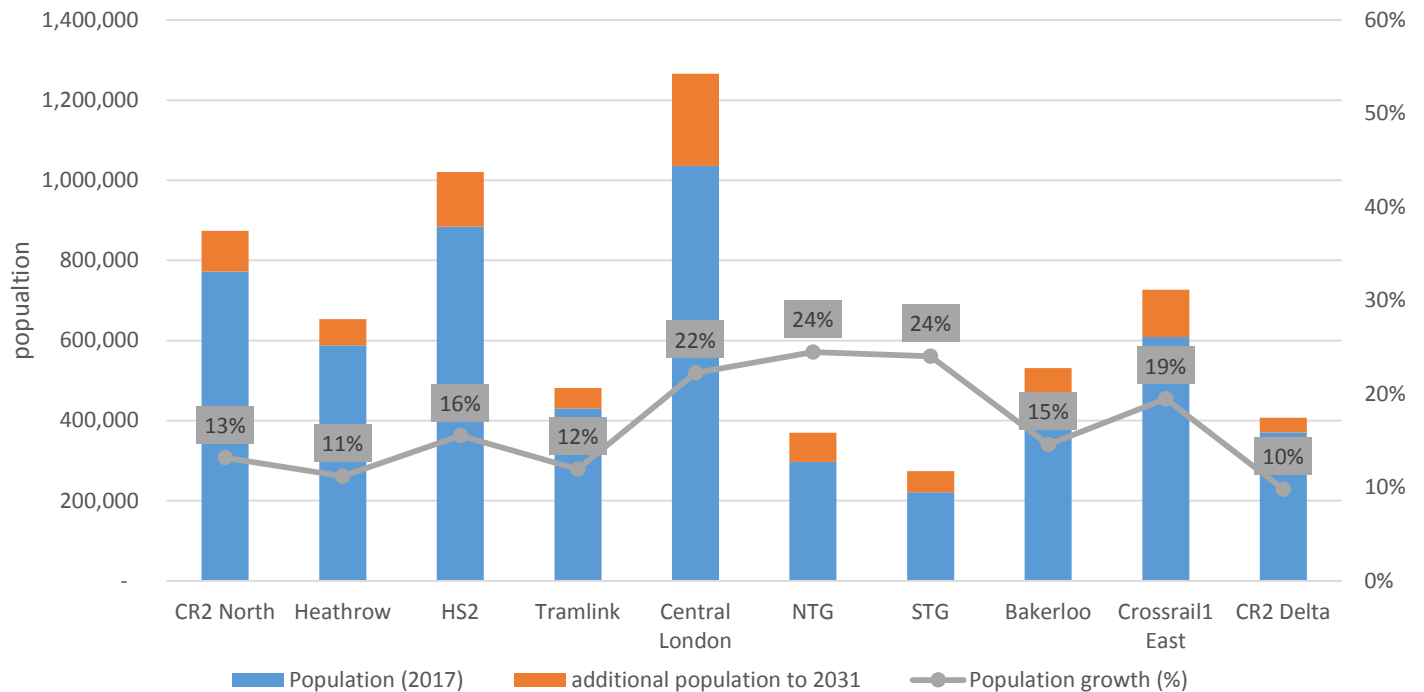
2. The spatial view of London's growth

2.3 Population, housing and employment growth projections

Population

There is a considerable population growth expected in many of the growth corridors. The most significant growth is projected for the North and South Thames Gateway (24% by 2031) and Central London (22% by 2031). On the other hand, slower growth is projected in the Crossrail 2 Delta (10%) and Heathrow (11%) corridors.

Figure 8: Population growth to 2031 within growth corridors



Source: GLA population 2015-based projections by MSOAs

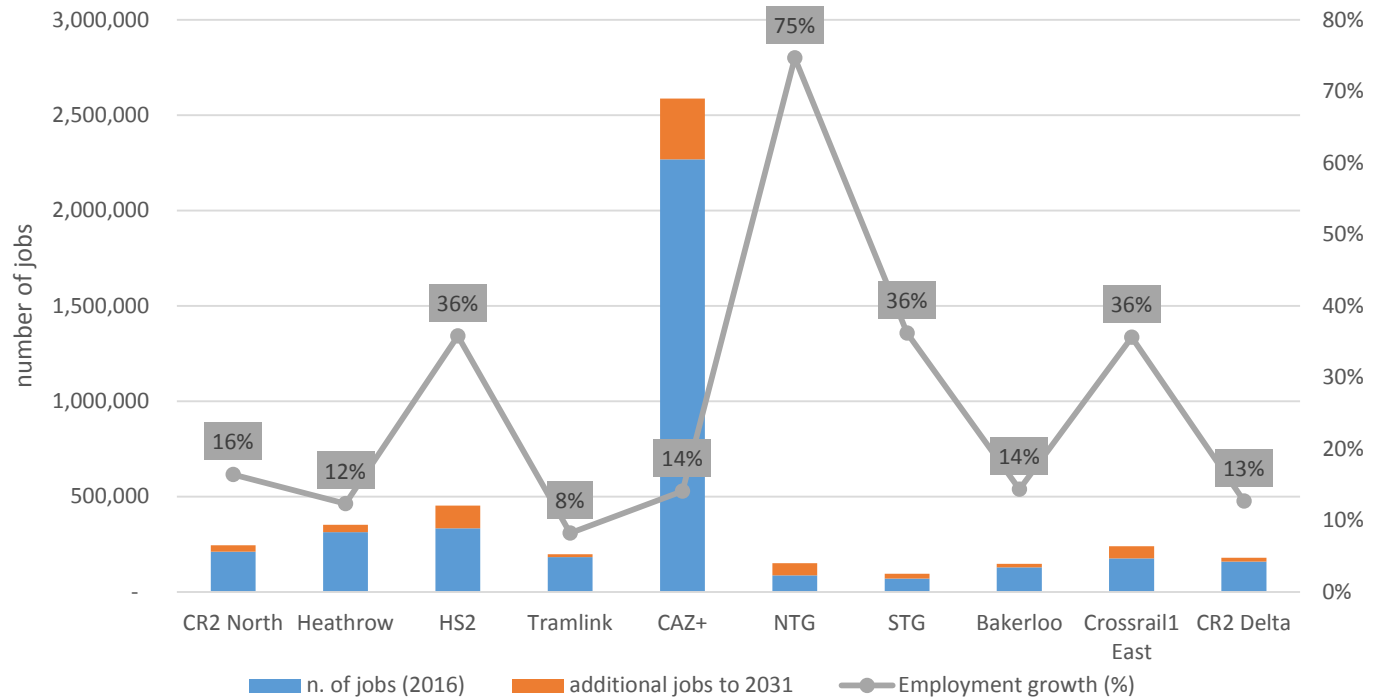
2. The spatial view of London's growth

2.3 Population, housing and employment growth projections

Employment

There is dramatic employment growth expected in many of the growth corridors. Although Central London growth corridor has the highest job projections based on absolute growth, when percentage is the focus the most significant increases are expected in the North Thames Gateway (75%), HS2 (36%), South Thames Gateway (36%) and Crossrail 1 East (36%).

Figure 9: Employment growth to 2031 within growth corridors



Source: GLA jobs projections for MSOAs not in Opportunity Areas, and Opportunity Area projections for other MSOAs

2. The spatial view of London's growth

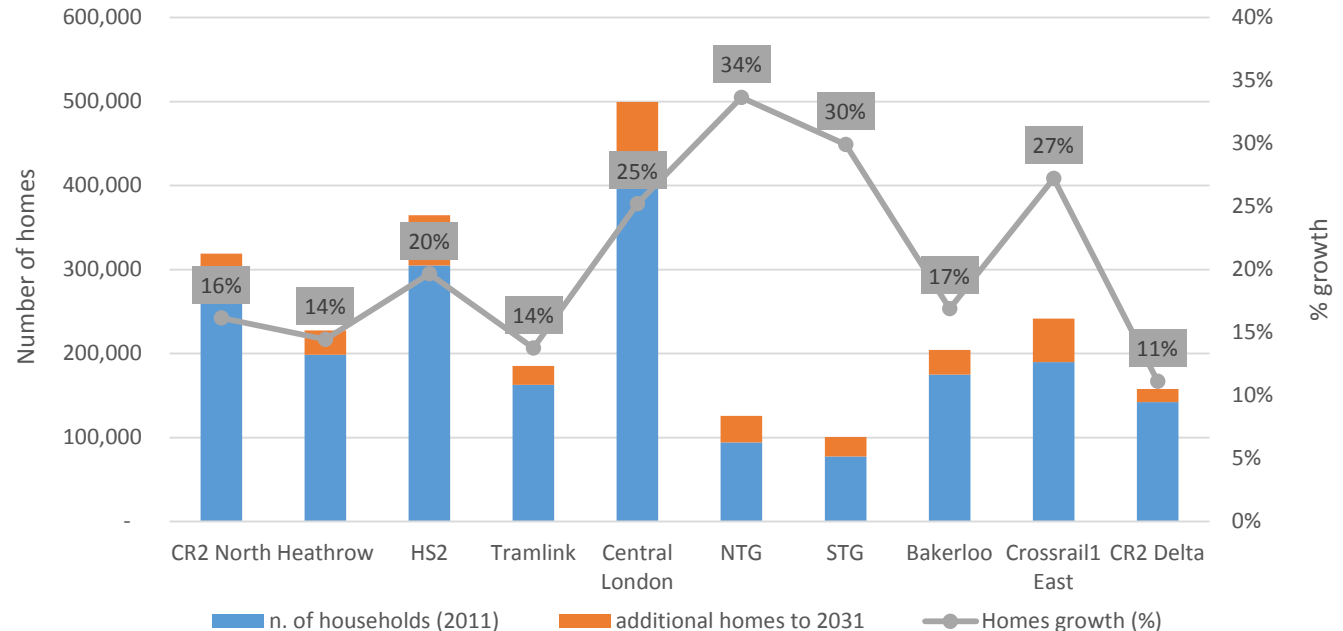
2.3 Population, housing and employment growth projections

Housing

Housing growth projections currently vary quite significantly between growth corridors. The North and South Thames Gateway corridors are projected to have the largest (percentage) growth in housing (34% and 30% respectively), followed by Crossrail 1 East (27%) and Central London (25%). In terms of absolute growth, Central London, HS2 and the Crossrail 1 East corridors have the largest impacts.

N.B. These figures may change significantly based on the 2017 SHLAA, due to be published in late 2017.

Figure 10: Estimated projected housing demand to 2031 within growth corridors



Source: Census 2011 and 2015-based GLA population projections (central estimate). We have calculated housing growth by assuming 2.29 residents per dwelling (GLA Population calculator). For further details see Appendix 2.

London's strategic infrastructure requirements – an evidence base for the London Plan

Section 3

The spatial view of infrastructure needs across London

3.1 Introduction

3. The spatial view of infrastructure needs across London

3.1 Introduction

Objectives and overview of approach

The objective of the strategic infrastructure needs analysis is to define the packages of infrastructure projects that are needed to deliver the growth projected in each of the key growth corridors in London.

In essence, this is a point-in-time analysis which identifies where there are strategic issues around deliverability of growth.

In this Section, we undertake the analysis detailed below.

1. Analysis of key strategic opportunities and challenges for growth

We have identified the primary strategic opportunities and challenges in each growth corridor particular in relation to infrastructure needs and their relationship with growth.

2. Identification of strategic infrastructure projects in pipeline

We have then identified strategic infrastructure projects that are already in the pipeline for each growth corridor. Sources used are detailed in Appendix 3. We have classified a project as “strategic” based on two main factors:

- Cost – over £100 million
- Criticality – if we consider it essential in delivering growth

At present, the majority of strategic projects in the pipeline are rail infrastructure upgrades, extensions or new lines. However, this is primarily due to them being planned over a long time-period – hence the GLA and TfL are considering rail infrastructure needs for 2040 at a much earlier date than they would typically look at bus infrastructure, or utility companies would look at energy or water infrastructure.

We have categorised strategic infrastructure projects into two main categories:

- Growth drivers
- Growth enablers

Growth drivers are projects that directly stimulate growth and are considered to be the primary pieces of infrastructure necessary to facilitate housing and/or commercial property delivery.

Growth enablers are projects that support or enable growth and without which housing and/or commercial property delivery would not be viable.

3. Assessment of strategic infrastructure needs and deliverability

Our overall focus for the assessment of strategic infrastructure needs and deliverability is to understand:

- How significant needs are within each growth corridor
- If needs are being appropriately planned for
- If projects are deliverable

Therefore, it aims to identify issues both of infrastructure needs and also of deliverability in relation to the growth projections for each corridor.

In this study we have analysed the following sectors: rail, highways, bus, electricity, heat, water, flood risk, waste, digital and open space. We do not include education, health or aviation.

Our detailed approach to the needs assessment by sector is included in Appendix 2.

London's strategic infrastructure requirements – an evidence base for the London Plan

Section 3

The spatial view of infrastructure needs across London

3.2 Crossrail 2 North

The spatial view of infrastructure needs across London Crossrail 2 North

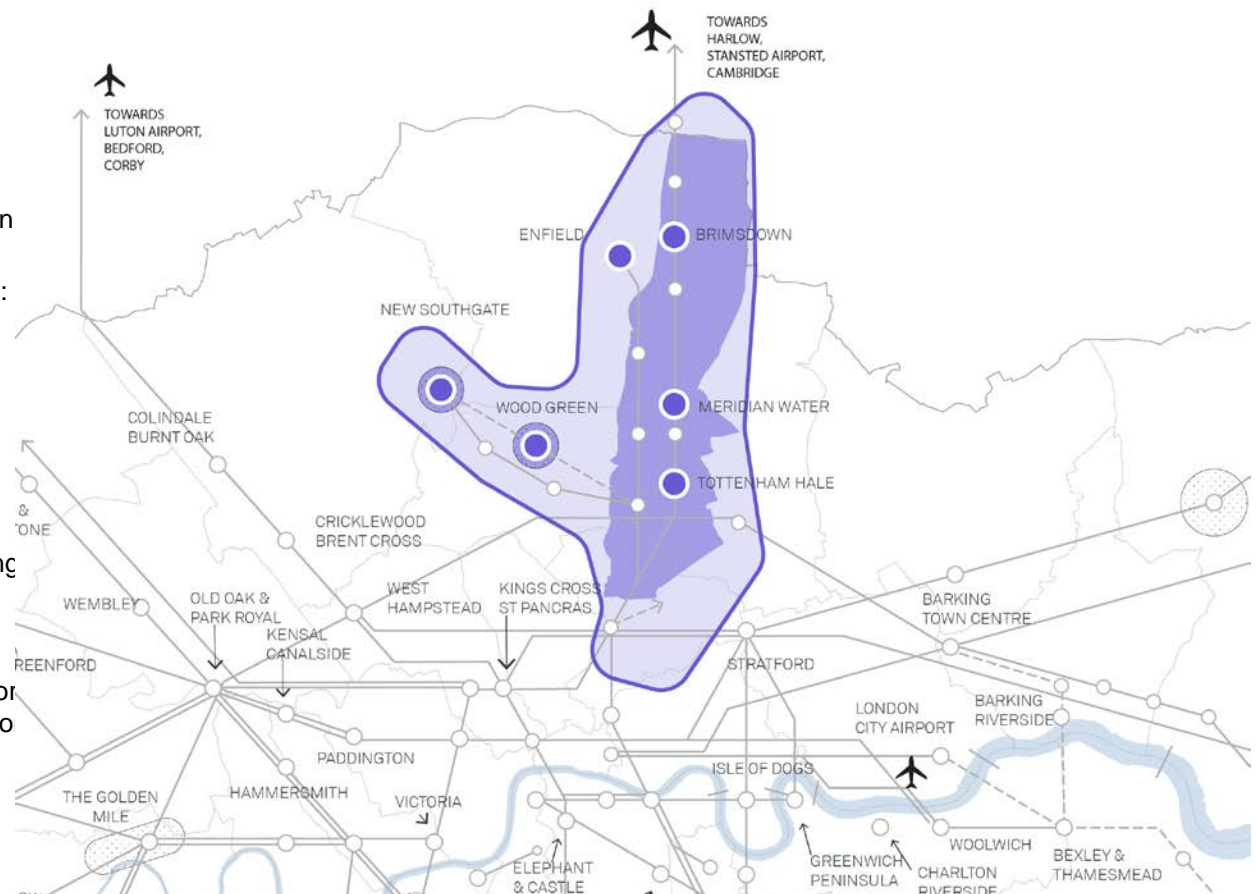
The Crossrail 2 North (C2N) growth corridor is contiguous with the northern section of Crossrail 2 across the Upper Lee Valley Opportunity Area. It encompasses some 3,900 hectares.

In addition, the western arm of the corridor includes New Southgate and Wood Green town centres, which will both be new Opportunity Areas (OAs) in the new London Plan.

It encompasses the following growth areas: Blackhorse Lane, Tottenham Hale, Northumberland Park, Meridian Water, Edmonton Green, Woodberry Down, Ponders End, A10/A1010 Corridor.

These are within the following boroughs: Enfield, Haringey, Waltham Forest and Hackney.

C2N is planned to rapidly urbanise – moving from an industrial centre to one which supports significant new mixed-use development. This housing-led mix use regeneration is primarily supported by major transport projects – including four tracking of the West Anglia Main Line, a necessary precursor to Crossrail 2.

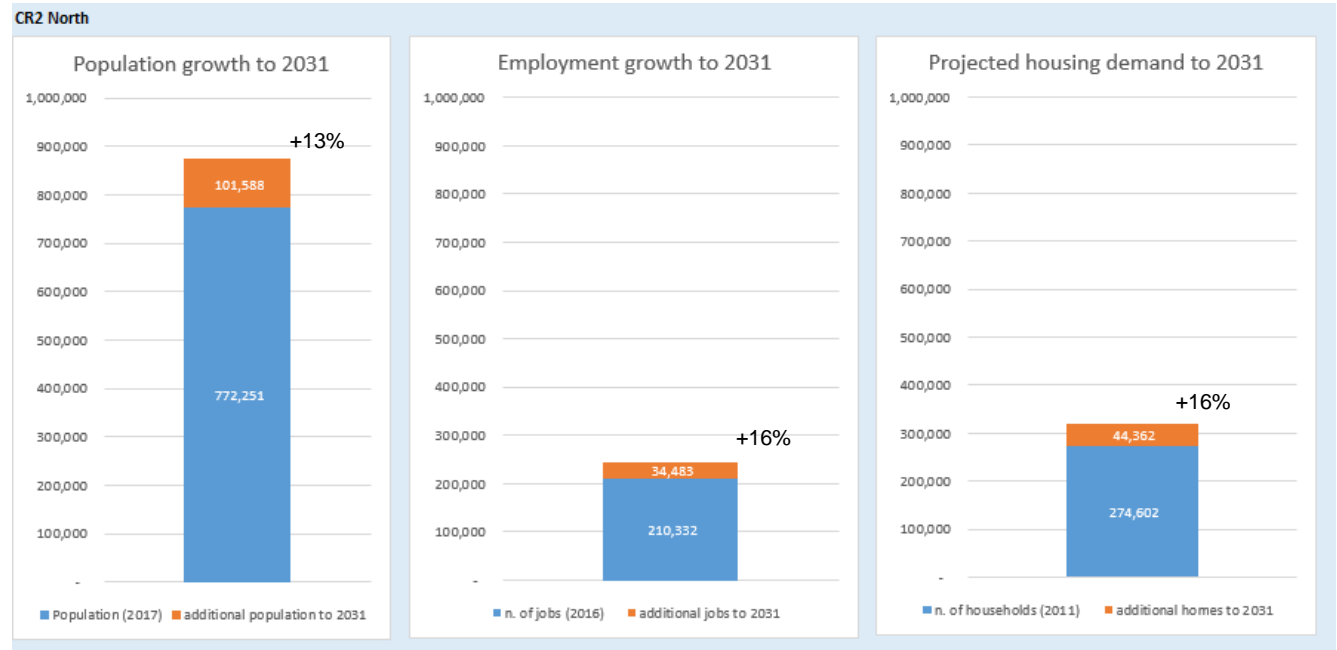


The spatial view of infrastructure needs across London Crossrail 2 North

Projected growth scenarios

The Crossrail 2 North growth corridor is projecting growth of 13% in population, 16% in employment and 16% in housing by 2031.

It currently ranks 4th of all growth corridors in terms of absolute population growth and 6th in absolute employment growth.



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London Crossrail 2 North

Strategic infrastructure projects in pipeline: map

Growth Drivers

C2N has three growth driver projects.

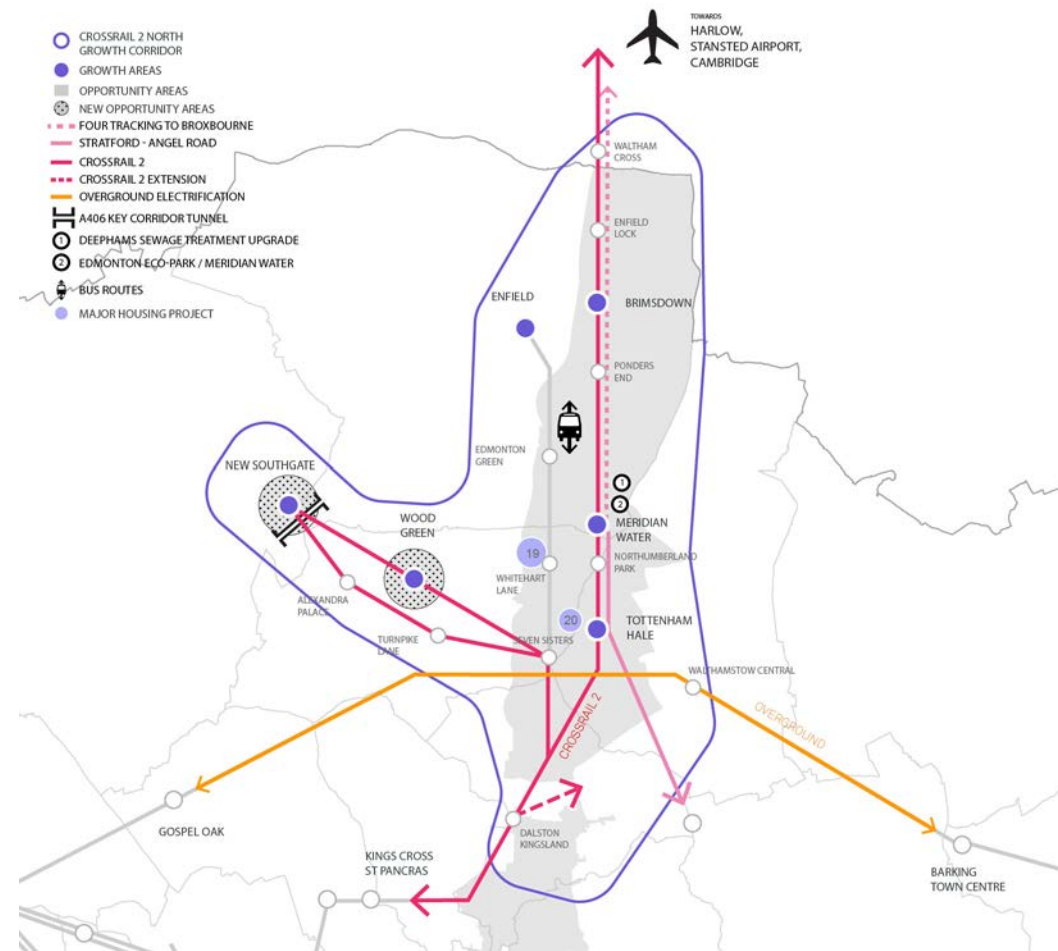
These are:

- STAR (Stratford-Angel Road)
- Four tracking to Broxbourne (West Anglia Line)
- Crossrail 2 (northern section)

Upgrades to the West Anglia Line are comprised of the first two projects:

- The first is the delivery of a 4tph service between Stratford and Angel Road (the STAR scheme) through adding a third track. This project is already confirmed, funded and to be delivered between 2017 and 2019.
- The second is the four tracking project between Coppermill Junction to Broxbourne – a necessary precursor to Crossrail 2. Funding and detailed planning approvals need to be further investigated whilst the project is planned to be delivered between 2017 and 2025.

Crossrail 2 is proposed to link the four-tracked West Anglia line to Broxbourne to the central and southern sections of Crossrail 2. A start date hasn't been agreed yet but Crossrail is planned to be completed by 2033.



Crossrail 2 North strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

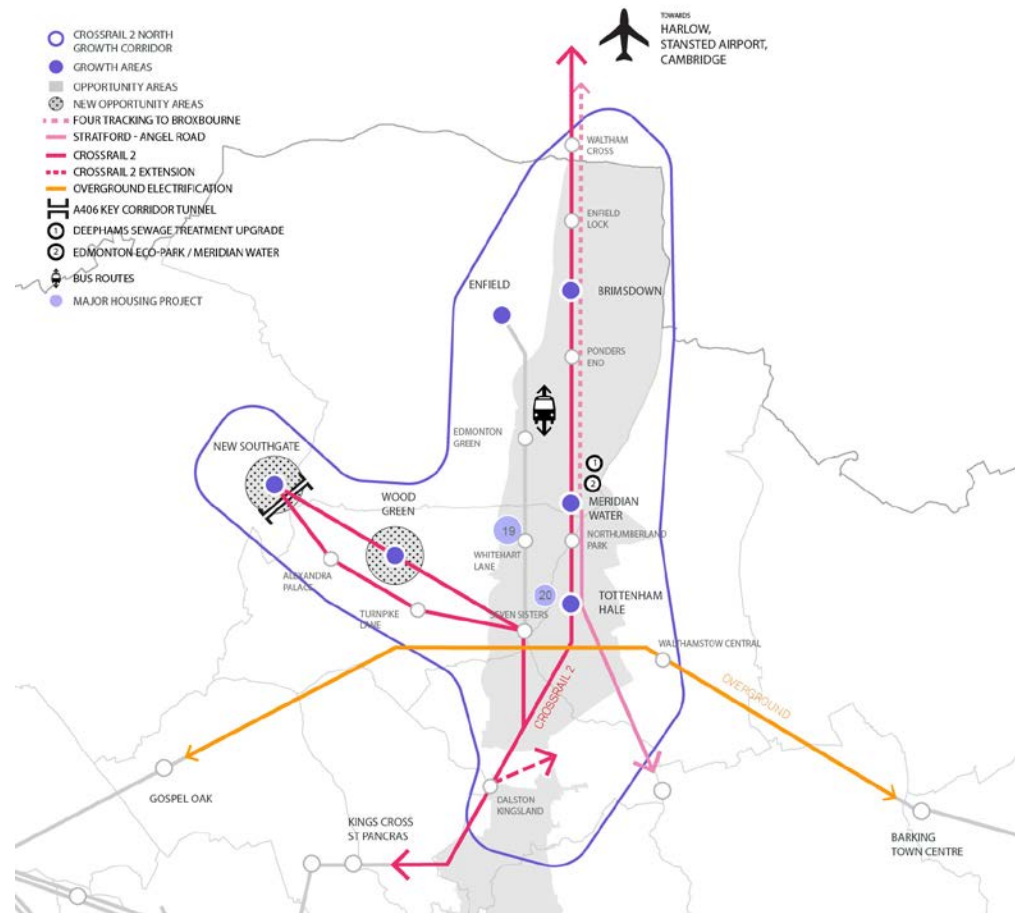
The spatial view of infrastructure needs across London Crossrail 2 North

Strategic infrastructure projects in pipeline: map

Growth Enablers

C2N has six growth enabler projects in addition to two major housing projects:

- **Electrification of Barking to Gospel Oak** London Overground line works have started in 2016, due to be completed by 2018.
- The **redevelopment of the Edmonton Eco Park** (North London Heat and Power Project) likely to start construction in 2017/8 and is set to complete in 2025. This will be a renovated Energy Recovery Facility which generates energy (heat and power) from waste.
- **Additional routes and bus** infrastructure identified in the DIFS study for the Upper Lee Valley to be fully implemented by 2031.
- **Deephams sewage treatment upgrade** of the wastewater treatment facilities started in 2015, expected to be completed by 2018.
- **A406 key corridor tunnel** is a TfL project to fix the congestion issues at New Southgate. The project is still in the early stages of planning development but is expected to be delivered between 2021 and 2031.
- **Northern Gateway Access Programme** is a proposed project (by TfL and Enfield) to provide a relief road link between the growth corridor (North South Road A1055) and the M25 (at Junction 25 and/or 26) but currently has no start/end dates.
- **Two major housing projects** in Tottenham (High Road West and Tottenham Hale) with a total 2,200 units planned by 2030.



Crossrail 2 North strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Crossrail 2 North

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
STAR (Stratford - Angel Road)	Driver	0 - 100	Network Rail	Secured	Detail approved							
Four tracking to Broxbourne	Driver	501 - 1,000	Network Rail	Uncertain	Outline submitted							
Crossrail 2	Driver	5,001+	TfL / Network Rail	Uncertain	Outline submitted							
Overground Barking to Gospel Oak electrification	Enabler	101 - 250	Network Rail	Secured	Detail approved							
Deephams sewage treatment upgrade - Phase 2	Enabler	101 - 250	Thames Water	Secured	Detail approved							
Additional bus routes and infrastructure	Enabler	101 - 250	TfL	Secured	Uncertain							
Redevelopment of Edmonton Eco Park	Enabler	0 - 100	North London Waste Authority / Enfield	Secured	Outline submitted							
A406 key corridor tunnel at New Southgate	Enabler	1,001 - 5,000	TfL	Speculative	No permission							
19: High Road West Regeneration Area (150+ units)	Enabler	251 - 500		Speculative	Uncertain							
20: Tottenham Hale Masterplan (150+ units)	Enabler	500 - 1,000		Uncertain	No Permission							

The spatial view of infrastructure needs across London Crossrail 2 North

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none">• Major new residential developments and town centres unlocked by Crossrail 2. Investment and land-use changes will open up significant opportunities for the corridor.• Transformation of connectivity between the growth corridor and Central London will support new employment opportunities for existing and new residents.• Opportunities to introduce “good growth” principles into new developments such as Meridian Water, with investment in cycling and pedestrian infrastructure to alleviate severance issues.• Link into broader London-Stansted-Cambridge corridor which is being supported by the West Anglia Taskforce.	<ul style="list-style-type: none">• Much of the expected growth is predicated on the successful funding and planning agreement for Crossrail 2, which currently is unfunded.• Lack of permeability/severance caused by predominance of reservoirs, high voltage electricity lines, railway lines, roads and large industrial uses.

The spatial view of infrastructure needs across London Crossrail 2 North

Crossrail 2 North

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Significant investment in rail infrastructure needed to support development, including Crossrail 2.	Unlikely to be resolved until funding secured for Crossrail 2.
Bus	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for the projected growth scenario. Costs likely to be between £100-500m.	Bus strategy for Crossrail 2 North.
Highways	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for the projected growth scenario. Costs are likely to be over £100m.	Highways plan for Crossrail 2 North.
Electricity	High	Incomplete Assessment	Under Conditions	UKPN has estimated infrastructure cost of £36.5m in the projected growth scenario. Northern ULV upgrades planned to increase in firm capacity (transformer) over 4 reinforcement substations from 2016-2025. The GLA power model projects a demand increase of 67% for the corridor, with 70% of the substations at overcapacity by 2050.	Energy strategy for Crossrail 2 North.
Heat	High	Incomplete Assessment	In Progress	Recent gas network upgrades for high-pressure. Low pressure upgrades are likely to be needed in projected growth scenario. Significant amount of heat network in this area which is planning to connect to the Lea Valley Heat Network, powered by the new Edmonton Ecopark.	Energy strategy for Crossrail 2 North.
Water Supply	Medium	Incomplete Assessment	Under Conditions	Needs are not fully defined for the projected growth scenario	Water supply strategy for Crossrail 2 North
Water management	Medium	Incomplete Assessment	Under Conditions	Needs are not fully defined for the projected growth scenario	Water management strategy for Crossrail 2 North.
Flood risk*	Medium Risk	Well Identified	Uncertain	Medium flood risk along the River Lea.	Flooding infrastructure investment at undefended areas through the Lea Valley.
Waste	Medium	Well Identified	In Progress	New capacity planned and projects in pipeline	Delivery of Edmonton Eco Park
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Low			Above 90% SFBB availability (see data caveats)	N/A
Digital – UFBB*	High			Only 3% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Low			Crossrail 2 North ranks in top third of growth corridors in terms of household access to open space.	N/A
Housing	Medium			Projected housing gap of around 29,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

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The spatial view of infrastructure needs across London

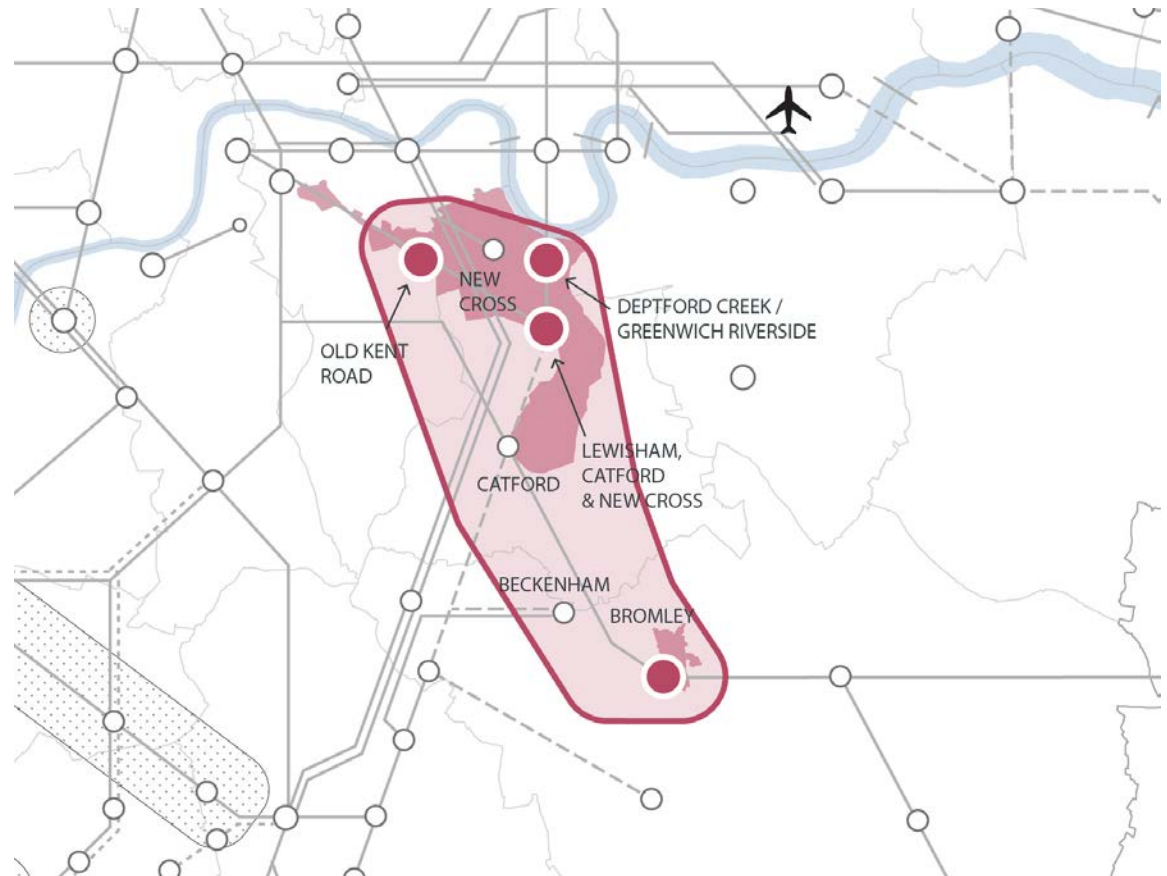
3.3 Bakerloo Line Extension

Bakerloo Line Extension

The Bakerloo Line Extension (BLE) growth corridor includes the area contiguous to the Bakerloo Line extension through the Old Kent Road to Lewisham. The growth corridor encompasses four OAs:

- Old Kent Road
- Deptford Creek/Greenwich Riverside
- Lewisham, Catford and New Cross
- Bromley

The Bakerloo Line Extension (BLE) growth corridor is planned to support high levels of housing and commercial growth through key transport corridors connecting town centres. Improved connectivity will enable business growth and new sectors to develop in existing commercial areas. In addition, the corridor includes intensification and regeneration centres, which have the potential to deliver more than 35,000 homes, in particular along the Old Kent Road.

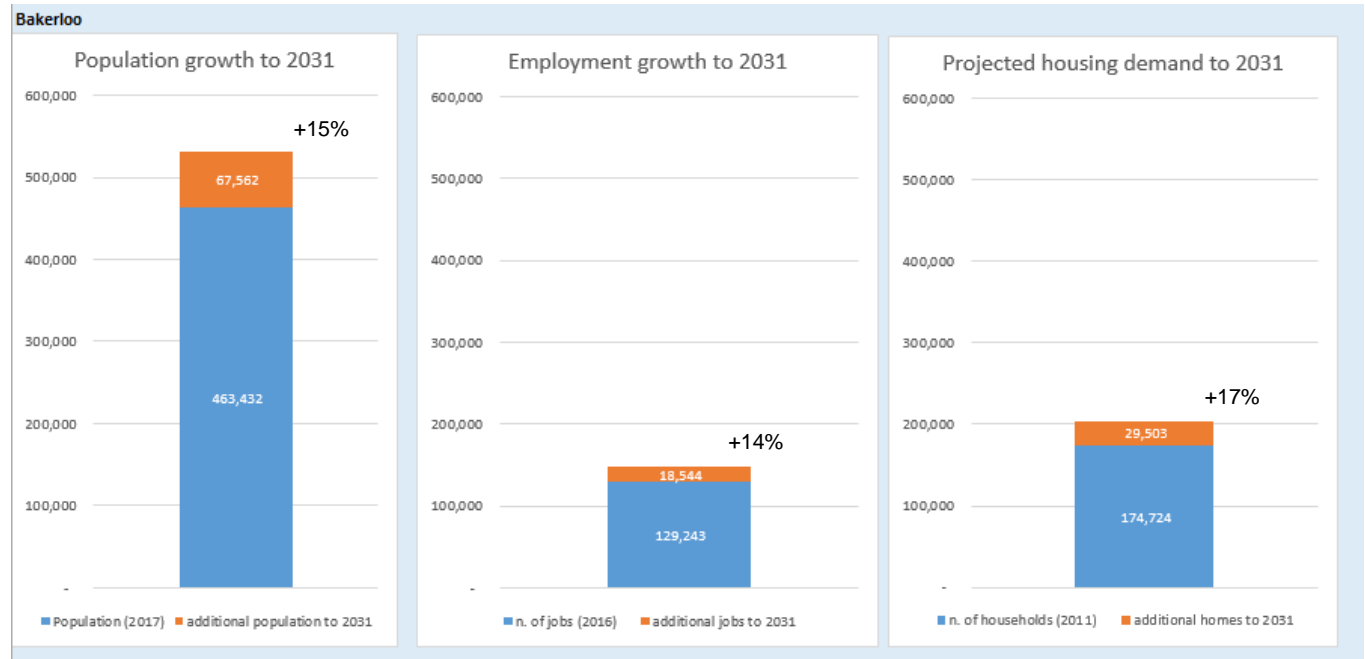


The spatial view of infrastructure needs across London Bakerloo Line Extension

Projected growth scenarios

The Bakerloo Line Extension growth corridor is projecting growth of 15% in population, 14% in employment and 17% in housing by 2031.

It currently ranks in the bottom half of the growth corridors for both population and employment growth in absolute terms (6th and 9th respectively).



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

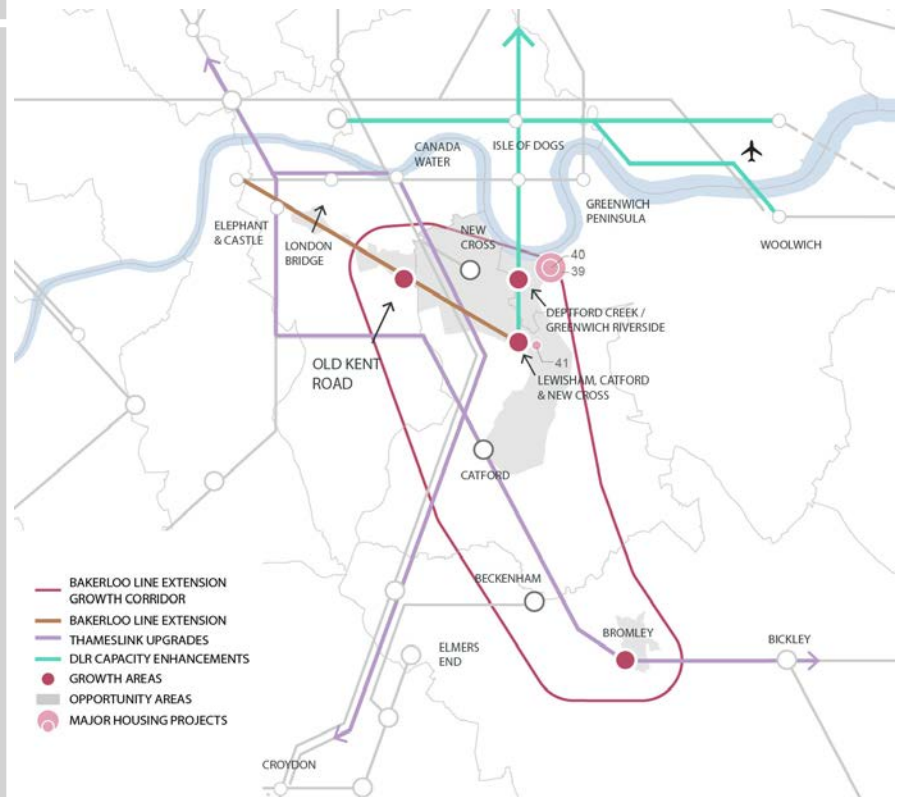
Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSAO and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London Bakerloo Line Extension

Strategic infrastructure projects in pipeline

Growth Drivers	Growth Enablers
<ul style="list-style-type: none"> • The Bakerloo Line Extension is planned to extend between Elephant and Castle and Lewisham with two proposed station locations at Old Kent Road and Camberwell. At present the route is at an early stage of development but is considered crucial to enabling growth in homes and jobs in south east London. There is no start date proposed but construction is currently programmed to be completed by 2029. A Phase 2 extension beyond Lewisham has been also considered as a future driver of growth for the corridor • The Thameslink programme will significantly boost passenger capacity and journey reliability through south east London into London Bridge. The programme is proposed to complete in 2018. 	<ul style="list-style-type: none"> • TfL will start a long term enhancement programme of the current DLR network, which include capacity improvements and asset renewals to the four stations south of the river to Lewisham station. The enhancements are proposed to be completed by 2039. • Greenwich Peninsula development (39,40) for up to 2,000 new homes in total due to be completed by 2030 and an initial phase by 2018 (40). • Lewisham Gateway Phase 2 (41) will deliver up to 170 homes by 2030.



Bakerloo Line Extension strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Bakerloo Line Extension

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Thameslink	Driver	5,001+	Network Rail	Secured	Detail approved							
Bakerloo line extension (to Lewisham)	Driver	1,001 - 5,000	TfL	Uncertain	Uncertain							
Enhancements to existing DLR capacity (30tph), new trains & depot	Enabler	501 - 1,000	TfL	Speculative	Uncertain							
Bakerloo line extension Phase 2 (beyond Lewisham)	Driver	251 - 500	TfL	Uncertain	Uncertain							
39: Greenwich Peninsula (150+ units)	Enabler	100 - 250		Uncertain	Outline Approved							
40: Greenwich Peninsula Central East - Phase 1 (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
41: Lewisham Gateway Phase 2 - Mixed Development (150+ units)	Enabler	100 - 250		Speculative	Outline Approved							

The spatial view of infrastructure needs across London Bakerloo Line Extension

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none"> • Potential for intensification and primarily residential-led development around the Bakerloo Line's new stations in the north of the corridor (Old Kent Road and Camberwell) including development of new town centres/high streets. • Public realm and high street upgrades across growth corridor could help to improve attractiveness and create sense of unified identity. 	<ul style="list-style-type: none"> • The Bakerloo Line Extension is essential for stimulating new development along the OKR and in Camberwell. Currently, rail access is limited and the area is heavily dependent on road. • Major challenge is delivering and funding the BLE, without which it will be difficult to support proposed increases in density along OKR. • Area is not very attractive for large-scale residential or commercial development at present. Many potentially available brownfield sites, big box retail outlets and large supermarkets, industrial facilities and warehousing. These are more typical of out-of-town locations. Lack of attractive public realm, high streets, issue with permeability.

The spatial view of infrastructure needs across London Bakerloo Line Extension

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Under Conditions	Significant investment in rail infrastructure needed to support development, including Thameslink, Bakerloo Line extension and Metro-isation of Southern rail.	Promote a Bakerloo Line extension beyond Lewisham.
Bus	Medium	Incomplete Assessment	Under Conditions	Medium level of investment will be required to support planned growth and improve connectivity of regenerated industrial land.	Bus strategy for projected growth at key OAs and town centres.
Highways	Medium	Incomplete Assessment	Under Conditions	Investment required to improve permeability at regenerated industrial land and expand capacity around town centres. Costs are likely to be over £100m.	Highways plan for projected growth at key OAs and town centres.
Electricity	High	Incomplete Assessment	Under Conditions	New primary substation and associated infrastructure (£16m) at Old Kent Road. Further capacity reinforcements are expected to be needed in the growth corridor. The GLA power model projects a demand increase of 66% for the corridor, with 64% of the substations at overcapacity by 2050.	Develop energy integrated strategies for other major developments in the growth corridor.
Heat	High	Incomplete Assessment	Under Conditions	A Decentralised Energy Strategy have been developed for Old Kent Road. Cost is likely to be around £60-70m.	Develop energy integrated strategies for other major developments in the growth corridor.
Water Supply	Medium	Incomplete Assessment	Under Conditions	Needs are not fully defined for the projected growth scenario	Develop an Integrated Water Management Strategy at Old Kent Road.
Water management	Medium	Incomplete Assessment	Under Conditions	Thames Water has identified some capacity constrains in sewerage and drainage network towards 2050, particularly at Lewisham town centre and Deptford.	Develop an Integrated Water Management Strategy at Old Kent Road.
Flood risk*	High	Well Identified	In Progress	High flood risk at Old Kent Road and Deptford/Greenwich Riverside. Defences have been implemented.	
Waste	Low	Incomplete Assessment	Under Conditions	South East London Joint Waste Management Group (SELJWPG) has projected sufficient capacity to respond to projected demand to 2031.	Waste management strategy at major developments.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Medium			88% of SFBB availability (see data caveats)	Support roll-out of SFBB
Digital – UFBB*	High			Only 2% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Medium			Bakerloo corridor ranks in middle range of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	Medium			Projected housing gap of around 17,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

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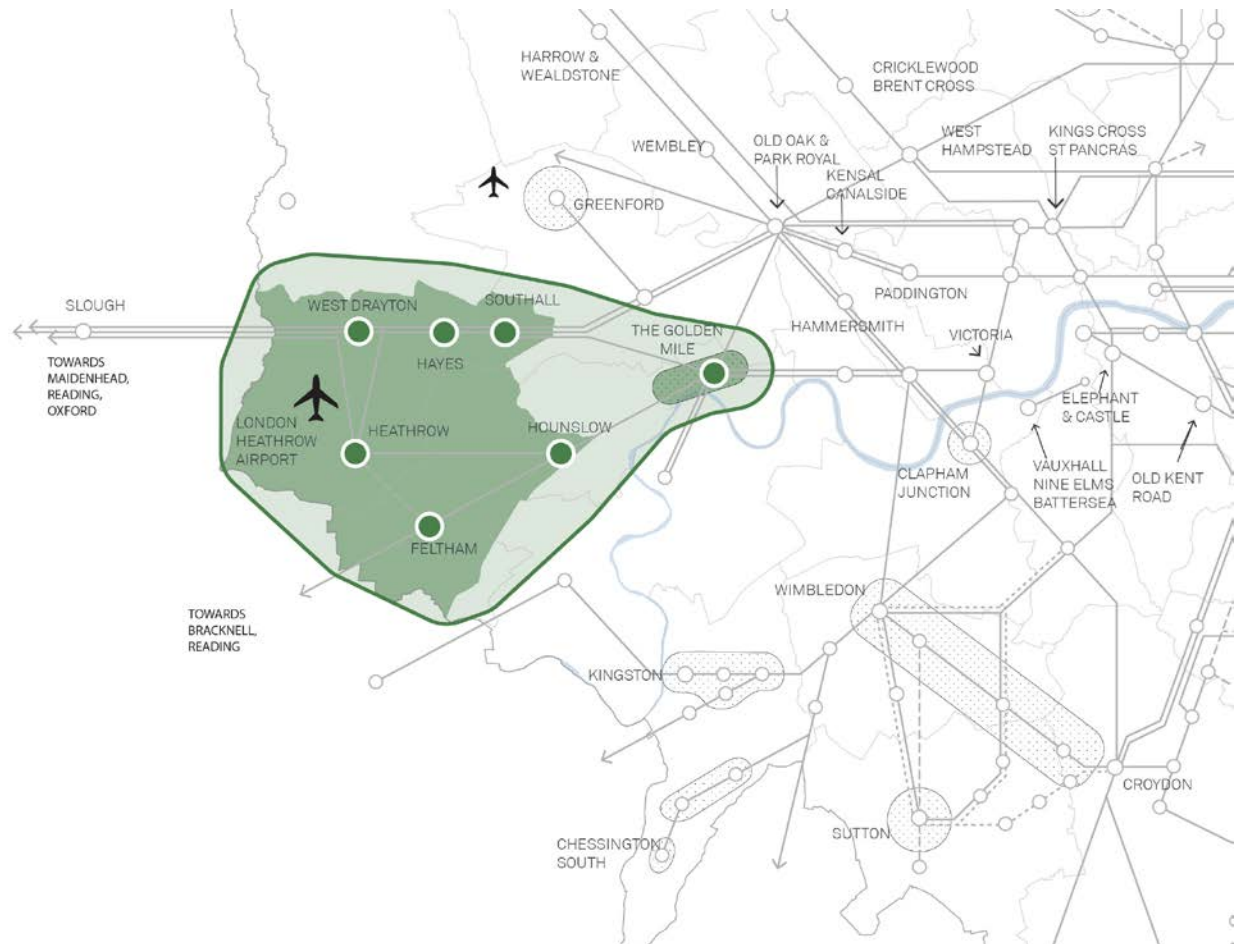
The spatial view of infrastructure needs across London

3.4 Heathrow

Heathrow

The 'Heathrow' growth corridor considers the Heathrow and Southall Opportunity Areas, plus the new Opportunity Area of the Golden Mile. In addition to Heathrow International Airport, the area encompasses Hayes, Southall*, Hounslow*, Feltham*, and Golden Mile (Brentford) town centres. It is a major employment area – with some 350,000 jobs, 120,000 of which are related to Heathrow Airport and its local supply chain.

The 'Heathrow' growth corridor is set to grow significantly with the arrival of Crossrail in 2018 and the potential third runway. Whilst the area's key strengths in logistics and important industrial and office/business clusters make it an attractive place for businesses; a significant number of brownfield sites around stations offer considerable scope for residential and commercial development. Sites within or close to town centres also have the potential for redevelopment for a range of potential uses, catalysing Heathrow Airport's capacity to drive economic growth within the corridor and through the Thames Valley (Western Wedge).



Heathrow corridor (Source: Arup; Basemap: GLA City in the East Plan)

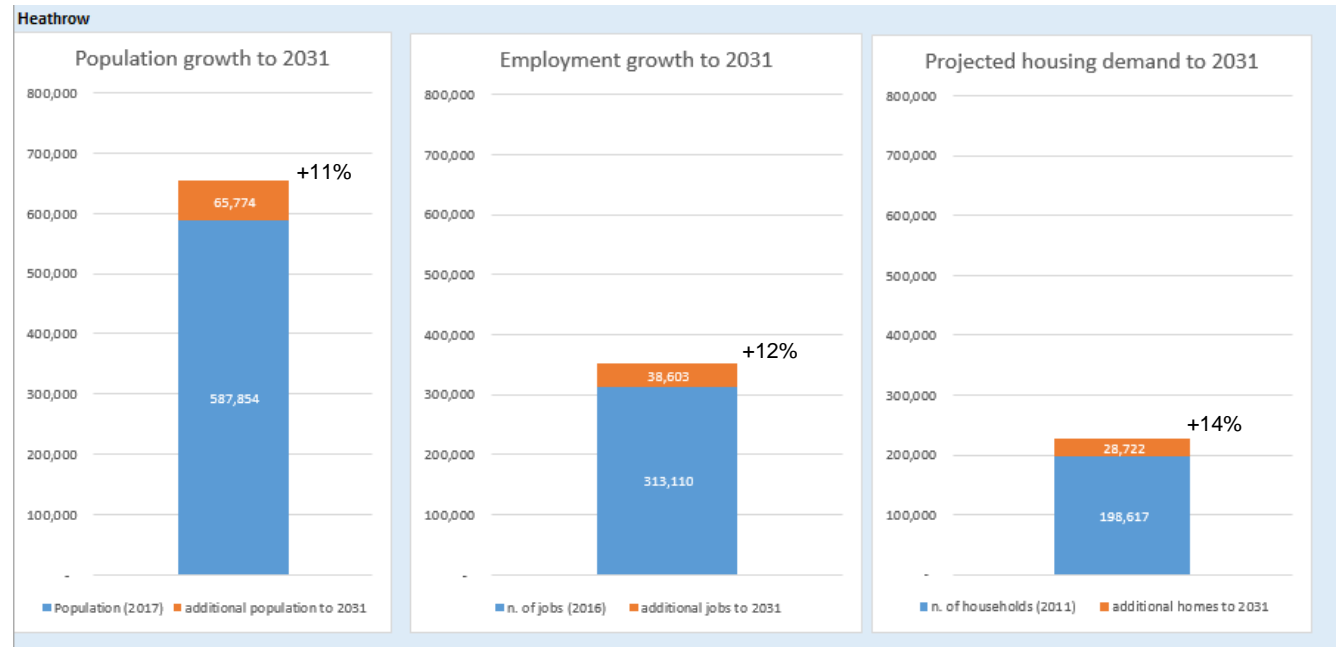
(*) Housing zones

The spatial view of infrastructure needs across London Heathrow

Projected growth scenarios

The Heathrow growth corridor is projecting growth of 11% in population, 12% in employment and 14% in housing by 2031.

It currently ranks in the bottom half of the growth corridors for both population and employment growth in absolute terms (7th and 5th respectively).



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

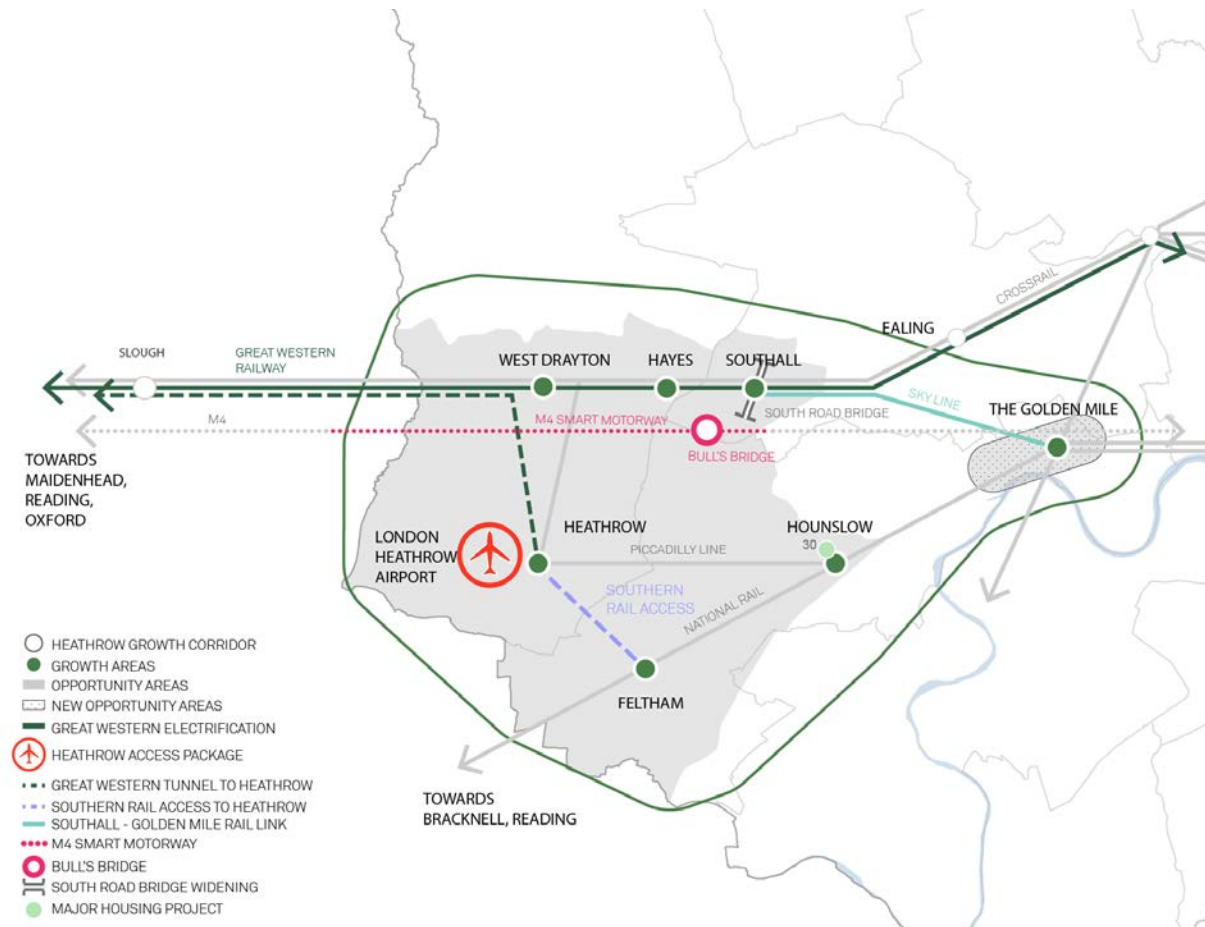
The spatial view of infrastructure needs across London Heathrow

Strategic infrastructure projects in pipeline

Growth Drivers

- **Great Western Mainline** rail electrification (started 2011, due 2024) will prepare the route for new rolling stock which will improve capacity (20 per cent more seats), journey times and air quality along the corridor.
- **“Heathrow access package”** is a TfL portfolio of projects with supporting bus and road infrastructure for the proposed third runway.

Note: we are not looking at aviation capacity within this study and therefore have excluded the third runway as a project, however we have noted its impacts, and related opportunities and challenges.



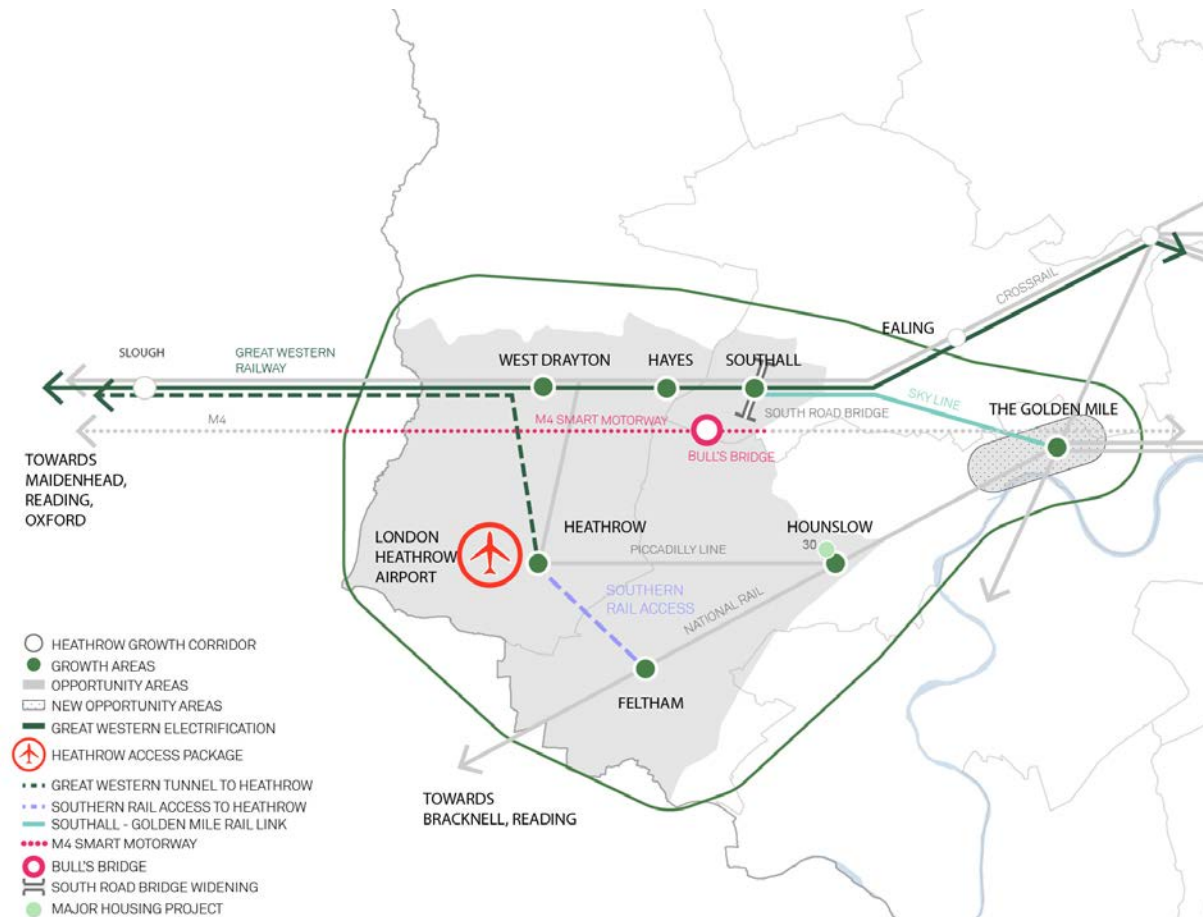
Heathrow Corridor strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London Heathrow

Strategic infrastructure projects in pipeline

Growth Enablers

- **Western Rail Link to Heathrow** Airport will link the Great Western Mainline to LHR Terminal 5. This will improve accessibility between the south west and LHR. It is currently under consultation and is proposed to be completed by 2024.
- **Southern Rail access to Heathrow** (from Staines/ Waterloo) is a project currently being considered by Network Rail to improve access between Waterloo station across south London and into LHR, proposed to be completed by 2025.
- **Southall-Golden Mile** (Brentford) rail link is a proposed project to link Brentford with Crossrail at Southall.
- **M4 J3 – J12 Smart Motorway** is a major upgrade to the M4 currently planned to complete in 2022.
- **South Road Bridge Widening** is a proposed project with secured funding to support development at Southall, planned for delivery between 2021 and 2023.
- **Bull's Bridge** – roundabout upgrade at M4 and A312 junction
- **London Overground extension to Hounslow** (concept only)
- **Heathrow surface access package** (concept only)
- **Hounslow High Street Quarter** is a mixed-use development that will deliver over 500 new homes by 2020. It is the only major housing scheme in the growth corridor.



Heathrow Corridor strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London Heathrow

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Crossrail 1	Driver	5,001+	TfL	Under construction	Detail approved							
Great Western Mainline rail electrification	Driver	1,001 - 5,000	Network Rail	Secured	Detail approved							
Western Rail Link to Heathrow Airport	Enabler	251 - 500	Network Rail	Speculative	Detail approved							
Southern Rail access to Heathrow (from Staines/ Waterloo)	Enabler	1,001 - 5,000	Network Rail	Uncertain	Uncertain							
South Road Bridge Widening	Enabler	0 - 100	Ealing	Secured	Uncertain							
M4 J3-12 Smart Motorway	Enabler	501 - 1,000	Highways England	Secured	Detail approved							
Southall-Golden Mile (Brentford) rail passenger re-opening	Enabler	0 - 100	TfL / Network Rail	Uncertain	Uncertain							
London Overground extension to Hounslow	Enabler	101 - 250	Network Rail	Uncertain	Uncertain							
Bulls Bridge roundabout upgrade	Enabler	0-100	Hillingdon	Uncertain	Uncertain							
Heathrow surface access package	Enabler	5,001+	DfT/ Heathrow	Uncertain	Uncertain							
30: Hounslow High Street Quarter - Mixed Use Development (150+ units)	Enabler	100 - 250		Uncertain	Detail Approved							

The spatial view of infrastructure needs across London Heathrow

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none">• Improvement in rail and road links to airport, in order to consolidate the area as a business/logistics strategic hub. Major upgrades required in rail and road access to LHR, particularly to support expansion with proposed 3rd runway.• Spur to Heathrow from Old Oak Common hub (Crossrail and HS2). Would open up significant opportunities, particularly in relation to Heathrow's supply chain and reduce congestion from road traffic.	<ul style="list-style-type: none">• Major challenge is political support for widening the M25 and potentially introducing a congestion charge.• Major issues with environmental negative spillovers as a result of proposed third runway at LHR. These include: noise, air and road congestion.

The spatial view of infrastructure needs across London Heathrow

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Significant investment in rail infrastructure needed to support development and a potential expansion of Heathrow Airport.	Improve transport access to Heathrow Airport and OAs across the growth corridor. Unlikely to be resolved until funding secured for Heathrow 3rd runway.
Bus	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for a 3rd runway growth scenario. Costs are likely to be over £100m.	Bus access plan to improve connectivity to Heathrow Airport and support development at OAs.
Highways	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for a 3rd runway growth scenario.	Surface access plan to improve connectivity to Heathrow Airport and support development at OAs.
Electricity	Low	Incomplete Assessment	Under Conditions	Southall DIFs estimated infrastructure cost of around £20m in the projected growth scenario. The GLA power model projects a demand increase of 47% for the corridor, with 43% of the substations at overcapacity by 2050.	Energy strategy for Heathrow's 3rd runway growth scenario.
Heat	Low	Incomplete Assessment	Under Conditions	Needs are well identified for Southall OA but further analysis is required for Heathrow OA.	Energy strategy for Heathrow's 3rd runway growth scenario.
Water Supply	Medium	Incomplete Assessment	Under Conditions	Needs are not fully defined for the projected growth scenario	Water supply strategy for Heathrow's 3rd runway growth scenario.
Water management	Medium	Incomplete Assessment	Under Conditions	Thames Water has projected medium utilisation of sewerage and drainage capacity towards 2050.	Water management strategy for Heathrow's 3rd runway growth scenario.
Flood risk*	Low	Incomplete Assessment	Under Conditions	Low flood risk across the growth corridor.	Flooding infrastructure investment needed at undefended areas
Waste	Medium	Well Identified	Under Conditions	Projects identified but no funding secured.	Secure funding and sites to deal with projected growth. Implement the sustainable management initiatives proposed by the West London Waste Plan.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Low			Above 90% SFBB availability (see data caveats)	N/A
Digital – UFBB*	High			Only 0.1% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	High			Heathrow ranks in bottom third of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	Medium			Projected housing gap of around 15,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

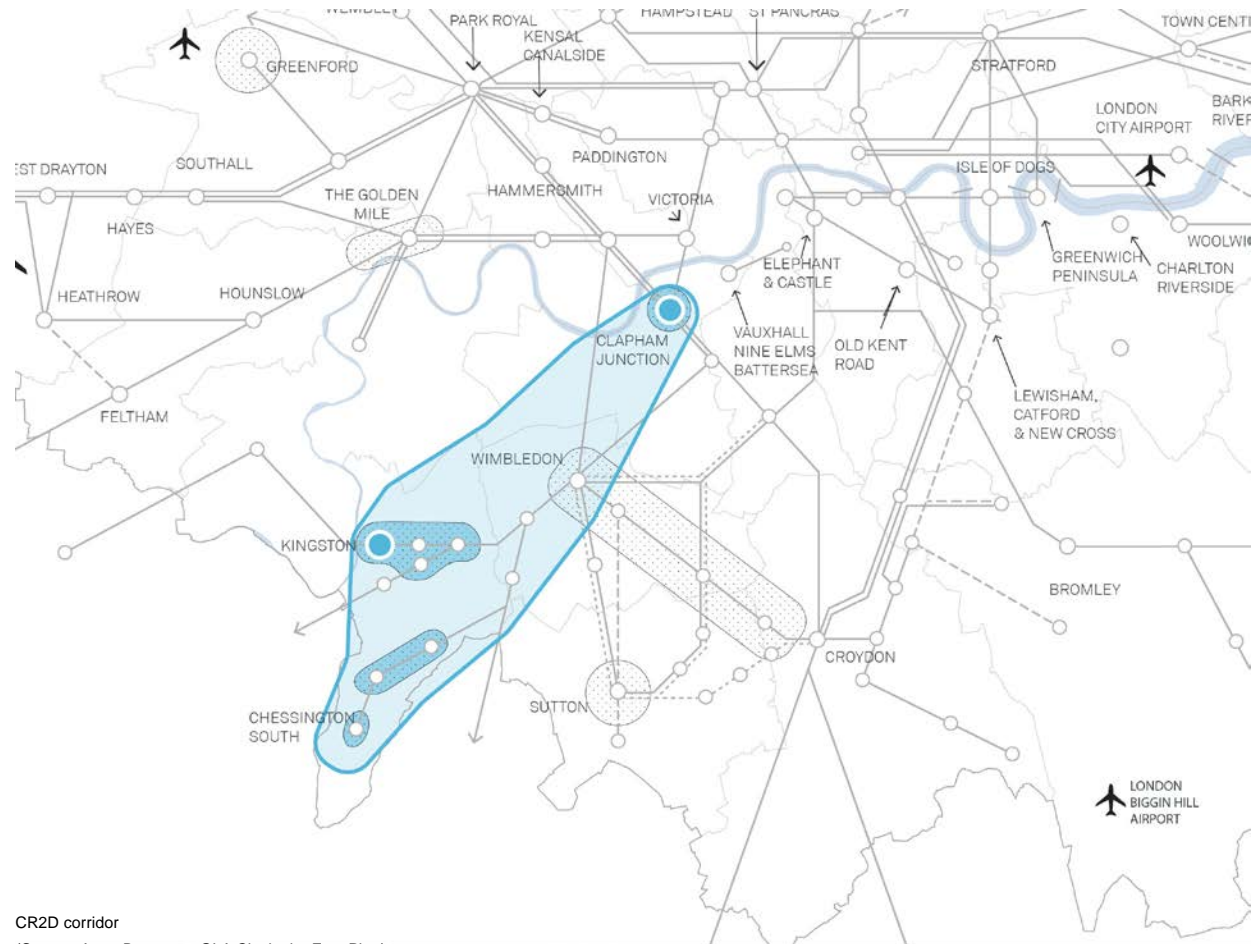
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The spatial view of infrastructure needs across London

3.5 Crossrail 2 Delta

Crossrail 2 Delta

The Crossrail 2 Delta (C2D) growth corridor is one of the most affluent parts of London. Levels of social deprivation and unemployment are well below the regional and national average. However, a lack of affordable housing, high demand and rental prices are key challenges. The lack of underground or tram services, and low train frequencies provide poor radial links to central London; Heathrow; and Gatwick. However, the area is reasonably well covered by an extensive bus network, although some pockets of residents are not within the acceptable walking distance of 400 meters. The CR2 Delta also contains high quality parks and open spaces; with densely populated residential areas and vibrant town centres.



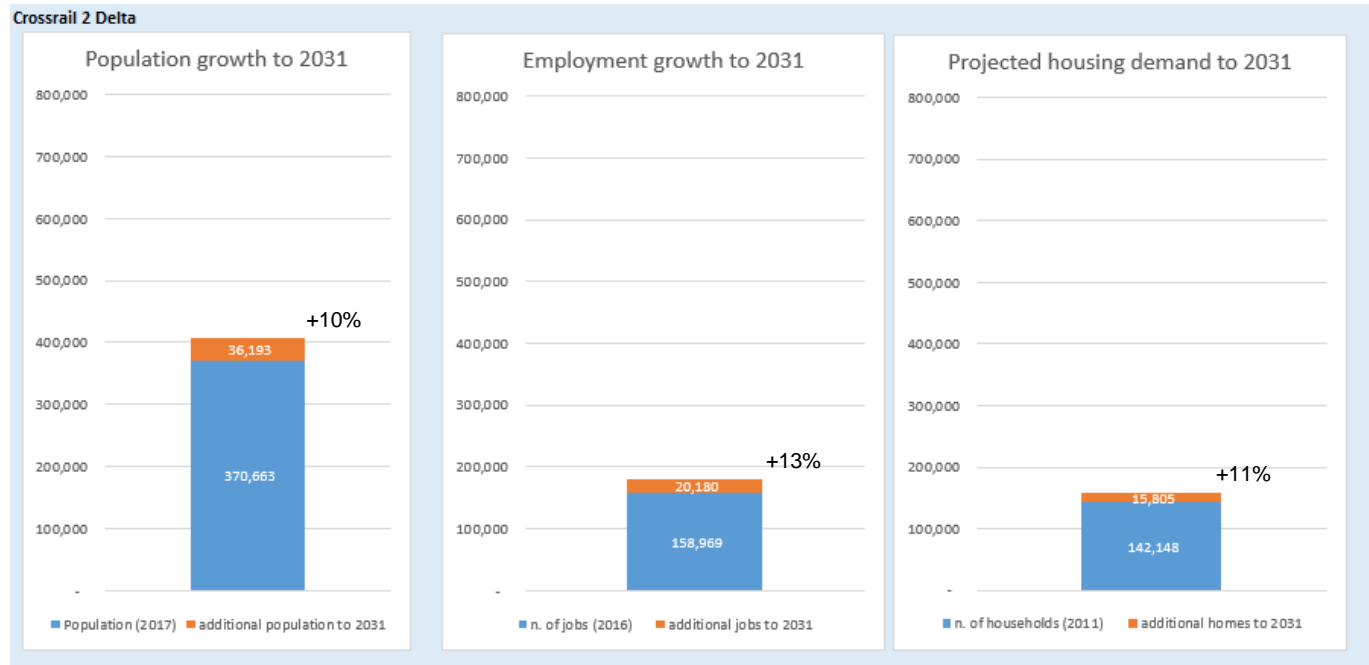
CR2D corridor
(Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London Crossrail 2 Delta

Projected growth scenarios

The Crossrail 2 Delta growth corridor is projecting growth of 10% in population, 13% in employment and 11% in housing by 2031.

It currently ranks in the bottom half of the growth corridors for population growth in absolute terms (10th) and for employment growth (8th). This reflects the fact that the Delta is primarily a residential corridor.



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London Crossrail 2 Delta

Strategic infrastructure projects in pipeline

Growth Drivers

This corridor has only one transformational growth driver project. The southern branch of Crossrail 2 transform the areas' connectivity levels and will unlock new Opportunity Areas.

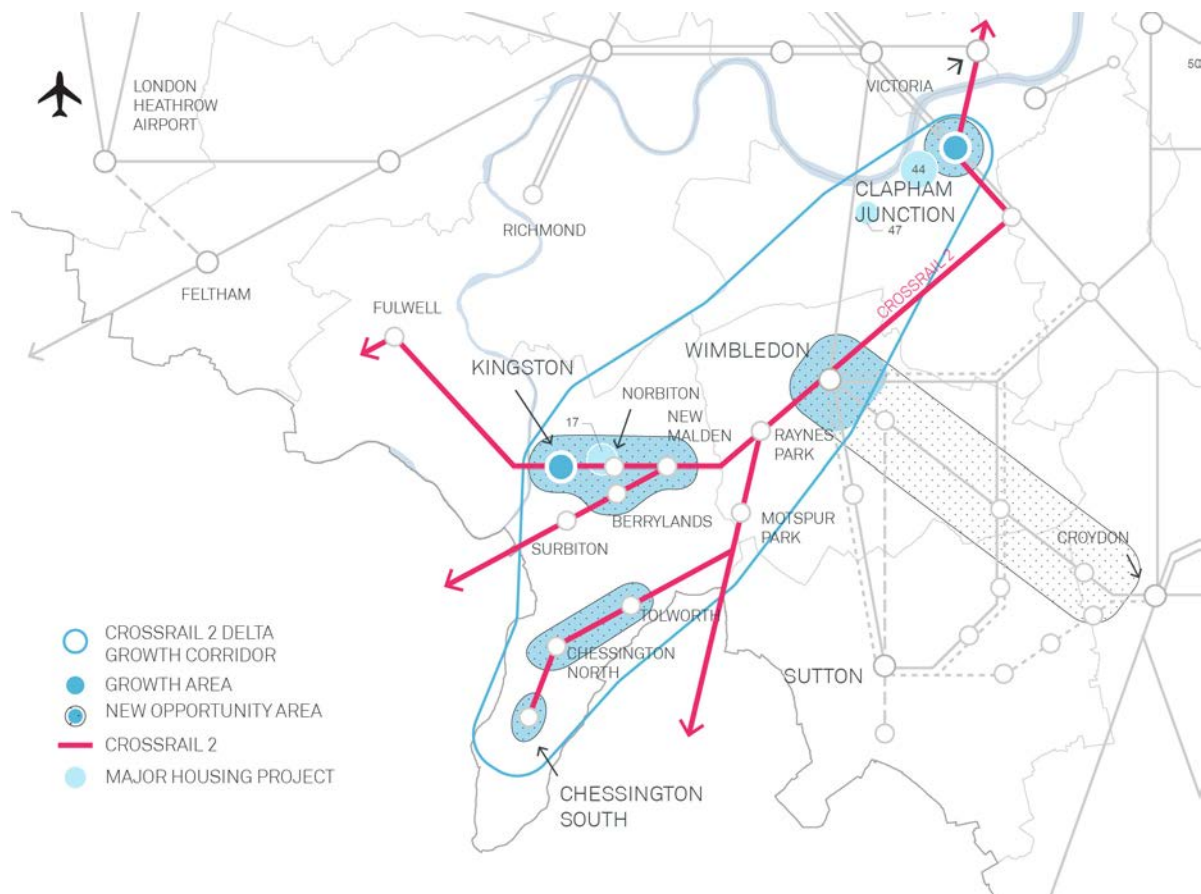
- The current proposed route for Crossrail 2 includes a new route between Clapham Junction and Wimbledon, with new stations at Clapham Junction, Balham / Tooting Broadway and Wimbledon. It will then connect through regional rail branches to Chessington South in the south of the Crossrail 2 Delta. Crossrail 2 is currently under further planning and funding investigation but has secured outline planning permissions with an estimate completion date by 2033.

Growth Enablers

Only one enabler project identified:

- A3 improvement to support growth** (concept only)

Three major housing projects: Cambridge Road in Kingston, Lewisham Gateway and Ram Brewery Regeneration in Clapham will in total deliver over 2,800 new homes in total in the corridor between 2019 and 2030.



CR2D strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London Crossrail 2 Delta

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Crossrail 2	Driver	5,001+	TfL / Network Rail	Uncertain	Outline submitted							
A3 improvement to support growth	Enabler	251 - 500	TfL: / Kingston	Uncertain	Uncertain							
17: Cambridge Road Estate Regeneration (150+ units)	Enabler	500 - 1,000		Uncertain	No Permission							
41: Lewisham Gateway Phase 2 - Mixed Development (150+ units)	Enabler	100 - 250		Speculative	Outline Approved							
47: Ram Brewery Regeneration Masterplan (150+ units)	Enabler	251 - 500		Uncertain	Outline Approved							

The spatial view of infrastructure needs across London Crossrail 2 Delta

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none">• Realise the development potential that will be facilitated by Crossrail 2, considering that the existing density of the area limits the availability of new development land• Tackling affordability issues for housing	<ul style="list-style-type: none">• High investment in non-rail transport infrastructure will be required in the southern part of the corridor, which has low PTAL scores• Preserving the high quality natural environment

The spatial view of infrastructure needs across London Crossrail 2 Delta

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Major rail investment plans including Crossrail 2 south and Metro-isation of suburban Southern railways.	Unlikely to be resolved until funding secured for Crossrail 2.
Bus	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for the projected growth scenario	Bus strategy for Crossrail 2 South.
Highways	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for the projected growth scenario	Highways plan for Crossrail 2 South.
Electricity	High	Uncertain	Under Conditions	Needs and costs are not fully defined for the projected growth scenario at the southern part of the corridor. The GLA power model projects a demand increase of 66% for the corridor, with 61% of the substations at overcapacity by 2050.	Energy strategy for Crossrail 2 South.
Heat	High	Uncertain	Under Conditions	Needs and costs are not fully defined for the projected growth scenario at the southern part of the corridor.	Energy strategy for Crossrail 2 South.
Water Supply	High	Incomplete Assessment	Under Conditions	Thames Water has identified serious water stress in the south east for the next 25 years.	Water supply strategy for Crossrail 2 South.
Water management	Low	Well Identified	Under Conditions	Thames Water has projected low utilisation of sewerage and drainage capacity towards 2050.	Improve the ecological standards at Hogsmill Valley Sewage.
Flood risk*	Low	Incomplete Assessment	Under Conditions	Low flood risk across the growth corridor.	Flooding infrastructure investment needed at undefended areas around Kingston Upon Thames.
Waste	High	Incomplete Assessment	Uncertain	South London Waste Plan has identified a deficit in landfill capacity and waste treatment facilities.	Secure funding and sites to deal with projected increase in waste management.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Low			Above 90% SFBB availability (see data caveats)	N/A
Digital – UFBB*	High			Only 0.3% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Medium			CR2 Delta ranks in middle range of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	Low			Projected housing gap of around 1,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

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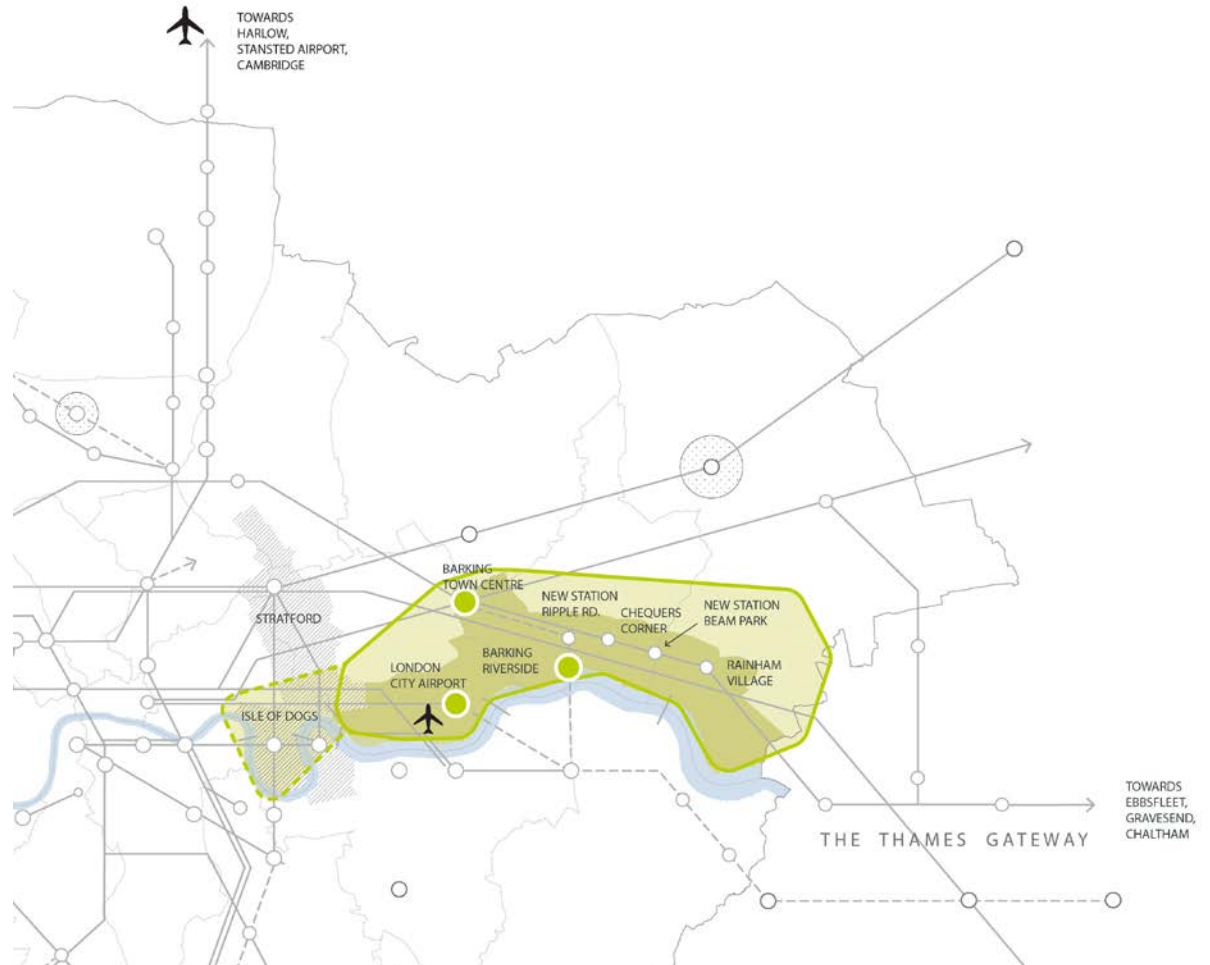
The spatial view of infrastructure needs across London

3.6 North Thames Gateway

North Thames Gateway

The North Thames Gateway (NTG) growth corridor includes the area north of the River Thames and south of the A124, with Barking Town Centre as a northern boundary and stretching from the Royal Docks in the West to London Riverside in the East. It consists of the opportunity areas of Royal Docks and Beckton Waterfront, and the London Riverside. These four OAs are in the boroughs of Havering, Newham; and Barking and Dagenham.

The NTG has large parcels of underused low value and low density brownfield land which could be re-developed for residential and commercial use; especially given the area's existing strategic connections with road (A13) and rail networks (DLR, Crossrail, Overground and Coast to Capital). Whilst strategic industrial land should be retained as important employment centres, revitalising the surplus industrial land into vibrant, distinctive and liveable neighbourhoods is required to attract and accommodate the planned growth. This calls for the delivery of a range of social and green infrastructure across the north bank of the River Thames and through the Lower Lea Valley up to the Olympic Park and Stratford.



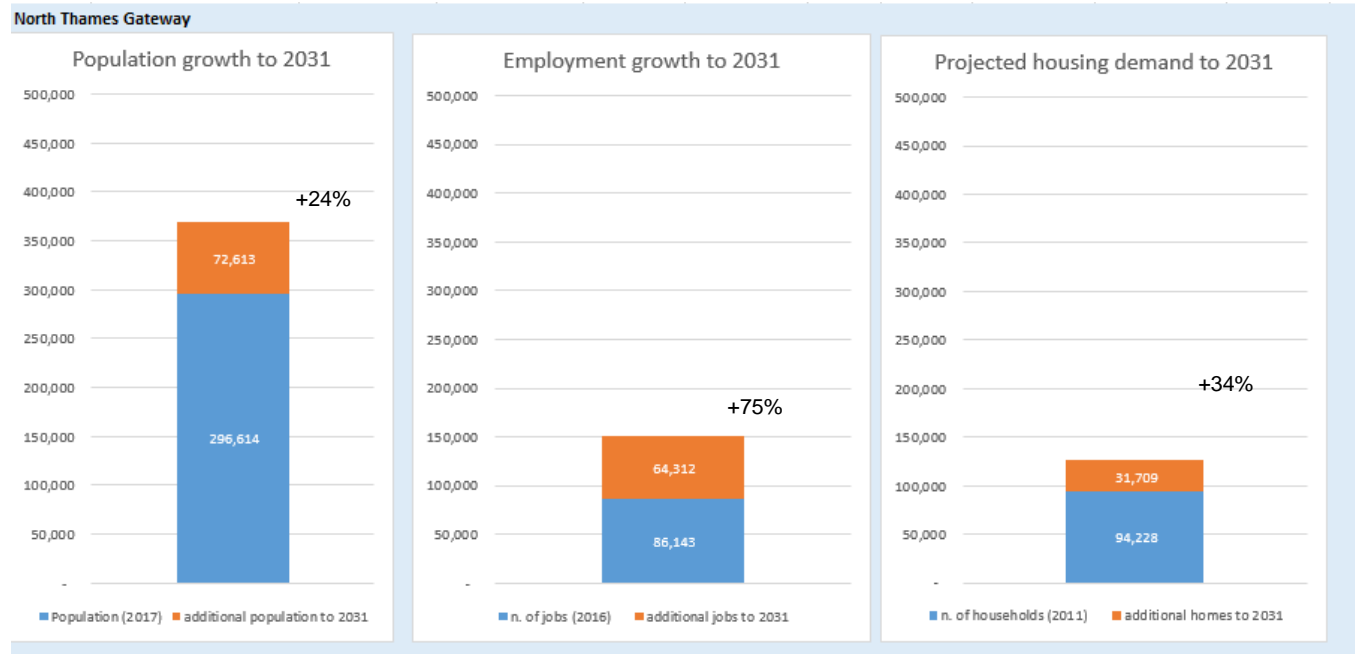
North Thames Gateway corridor
(Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London North Thames Gateway

Projected growth scenarios

The NTG growth corridor is projecting growth of 24% in population, 75% in employment and 34% in housing by 2031.

It currently ranks 5th in population growth in absolute terms and in the top half for employment growth (3rd).



Note:

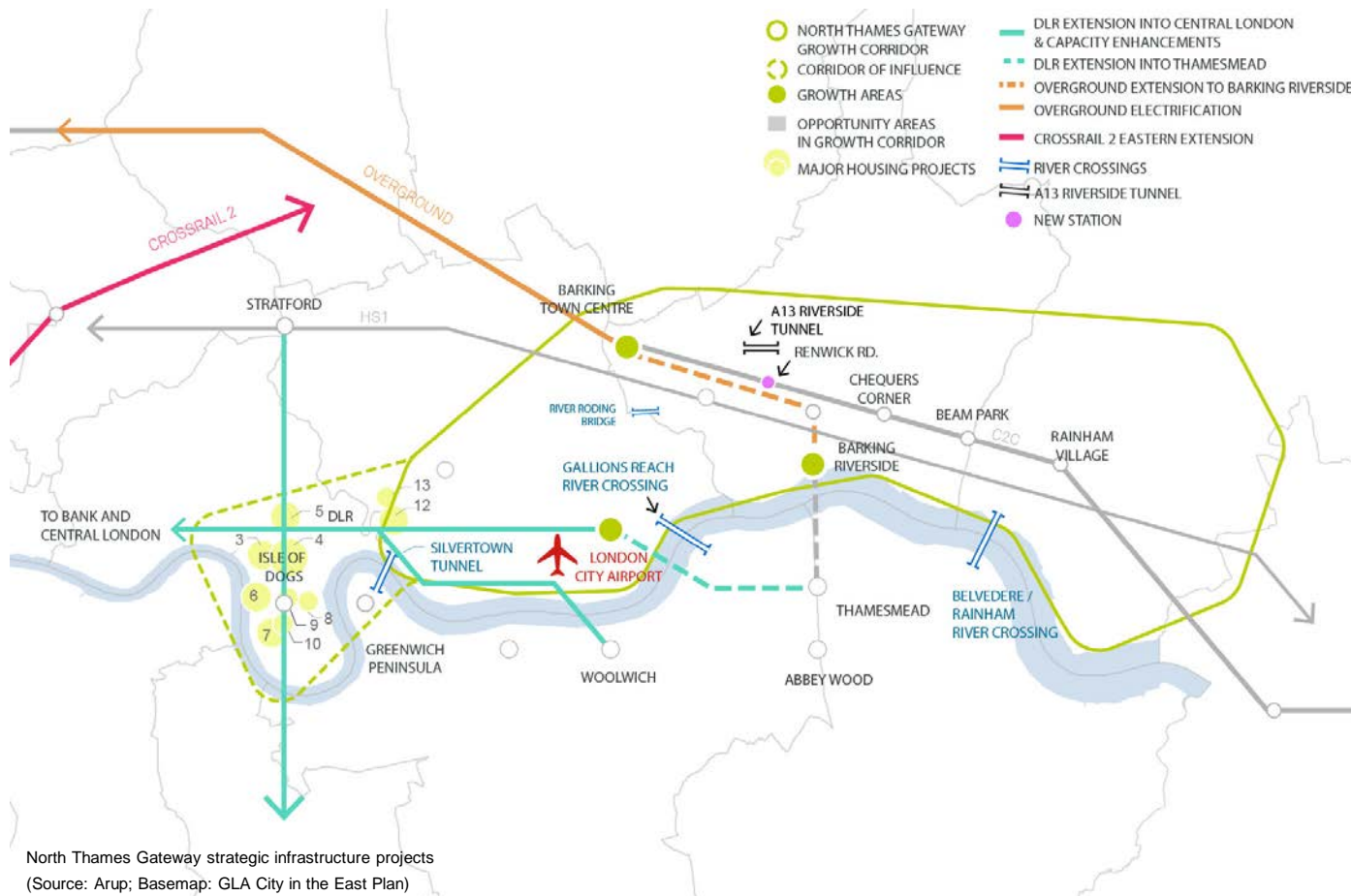
Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSAO and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details. These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London North Thames Gateway

Strategic infrastructure projects in pipeline



The spatial view of infrastructure needs across London North Thames Gateway

Strategic infrastructure projects in pipeline

Growth Drivers	Growth Enablers
<ul style="list-style-type: none"> Proposed DLR extension to Thamesmead would support the Mayor's ambition to increase rail connectivity to southeast London. This project would likely be delivered between 2018 and 2023 but there are no funding or planning secured at present. Extension of the DLR to Euston would further support capacity increase of the underground network and connections between HS2 and City Airport / Canary Wharf. The project is planned between 2025 and 2030, and planning and funding remain uncertain at this date London Overground to Barking Riverside is proposed to add 4km to the LO Gospel Oak to Barking line. The extension will increase connectivity in the corridor and support housing growth in east London. The project received planning approval and secured funding, and is planned for construction in 2018 (tfor completion by 2022). The eastern branch of Crossrail 2 and the route remains under consideration at this stage, but could further unlock growth across the corridor. If approved, the extension could be delivered between 2020 and 2040. 	<ul style="list-style-type: none"> Four new vehicular river crossings are currently being proposed to relieve congestion and increase north-south connectivity: <ul style="list-style-type: none"> Silvertown Tunnel is currently under public examination with a detailed outline permission submitted but no funding secured at present. Construction is planned to start in 2018, due for completion by 2023. Belvedere to Rainham and Gallions Reach (connecting Beckton to Thamesmead) are planned for construction between 2025 and 2050, but haven't secured funding yet. Lower Thames Crossing (Gravesend – Tilbury) will relieve congestion and pressure on the A2 and Dartford crossing whilst providing better freight connection. Funding and planning development are still in early stage, with construction planned between 2021 and 2026. Electrification of Barking to Gospel Oak London Overground line works have started in 2016, due to be completed by 2018. DLR capacity enhancements includes asset renewal and increased capacity up to 30 tph with supporting new depot. The programme is planned to start in 2017, for completion by 2037 but funding and planning permissions remain uncertain. Proposals for A13 Riverside Tunnel & a new rail station at Renwick Road remain at early stages of planning development with no funding secured to date. If approved construction is expected between 2021 and 2030. Two major Housing projects (12: Brunel Street Works, and 13: Hallsville Quarter) on the western edge of the corridor will deliver over 1,300 new homes in total between 2017 and 2022.

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
London Overground Barking to Barking Riverside extension	Driver	251 - 500	TfL	Secured	Detail approved							
DLR Beckton branch extension to Thamesmead	Driver	101 - 250	TfL	Uncertain	Uncertain							
DLR extension into Central London - Bank to Euston	Driver	1,001 - 5,000	TfL	Uncertain	Uncertain							
Extension of Crossrail 2 (Eastern Branch)	Driver	1,001 - 5,000	TfL / Network Rail	Uncertain	Uncertain							
Silvertown Tunnel	Enabler	501 - 1,000	TfL	Speculative	Outline submitted							
River Crossing - Gallions Reach	Enabler	501 - 1,000	TfL	Uncertain	Uncertain							
River Crossing - Belvedere to Rainham	Enabler	501 - 1,000	TfL	Uncertain	Uncertain							
A13 Riverside Tunnel & rail station at Renwick Road	Enabler	1,001 - 5,000	TfL	Uncertain	Uncertain							
Enhancements to existing DLR capacity (30tph), new trains & depot	Enabler	501 - 1,000	TfL	Speculative	Uncertain							
Overground Barking to Gospel Oak electrification	Enabler	101 - 250	Network Rail	Secured	Detail approved							
Lower Thames Crossing (Gravesend - Tilbury) & links	Enabler	1,001 - 5,000	Highways England	Uncertain	Uncertain							
River Roding bridge	Enabler	101 - 250	TfL	Uncertain	Uncertain							
Overground extension from Barking Riverside to Abbey Wood	Enabler	501 - 1,000	TfL	Uncertain	Uncertain							
12: Brunel Street Works (150+ units)	Enabler	100 - 250		Uncertain	Detailed Submitted							
13: Hallsville Quarter - Phase 2 (150+ units)	Enabler	100 - 250		Secured	Detail Approved							

The spatial view of infrastructure needs across London North Thames Gateway

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none">• Opportunities to intensify industrial area and bring new mix-use development into under-utilised land; alongside social infrastructure and local transport provision for housing development.• High availability of land for development for housing and office space	<ul style="list-style-type: none">• Overcome physical constraints resulting from the area's historical land use, which prevents local connectivity and effective linkages between local town centres.• Poor permeability and connectivity between local centres and residential communities.• Investments are needed to deliver schemes that overcome road, rail and water barriers to local connectivity.• The phase of development could be reduced by the considerable remediation costs needed to regenerate some of the available plots, which may be derelict or contaminated by former industrial uses.• Key development sites towards the east of the corridor are not served by rail links. Prioritise these crucial investments to attract the private sector in order to accelerate housing delivery

The spatial view of infrastructure needs across London North Thames Gateway

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	High level of investment identified for the area, including Crossrail 2 potential extension, DLR and Overground extensions.	Secure funding for Crossrail 2 eastern branch to further improve connectivity across the corridor.
Bus	Medium	Incomplete Assessment	Uncertain	Needs are not fully defined for the projected growth scenario. Costs likely to be between £100-500m.	Bus strategy for projected growth.
Highways	High	Well Identified	Under Conditions	Significant investment in road network to improve both east-west connectivity and river crossings.	Reduce uncertainty around funding of river crossing schemes.
Electricity	Medium	Incomplete Assessment	Under Conditions	UKPN has estimated infrastructure cost of £34m in the projected growth scenario. The GLA power model projects a demand increase of 56% for the corridor, with 57% of the substations at overcapacity by 2050.	Energy strategy and secure funding for infrastructure across the corridor.
Heat	Medium	Well Identified	Under Conditions	National Grid has estimated infrastructure cost of £40m in the projected growth scenario.	Energy strategy and secure funding for infrastructure across the corridor.
Water Supply	Medium	Well Identified	Under Conditions	£50m of water investment identified for the corridor - partly funded by Essex and Suffolk Water	Water supply strategy for the projected growth.
Water management	High	Incomplete Assessment	Uncertain	Thames Water has identified high capacity constraints in sewerage and drainage network towards 2050.	Water management strategy for the projected growth - particularly at highly constrained areas as the west part of the Royal Docks.
Flood risk*	High	Well Identified	In Progress	High flood risk along river Thames. Defences have been implemented.	
Waste	Medium	Incomplete Assessment	Uncertain	East London Waste Authority identified requirements for additional waste treatment capacity for the corridor.	Identify investment and secure funding for waste management infrastructure.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Medium			88% of SFBB availability (see data caveats)	Support roll-out of SFBB
Digital – UFBB*	High			Only 6% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Medium			NTG ranks in middle range of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	Medium			Projected housing gap of around 15,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

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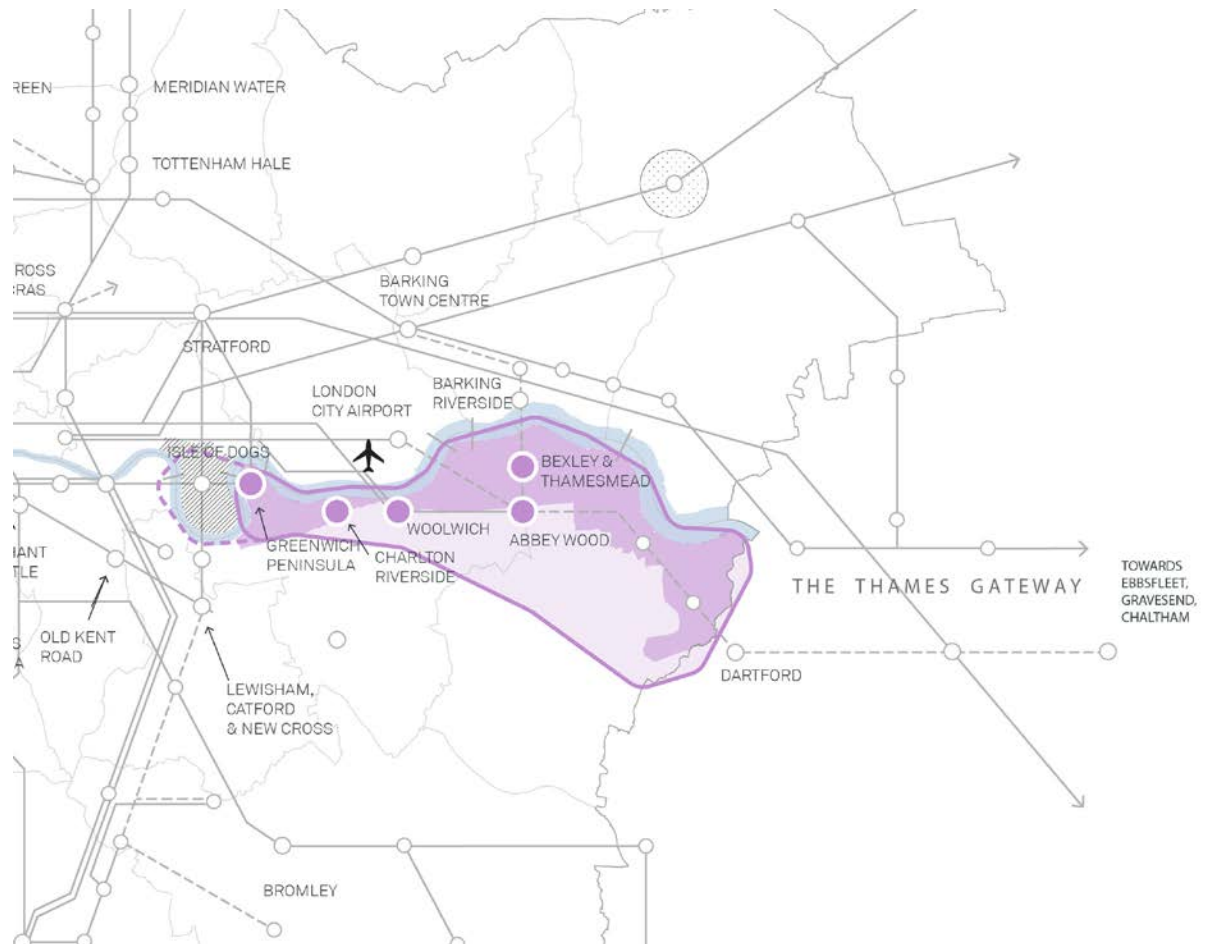
The spatial view of infrastructure needs across London

3.7 South Thames Gateway

South Thames Gateway

The South Thames Gateway (STG) growth corridor considers the area south of the River Thames and north of the A207; stretching from the Greenwich Peninsula in the West to Erith in the East. It covers the opportunity areas of Bexley Riverside; Thamesmead and Abbey Wood; Woolwich; Charlton Riverside; and the Greenwich Peninsula. These five OAs are in the boroughs of Bexley and Greenwich.

This growth corridor presents substantial potential for residential development. Its riverside location has historically been used as a mixture of strategic industrial land and retail warehouses, addressing London's logistics requirement and providing important employment areas. However, greater accessibility to Central London brought by the DLR and Crossrail has unlocked opportunities to convert some of these surplus industrial sites into mixed use schemes; introduce greater residential use and revitalise the riverside through a network of enhanced green spaces and active uses. The area is largely unwelcoming to cyclists and pedestrians and there are clear opportunities for improving movement across the corridor, strengthen linkages with the NTG, and connectivity towards central London (only Woolwich has a PTAL above 5).



South Thames Gateway corridor

(Source: Arup; Basemap: GLA City in the West Plan)

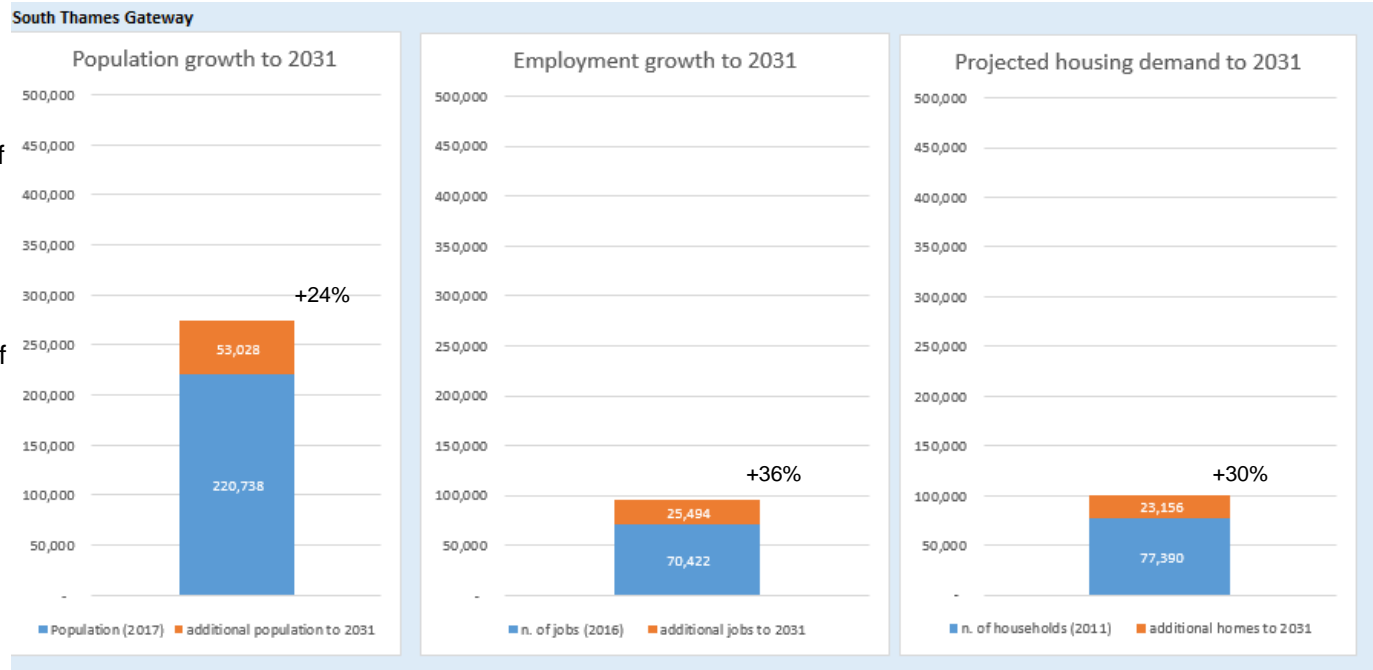
The spatial view of infrastructure needs across London South Thames Gateway

Projected growth scenarios

The STG growth corridor is projecting growth of 24% in population, 36% in employment and 30% in housing by 2031.

It currently ranks in the bottom half of growth corridors for population growth in absolute terms (8th) and for employment growth (7th).

However, in percentage terms the STG is undergoing transformational growth in terms of commercial development and housing growth.



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

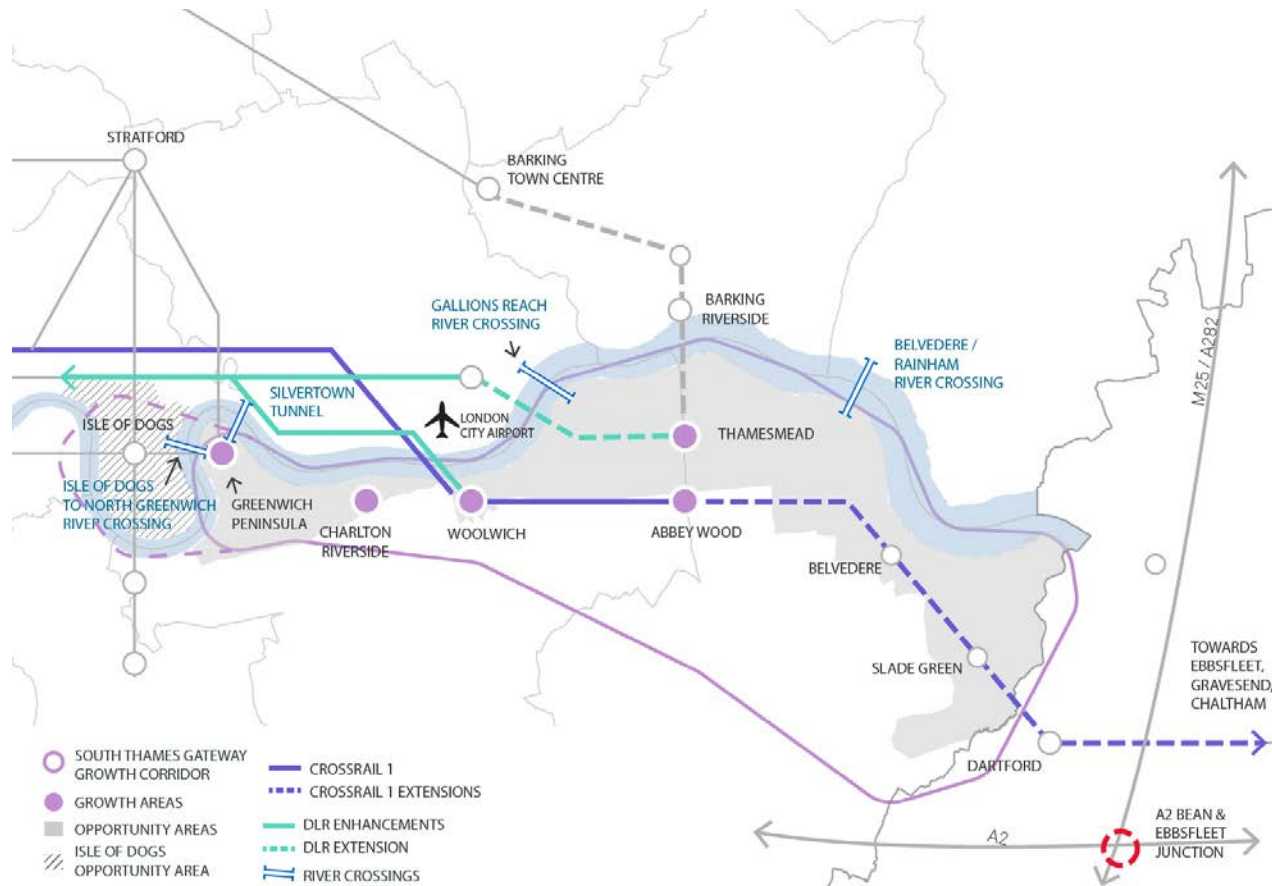
Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London South Thames Gateway

Strategic infrastructure projects in pipeline



South Thames Gateway strategic infrastructure projects

(Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London South Thames Gateway

Strategic infrastructure projects in pipeline

Growth Drivers	Growth Enablers
<p>Southern Thames Gateway has three projects driving future growth:</p> <ul style="list-style-type: none"> • Extension of Crossrail 1 from Abbey Wood to Slade Green is a safeguarded route, with plans to deliver it between 2021 and 2024. However funding and planning remain uncertain at present. • Safeguarded route from Slade Green to Gravesend secures the route for the second stage of Crossrail 1 by 2035. There are no plans in place to develop this further at present. • Proposed DLR extension to Thamesmead would support the Mayor's ambition to increase rail connectivity to southeast London. This project would likely be delivered between 2018 and 2023 but there are no funding or planning secured at present. 	<ul style="list-style-type: none"> • DLR capacity enhancements includes asset renewal and increased capacity up to 30 tph with supporting new depot. The programme is planned to start in 2017, for completion by 2037 but funding and planning permissions remain uncertain. • Four new vehicular river crossings are currently being proposed to relieve congestion and increase north-south connectivity: <ul style="list-style-type: none"> • Silvertown Tunnel is currently under public examination with a detailed outline permission submitted but no funding secured at present. Construction is planned to start in 2018, due for completion by 2023. • Belvedere to Rainham and Gallions Reach (connecting Beckton to Thamesmead) are planned for construction between 2025 and 2050, but haven't secured funding yet. • Lower Thames Crossing (Gravesend – Tilbury) will relieve congestion and pressure on the A2 and Dartford crossing whilst providing better freight connection. Funding and planning development are still in early stage, with construction planned between 2021 and 2026. • A2 Bean and Ebbsfleet junction improvements forms part of the Kent Thameside Strategic Transport Programme to support significant homes and employment growth served by the junctions. Funding and planning remain uncertain, with construction planned between 2021 and 2026. • A13 Riverside Tunnel & rail station at Renwick Road • Isle of Dogs to North Greenwich River Crossing • Overground extension from Barking Riverside to Abbey Wood • North Greenwich bus and tube stations interchange upgrade

The spatial view of infrastructure needs across London South Thames Gateway

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Extension of Crossrail 1 from Abbey Wood to Slade Green	Driver	501 - 1,000	TfL / Network Rail	Speculative	Uncertain							
Extension of Crossrail 1 - Slade Green to Gravesend	Driver	1,001 - 5,000	TfL / Network Rail	Uncertain	Uncertain							
DLR Beckton branch extension to Thamesmead	Driver	101 - 250	TfL	Uncertain	Uncertain							
Overground extension from Barking Riverside to Abbey Wood	Enabler	501 - 1,000	TfL	Uncertain	Uncertain							
Silvertown Tunnel	Enabler	501 - 1,000	TfL	Speculative	Outline submitted							
River Crossing - Gallions Reach	Enabler	501 - 1,000	TfL	Uncertain	Uncertain							
River Crossing - Belvedere to Rainham	Enabler	501 - 1,000	TfL	Uncertain	Uncertain							
A13 Riverside Tunnel & rail station at Renwick Road	Enabler	1,001 - 5,000	TfL	Uncertain	Uncertain							
Enhancements to existing DLR capacity (30tph), new trains & depot	Enabler	501 - 1,000	TfL	Speculative	Uncertain							
A2 Bean and Ebbsfleet junction improvements	Enabler	0 - 100	Highways England	Speculative	Uncertain (consultation)							
Lower Thames Crossing (Gravesend - Tilbury) & links	Enabler	1,001 - 5,000	Highways England	Uncertain	Uncertain							
Isle of Dogs to North Greenwich River Crossing	Enabler	101 - 250	TfL	Uncertain	Uncertain							
North Greenwich Bus Station/ tube station interchange upgrade	Enabler	0 - 100	Greenwich/ TfL	Secured	Detail approved							

The spatial view of infrastructure needs across London South Thames Gateway

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none"> • Opportunity to release surplus industrial land to create mixed-use developments, enlarging the employment base of the area – around 30% relies in wholesale and manufacturing jobs. • Considerable potential for residential intensification around Woolwich and Abbey Wood Crossrail stations. • Opportunity to promote and develop the river edge, its foreshore and banks as a public amenity with walking, cycling and other leisure opportunities. 	<ul style="list-style-type: none"> • Crucial to unlocking the full development potential of the STG is the implementation of the identified river crossing schemes • Low accessibility to open spaces should be enhanced and contribute to high quality public realm with potential to improve pedestrian and cycle linkages. • Lack of local connectivity and permeability to the river through large industrial estates that segregate residential communities from retail and employment areas. • Increasing population pressures will require changes to the constrained bus service frequency, capacity and accessibility. • Particular attention should be given to flood risk management. New developments in flood risk zones would require suitable evacuation routes to higher grounds.

The spatial view of infrastructure needs across London South Thames Gateway

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Significant rail investment identified for the growth corridor, including potential extensions to Crossrail, DLR and potential Overground.	Unlikely to be resolved until funding secured for Crossrail 1 extensions.
Bus	Medium	Well Identified	Under Conditions	Medium investment needs across the area, including North Bexley Transport scheme, priority bus measures, and capacity and accessibility improvements at town centres and waterfront. Cost likely to be over £100m.	Secure funding for key schemes.
Highways	High	Well Identified	Under Conditions	Significant investment in road network to improve both east-west connectivity and river crossings.	Reduce uncertainty around funding of river crossing schemes.
Electricity	Medium	Incomplete Assessment	Under Conditions	The GLA power model projects a demand increase of 67% for the corridor, with 50% of the substations at overcapacity by 2050.	Energy strategy for projected growth.
Heat	Medium	Well Identified	Under Conditions	Bexley Riverside DIFs identifies the need for two gas related schemes to reinforce the pressure network and connect to gas supply (total of £11m). A CHP Plant to serve Erith, Thamesmead, Slade Green and Belvedere has also been put forward (£60.4m). Large heat network development planned on Greenwich Peninsula by Pinnacle Power to heat 15,700 homes.	Energy strategy for projected growth.
Water Supply	High	Well Identified	Under Conditions	STG is a water resource constrained area, particularly in relation to the risk of low pressure. Thames Water estimates that there will be a 50% increase in water demand; major water supply reinforcement planned, potentially using resources from Nunhead Reservoir (£20m).	Water supply strategy for projected growth.
Water management	Medium	Incomplete Assessment	Under Conditions	Thames Water has identified some capacity constraints in sewerage and drainage network towards 2050.	Water management strategy for projected growth - particularly at areas with critical flow capacity as Greenwich Peninsula and Thamesmead-Brexley boundary.
Flood risk*	High	Well Identified	In Progress	High flood risk along river Thames. Defences have been implemented.	
Waste	Low	Well Identified	Under Conditions	Sufficient waste management capacity in the corridor to cope projected demand. An anaerobic digestion facility (£16.4m) is planned at Greenwich.	Delivery of Greenwich Anaerobic Digestion facility.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Medium			89% of SFBB availability (see data caveats)	Support roll-out of SFBB
Digital – UFBB*	High			Only 0.4% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Low			STG ranks in top third of growth corridors in terms of household access to open space.	N/A
Housing	Medium			Projected housing gap of around 17,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

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The spatial view of infrastructure needs across London

3.8 Tramlink

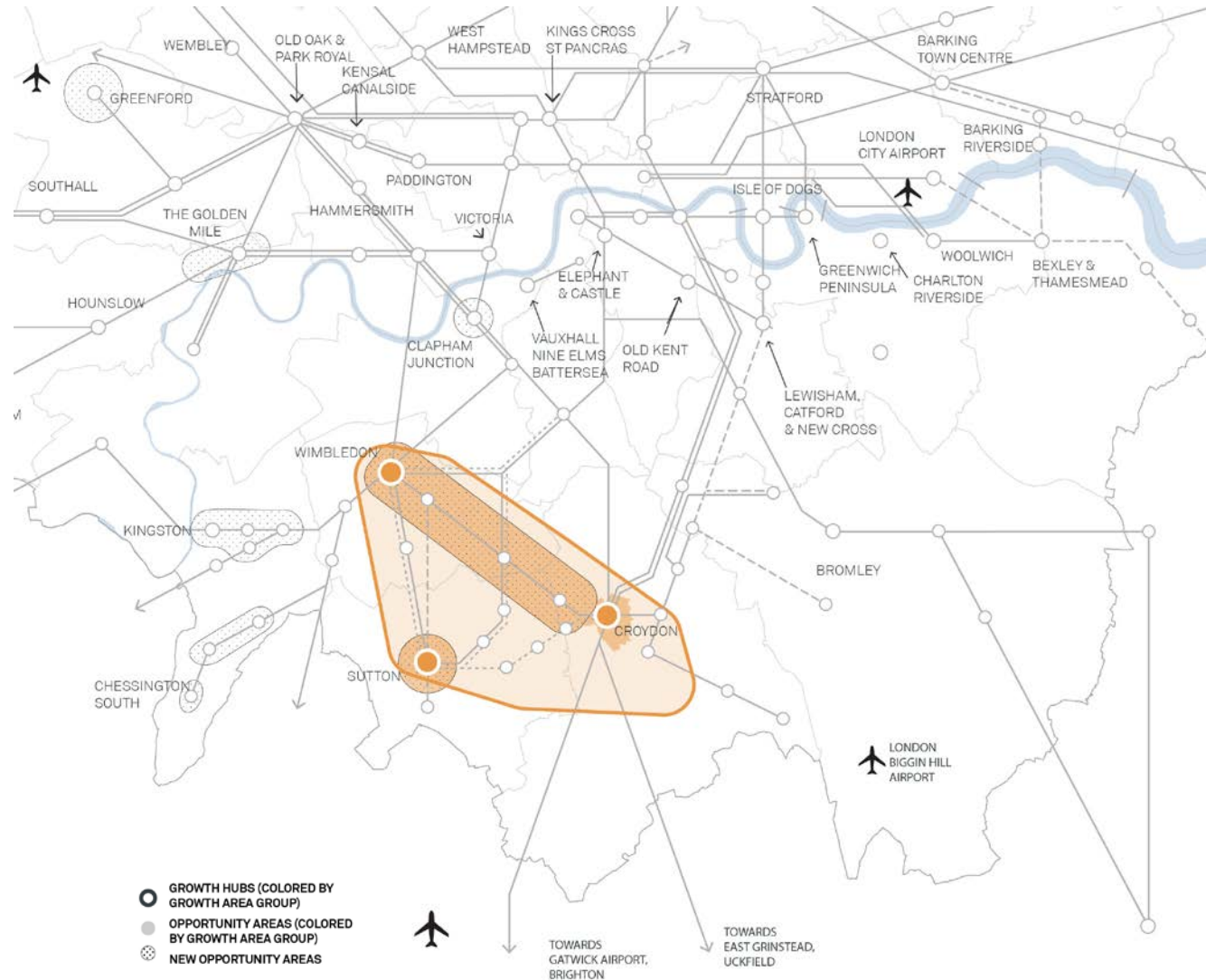
Tramlink

The Tramlink (TL) growth corridor considers the area contiguous with the Wimbledon-Croydon corridor. Given the Tramlink southern extension, we have also included the Sutton town centre into the analysis.

The TL corridor encompasses the Croydon Opportunity Area, South Wimbledon / Colliers Wood Intensification Area and the Sutton Housing Zone (Sutton One).

The TL contains a mix of retail, commercial and residential areas around town centres and hold opportunities to deliver growth at strategic industrial locations and unlock housing delivery.

Infrastructure and developments in the corridor will accelerate delivery and attract investment to boost the potential of the south west as a pole of growth beyond central London. The TL is one of the cornerstones of the Mayor's City in the West plan, which promotes intensification of uses through improved connectivity and accessibility at Wimbledon, Croydon and Sutton town centres; and positioning the area as a feeder cluster for Crossrail 2.



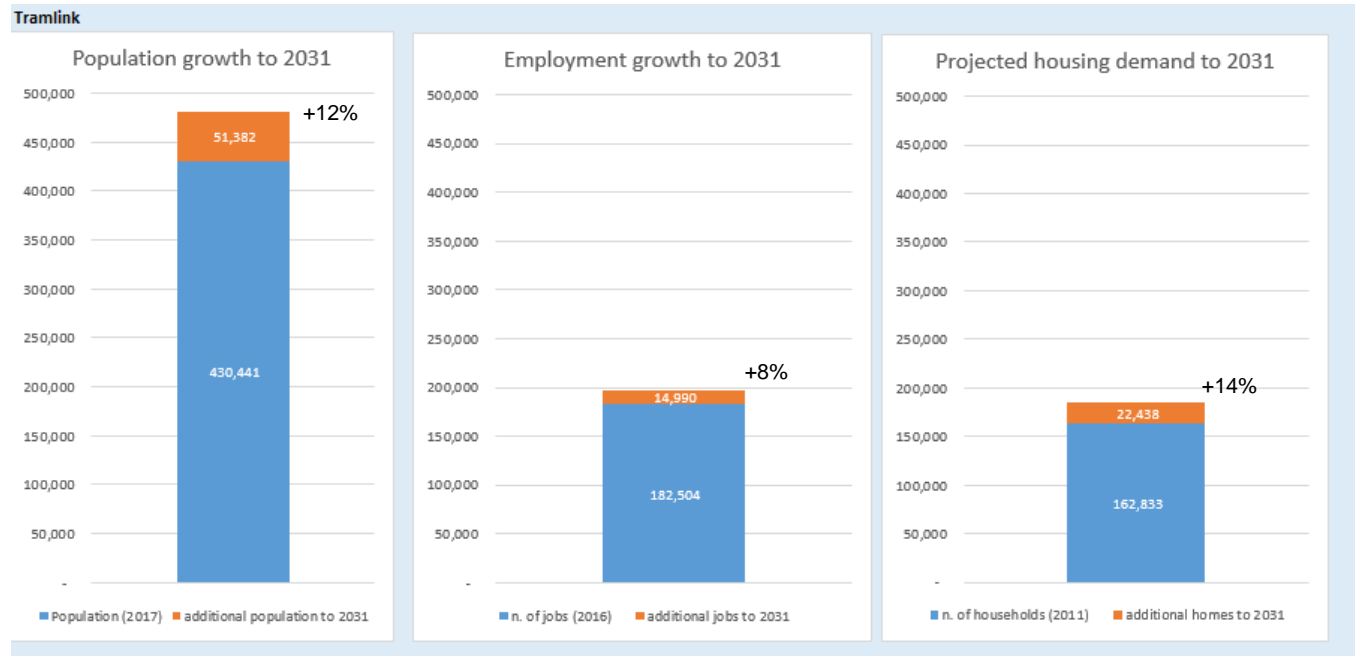
Tramlink Triangle Corridor
(Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Tramlink

Projected growth scenarios

The Tramlink growth corridor is projecting growth of 12% in population, 8% in employment and 14% in housing by 2031.

It currently ranks in the bottom half of growth corridors for population and employment growth in absolute terms (9th and 10th respectively).



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Dastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Dastore.

Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Dastore for non-OA MSOAs. Baseline data is from the GLA Dastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

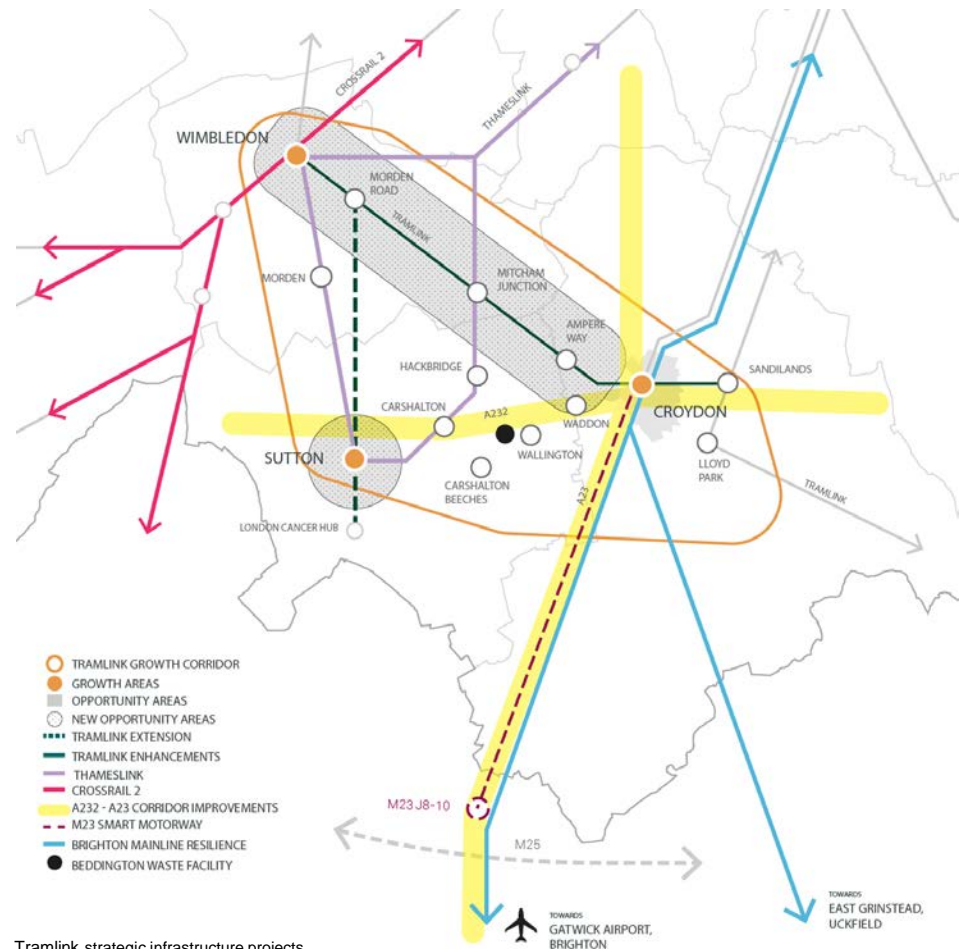
The spatial view of infrastructure needs across London Tramlink

Strategic infrastructure projects in pipeline

Growth Drivers

Tramlink has three growth driver strategic infrastructure projects:

- The **proposed Tramlink extension** to Sutton is a TfL project, however is currently unfunded. The project is planned to be delivered between 2025 and 2030.
- **The Thameslink** improvement programme will deliver improved connectivity within the area at East Croydon. The Network Rail project is due for completion by 2018 (started 2009).
- The proposed **southern section of Crossrail 2** will deliver improved connectivity at Wimbledon by 2033. Although funding mechanisms remain uncertain at this date, the outline planning application has been submitted.



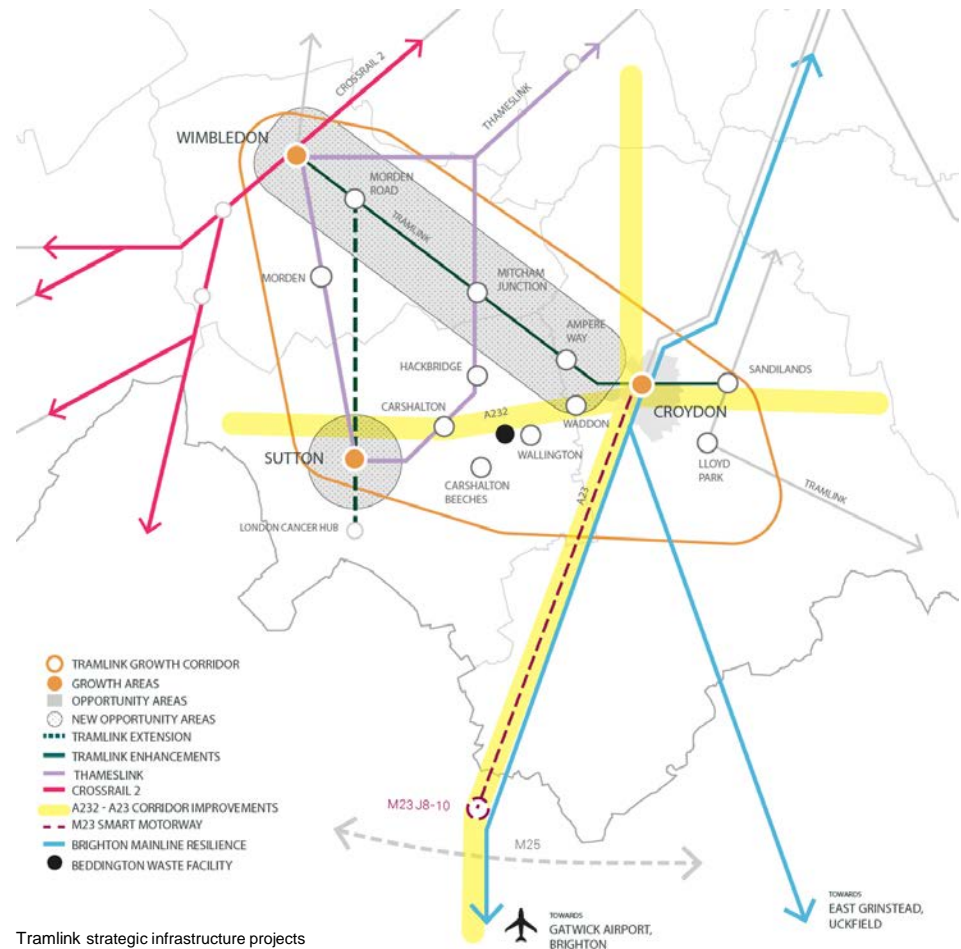
Tramlink strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Tramlink

Strategic infrastructure projects in pipeline

Growth Enablers

- **Smart Motorway schemes** on the M23 (J 8-10) will improve journey reliability to Gatwick Airport. This Highways England project has secured funding and detailed planning permissions, and will be delivered between 2021 and 2022.
- Improvements to the London **Tram** include new trains and increased capacity
- **A232 and A23 corridor** improvements through a number of junction and gyratory improvements. This project is due to start construction in 2019 (due for completion by 2021) and have secured funding and planning approval.
- **Brighton Mainline resilience programme** between London, Gatwick and Brighton will support growth potential along the corridor and Croydon. Detailed planning application has been submitted and funding is secured, the project is due to start in 2017 to be completed by 2020
- **Beddington Energy Recovery Facility** is a new waste treatment plant part of a 25-year contract with the London Waste Partnership. Construction started in 2016 due for completion by 2019, and it is expected that the plant could begin treating waste by around 2017.



Tramlink strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Tramlink

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Crossrail 2	Driver	5,001+	TfL / Network Rail	Uncertain	Outline submitted							
Thameslink	Driver	5,001+	Network Rail	Secured	Detail approved							
Proposed Tramlink extension to Sutton	Driver	251 - 500	TfL	Uncertain	Uncertain							
M23 Junctions 8 to 10 Smart Motorway	Enabler	101 - 250	Highways England	Secured	Detail approved							
London Tram existing network enhancements & new fleet	Enabler	251 - 500	TfL	Speculative	Uncertain							
Brighton Mainline resilience (London – Gatwick – Brighton)	Enabler	251 - 500	DfT / Network Rail	Secured	Detailed submitted							
Beddington Energy Recovery Facility	Enabler	101 - 250	South London Waste Partnership	Secured	Detail approved							
A232 and A23 Corridor improvements	Enabler	0 - 100	TfL / Croydon	Secured	Outline submitted							

The spatial view of infrastructure needs across London Tramlink

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none"> • Croydon Growth Zone funding package to catalyse regeneration of Croydon Town Centre. 	<ul style="list-style-type: none"> • The poor quality of the TL's physical environment, most notably around Croydon and East of Merton, is a significant barrier towards attracting inward investment. • The renewal of economically prosperous urban centres and deprived residential areas will be an important catalyst for stimulating change and instilling confidence in the area as a place to both live and work. • Future transport infrastructure upgrades and airport expansion decisions will be critical to the future success of the TL as a vibrant local economy that combines the benefits of increasing job opportunities and the suburban life. • Frequent congestion and overcrowding on the road and rail network at peak periods. • In addition to the TL's function as a regional centre in its own right, the area holds a great potential as a key transport interchange, given its good connections to central London and outside the GLA boundaries (e.g. Thameslink, CR2). • Limited brownfield land suitable for regeneration

The spatial view of infrastructure needs across London Tramlink

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Under Conditions	Major rail investment plans, including Thameslink, Crossrail 2 and a potential Tram Link extension.	Secure funding for CR2 and Tram Link extension.
Bus	Medium	Incomplete Assessment	Uncertain	Needs are defined for the projected growth scenario. Costs likely to be between £100-500m.	Secure funding for all identified bus infrastructure.
Highways	Medium	Incomplete Assessment	Uncertain	Over £300m of investment identified to improve the road network and tackle congestion in peak hours.	Secure funding for all identified road infrastructure.
Electricity	Medium	Incomplete Assessment	Under Conditions	Reinforced needed for electricity supply infrastructure estimated at £34m. Asset replacement and reinforcement works to East Croydon and Beddington substations will moderately increase firm capacity by 2022. The GLA power model projects a demand increase of 68% for the corridor, with 56% of the substations at overcapacity by 2050.	Energy integrated strategy for South Wimbledon planned development
Heat	Medium	Incomplete Assessment	Under Conditions	Sutton Decentralised Energy Network will deliver heat to 19,000 new homes (Phase 1 in progress). Needs are not fully defined for other growth centres of the corridor.	Energy integrated strategy for South Wimbledon planned development
Water Supply	Low	Well Identified	In Progress	Sutton & East Surrey has estimated sufficient capacity to meet demand until 2040. Capacity and resilience investment identified.	
Water management	Low	Well Identified	In Progress	Thames Water has projected low utilisation of sewerage and drainage capacity towards 2050.	
Flood risk*	Low	Incomplete Assessment	Under Conditions	Low flood risk across the growth corridor. Some areas are undefended.	Flooding infrastructure investment at undefended areas south of Merton.
Waste	High	Incomplete Assessment	Under Conditions	The South London Waste Plan identified a capacity gap of waste management for the area.	Secure the implementation of planned waste management infrastructure.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Low			Above 90% SFBB availability (see data caveats)	N/A
Digital – UFBB*	High			Only 2% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	High			Tramlink ranks in bottom third of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	Medium			Projected housing gap of around 15,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

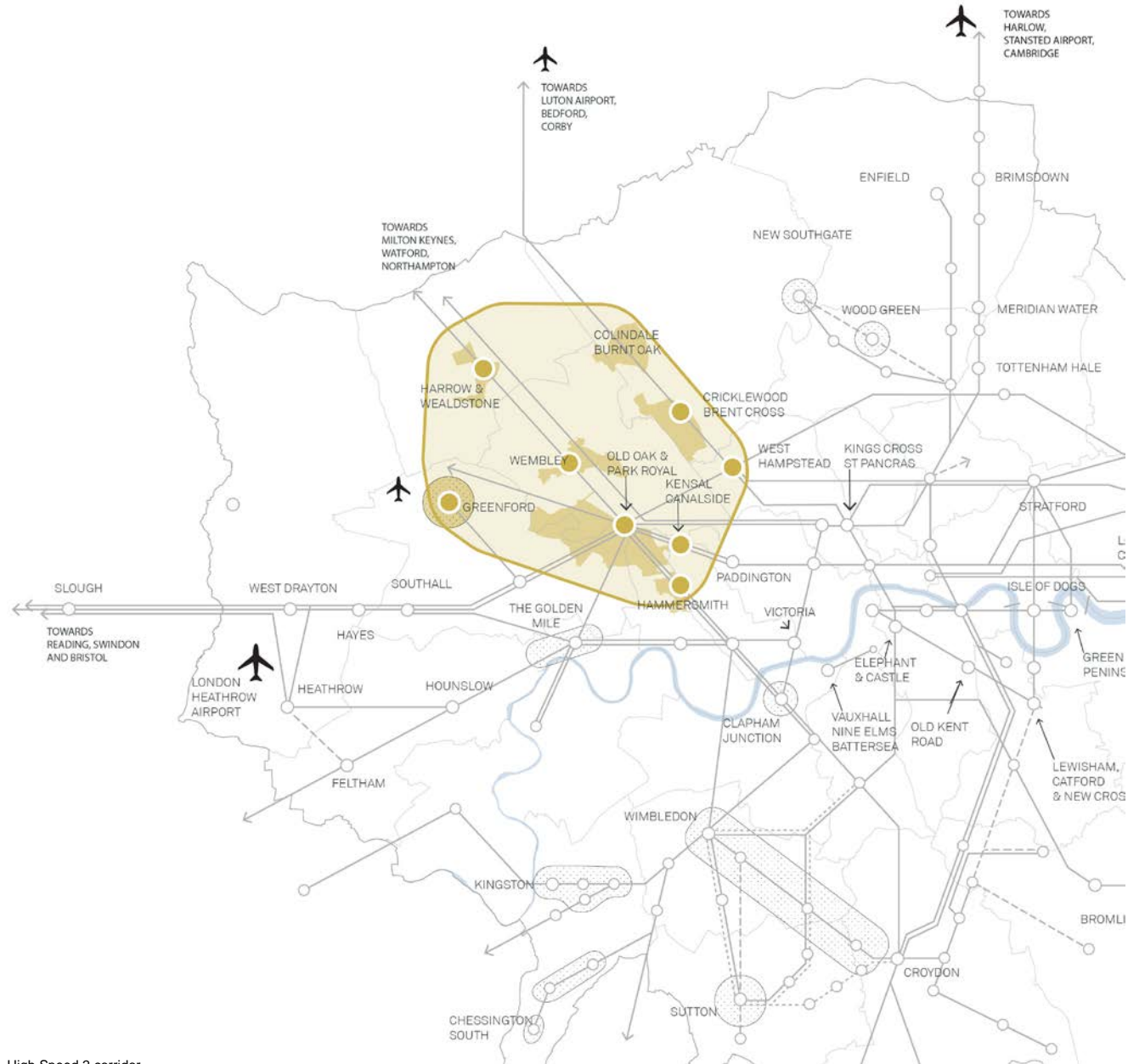
Section 3

The spatial view of infrastructure needs across London

3.9 HS2

HS2

The High Speed (HS2) growth corridor considers the area to the north west of London along the new High Speed rail alignment; stretching to Brent Cross and Burnt Oak to the North, Greenford and White City to the south up to Paddington in central London. It covers the opportunity areas of Colindale and Burnt Oak; Cricklewood and Brent Cross; Harrow and Wealdstone; Old Oak and Park Royal; White City; Kensal Canalside; Wembley; Mill Hill East; West Hampstead and Paddington. These eleven opportunity areas spread over the boroughs of Hammersmith & Fulham, Brent, Ealing, Harrow, Barnet and Westminster.



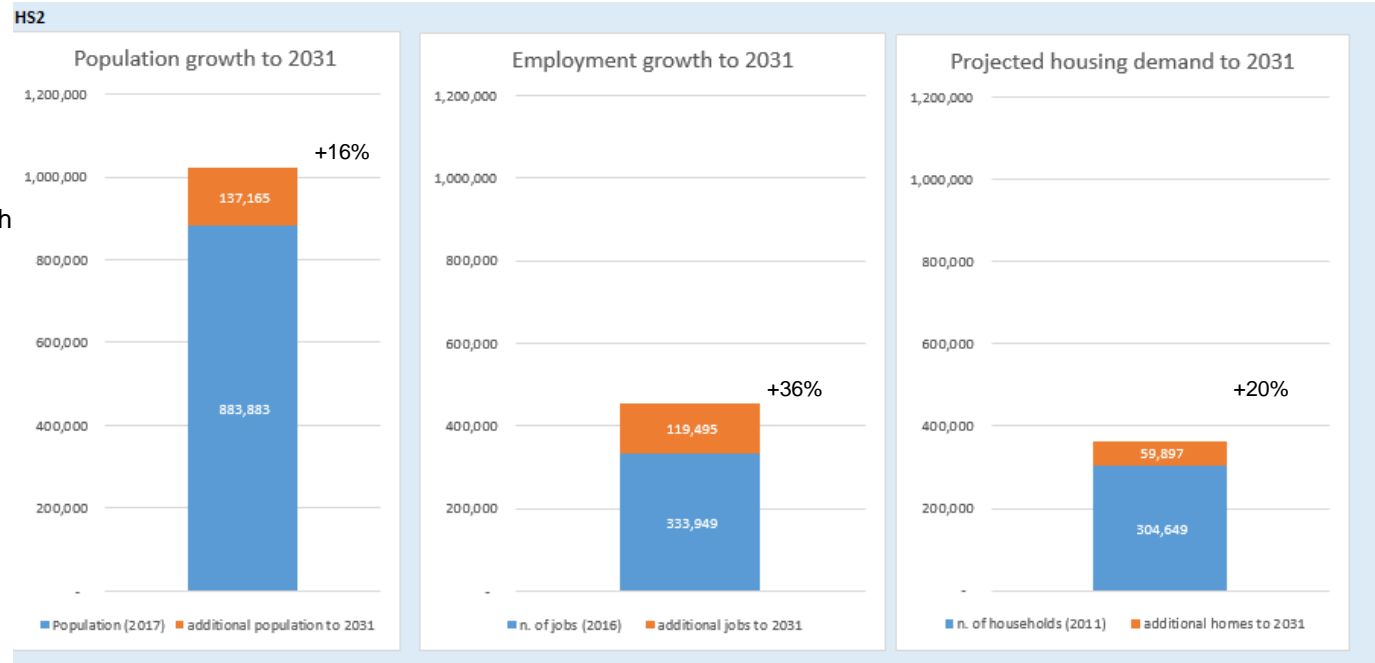
High Speed 2 corridor
 (Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London HS2

Projected growth scenarios

The HS2 growth corridor is projecting growth of 16% in population, 36% in employment and 20% in housing by 2031.

It currently ranks 2nd out of all growth corridors for both population and employment growth in absolute terms, reflecting the extent of opportunity available in the area.



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

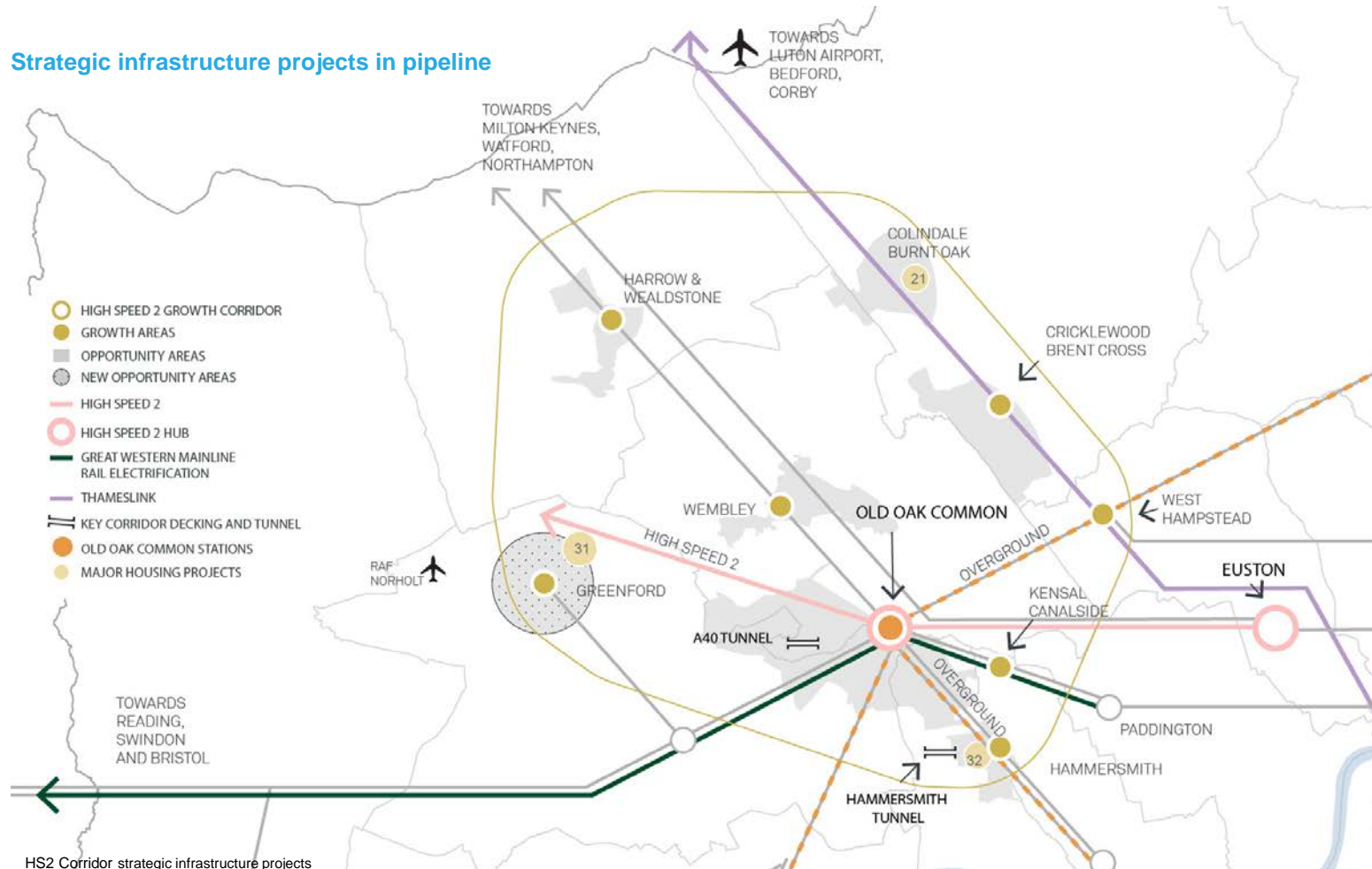
Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London HS2 corridor

Strategic infrastructure projects in pipeline



HS2 Corridor strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London HS2 corridor

Strategic infrastructure projects in pipeline

Growth Drivers	Growth Enablers
<ul style="list-style-type: none"> • Great Western Mainline rail electrification (started 2011, due 2024) will prepare the route for new rolling stock which will improve capacity (20 per cent more seats), journey times for routes into Paddington, and air quality along the corridor. • High Speed 2 hub at Old Oak Common will unlock strategic housing and employment growth for London. Additional infrastructure funding and planning status from HS2 is still uncertain, with development planned between 2021 and 2025 ahead of HS2 trains stopping at Old Oak. • Thameslink planned to stop at Brent Cross Station by 2021 (start planned in 2018) following the route's capacity improvement to 24 tph through the core due by 2018. Funding and planning status unclear. • Two overground new stations in Old Oak Common (Hythe road and Old Oak Common lane) are planned between 2023 and 2036, but yet have to secure funding and planning permissions. These new stations would improve accessibility levels and further support growth planned at Old Oak Common Opportunity Area. 	<ul style="list-style-type: none"> • Key corridor decking and tunnel schemes (A4 Hammersmith and A40 Savoy Circus to Gypsy Corner) are planned between 2023 and 2030, with no funding or planning permissions secured as this date. These schemes will greatly improve permeability and air quality on the local areas, supporting employment and housing growth in the Opportunity Areas. • OOC Crossrail station • OOC permeability improvements • Colindale station (Northern Line) <p>Three major housing projects (31,32,21) in Colindale / Burnt Oak (Grahame Park), Greenford (Greenford Green), and Hammersmith (M&S site) will deliver in total over 4,000 new homes across the corridor respectively by 2025, 2030 and 2022.</p>

The spatial view of infrastructure needs across London HS2 corridor

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
High Speed 2 - Euston and OOC hub	Driver	501 - 1,000	HS2	Speculative	Uncertain							
Thameslink	Driver	5,001+	Network Rail	Secured	Detail approved							
Great Western Mainline rail electrification	Driver	1,001 - 5,000	Network Rail	Secured	Detail approved							
Old Oak Common Overground Stations x 2	Driver	251 - 500	TfL / HS2	Speculative	Uncertain							
Crossrail 1	Driver	5,001+	TfL	Secured	Detail approved							
OOO Crossrail 1 station	Enabler	0 - 100	TfL	Secured	Outline submitted							
Key corridor decking and tunnel schemes (A4 Hammersmith and A40 Savoy Circus to Gypsy Corner)	Enabler	1,001 - 5,000	TfL	Uncertain	Uncertain							
Brent Cross Station (Thameslink)	Enabler	N/A	Network Rail	Secured	Detail approved							
OOO permeability improvements	Enabler	0 – 100	OPDC	Speculative	Outline submitted							
Colindale station (Northern Line)	Enabler	0 – 100	Developer/Council/TfL	Secured	Outline submitted							
21: Grahame Park - Stage B (150+ units)	Enabler	100 - 250		Uncertain	Outline Submitted							
31: Greenford Green Development (150+ units)	Enabler	100 - 250		Speculative	Detailed Submitted							
32: M&S White City Site (150+ units)	Enabler	100 - 250		Uncertain	Detail Approved							

The spatial view of infrastructure needs across London HS2 corridor

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none">• Major opportunities for growth around Old Oak Common with the convergence of Crossrail 2 and HS2.• The growth corridor as a whole has the opportunity to be one of the best connected parts of London with connectivity provided by Crossrail, Crossrail 2, Thameslink, HS2, the Great Western Mainline, London Underground and Overground.• Opportunity for a rail station at Brent Cross to reduce dependence on car, increase public transport access to new town centre and accelerate projected development.	<ul style="list-style-type: none">• Significant challenges around congested road network; most notably the A40• Supporting infrastructure is needed to accommodate development and create accessible and serviced sites. Particularly to improve permeability at regenerated industrial land in Old Oak Common.

The spatial view of infrastructure needs across London HS2 corridor

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Significant investment in rail infrastructure needed to support development, including Great Western Mainline electrification, Thameslink and OOC&PR transport hub.	Delivery of Old Oak Common transportation hub coordinating HS2, Crossrail 1 and new Overground Stations.
Bus	Medium	Incomplete Assessment	Under Conditions	Over a £100m identified for additional bus services and infrastructure to meet projected demand across the corridor.	Secure funding for all identified bus infrastructure.
Highways	High	Well Identified	Under Conditions	Significant investment in road network to serve Old Oak Common and the Thameslink corridor.	Secure funding for all identified road infrastructure.
Electricity	High	Incomplete Assessment	Under Conditions	Needs and costs are not fully defined for the projected growth scenario. The GLA power model projects a demand increase of 61% for the corridor, with 67% of the substations at overcapacity by 2050.	Integrated Energy strategy and delivery plan for major developments.
Heat	High	Incomplete Assessment	Under Conditions	Needs and costs are not fully defined for the projected growth scenario	Integrated Energy strategy and delivery plan for major developments.
Water Supply	High	Incomplete Assessment	Under Conditions	Reinforcement of the strategic water mains network will be required to cater for the proposed scope of development. OOC&PR is developing an integrated water strategy.	Develop a Integrated Water Management Strategy across developments to increase efficiencies and reduce costs
Water management	High	Incomplete Assessment	Uncertain	Thames Water has projected full utilisation of sewerage and drainage capacity towards 2050.	Water management strategy to expand capacity.
Flood risk*	Low	Incomplete Assessment	Under Conditions	Low flood risk across the growth corridor. Some areas still undefended.	Flooding infrastructure investment at undefended areas around Greenford.
Waste	High	Incomplete Assessment	Under Conditions	Increase in waste production is expected from projected growth. Projects and waste management strategies under development.	Consolidate circular economy and waste minimisation priorities at Old Oak Common and White City,
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Low			Above 90% SFBB availability (see data caveats)	N/A
Digital – UFBB*	High			Only 2% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	High			HS2 corridor ranks in bottom third of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	High			Projected housing gap of around 34,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

Section 3

The spatial view of infrastructure needs across London

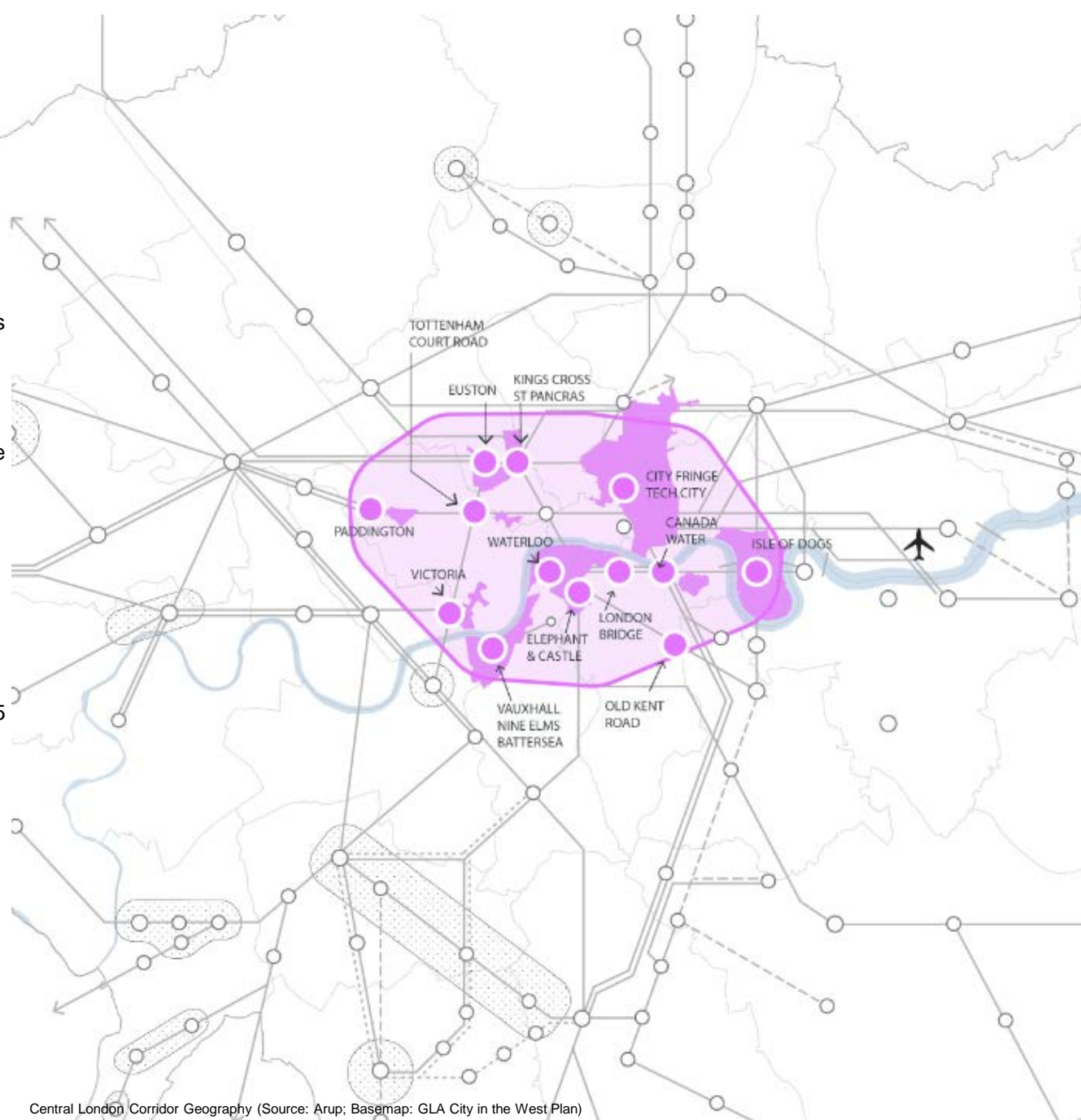
3.10 Central London

Central London

The Central London growth corridor includes the traditional Central London area in addition to the Isle of Dogs and Canada Water.

It comprises thirteen opportunity areas in the centre of London; going through eleven boroughs (Kensington and Chelsea; Westminster; Wandsworth; Camden; Islington; Hackney; City of London; Tower Hamlets; Lewisham; Southwark and Lambeth).

The Central London corridor is a key driver for both London's and the UK economy, respectively accounting for approximately 55 and 10 percent of output; and containing 1.5 million jobs and 700,000 residents. This imbalance between dwellings and employment; and the corridor's economic success are facilitated by its location in one of the most connected places in the world, accommodating around 3.5 million public transit trips on a daily basis thanks to extensive networks of rail, underground, road, bus, river, walking and cycling infrastructure.



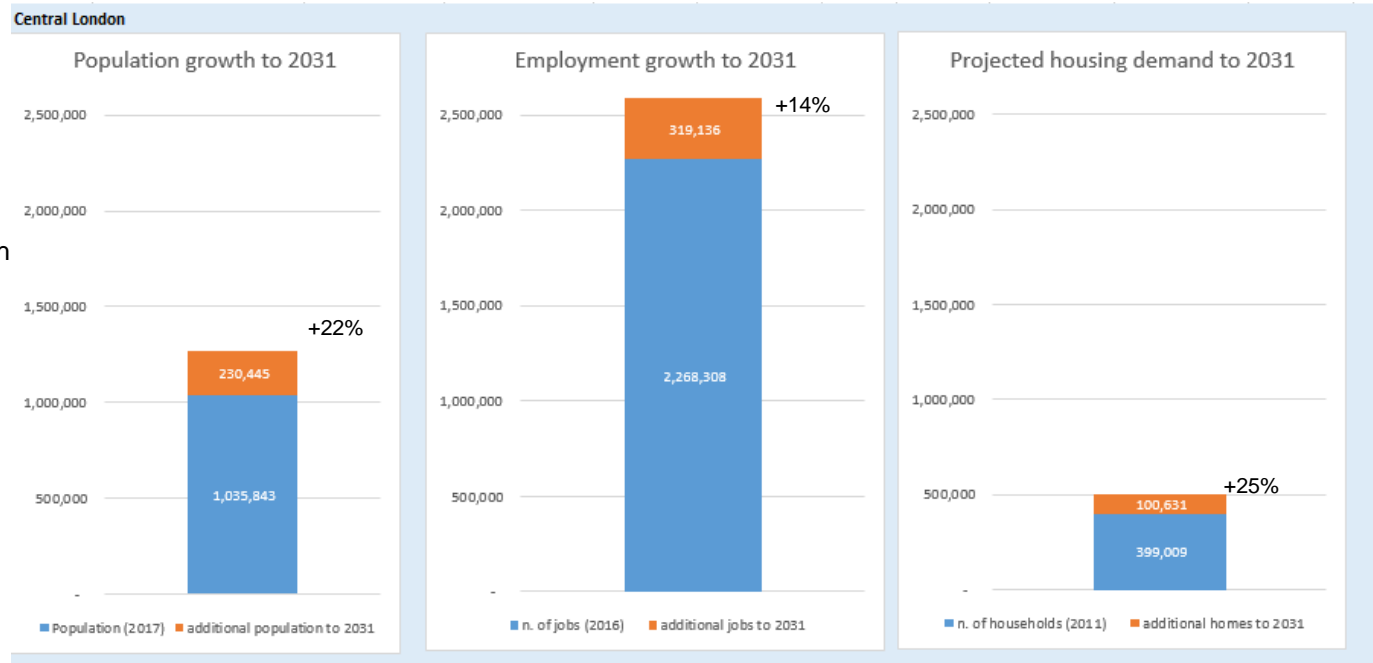
Central London Corridor Geography (Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Central London

Projected growth scenarios

The Central London growth corridor is projecting growth of 22% in population, 14% in employment and 32% in housing by 2031.

It currently ranks 1st out of all growth corridors for both population and employment growth in absolute terms, reflecting the extent of opportunity available in the area.



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

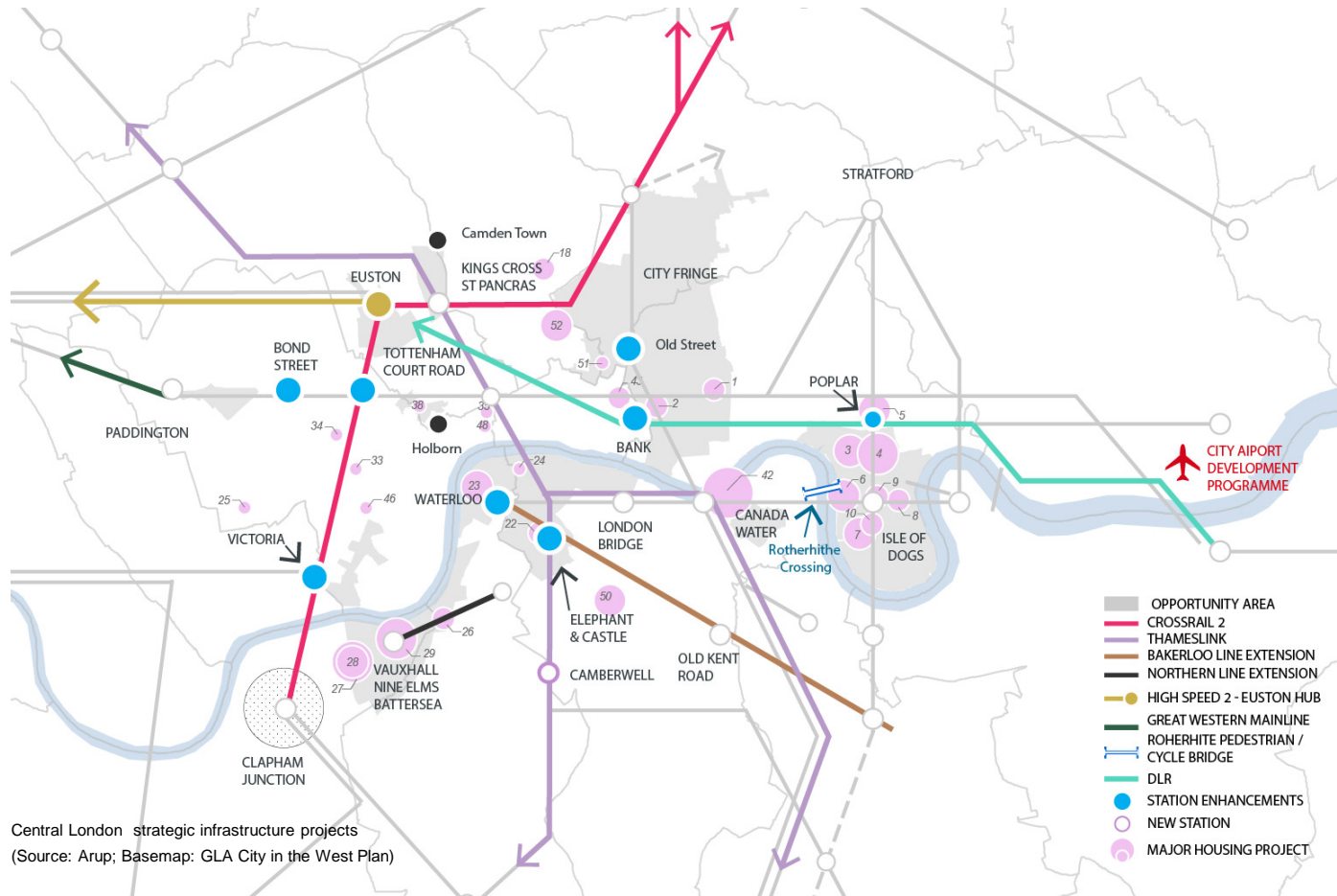
Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details.

These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London Central London

Strategic infrastructure projects in pipeline



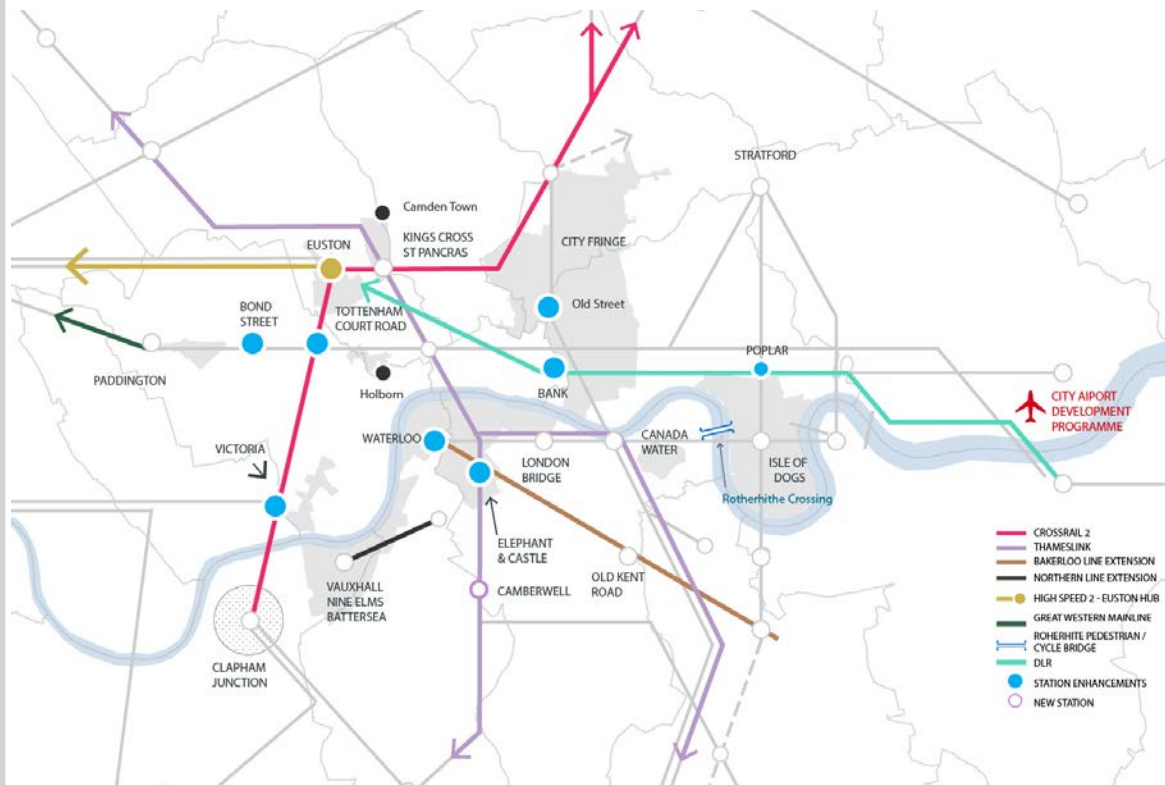
Central London strategic infrastructure projects
(Source: Arup; Basemap: GLA City in the West Plan)

Growth Drivers

The Central London corridor has five growth driver projects:

- The proposed route for **Crossrail 2** in central London will greatly improve capacity at key interchange station from Clapham Junction to Kings Cross. Due to be completed in 2033, the outline planning application was submitted and funding model is still uncertain.
- **Thameslink** increased capacity to 24 tph in central London, new stations at Farringdon, Blackfriars and London Bridge improve connections and journey reliability. The project started in 2009, due to be completed in 2018 with funding and planning details approved.
- The **extension of Bakerloo Line** to Lewisham via Old Kent Road will greatly increase accessibility levels in an area of south-east London that has significant housing growth potential. The project is still in early planning stages and funding not yet secured, planned between 2023 and 2029.
- The **extension of the Northern Line** between Kennington and Battersea has helped to regenerate the Vauxhall, Nine Elms and Battersea areas. The project started in 2015 with full funding and planning approvals, due to be completed by 2020.
- **Great Western Mainline** rail electrification (started 2011, due 2024) will improve capacity, journey times and air quality for routes into Paddington.

- **High Speed 2 hub at Old Oak Common** will unlock strategic housing and employment growth for London. Additional infrastructure funding and planning status from HS2 is still uncertain, with development planned between 2021 and 2025 ahead of HS2 trains stopping at Old Oak.
- **Extension of the DLR to Euston** would further support capacity increase of the underground network and connections between HS2 and City Airport / Canary Wharf. The project is planned between 2025 and 2030, and planning and funding remain uncertain at this date.



Inner London Geography (Source: Arup; Basemap: GLA City in the West Plan)

The spatial view of infrastructure needs across London Central London

Strategic infrastructure projects in pipeline

Growth Enablers		
<p>The following projects are either currently under development or have secured funding and/or planning approval:</p> <ul style="list-style-type: none"> • Major underground station capacity improvements and congestion relief schemes (Bank, Victoria, Tottenham Court Road, Bond Street, Holborn, Camden Town, Old street) planned between 2017 and 2023 with secured funding and planning approvals. • A new pedestrian and cycle bridge between Rotherhithe and Canary Wharf will support active transport and north-south river connectivity for local movement. The bridge is funded and planned to be delivered between 2019 and 2022. • Brighton Mainline resilience programme between London, Gatwick and Brighton will support growth potential along the corridor. Detailed planning application has been submitted and funding is secured, the project is due to start in 2017 to be completed by 2020. 	<p>The following growth enabler projects remain aspirational at this date but would further support growth in the Central London area:</p> <ul style="list-style-type: none"> • Improvements works at Waterloo International Terminal and Platform 1-4 Works should allow additional rail capacity across London and the South East. Funding is secured but planning status uncertain, with completion by 2019 (started 2016). • Elephant and Castle capacity enhancement planned between 2017 and 2022 remain unfunded and uncertain planning status. • The re-opening of Camberwell Station on Thameslink remains uncertain, with a completion date planned by 2024 (start date uncertain) • Decking of A1261 & DLR corridors at Poplar would improve permeability in the area and is planned to start in 2021 (completion by 2030). Planning and funding remain uncertain at this date. • Isle of Dogs to North Greenwich River Crossing 	<ul style="list-style-type: none"> • There are 27 major housing projects in Central London growth corridor which will deliver in total over 19,500 units. • The majority of these (18) have funding secured and detailed planning approval, delivering 4,400 homes by 2020 and 4,500 by 2030. • Only one (42:Canada Water 3,500 units) remains aspirational at this date with no planning permission.

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Crossrail 1	Driver	5,001+	TfL	Under construction	Fully funded							
Crossrail 2	Driver	5,001+	TfL / Network Rail	Uncertain	Outline submitted							
High Speed 2 - Euston and OOC hub	Driver	501 - 1,000	HS2	Speculative	Uncertain							
Thameslink	Driver	5,001+	Network Rail	Secured	Detail approved							
Great Western Mainline rail electrification	Driver	1,001 - 5,000	Network Rail	Secured	Detail approved							
Bakerloo line extension (to Lewisham)	Driver	1,001 - 5,000	TfL	Uncertain	Uncertain							
Northern Line extension	Driver	501 - 1,000	TfL	Secured	Detail approved							
DLR extension into Central London - Bank to Euston	Driver	1,001 - 5,000	TfL	Uncertain	Uncertain							
River Crossing - Rotherhithe to Canary Wharf pedestrian/ cycle bridge	Enabler	101 - 250	TfL	Uncertain	Uncertain							
Poplar A1261 & DLR Decking over	Enabler	1,001 - 5,000	TfL	Speculative	Uncertain							
Station enhancement schemes (Central London)	Enabler	501 - 1,000	TfL	Uncertain (some Secured)	Uncertain							
Waterloo International Terminal & Platforms 1-4 Works	Enabler	251 - 500	Network Rail	Secured	Detail approved							
Elephant & Castle capacity enhancement	Enabler	0 - 100	TfL	Uncertain	No permission							
Brighton Mainline resilience (London – Gatwick – Brighton)	Enabler	251 - 500	DfT / Network Rail	Secured	Detailed submitted							
Re-opening of Camberwell Station	Enabler	0 - 100	TfL	Uncertain	Uncertain							
Isle of Dogs to North Greenwich River Crossing	Enabler	101 - 250	TfL	Uncertain	Uncertain							

ARUP

The spatial view of infrastructure needs across London
Central London

Strategic infrastructure projects in pipeline (cont.)

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
27: Former Battersea Power Station - Phase 1 Building Rs-1a (150+ units)	Enabler	251 - 500		Secured	Detail Approved							
48: 190 Strand - Flats Office & Retail (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
38: Centre Point Regeneration - Scheme A (1 to 150 units)	Enabler	251 - 500		Secured	Detail Approved							
33: Clarges Estate Redevelopment (1 to 150 units)	Enabler	100 - 250		Secured	Detail Approved							
18: Packington Estate Phases 3-6 (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
2: Aldgate Place - Housing Hotel And Retail (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
35: Lincoln Square - Westminster (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
52: 250 City Road - City Forum (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
51: Principal Place (150+ units)	Enabler	251 - 500		Secured	Detail Approved							
34: Canadian Embassy - Grosvenor Square - 44 Luxury Mansion Apartments (1 to 150 units)	Enabler	100 - 250		Secured	Detail Approved							
3: Spire London - Hertsmere House West India Quay (150+ units)	Enabler	500 - 1,000		Secured	Detail Approved							
23: London Shell Centre Redevelopment Masterplan (150+ units)	Enabler	251 - 500		Secured	Detail Approved							
6: Landmark Pinnacle (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
7: Westferry Printworks (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
50: Aylesbury Estate Regeneration - Phase 1 (150+ units)	Enabler	100 - 250		Secured	Detail Approved							

Strategic infrastructure projects in pipeline (cont.)

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
9: City Island Leamouth Peninsula North - Phase 1 - Buildings G H I J (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
26: Aykon Nine Elms - 360 Apartments (150+ units)	Enabler	100 - 250		Secured	Detail Approved							
43: 150 Bishopsgate Heron Plaza - 120 Flats/shops/public Plaza (150+ units)	Enabler	251 - 500		Secured	Detail Approved							
1: Whitechapel Central - 564 Flats (150+ units)	Enabler	100 - 250		Speculative	Detail Approved							
29: Nine Elms Parkside (150+ units)	Enabler	100 - 250		Uncertain	Detail Approved							
4: North Quay Poplar - Offices 1243 Flats Shops & Restaurants (150+ units)	Enabler	500 - 1,000		Uncertain	Detailed Submitted							
28: Battersea Power Station Site - Phase 3 - The High Street (150+ units)	Enabler	100 - 250		Uncertain	Detail Approved							
5: Chrisp Street Poplar - Redevelopment (150+ units)	Enabler	251 - 500		Uncertain	Detailed Submitted							
10: Glengall Quay (150+ units)	Enabler	100 - 250		Uncertain	Detailed Submitted							
22: Skipton House Redevelopment - Southwark (150+ units)	Enabler	251 - 500		Uncertain	Detail Approved							
8: 225 Marsh Wall Redevelopment - Madison Tower (150+ units)	Enabler	100 - 250		Uncertain	Detailed Submitted							
42: Canada Water - Mixed Development (150+ units)	Enabler	500 - 1,000		Uncertain	No Permission							

The spatial view of infrastructure needs across London Central London

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none"> • Central London is where the majority of opportunities for both population and employment growth are situated in London. The scale and variety of amenities within Central London mean that it is likely to remain the most attractive growth corridor for both residential and commercial development in the short to medium term. • Its development is being supported by significant investment in connectivity with Crossrail 1, Crossrail 2 and the Northern Line Extension. • Better planning of bus routes in order to alleviate road congestion in central London • Better use of active transport to support sustainable development 	<ul style="list-style-type: none"> • Low availability of land for development means increasing densification is likely • Public transport network is at capacity – it is anticipated that when Crossrail 1 opens its capacity will already have been used up by existing demand. However, Crossrail 2 is not scheduled to open until at least the early 2030s. Incremental capacity can be found on some underground lines (up to 36 per hour), however innovative solutions will be needed to support demand in the medium term. • The road network is critically congested, particularly in central London/Westminster • Digital infrastructure provision, particularly ultrafast broadband, has been identified as a disincentive to investment.

The spatial view of infrastructure needs across London Central London

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Significant investment in high-capacity rail infrastructure needed to support connectivity, including Crossrail 2, Thameslink, Northern and Bakerloo Line extensions, and HS2 Euston hub, in addition to several tube lines and stations enhancement schemes.	Secure funding for transformational projects as Crossrail 2 to keep improving Central London connectivity.
Bus	High	Incomplete Assessment	Under Conditions	High level of ongoing investment required to optimise bus services across the growth area and support the planned scale of development.	Bus strategy for key areas of growth as Nine Elms, Elephant & Castle, Old Kent Road, Canada Water, and City Fringe.
Highways	Medium	Incomplete Assessment	Under Conditions	Identified investment in highways and road network in major developments, key junctions and strategic pedestrian river crossings.	Highways strategy for projected growth.
Electricity	Low	Well Identified	Under Conditions	New substations and some decentralised energy strategies has been developed across the corridor. The GLA power model projects a demand increase of 45% for the corridor, with 48% of the substations at overcapacity by 2050.	Develop energy strategies for major areas of development.
Heat	Low	Incomplete Assessment	Under Conditions	National Grid has identified capacity constrains across the corridor, but needs and costs are not fully defined for the projected growth scenario.	Develop energy strategies for major areas of development.
Water Supply	High	Incomplete Assessment	Under Conditions	Thames Water has identified considerable water supply stress for the growth corridor, particularly in London Bridge and City Fringe OAs.	Water supply strategy for projected growth.
Water management	Medium	Incomplete Assessment	Under Conditions	Thames Water has projected medium utilisation of sewerage and drainage capacity towards 2050.	Water management strategy to improve flow capacity at City Fringe and Canada Water.
Flood risk*	High	Well Identified	In Progress	High flood risk along river Thames. Defences have been implemented.	
Waste	Low	Incomplete Assessment	Under Conditions	DIFs and other OAPF statutory documents have identified sufficient waste management capacity for the corridor.	Waste management and minimisation strategy for the growth corridor.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	High			68% of SFBB availability (see data caveats)	Support roll-out of SFBB
Digital – UFBB*	High			Only 3% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Low			Central London ranks in top third of growth corridors in terms of household access to open space.	N/A
Housing	High			Projected housing gap of around 38,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

Section 3

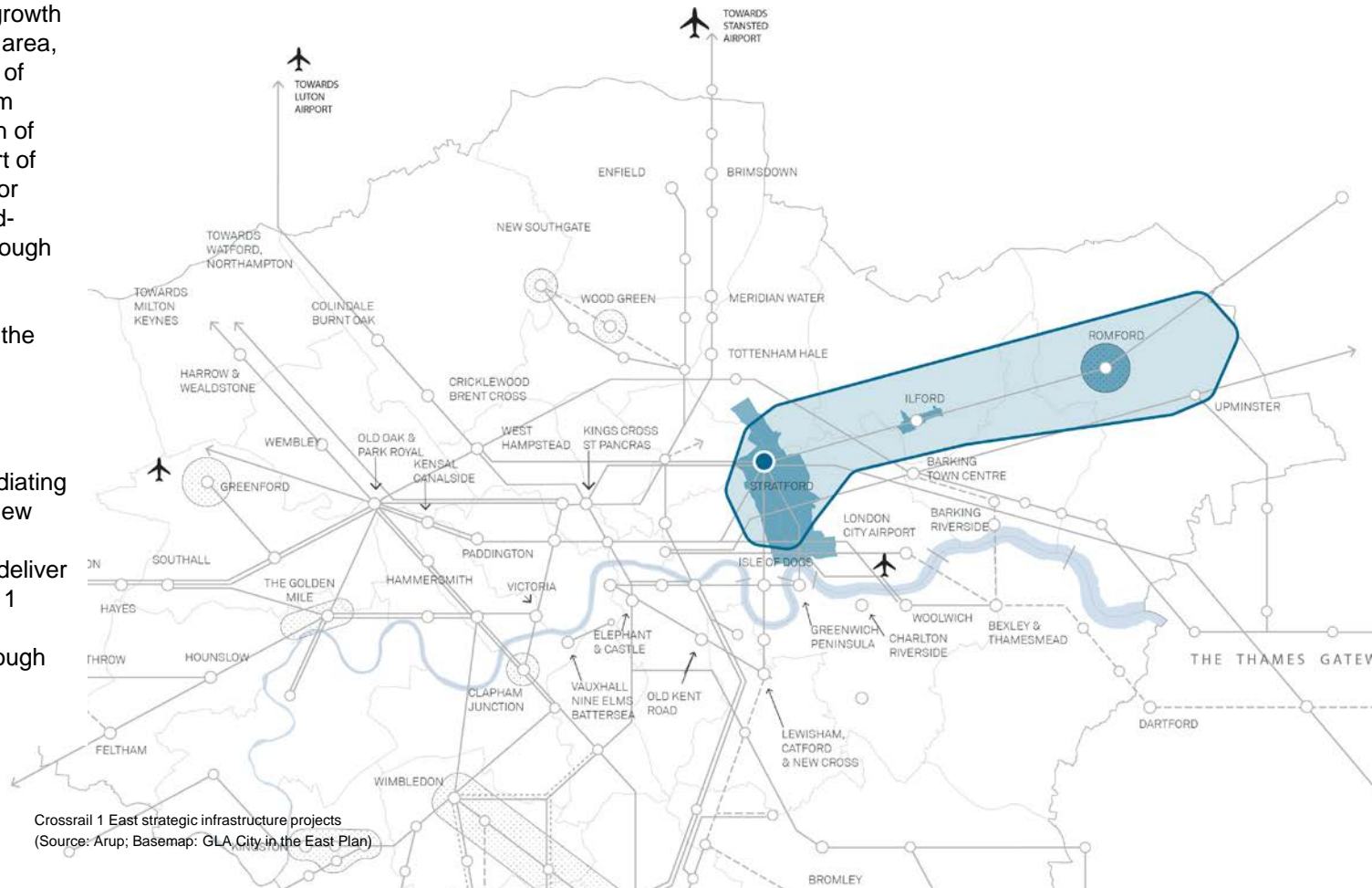
The spatial view of infrastructure needs across London

3.11 Crossrail 1 East

Crossrail 1 East

The Crossrail 1 East (C1E) growth corridor covers an extensive area, transcending the boundaries of seven London boroughs: from Hackney Wick in the borough of Hackney and the eastern part of Tower Hamlets, to the corridor defined by the Stratford-Ilford-Romford alignment going through Waltham Forest, Newham, Redbridge, Barking and Dagenham, and Havering to the east.

The Olympics held in 2012 generated an impetus for transformation in C1E; remediating industrial land and bringing new open spaces and social infrastructure appropriate to deliver change. Moreover, Crossrail 1 operation will bring forward development and growth through the corridor

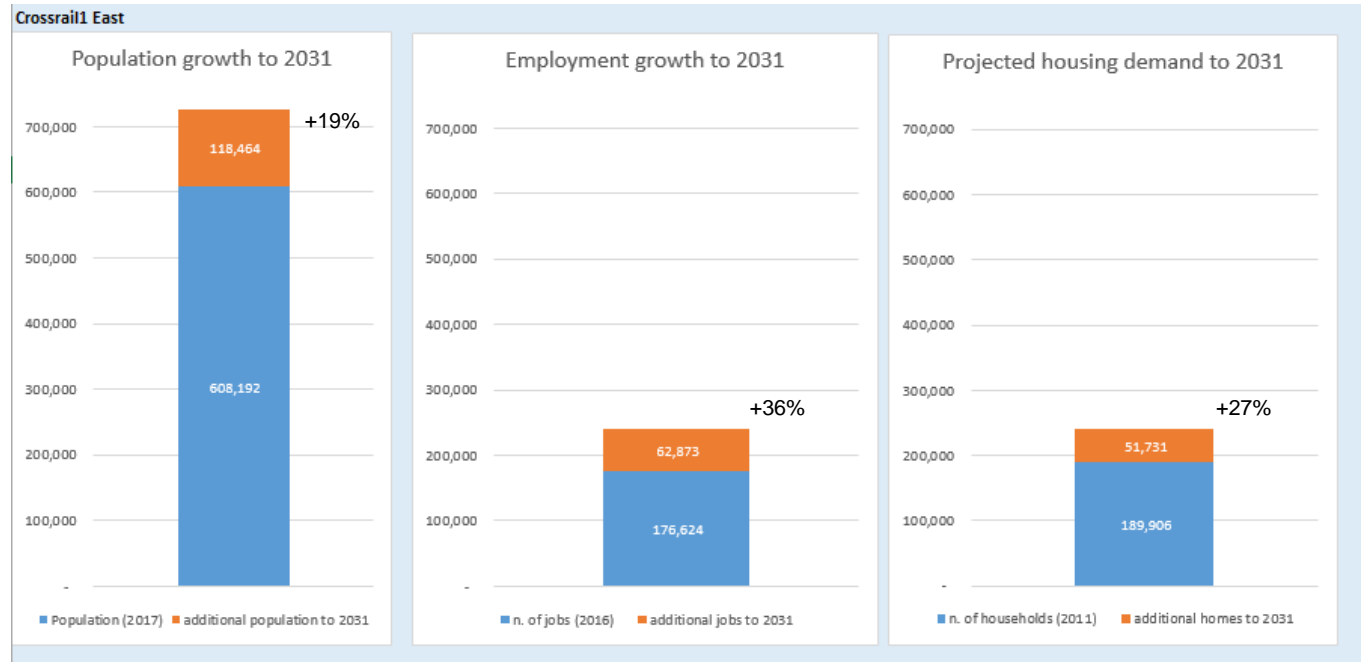


The spatial view of infrastructure needs across London Crossrail 1 East

Projected growth scenarios

The Crossrail 1 East growth corridor is projecting growth of 19% in population, 36% in employment and 88% in housing by 2031.

It currently ranks at the top of all growth corridors in terms of absolute population and employment growth; 3rd and 4th respectively.



Note:

Population projections come from available Development Infrastructure Funding studies (DIFs) and the GLA Datastore, for those MSOAs not considered in the DIFs. Baseline data is from the GLA Datastore.

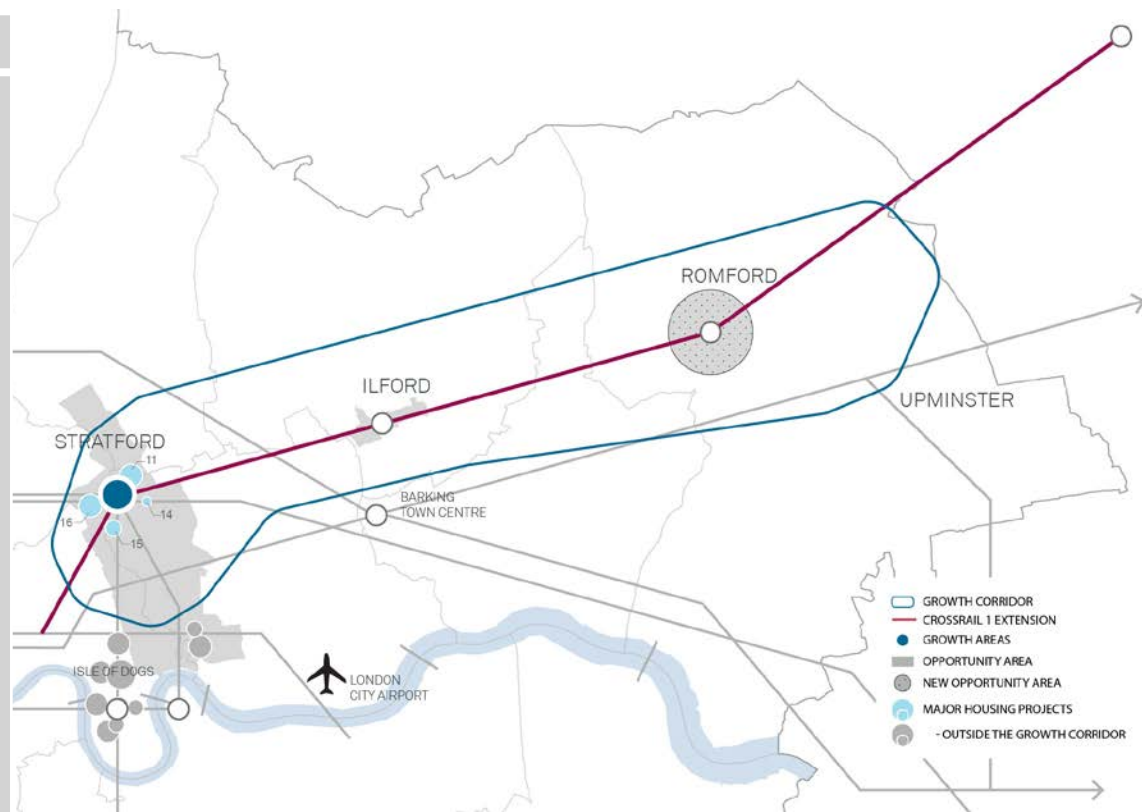
Employment projections come from Opportunity Areas (OAs) indicative jobs in the City in the East/City in the West planning documents, and the GLA Datastore for non-OA MSOAs. Baseline data is from the GLA Datastore.

Projected housing demand is based on population forecasts from the GLA. We considered additional population growth to 2031 by MSOA and applied a resident per dwelling factor of 2.29 to estimate the housing requirement. The baseline number of households is from Census 2011. See Appendix 2 for further details. These projections will be updated based on the 2017 SHLAA (anticipated to be released in late 2017).

The spatial view of infrastructure needs across London Crossrail 1 East

Strategic infrastructure projects in pipeline

Growth Drivers	Growth Enablers
<ul style="list-style-type: none"> Potential extension of an eastern branch to Crossrail 2 to Stratford, Ilford, Romford and beyond would further enhance connectivity across the corridor. Both funding and planning status are uncertain at this date, and estimated cost is £5 billion. 	<ul style="list-style-type: none"> Gospel Oak to Barking electrification will improve the Overground service and capacity at the western part of the corridor. Funding and detailed planning are secured, and the project due to completion by 2018 (start 2016). Four major housing projects located in Hackney and Stratford will deliver up to 900 new homes by 2021 and another 1,200 by 2030. The nearby Isle of Dogs hosts many other projects (see Central London).



Crossrail 1 East Geography (Source: Arup; Basemap: GLA City in the East Plan)

The spatial view of infrastructure needs across London Crossrail 1 East

Strategic infrastructure projects in pipeline

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Crossrail 1	Driver	5,001+	TfL	Under construction	Fully funded							
Extension of Crossrail 2 (Eastern Branch)	Driver	1,001 - 5,000	TfL / Network Rail	Uncertain	Uncertain							
Overground Barking to Gospel Oak electrification	Enabler	101 - 250	Network Rail	Secured	Detail approved							
A12 Leyton and Leytonstone key corridor decking	Enabler	251 - 500	TfL	Uncertain	Uncertain							
11: Stratford City East Village (150+ units)	Enabler	100 - 250		Uncertain	Detail Approved							
14: Strand East (150+ units)	Enabler	100 - 250		Uncertain	Detail Approved							
15: Glasshouse Gardens - The International Quarter (150+ units)	Enabler	251 - 500		Secured	Detail Approved							
16: Hackney Wick Central (150+ units)	Enabler	100 - 250		Uncertain	Outline Submitted							

The spatial view of infrastructure needs across London Crossrail 1 East

Strategic opportunities and challenges for growth

Strategic Opportunities for growth	Strategic Challenges for growth
<ul style="list-style-type: none"> • Available surplus industrial and under-used land in local town centres • The growth corridor is extremely well connected on a strategic level at the Lower Lea Valley OA. This will be further amplified with the arrival of Crossrail in 2018 • Potential of the public realm to be turned into a pleasant pedestrian environment bordered by waterways, in order to attract people and investments • Strong retail presence and clusters of creative industries; particularly at Three Mills. 	<ul style="list-style-type: none"> • Local access and connectivity varies considerably towards the east side of the study area. This issue will be overcome in part by Crossrail 1, however, further investment will be key to enhance local connectivity and unlock developments. • Waterways, railway lines and major roads offer strategic movement routes but often fragment the area and create permeability issues; most notably along the A12 or Newham's side of the river Lea which lack links to the riverside walk. • Provide leisure opportunities and social amenities for scale of growth. • Some contaminated land and disassembled sites will require high remediation costs to allow development to come forward.

The spatial view of infrastructure needs across London Crossrail 1 East

Assessment of strategic infrastructure needs

Category	Is there a significant need?	Are needs planned for?	Are projects deliverable?	Description	Priority action
Rail	High	Well Identified	Uncertain	Significant investment in rail infrastructure needed to support development and realised the economic potential of the area. Rail infrastructure includes Crossrail 1, Overground enhancements and a potential eastern branch of Crossrail 2.	Secure funding for Crossrail 2 eastern branch to further improve connectivity across the corridor.
Bus	Medium	Incomplete Assessment	Under Conditions	Projects identified to enhance the bus network and permeability around Stratford. Further connectivity improvements along Crossrail 1 are needed. Costs likely to be between £100-500m.	Bus strategy for Crossrail 1.
Highways	High	Incomplete Assessment	Under Conditions	Major road upgrades including A12 Leyton and Leytonstone corridor decking (£425m).	Secure funding for A12 decking.
Electricity	High	Incomplete Assessment	Under Conditions	Reinforcement needed to energy infrastructure. Substations limited capacity to meet projected demand at the Lower Lea Valley. The GLA power model projects a demand increase of 59% for the corridor, with 61% of the substations at overcapacity by 2050.	Energy strategy for projected growth.
Heat	High	Incomplete Assessment	Under Conditions	Needs are not fully defined for the projected growth scenario	Energy strategy for projected growth.
Water Supply	Medium	Incomplete Assessment	Under Conditions	Needs are not fully defined for the projected growth scenario	Water supply strategy for projected growth.
Water management	High	Incomplete Assessment	Uncertain	Thames Water has projected full utilisation of sewerage and drainage capacity towards 2050.	Water management strategy for projected growth at the Lower Lea Valley
Flood risk*	High	Well Identified	Under Conditions	High flood risk along the River Lea. Most of 'Flood 3' areas are defended.	Flooding infrastructure investment at undefended areas around Leyton.
Waste	Medium	Incomplete Assessment	Under Conditions	Needs are defined and projects identified.	Implement recycling and waste minimisation plans from the East London Waste Authority.
Digital – NGA*	Low			Above 90% NGA availability (see data caveats)	N/A
Digital – SFBB*	Medium			83% of SFBB availability (see data caveats)	Support roll-out of SFBB
Digital – UFBB*	High			11% UFBB availability in corridor at present (see data caveats)	Support roll-out of UFBB and/or support obtaining better data on UFBB provision
Open space	Medium			Crossrail 1 East ranks in middle range of growth corridors in terms of household access to open space.	Identify projects and secure funding for green and open space infrastructure across the growth corridor.
Housing	High			Projected housing gap of around 37,000 homes.	N/A

*Based on current data on supply of and demand for infrastructure – does not include future projections of demand for infrastructure and/or funding for that infrastructure

London's strategic infrastructure requirements – an evidence base for the London Plan

Section 4

The sectoral view of London's
infrastructure: strategic
opportunities and challenges

Strategic Infrastructure Investment Programme for London

4. The sectoral view of London's infrastructure: strategic opportunities and challenges

Introduction

In this section, we analyse the strategic opportunities and challenges for infrastructure, specifically related to its capacity to drive and enable growth, across London.

Within each infrastructure sector we have identified:

- The key cross-London strategic infrastructure projects in the pipeline
- Mayoral sector-specific priorities
- Challenges for the delivery of growth
- Opportunities for innovation

N.B. At present this analysis does not include the housing sector, but this may be added in a later version of the report.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.1 Rail infrastructure

Strategic cross-London projects and programmes

Growth Drivers	Growth Enablers
<p>There are three primary growth driver cross-London rail projects:</p> <p>Crossrail 2 is a major proposed north-south rail project, aimed at significantly increasing capacity on commuter rail routes into central London. It is proposed to connect the South Western Main Line to the West Anglia Main Line through central London. It is currently expected to open in 2033.</p> <p>HS2 is a major proposed national high-speed rail project, aimed to connect London to Birmingham in phase 1 and Birmingham to Manchester, Sheffield and Leeds. At present there are two stations planned within London – the terminus at Euston where it will link with Crossrail 2 and one at Old Oak Common where it will link with the London Overground, Crossrail 1 and the Underground. The completion of the Euston and OOC hub is proposed to be in 2025.</p> <p>The Thameslink programme is a major upgrade and expansion of the Thameslink rail network which includes a number of elements: lengthening platforms, refurbishing and remodelling stations, new track and infrastructure and new rolling stock. The project will deliver higher train frequency through the central London “core”. Completion of the programme is currently expected to be in 2018.</p>	<p>There are five primary growth enabler cross-London rail projects:</p> <p>The Intercity Express Programme (IEP) is a procurement programme for new trains on the East Coast Main Line and Great Western Main Line. The trains will enter into service in 2017 and 2018.</p> <p>New Tube for London is a programme planned to introduce 250 new trains and new signalling on many London Underground deep-tube lines between 2025 and 2033. Fully automated trains will increase capacity on Piccadilly, Central, Waterloo & City and Bakerloo lines.</p> <p>Four Lines Modernisation (4LM) is a single combined and integrated project on the Circle, Hammersmith & City, Metropolitan and District lines. The project includes: new rolling stock, new track and drainage and a new signalling system with subsequent upgrades to train frequencies from 2021.</p> <p>Upgrades to the Jubilee, Northern and Victoria Lines include new rolling stock, signalling, station refurbishment/remodelling and lift upgrades.</p> <p>Metro-isation is a proposal by the Mayor to devolve suburban and south eastern rail lines to TfL to improve capacity and services. This would include new rolling stock, integration of ticketing and information processes, more consistent stopping patterns, clearer routes and new interchanges, improvements to track, junctions and signalling to increase capacity, and station enhancements.</p>

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.1 Rail infrastructure

Strategic cross-London projects and programmes

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Major new rail infrastructure and rolling stock												
Crossrail 2	Driver	5,001+	TfL / Network Rail	Uncertain	Outline submitted							
HS2	Driver	5,001+	TfL / Network Rail	Uncertain	Outline submitted							
Thameslink	Driver	5,001+	Network Rail	Secured	Detail approved							
Intercity Express Programme	Enabler	5,001+	DfT	Secured	Detail approved							
Major rail upgrades and enhancements												
24/7 Night Tube	Enabler	251 - 500	TfL	Secured	Detail approved							
Four Lines Modernisation	Enabler	1,001 - 5,000		Secured	Detail approved							
New Tube for London	Enabler	1,001 - 5,000		Secured	Detail approved							
Upgrades to Victoria, Jubilee and Northern Lines	Enabler			Secured	Detail approved							
Major operations projects												
Metro-isation of suburban Southeastern & Southern rail	Enabler	1,001 - 5,000	TfL / Network Rail / DfT	Uncertain	Uncertain							

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.1 Rail infrastructure

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

The developing Mayor’s Transport Strategy includes three main priorities:

- “Good growth” – concentrating development density in places that are well connected by public transport, and integration of cycle and pedestrian infrastructure
- Integrated land use and transport planning
- A focus on improvements to the existing network – maximising capacity and efficiency

Challenges for the delivery of growth

Funding	<ul style="list-style-type: none"> • Funding – securing major capital investment for Crossrail 2 and HS2 will be a significant challenge
Infrastructure gap	<ul style="list-style-type: none"> • Many of the large rail projects planned for London, including Crossrail 2, are not planned to open until the early to mid 2030s. This means that interim projects are required to support growth and avoid car dependency in new developments.
Capacity constraint	<ul style="list-style-type: none"> • It is already anticipated by Transport for London that - on the day Crossrail 1 opens – its additional capacity will already be largely serving existing/latent demand. With an increasing modal shift to public transport expected, the GLA is currently predicting an estimated 50 per cent increase in public transport trips. Public transport use is expected to increase from 9.5 million trips a day in 2014 to 12.3 million a day by 2041 which will outstrip planned and proposed capacity increases. Crossrail 2, Bakerloo Line Extension and DLR Extensions and incremental Tube capacity upgrades will deliver additional capacity, however it is unclear whether these will be sufficient to meet increases in demand predicted for the 2030s, particularly in inner London. Due to the extended project development and planning process required for transformational transport investment, should we be considering the next major capacity upgrade sooner rather than later (ie now)?

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.1 Rail infrastructure

Mayoral priorities, challenges for delivery and opportunities for innovation

Opportunities for innovation

Funding	<ul style="list-style-type: none">• New value capture mechanisms to link infrastructure investment with property development and value increases• Fiscal devolution, as proposed by the London Finance Commission's recent report "Devolution: A Capital Idea" (January 2017) is required to support London's infrastructure ambitions.
Dual-use infrastructure	<ul style="list-style-type: none">• Rail corridors that also contain electricity networks, digital infrastructure or act as flood defences – a way of increasing synergies and reducing cost of infrastructure
Automation	<ul style="list-style-type: none">• Trains controlled by digital signalling systems are likely to be normal by 2030s, which makes possible closer headways between trains, enabling extra capacity to be provided.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.2 Highways

Strategic cross-London projects and programmes

Growth Enablers	Other – policy priorities and operational improvements
<p>There is one major cross-London growth enabler project:</p> <ul style="list-style-type: none"> • M25 Junction 10-Junction 16 Smart Motorway <p>The smart motorway scheme will relieve congestion by making the hard shoulder available for use by traffic. It will also use technology to monitor traffic levels, change speed limits, activate warning signs and close lanes. It is planned to start construction in 2020 but no end date is yet committed.</p>	<p>Other major strategic cross-London highways projects and programmes include:</p> <ul style="list-style-type: none"> • The ULEZ (Ultra-Low Emissions Zone); and • The Surface Intelligent Transport System (SITS) <p>The ULEZ is a 24/7 zone which will come into force in September 2020 – the standards are in addition to the Congestion Charge and the Low Emission Zone (LEZ) requirements. From September 2020 all cars, motorcycles, vans, minibuses, buses, coaches and HGVs will need to meet exhaust emissions standards or pay a daily charge when travelling in central London. There are also proposals to bring forward the central London ULEZ to 2019, and extend beyond central London from 2020.</p> <p>The SITS programme is a major upgrade of TfL’s operational models and systems which includes:</p> <ul style="list-style-type: none"> • a replacement of the Urban Traffic Control (UTC) system • An upgrade to LondonWorks – the system for coordinating road works and events to enable TfL to better coordinate road works and minimise disruption on the road network

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.2 Highways

Strategic cross-London projects

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
M25 improvements: Junction 10-16 Smart Motorway	Enabler	251 - 500	Highways England	Speculative	Uncertain							
Surface ITS	Enabler	101 - 250	TfL	Secured	Detail approved							
Ultra Low Emission Zones (ULEZ)	Enabler	101 - 250	TfL	Secured	Uncertain							

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.2 Highways

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

- One of the core principles of the new Mayor’s Transport Strategy (MTS) will be that the capacity of the road network will not grow, which means that car use must decline. The MTS will have a focus on car reduction strategies and densification of town centres and around stations in order to support sustainable transport.
- Other Mayoral priorities linked to highways infrastructure include:
 - Congestion: the London Assembly Transport Committee published “London Stalling” in January 2017 which includes recommendations on introducing new road pricing mechanisms reducing daytime deliveries and devolving vehicle excise duty to the Mayor.
 - Air quality: the main policy the Mayor has launched to tackle London’s poor air quality is the ULEZ. He is also developed the Mayor’s Air Quality Strategy to provide a framework for policy and management.

Challenges for the delivery of growth

Congestion	<ul style="list-style-type: none"> • Congestion in London continues to rise. It is the most congested city in Europe. Between 2012 and 2015 journey times in central London have increased by 12 per cent annually. However car traffic (including taxis and private hire vehicles) is decreasing. The main contributors are roadworks (increased 362 per cent from 2012-2015), and an increase in delivery vehicles in central London (8 per cent increase since 2012 in central London and close to 15 per cent in outer London).** • Congestion is a market failure and has first order/direct impacts in terms of the monetary value of time lost, and also second order/indirect impacts on productivity so it is a significant economic issue for London. • Traffic congestion on the road network is forecast to cost London £9.3 billion by 2030 • 90% of all freight in London is carried by road and demand for road-based freight activities is predicted to grow in the future. Growing popularity of e-commerce is expected to add to congestion with van trips in London projected to increase by 26% to 2031 (compared to 2011).
Road capacity	<ul style="list-style-type: none"> • Local road capacity in west London has been identified as a potential challenge for delivery of major projects such as the Heathrow 3rd runway and HS2. However, a major widening of the M25 risks being very contentious.
Air quality	<ul style="list-style-type: none"> • Improving air quality is a significant challenge for London, and much of the challenge will be met by road usage and a general move to electric and hybrid vehicles for public sector vehicle fleets.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.2 Highways

Mayoral priorities, challenges for delivery and opportunities for innovation

Opportunities for innovation

Tunnelling of major roads	<ul style="list-style-type: none"> • Tunnelling major roads (proposed in North and South Thames Gateway) – including the A406 in new Southgate, A1261 in Poplar
Improving efficiency of roadwork implementation	<ul style="list-style-type: none"> • SITS programme to improve efficiency of roadwork implementation
Improving efficiency of road usage	<ul style="list-style-type: none"> • Due to the Mayor’s priority of not increasing capacity of the road network – the emphasis will need to be on doing more with the same, or less. Systems upgrades such as the SITS will be important but there will also be a need for private sector innovation around construction logistics. • Connected and autonomous vehicles (CAVs) could add to road capacity, since they enable shorter driving and stopping distances between vehicles. However, there are also significant safety risks and perceptions of risks that will need to be overcome to support market penetration of these technologies.

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.3 Healthy Streets

Strategic cross-London projects and programmes

Growth Enablers

The **Cycling Vision programme** – a total budget of £900m from 2016-2022 – includes a number of different projects and programmes such as cycle superhighways, cycle hire, greenways, mini Hollands, quiet ways, rail superhubs and wayfinding improvements

The **Healthy Streets programme** is a £1.3 billion programme aimed at increasing walking, cycling and the use of public transport.

The **Transforming streets and places programme** is a £600m programme aimed at improving local streets and town centres including enhancing public realm, pedestrian environment and improved access to stations.

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.3 Healthy streets

Strategic cross-London projects

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Transforming Streets and Places	Enabler	501 - 1,000	TfL	Secured	Detail approved							
Healthy Streets	Enabler	1,001 - 5,000	TfL	Secured	No permission							
Cycling Vision Programme	Enabler	501 - 1,000	TfL	Speculative	No permission							

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.3 Healthy Streets

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

- The Mayor recently released his “Healthy Streets for London” strategy (February 2017) which places an emphasis on the importance of active transport in improving Londoners’ health outcomes. It makes the social and economic case for better pavement design, better designed public realm and open space, major investments in prioritising walking and cycling such as transformation of Oxford Street, and a new governance structure in the Healthy Streets Portfolio Board which will oversee investment and strategy.

Challenges for the delivery of growth

Safety and security	<ul style="list-style-type: none"> • Currently modal shares of active transport are low, and depressed due to perceived lack of safety and security – particularly in relation to cycling.
Road capacity	<ul style="list-style-type: none"> • Segregated cycling projects such as cycle superhighways take up space on already very overcrowded roads and therefore constrain capacity. This is a significant challenge for these projects, particularly as they tend to be vehemently opposed by local residents and vehicle-related interest groups.

Opportunities for innovation

Zero Emissions Networks	<ul style="list-style-type: none"> • Zero Emissions Network (Shoreditch) which includes: free trials of electric cars and cargo bikes
Policy initiatives	<ul style="list-style-type: none"> • The Mayor’s recent consultation on a “Direct Vision” standard for HGVs in London could improve perceptions of safety and therefore drive trips by cycling and walking

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.4 Electricity and heat

Strategic cross-London projects and programmes

Growth Enablers

The **London Power Tunnels** comprises a 32km electricity "super highway". This £1.3bn project will rewire the capital via deep underground tunnels, in order to meet increasing electricity demand.

UK Power Networks – London (LPN) RIIO

National Gas Grid Distribution London RIIO-GD1

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.4 Electricity and heat

Strategic cross-London projects and programmes

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
London Power Tunnels	Enabler	1,001 - 5,000	National Grid	Secured	Detail approved							
UK Power Networks - London (LPN) RIIO	Enabler	1,001 - 5,000	UKPN	Secured	Detail approved							
National Gas Grid Distribution (NGGD) London RIIO-GD1	Enabler	1,001 - 5,000	National Grid Gas Distribution (NGGD)	Secured	Detail approved							

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.4 Electricity and heat

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

The Mayor’s primary energy policy objectives are:

- For London to become a net zero carbon emission city by 2050, including decarbonisation of heating by 2050 (displacing gas).
- Encouraging and enabling Londoners to reduce their emissions from daily activities including tackling fuel poverty
- Using energy for building and transport more effectively including retrofitting homes and workplaces and more efficient public transport operation
- Facilitating an affordable, sustainable and secure energy system based on local energy sustainable generation by 2050
- Setting up London Energy Supply Company with the aim of addressing fuel poverty

More specific aims are to generate a significant proportion of London’s energy supply within the city, to generate more heat supply from electricity, a Solar Action Plan for London (with a focus on publicly-owned buildings), exploring the use of a DevCo model and a Licence Lite model.

Challenges for the delivery of growth

Electricity grid capacity	<ul style="list-style-type: none"> • There is a significant challenge related to whether the existing grid will be able to cope with new electricity demand and what reinforcement and mitigation strategies will be needed in the network. London is currently heavily reliant upon the national grid for electricity and for gas, and its supply is inextricably linked to national energy infrastructure and national energy policy. Therefore costs and security of supply challenges at the national level will directly affect London’s resilience and its customers, potentially exposing them to risks that are beyond the direct control of London’s authorities. • In general the London Infrastructure Plan 2050 estimated that London will require a 20 per cent increase in energy supply to 2050 unless significant demand reduction is realised through retrofit and/or user behaviour.
Generating more energy, locally	<ul style="list-style-type: none"> • There is no clear direction from the GLA on which should be the energy supply matrix to generate 25% of London energy requirements. The Solar action plan will support this, but this is still a small proportion of the supply. Increase in District Heating Networks will provide most of the decentralised resources but identifying and then delivering networks remains a challenge. Need to define milestones and metric to review over time.
Trade-offs between zero carbon policies and supply capacity	<ul style="list-style-type: none"> • Electric heat pumps are being prioritised to replace gas boilers in order to deliver zero carbon heat, however they may not be the most efficient technology and a wholesale switch will put a significant amount of pressure on the grid capacity.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.4 Electricity and heat

Mayoral priorities, challenges for delivery and opportunities for innovation

Opportunities for innovation

DevCo model or alternative fit for purpose model	<ul style="list-style-type: none"> GLA is exploring the use of a DevCo model to provide and manage investment in electricity distribution infrastructure which would reduce developer and investor risk in investing ahead of need
Licence Lite model	<ul style="list-style-type: none"> GLA is exploring a Licence Lite model which involves the GLA obtaining a junior electricity supply licence whereby it can purchase output from low and zero carbon electricity generators and supply the electricity produced to public and commercial electricity users in London.
Integrated energy strategies	<ul style="list-style-type: none"> Develop a framework and implement integrated energy strategies in all new developments and major refurbishment projects in order to reduce demand on the grid and create a more sustainable and self-sufficient system.
Smart grid	<ul style="list-style-type: none"> Move towards a zero carbon and ‘smart’ electricity grid able to accommodate decentralised electricity generation at all scales and in coordination with national energy policy – intermittent wind generation at the national scale, and manage demand associated with electric vehicles, heating, and energy hungry locations at vulnerable points on the network.
District heating	<ul style="list-style-type: none"> District heating to connect buildings in dense areas and areas not suited to building-scale heat pumps.
Integrated provision of infrastructure	<ul style="list-style-type: none"> Agglomeration of schemes and infrastructure solutions could be an important way for DNOs and suppliers to efficiently reinforce an area, rather than following a development-by-development approach. Within developments, there is the example of Nine Elms which has a linear park along which major utilities are provided and has supported a “dig once” approach.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.5 Waste

Strategic cross-London projects and programmes

Growth Enablers	Other – policy priorities and operational improvements
<p>The Beddington Energy Recovery Facility is a £191 million investment which will reduce the amount of waste the South London Waste Partnership is depositing in landfill. It is estimated that the plant will reduce CO2 emissions by 128,000 tonnes per year.</p>	<p>The LWARB Advance London programme supports circular economy by investing – alongside private sector partners – in businesses looking to develop and maximise impact of circular business models. Through tailored investment programmes, Advance London will aim to catalyse private sector engagement in the circular economy and fund innovative waste management infrastructure and solutions for London. The programme includes an Accelerator/Incubator that will provide an holistic support package (training, mentoring and funding) for start-ups operating in the circular economy sector.</p> <p>In addition, the programme will comprise the London Green Fund II which targets, in a co-investment model with the private sector, investment into up to 50 high growth early stage circular economy businesses capable of support the Mayor’s manifesto commitments. The Advance London programme has a budget of £39 million for the period 2017-2020 (£20.7 million will come from external partners).</p> <p>The London Waste Authority Support Programme helps London Waste Authorities in the implementation of more consistent and efficient waste management services, aiming to divert materials from landfill, increase recycling rates and maximise the income generated. It has a £7.5 million budget to 2020.</p>

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.5 Waste

Strategic cross-London projects and programmes

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
London Waste Authority Support Programme	Enabler	0 - 100	LWARB	Secured	Detail approved							
LWARB Advance London Programme	Enabler	0 - 100	LWARB	Speculative	Detail approved							
Beddington Energy Recovery Facility	Enabler	101 - 250	South London Waste Partnership	Secured	Detail approved							

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.5 Waste management

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

- Increase the amount of avoidable waste that is collected for recycling so that we get back on track to hit 65% of municipal waste by 2030 – 70% at the moment.
- Ensure all waste management activities contribute to the delivery of a zero carbon city by 2050.
- Create jobs in reuse, repair, remanufacturing and materials innovation.
- Moving London towards circular economy principles.
- Collaborate with other cities through international networks to develop innovative solutions to the challenge of tackling climate change and other environmental challenges cities like London face.
- Updated London Plan waste model estimates 4 million tonnes extra capacity needed for London. **GLA to list priorities; in particular around capacity gap.**

Challenges for the delivery of growth

Waste management capacity	<ul style="list-style-type: none"> • Increasing capacity gap across London. • Challenge to deliver waste management capacity to cope projected growth – 4 million additional tonnes.
Waste management uncertainties	<ul style="list-style-type: none"> • Barriers to investment – increasing land costs, planning constraints, and waste commodity price fluctuations. • Waste crosses boundaries often going to cheapest solution outside London where there is cheaper land. This provides financial risk/uncertainty. • Waste infrastructure can be a high risk investment unless you have a vertically integrated supply chain e.g. plastic recycling and AD facilities.
Waste sites	<ul style="list-style-type: none"> • Increasing pressure on waste sites to accommodate London's population growth - the London Waste map highlights the tension between waste sites located on HZs and OAs and planned housing development. • 65% of London’s waste goes through OAs and 100% of incineration plants are within OAs boundaries. • The Mayor is not a waste planning authority and can't designate/identify land for waste and CE. London Plan apportionment policy under revision at the moment to decide which parts of London have new treatment capacity.
Transition to a Circular Economy	<ul style="list-style-type: none"> • It will require a multitude of industries, from financial and manufacturing.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.5 Waste management

Mayoral priorities, challenges for delivery and opportunities for innovation

Opportunities for innovation

Circular Economy	<ul style="list-style-type: none"> • Opportunities for waste reduction through accelerating a circular economy approach in London. • Work with waste infrastructure providers on how they will contribute to a London with a more circular economy. • Engage financial institutions on circular economy investment opportunities • Contribute to the delivery of LWARBs circular economy route map – e.g. Edmonton incinerator.
Capacity gap	<ul style="list-style-type: none"> • GLA to identify measures from ES – besides CE – to address the capacity gap. • Areas identified with significant waste facility capacity and land availability: <ul style="list-style-type: none"> - Lea Valley: industrial land availability - Tramlink: Beddington plant and existing industrial land. - Thames Gateway: industrial land availability. - Old Kent Road – Veolia plant. - Heathrow: land availability.
Waste collection efficiency	<ul style="list-style-type: none"> • Implement integrated waste collection approach. • Coordination and permissions between waste authorities is crucial to realise efficiency.

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.6 Water

Strategic cross-London projects and programmes

Growth Enablers

The London Sustainable Drainage Action Plan sets a long-term strategy to manage rainwater sustainably and to reduce flood risk. Through **Sustainable Urban Drainage**, the ambition is to achieve a 1% reduction in surface water flows in the sewer network each year until 2040. Based on the estimates from the *London Infrastructure Plan 2050*, the scheme will have a cost of around £5bn (2014 prices).

The **Thames Tideway Tunnel** (£4.5bn) is a 25km long tunnel which goes across London, under the river Thames. It will provide capture, storage and conveyance of raw sewage and rainwater that currently overflows into the river.

The **Thames Estuary Asset Management Programme** (TEAM2100) provides plan to defend London and the Thames Estuary from tidal flooding to the year 2100.

The **River Thames Scheme** aims to reduce flood risk in London by increasing the capacity of the river Thames between Datchet and Teddington. The scheme has an estimated cost of £120 million.

The **Flood and Coastal Erosion Risk Management Schemes (FCERM)** will invest in more than 1,500 projects to reduce risk of flooding and costal erosion across England. The National Infrastructure Commission project pipeline identifies £120 million investment for London related projects.

Thames Water has an ongoing investment programme (£4.6bn) for maintenance and improvements of wastewater and water supply infrastructure between 2015 and 2020.

Thames Water is currently considering four main options for major supply reinforcement including: an effluent reuse plant, desalination, a transfer from the River Severn and the Upper Thames Reservoir

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.6 Water

Strategic cross-London projects and programmes

Project	Driver / Enabler	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
						2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Implementation of SuDs measures across London	Enabler	1,001 - 5,000	Thames Water / London Councils / Environment Agency	Speculative	Uncertain							
Thames Tideway Tunnel	Enabler	1,001 - 5,000	Bazalgette Tunnel Ltd (also trading as 'Tideway')	Secured	Detail approved							
Thames Estuary Asset Management Programme (TEAM2100)	Enabler	251 - 500	Environment Agency	Secured	Detail approved							
Environment Agency River Thames Scheme : Datchet to Teddington - Capacity Improvements and Flood Channel	Enabler	101 - 250	Environment Agency	Secured	Uncertain							
Flood and Coastal Erosion Risk Management (FCERM) Construction Programme - London	Enabler	101 - 250	Environment Agency	Secured	Uncertain							
Thames Water: >Sewage Service AMP6 >Water Service AMP6 >Smart meter programme	Enabler	1,001 - 5,000	Thames Water	Secured	Detail approved							

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.6.1 Water supply – potable and non-potable

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

- The Draft London Environment Strategy aim is for water to be managed in an integrated way to manage the impacts of water pollution, flooding and resource pressures to the benefit of Londoners and the environment.
- This may lead to explicit support of Integrated Water Management Strategies for major new developments.

Challenges for the delivery of growth

Water supply capacity	<ul style="list-style-type: none"> • Currently all water companies in London - Thames Water (supplies 76% of London’s water), Affinity Water (14%), Essex and Suffolk (7%) and Sutton and East Surrey (4%) - are rated “serious” in terms of water stress and are designated “areas of serious water stress” by the Environment Agency. • Thames Water projects a 6% capacity deficit by 2020 (could be up to 30% by 2050).
Water demand increases	<ul style="list-style-type: none"> • Population growth and a reduction in average household sizes means growth in water supply will be required unless demand management activity is significantly increased.
London-wide resilience issues	<ul style="list-style-type: none"> • Aged infrastructure – large proportion of the pipe network is over 100 years old and there is a high leakage rate. • Retrofitting meters imply major challenges for implementation, particularly in flats.
Difficulty of separating demand and supply based on GLA boundaries	<ul style="list-style-type: none"> • Interaction with boroughs immediately outside the GLA boundaries is very important to understand demand and management issues.
Funding mechanisms	<ul style="list-style-type: none"> • Water companies concentrate expenditures on a 5 year cycle – issues in delivering supply for the long-term based on a short cycle. • Water companies have constraints on what they can charge customers. • Most of their funding comes through asset management plans.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.6.1 Water supply – potable and non-potable

Mayoral priorities, challenges for delivery and opportunities for innovation

Opportunities for innovation

Integrated Water Management strategies	<ul style="list-style-type: none"> • IWMS for major developments could be a way of ensuring the water supply and management is planned in an integrated way. It is likely to be a more viable solution if it has a compound effect for a number of developments across a growth corridor.
Water management and resources	<ul style="list-style-type: none"> • Actively promote demand management measures to reduce leakages and improve efficiency across London – e.g. smart meters, recycling wastewater for non-potable supply (certain issues around re-using – provenance and future use of recycled water). • After demand management and leakages are maximised, all water companies in the SE must coordinate to guaranty an efficient utilisation of resources and agree the most suitable supply source for the future.
Affordability	<ul style="list-style-type: none"> • Increase supply within regulatory framework specified by OFWAT which prescribes resilience as a priority, allowing more innovative solutions.
Retail sector competition	<ul style="list-style-type: none"> • From 2017, non-residential water users will be allowed to sell water surpluses and become small providers. • Potential for multi-utility companies that could add competition and innovation to the market.
Utilities coordination	<ul style="list-style-type: none"> • Opportunities around cross-sector utilities coordination to increase cost-efficiency and reduce road disruptions.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.6.2 Water management – stormwater, foul water and flood risk

Mayoral priorities, challenges for delivery and opportunities for innovation

Mayoral sector-specific priorities

- More extreme weather conditions and climate events will increase strain on the drainage system of the city. London’s Sustainable Drainage Action Plan aimed at increasing delivery of sustainable drainage systems through retrofitting.
- Tidal flood risk (esp. in Thames Gateway) – TE2100 (Thames Estuary 2100) plan to maintain protection along the Thames Estuary.
- Fluvial flood risk - future policy is likely to focus on ensuring the EA prioritise fluvial flood risk measures for London
- Surface water SuDs – strategic implementation of SuDs over a wider catchment and link this infrastructure into the London Action Plan e.g. Lee Valley pilot linking SuDs, tidal and fluvial flooding.
- Groundwater flooding – infrastructure have been deployed in Clapham Junction and Croydon
- Water management policies – additional sewerage treatment and drainage capacity needed across London.

Challenges for the delivery of growth

Network capacity	<ul style="list-style-type: none"> • London’s projected population growth to 2050 will challenge the capacity of drainage and sewerage network. Based on Thames Water’s model (*) of flow capacity utilisation, several growth corridors across the city will not have sufficient capacity to manage the expected flows. • The Thames Tideway Tunnel project will address current problems of combined sewer overflows into the Thames but will not increase capacity of the network. • Treatment capacity (five main treatment works) will need upgrading during the next 20 years.
Funding	<ul style="list-style-type: none"> • Challenges around securing funding for fluvial and surface water. For example, SuDs programme is funded until 2021 and its extension is subject to evaluation. • Potential of partnership contributions as funding mechanism.
Coordination beyond GLA boundaries	<ul style="list-style-type: none"> • Cross-boundaries water management plans to extend catchment and include boroughs outside the GLA boundary. • The Environment Agency and the GLA are working together in relation to water management, flood risk interventions, and land/sites safeguarding.

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.6.2 Water management – stormwater, foul water and flood risk

Mayoral priorities, challenges for delivery and opportunities for innovation

Opportunities for innovation

Flood risk	<ul style="list-style-type: none">• Natural flood management which can provide multiple societal benefits alongside reducing flood risk. Assessment of opportunities at a river basin/catchment scale is required.• Opportunity to develop long-term (25 year) flooding plans looking at challenges, solutions and high-level costs of flood infrastructure across London – e.g. Lea Valley pilot plan.
Cross-sector synergies	<ul style="list-style-type: none">• Identify synergies between sectors that will help to optimise investments and improve capacity and performance – e.g. coordinated solutions that make use of existing and planned green infrastructure.

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.7 Digital

Strategic cross-London projects and programmes

Growth Enablers

The projects that are currently being supported include:

- The 5G Innovation Gateway with 5G Innovation Centres
- Public building Wi-Fi scheme
- Wi-Fi in stations.

However, these are not considered to be major strategic projects.

The major strategic projects that are planned to support digital infrastructure across London include:

- Virgin Media's ultrafast broadband network (£3 billion across the UK)
- BT's ultrafast broadband network (£6 billion across UK)
- London Underground 4G network (in planning)
- TfL connectivity plan (in planning)
- 4G upgrades likely due to emergency services usage (moving off airwaves) and Home Office usage for public safety

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.7 Digital

Sector-specific priorities

The Digital sector is perhaps the most challenging sector to plan infrastructure for in the medium term due to the fast pace of its development. At present, planning has started for "5G" or fifth-generation mobile communication technologies, but with an average five year length of "generations," we could have another two or more by the mid 2030s. UK Government recently published a strategy for "Next Generation Mobile Technologies: A 5G strategy for the UK" in March 2017 – but definitive standards for 5G are not set to be agreed until 2019.

5G is proposed to support a number of different "use cases" which could transform the form and functions of London's infrastructure including: connected vehicles, the usage of drones for logistics and maintenance and smart cities applications like traffic management, street lighting controls, smart grids and waste management.

In the LSIR we have focused on two main priorities which are primarily related to the infrastructure itself i.e. the provision of connectivity, rather than focusing on particular use cases of 5G for example:

1. **Getting the "basics" right for households and businesses** i.e. ensuring that there is close to 100 per cent coverage of 4G across London (indoor and outdoor), and close to 100 per cent coverage of superfast broadband (over 24 Mbps). It is acknowledged that some categories of business (particularly large companies) have very different needs to SMEs or home users. Therefore, the general principle that the GLA is likely to adopt is that all households and businesses should be able to access the connectivity service that best fits their needs wherever they are in London.
2. **Supporting future access by households and businesses** by considering key opportunities and challenges to the delivery of infrastructure i.e. access to ultrafast broadband of at least 100Mbps (whether by Fibre to the Property – FTTP or other means), next generation "5G" mobile access to the internet from close to 100 per cent of London (indoor and outdoor)

4 The sectoral view of London's infrastructure: strategic opportunities and challenges

4.7 Digital

Strategic cross-London projects and programmes

There are currently no major strategic projects that are dedicated to improving London's connectivity.

There are major projects at a UK-scale including:

- Virgin Media's ultrafast broadband network (at a cost of £3billion across the UK)
- British Telecom's ultrafast broadband network (at a cost of £6 billion across the UK)

There are also some small scale projects that are being facilitated by the GLA and Transport for London including:

- The 5G Innovation Gateway and 5G Innovation Centres
- The Public building Wi-Fi scheme
- London Underground's 4G network (in planning)
- TfL's connectivity plan (in planning)

It is likely that the coverage of 4G will improve in London due to the emergency services moving off airwaves and Home Office usage to monitor public safety.

However, the GLA could help to facilitate improvement of London's digital connectivity through:

- Working with Boroughs to facilitate the use of street furniture as nodes for improving mobile connectivity
- Including policy guidance in the London Plan on digital infrastructure particularly enabling better use of public buildings to enable connectivity and avoiding new developments blocking digital signals
- Encouraging the use of shared ducts in new developments

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.7 Digital

Challenges for delivery of growth

	Challenges
Getting the “basics” right	<ul style="list-style-type: none"> • London currently ranks poorly on the European Digital City Index 2016 – 42 out of 60 cities and below many of its competitors including Paris, Barcelona, Amsterdam and Stockholm. It ranks particularly poorly for internet download/upload speed (44/60), mobile internet download/upload speed (45/60) and ranks last in terms of availability of fibre internet (60/60). • Main tools to support infrastructure roll-out are at national government level such as UK Government’s support of Virgin’s Ultra-fast Broadband scheme through the UK Guarantees scheme, and at the regulatory (OFCOM) level. Other issues are supra-national such as European State aid regulation which affects how much fiscal support UK government can give to this sector (even post-Brexit it is likely UK will need to retain a lot of the constraints to maintain a level-playing field). • Due to industry investment cycles, digital infrastructure is not “future-proofed” i.e. providers do not invest ahead of demand. • Improving 4G coverage across London, particularly central London (although evidence is not available at present)
Supporting future access	<ul style="list-style-type: none"> • Many of the future “use cases” identified for 5G will involve a significant amount of street-furniture including sensors, charging points etc. In general a much greater densification of nodes is necessary. Main issue is how to cope with and facilitate densification of infrastructure including mobile base stations, small cells, and fibre • There are significant challenges involved in installing small-cell sensors which include fragmented ownership of street furniture (street lights, advertising billboards etc.) and difficulties in securing planning permission for new street furniture including sensors • There is a challenge involved in the data that is available from OFCOM to understand broadband provision across London. At present OFCOM only presents data based on BT and Virgin provision, and does not include a number of the other fibre providers that are currently providing FTTP connections across London such as Hyperoptic and Venus Fibre. Other providers such as Optimity provide access to an ultra-fast network using wireless technology (fixed wireless access). This means that the ultra-fast broadband availability data from OFCOM is not an accurate portrayal and therefore it is challenging for the GLA to understand the true picture of availability across London.

4 The sectoral view of London’s infrastructure: strategic opportunities and challenges

4.7 Digital

Opportunities for innovation

	Opportunities
Getting basics right	<ul style="list-style-type: none"> • Making it as transparent as possible for the private sector to invest in London such as having information on which assets are available for the private sector to install their infrastructure • Tackling information failures about alternatives to standard FTTP fibre connections such as point-to-point fixed access wireless. These technologies are very quick to set-up and can provide an equivalent service to UFBB. They can be used as “last mile” technologies to facilitate connections to businesses in areas which have poor FTTP provision or where it is more challenging to implement FTTP.
Supporting future access	<ul style="list-style-type: none"> • Innovative approaches to planning for street works and street furniture. GLA could support by mapping out small cell planning availability which will support the private sector in their investment programmes. At present many local authorities do not have this information. • The GLA could use the London Plan to provide an overarching view of what should be enabled in terms of the densification of nodes. • The GLA could support fibre provision by ensuring that every time there are development works, there is a duct installed which enables fibre to be installed by various providers at a later date. The GLA could then keep mapping information of duct locations and enter into arrangements with providers whereby they can provide fibre to an entire network using the available ducts. An example of where this has been done previously is in the Olympic Park whereby ducting was installed across the area so that any provider could use it to run their cabling.

London's strategic infrastructure requirements – an evidence base for the London Plan

Appendix 1 Strategic infrastructure projects and current programme

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline							
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	
Crossrail 2	Driver	Transport	N/A	2033	5,001+	TfL / Network Rail	Uncertain	Outline submitted								
High Speed 2 - Euston and OOC hub	Driver	Transport	2021	2025	501 - 1,000	HS2	Speculative	Uncertain								
Thameslink	Driver	Transport	2009	2018	5,001+	Network Rail	Secured	Detail approved								
Extension of Crossrail 2 (Eastern Branch)	Driver	Transport	2020	2040	1,001 - 5,000	TfL / Network Rail	Uncertain	Uncertain								
Four tracking to Broxbourne	Driver	Transport	2017	2025	501 - 1,000	Network Rail	Uncertain	Outline submitted								
Extension of Crossrail 1 from Abbey Wood to Slade Green	Driver	Transport	2020	2024	501 - 1,000	TfL / Network Rail	Speculative	Uncertain								
Extension of Crossrail 1 - Slade Green to Gravesend	Driver	Transport	2029	2035	1,001 - 5,000	TfL / Network Rail	Uncertain	Uncertain								
Great Western Mainline rail electrification	Driver	Transport	2011	2024	1,001 - 5,000	Network Rail	Secured	Detail approved								
Bakerloo line extension (to Lewisham)	Driver	Transport	2023	2029	1,001 - 5,000	TfL	Uncertain	Uncertain								
Northern Line extension	Driver	Transport	2015	2020	501 - 1,000	TfL	Secured	Detail approved								
Proposed Tramlink extension to Sutton	Driver	Transport	2025	2030	251 - 500	TfL	Uncertain	Uncertain								
DLR extension into Central London - Bank to Euston	Driver	Transport	2025	2030	1,001 - 5,000	TfL	Uncertain	Uncertain								
DLR Beckton branch extension to Thamesmead	Driver	Transport	2019	2023	101 - 250	TfL	Uncertain	Uncertain								
STAR (Stratford - Angel Road)	Driver	Transport	2017	2019	0 - 100	Network Rail	Secured	Detail approved								
London Overground Barking to Barking Riverside extension	Driver	Transport	2018	2022	251 - 500	TfL	Secured	Detail approved								
Old Oak Common Overground Stations x 2	Driver	Transport	2023	2036	251 - 500	TfL / HS2	Speculative	Uncertain								
Bakerloo line extension Phase 2 (beyond Lewisham)	Driver	Transport	2025	2030	251 - 500	TfL	Uncertain	Uncertain								
Crossrail 1	Driver	Transport	2009	2019	5,001+	TfL	Secured	Detail approved								
London Power Tunnels	Enabler	Energy	2015	2028	1,001 - 5,000	National Grid	Secured	Detail approved								
5G connectivity (5g innovation gateway with 5G innovation centre): >Ultrafast broadband to SMEs >Public building Wi-Fi scheme >WIFI in stations	Enabler	Digital	N/A	N/A	0 - 100	GLA	Speculative	No permission								
UK Power Networks - London (LPN) RII0	Enabler	Energy	2015	2023	1,001 - 5,000	UKPN	Secured	Detail approved								
National Gas Grid Distribution (NGGD) London RII0-GD1	Enabler	Energy	2013	2021	1,001 - 5,000	National Grid Gas Distribution (NGGD)	Secured	Detail approved								

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Ultra Low Emission Zones (ULEZ)	Enabler	Transport	2018	2020	101 - 250	TfL	Secured	Uncertain							
London Tube sustaining schemes: >Full 24/7 Night Tube service >Air con on the tube >Customer Experience investment	Enabler	Transport	2016	2021	1,001 - 5,000	TfL	Secured	Outline submitted							
Intercity Express Programme	Enabler	Transport	2009	2020	5,001+	DfT	Secured	Detail approved							
River Crossing - Rotherhithe to Canary Wharf pedestrian/ cycle bridge	Enabler	Transport	2019	2022	101 - 250	TfL	Uncertain	Uncertain							
Poplar A1261 & DLR Decking over	Enabler	Transport	2021	2030	1,001 - 5,000	TfL	Speculative	Uncertain							
Silvertown Tunnel	Enabler	Transport	2018	2023	501 - 1,000	TfL	Speculative	Outline submitted							
River Crossing - Gallions Reach	Enabler	Transport	2025	2050	501 - 1,000	TfL	Uncertain	Uncertain							
River Crossing - Belvedere to Rainham	Enabler	Transport	2025	2050	501 - 1,000	TfL	Uncertain	Uncertain							
A13 Riverside Tunnel & rail station at Renwick Road	Enabler	Transport	2021	2030	1,001 - 5,000	TfL	Uncertain	Uncertain							
London Tube enhancements: >Modernisation of the Circle, District, Hammersmith & City and Metropolitan lines (Four Lines Modernisation) >Deep Tube upgrade programme (New Tube For London) >Upgrades to Victoria, Jubilee and Northern Lines >Fleet and signalling renewals >Station step-free access	Enabler	Transport	2017	2022	1,001 - 5,000	TfL	Secured	Detail approved							
Key corridor decking and tunnel schemes (A4 Hammersmith and A40 Savoy Circus to Gypsy Corner)	Enabler	Transport	2023	2031	1,001 - 5,000	TfL	Uncertain	Uncertain							
Metro-isation of suburban Southeastern & Southern rail	Enabler	Transport	2022	2028	1,001 - 5,000	TfL / Network Rail / DfT	Uncertain	Uncertain							
Cycling Vision Programme	Enabler	Transport	2013	2022	501 - 1,000	TfL	Speculative	No permission							
Healthy Streets	Enabler	Transport	2017	2022	1,001 - 5,000	TfL	Secured	No permission							
Transforming Streets and Places	Enabler	Transport	2017	2022	501 - 1,000	TfL	Secured	Detail approved							
Station enhancement schemes (Central London): >Bank Station capacity upgrade >Major station upgrades (including Victoria, Tottenham Court Road, Bond Street and Bank) >Victoria Station >Holborn Tube Station redevelopment >Camden Town station redevelopment >Old Street Station capacity enhancement	Enabler	Transport	2017	2023	501 - 1,000	TfL	Uncertain	Uncertain							
Waterloo International Terminal & Platforms 1-4 Works	Enabler	Transport	2016	2019	251 - 500	Network Rail	Secured	Detail approved							
Enhancements to existing DLR capacity (30tph), new trains & depot	Enabler	Transport	2017	2037	501 - 1,000	TfL	Speculative	Uncertain							
M25 improvements: Junction 10-16 Smart Motorway	Enabler	Transport	2020	2025	251 - 500	Highways England	Speculative	Uncertain							
London Bus - Network Performance & Safety	Enabler	Transport	2015	2020	101 - 250	TfL	Secured	Detail approved							
M23 Junctions 8 to 10 Smart Motorway	Enabler	Transport	2021	2022	101 - 250	Highways England	Secured	Detail approved							
Overground Barking to Gospel Oak electrification	Enabler	Transport	2016	2018	101 - 250	Network Rail	Secured	Detail approved							

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline							
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	
Surface ITS	Enabler	Transport	2016	2020	101 - 250	TfL	Secured	Detail approved								
Western Rail Link to Heathrow Airport	Enabler	Transport	2019	2024	251 - 500	Network Rail	Speculative	Detail approved								
Elephant & Castle capacity enhancement	Enabler	Transport	2017	2022	0 - 100	TfL	Uncertain	No permission								
London Tram existing network enhancements & new fleet	Enabler	Transport	2015	2030	251 - 500	TfL	Speculative	Uncertain								
A2 Bean and Ebbsfleet junction improvements	Enabler	Transport	2020	2023	0 - 100	Highways England	Speculative	Uncertain (consultation)								
Southern Rail access to Heathrow (from Staines/Waterloo)	Enabler	Transport	2021	2025	1,001 - 5,000	Network Rail	Uncertain	Uncertain								
Brighton Mainline resilience (London – Gatwick – Brighton)	Enabler	Transport	2017	2020	251 - 500	DfT / Network Rail	Secured	Detailed submitted								
Gatwick Airport Station	Enabler	Transport	2019	2024	0 - 100	Network Rail	Secured	Planning and consents								
Additional bus routes and infrastructure	Enabler	Transport	2021	2031	101 - 250	TfL	Secured	Uncertain								
South Road Bridge Widening	Enabler	Transport	2021	2023	0 - 100	Ealing	Secured	Uncertain								
M4 J3-12 Smart Motorway	Enabler	Transport	2017	2022	501 - 1,000	Highways England	Secured	Detail approved								
Southall-Golden Mile (Brentford) rail passenger re-opening	Enabler	Transport	2,030	2,050	0 - 100	TfL / Network Rail	Uncertain	Uncertain								
A232 and A23 Corridor improvements	Enabler	Transport	2019	2021	0 - 100	TfL / Croydon	Secured	Detail approved								
Lower Thames Crossing (Gravesend - Tilbury) & links	Enabler	Transport	2021	2026	1,001 - 5,000	Highways England	Uncertain	Uncertain								
Brent Cross Station (Thameslink)	Enabler	Transport	2018	2021	251 - 500	Network Rail	Secured	Detail approved								
Re-opening of Camberwell Station	Enabler	Transport	2020	2025	0 - 100	TfL	Uncertain	Uncertain								
Bus Priority measures in central London & low emission corridors	Enabler	Transport	2017	2022	0 - 100	TfL	Speculative	Uncertain								
A406 key corridor tunnel at New Southgate	Enabler	Transport	2021	2031	1,001 - 5,000	TfL	Speculative	Uncertain								
River Roding bridge	Enabler	Transport	2026	2040	101 - 250	TfL	Uncertain	Uncertain								
Isle of Dogs to North Greenwich River Crossing	Enabler	Transport	2026	2040	101 - 250	TfL	Uncertain	Uncertain								
Overground extension from Barking Riverside to Abbey Wood	Enabler	Transport	2022	2026	501 - 1,000	TfL	Uncertain	Uncertain								
London Overground extension to Hounslow	Enabler	Transport	2022	2026	101 - 250	Network Rail	Uncertain	Uncertain								

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
A12 Leyton and Leytonstone key corridor decking	Enabler	Transport	2030	2035	251 - 500	TfL	Uncertain	Uncertain							
OOO Crossrail 1 station	Enabler	Transport	2024	2026	0 - 100	TfL	Secured	Outline submitted							
North Greenwich Bus Station/ tube station interchange upgrade	Enabler	Transport	2019	2025	0 - 100	Greenwich/ TfL	Secured	Detail approved							
A23/A232 Fiveways gyratory Croydon	Enabler	Transport	2019	2023	0 - 100	TfL	Secured	Outline submitted							
A3 improvements to support growth	Enabler	Transport	2027	2031	251-500	TfL/ Kingston	Uncertain	Uncertain							
Old Oak Common permeability improvements	Enabler	Transport	2025	2035	0-100	OPDC	Speculative	Outline submitted							
Bulls Bridge roundabout upgrade	Enabler	Transport	2020	2024	0-100	Hillingdon	Uncertain	Uncertain							
Heathrow surface access package	Enabler	Transport	2021	2026	5,001+	DfT/ Heathrow	Uncertain	Uncertain							
Colindale station (Northern Line)	Enabler	Transport	2018	2020	0 - 100	Developer/Council/TfL	Secured	Outline submitted							
Beddington Energy Recovery Facility	Enabler	Waste	2016	2019	101 - 250	South London Waste Partnership	Secured	Detail approved							
LWARB Advance London Programme	Enabler	Waste	2017	2020	0 - 100	LWARB	Speculative	Detail approved							
London Waste Authority Support Programme	Enabler	Waste	2015	2020	0 - 100	LWARB	Secured	Detail approved							
Redevelopment of Edmonton Eco Park	Enabler	Waste	2015	2025	0 - 100	North London Waste Authority / Enfield	Secured	Outline submitted							
Implementation of SuDs measures across London	Enabler	Water and Flood risk	2020	2050	1,001 - 5,000	Thames Water / London Councils / Environment Agency	Speculative	Uncertain							
Thames Tideway Tunnel	Enabler	Water and Flood risk	2016	2023	1,001 - 5,000	Bazalgette Tunnel Ltd (also trading as 'Tideway')	Secured	Detail approved							
Thames Estuary Asset Management Programme (TEAM2100)	Enabler	Water and Flood risk	2015	2025	251 - 500	Environment Agency	Secured	Detail approved							
Environment Agency River Thames Scheme : Datchet to Teddington - Capacity Improvements and Flood Channel	Enabler	Water and Flood risk	2019	2023	101 - 250	Environment Agency	Secured	Uncertain							
Flood and Coastal Erosion Risk Management (FCERM) Construction Programme - London	Enabler	Water and Flood risk	2015	2021	101 - 250	Environment Agency	Secured	Uncertain							
Thames Water: >Sewage Service AMP6 >Water Service AMP6 >Smart meter programme	Enabler	Water and Flood risk	2020	2030	1,001 - 5,000	Thames Water	Secured	Detail approved							
Deephams sewage treatment upgrade - Phase 2	Enabler	Water and Flood risk	2015	2018	101 - 250	Thames Water	Secured	Detail approved							

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Whitechapel Central - 564 Flats	Enabler	Housing	2017	2021	101 - 250	Stock Woolstencroft Architects	Speculative	Detail Approved							
Aldgate Place - Housing Hotel And Retail	Enabler	Housing	2013	2018	101 - 250	Stanmore Limited	Secured	Detail Approved							
Spire London - Hertsmere House West India Quay	Enabler	Housing	2017	2020	501 - 1,000	Bilfinger GVA	Secured	Detail Approved							
North Quay Poplar - Offices 1243 Flats Shops & Restaurants	Enabler	Housing	2016	2030	501 - 1,000	WSP Parsons Brinckerhoff (Head Office)	Uncertain	Detailed Submitted							
Chrisp Street Poplar - Redevelopment	Enabler	Housing	2017	2030	251 - 500	Poplar HARCA Head Office	Uncertain	Detailed Submitted							
Landmark Pinnacle	Enabler	Housing	2017	2022	101 - 250	Squire and Partners	Secured	Detail Approved							
Westferry Printworks	Enabler	Housing	2018	2023	101 - 250	Mace Limited Head Office	Secured	Detail Approved							
225 Marsh Wall Redevelopment - Madison Tower	Enabler	Housing	2018	2022	101 - 250	Hoare Lea	Uncertain	Detailed Submitted							
City Island Leamouth Peninsula North - Phase 1 - Buildings G H I J	Enabler	Housing	2014	2030	101 - 250	Select Interiors Limited	Secured	Detail Approved							
Glengall Quay	Enabler	Housing	2017	2019	101 - 250	Healey Development Solutions Limited	Uncertain	Detailed Submitted							
Stratford City East Village - Plots N18 & N19	Enabler	Housing	2017	2030	101 - 250	Arup Head Office	Uncertain	Detail Approved							
Brunel Street Works	Enabler	Housing	2018	2022	101 - 250	Linden Homes Eastern LLP	Uncertain	Detailed Submitted							
Hallsville Quarter - Phase 2	Enabler	Housing	2015	2017	101 - 250	M Clarke & Sons Limited	Secured	Detail Approved							
Strand East Plot R1	Enabler	Housing	2017	2020	101 - 250	GL Hearn & Partners	Uncertain	Detail Approved							
Glasshouse Gardens - The International Quarter S7 & S8	Enabler	Housing	2014	2030	251 - 500	Prater Limited Head Office	Secured	Detail Approved							
Hackney Wick Central - 874 Houses & Retail Units	Enabler	Housing	2018	2021	101 - 250	London Legacy Development Corporation	Uncertain	Outline Submitted							
Cambridge Road Estate Regeneration	Enabler	Housing	2016	2030	501 - 1,000	The Royal Borough of Kingston upon Thames	Uncertain	No Permission							
Packington Estate Phases 3-6	Enabler	Housing	2012	2018	101 - 250	A & B Decorators	Secured	Detail Approved							
High Road West Regeneration Area	Enabler	Housing	2016	2030	251 - 500	London Borough of Haringey	Speculative	Uncertain							
Tottenham Hale Masterplan	Enabler	Housing	2016	2030	501 - 1,000	Argent Group	Uncertain	No Permission							
Grahame Park - Stage B - Plots 10 11 And 12	Enabler	Housing	2018	2025	101 - 250	Tibbalds Planning & Urban Design Limited	Uncertain	Outline Submitted							
Skipton House Redevelopment - Southwark	Enabler	Housing	2018	2022	251 - 500	Norman Disney & Young Limited	Uncertain	Detail Approved							
London Shell Centre Redevelopment Masterplan	Enabler	Housing	2015	2021	251 - 500	Qatari Diar	Secured	Detail Approved							

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Blackfriars - Twin Towers Development	Enabler	Housing	2016	2030	251 - 500	EHA Group	Speculative	Detail Approved							
Princes Gate Mansions - 2 Mansion Houses	Enabler	Housing	2016	2018	101 - 250	DP9 Planning Consultants	Secured	Detail Approved							
Aykon Nine Elms - 360 Apartments	Enabler	Housing	2016	2030	101 - 250	Lendlease Construction (EMEA) Limited	Secured	Detail Approved							
Former Battersea Power Station - Phase 1 Building Rs-1a	Enabler	Housing	2014	2017	251 - 500	Astins Limited	Secured	Detail Approved							
Battersea Power Station Site - Phase 3 - The High Street	Enabler	Housing	2017	2022	101 - 250	Battersea Power Station Development Company	Uncertain	Detail Approved							
Nine Elms Parkside	Enabler	Housing	2017	2027	101 - 250	Royal Mail Group Limited	Uncertain	Detail Approved							
Hounslow High Street Quarter - Mixed Use Development	Enabler	Housing	2017	2020	101 - 250	Barratt (West London) Limited	Uncertain	Detail Approved							
Greenford Green Development	Enabler	Housing	2018	2030	101 - 250	Greystar Europe Holdings Limited	Speculative	Detailed Submitted							
M&s White City Site - Phases 1b	Enabler	Housing	2018	2022	101 - 250	Curtins Consulting Engineers	Uncertain	Detail Approved							
Clarges Estate Redevelopment	Enabler	Housing	2014	2017	101 - 250	CORE	Secured	Detail Approved							
Canadian Embassy - Grosvenor Square - 44 Luxury Mansion Apartments	Enabler	Housing	2017	2019	101 - 250	Savills Plc	Secured	Detail Approved							
Lincoln Square - Westminster	Enabler	Housing	2017	2018	101 - 250	Robert Bird Group	Secured	Detail Approved							
The Glebe - Chelsea	Enabler	Housing	2014	2017	251 - 500	Orion Capital Managers	Secured	Detail Approved							
King Street Regeneration	Enabler	Housing	2017	2020	101 - 250	Helical Bar Plc Head Office	Uncertain	Detail Approved							
Centre Point Regeneration - Scheme A	Enabler	Housing	2014	2017	251 - 500	AVV Solutions Limited	Secured	Detail Approved							
Greenwich Peninsula Quays - Plot N0506	Enabler	Housing	2016	2030	101 - 250	Aukett Swanke Head Office	Uncertain	Outline Submitted							
Greenwich Peninsula Central East - Phase 1 Plot N0205	Enabler	Housing	2016	2018	101 - 250	Bachy Soletanche	Secured	Detail Approved							
Lewisham Gateway Phase 2 - Mixed Development	Enabler	Housing	2017	2030	101 - 250	Lewisham Gateway Developments Limited	Speculative	Outline Submitted							
Canada Water - Mixed Development	Enabler	Housing	2019	2039	501 - 1,000	British Land Corporation Plc	Uncertain	No Permission							
150 Bishopsgate Heron Plaza - 120 Flats/shops/public Plaza	Enabler	Housing	2018	2030	251 - 500	Keltray Limited Head Office	Secured	Detail Approved							
Winstanley And York Road Estates Regeneration - Wandsworth	Enabler	Housing	2018	2048	501 - 1,000	London Borough of Wandsworth	Speculative	Uncertain							
Kidbrooke Village Phase 4 - 1260 Houses	Enabler	Housing	2016	2030	101 - 250	Berkeley Homes East Thames	Uncertain	Outline Submitted							

Appendix 1 Strategic infrastructure projects and current programme

Project	Driver / Enabler	Sector	start date	completion date	Cost band (£m)	Sponsor	Funding status	Planning status	Timeline						
									2016-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Buckingham Palace - Refurbishment	Enabler	Housing	2017	2027	251 - 500	The Royal Household Royal Collection Trust	Uncertain	No Permission							
Ram Brewery Regeneration Masterplan	Enabler	Housing	2013	2019	251 - 500	WSP Parsons Brinckerhoff (Head Office)	Uncertain	Outline Submitted							
190 Strand - Flats Office & Retail	Enabler	Housing	2012	2017	101 - 250	WSP Parsons Brinckerhoff (Head Office)	Secured	Detail Approved							
Kidbrooke Village Centre - Phase 3	Enabler	Housing	2016	2021	101 - 250	Berkeley Homes East Thames	Secured	Detail Approved							
Aylesbury Estate Regeneration - Phase 1	Enabler	Housing	2018	2026	101 - 250	HTA Design LLP	Secured	Detail Approved							
Principal Place	Enabler	Housing	2014	2019	251 - 500	WSP Parsons Brinckerhoff (Head Office)	Secured	Detail Approved							
250 City Road - City Forum	Enabler	Housing	2014	2019	101 - 250	Briggs & Forrester Group Limited Head Office	Secured	Detail Approved							

London's strategic infrastructure requirements – an evidence base for the London Plan

Appendix 2 Strategic infrastructure needs assessment approach

Appendix 2 Strategic Infrastructure Needs Assessment approach Rail, highway and bus infrastructure

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability by sector.

Rail, highway and bus infrastructure

1. Data and document review

Our general approach is to review relevant Opportunity Area Planning Frameworks (OAPFs) and Development Infrastructure Funding Studies (DIFS) for each growth corridor. We have then supported this with a review of the evidence base for the London Infrastructure Plan 2050 and Infrastructure Mapping Application (IMA LDN), relevant project-related documents and other GLA documents such as the City in the East/City in the West strategic documents.

2. Engagement

- GLA Transport meetings
- Transport for London meetings

3. Scoring approach

Our scoring approach is presented in the table opposite. It concentrates both on the needs and the deliverability of projects by analysing:

- If there is a significant need for infrastructure, represented by the cost of infrastructure projects in the pipeline
- If the needs are being planned for, represented by whether the projects are included in relevant DIFS, OAPFs or local plans
- If the projects identified are deliverable, represented by whether project sponsors have been identified and funding secured.

Scoring approach for rail, highway and bus infrastructure needs assessment

Category	Criteria	RAG
Is there a significant need?	Low (<£100m)	Green
	Medium (£100-500m)	Yellow
	High (£500m+)	Red
Are needs planned for?	Projects being implemented	Green
	Projects identified in DIFS/OAPF/Local Plan	Yellow
	Needs identified in DIFS/OAPF/Local Plan	Red
Are projects deliverable?	Project sponsor in place and funding secured/funding highly likely to be secured	Green
	Project sponsor in place but no funding is secured	Yellow
	Project sponsor identified but no funding secured + funding is uncertain	Red
	No project sponsor, no funding	Red

Appendix 2 Strategic Infrastructure Needs Assessment approach Electricity and heat

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability by sector.

Electricity and heat infrastructure

1. Data and document review

In addition to the general approach described on PX, we have reviewed the UKPN business plan and undertaken analysis on the GLA energy power model outputs of UKPN substations firm capacity and estimated peak electricity demand for commercial, domestic and transport (excl. National Rail and London Underground) to 2050.

2. Engagement

We have engaged with the GLA Environment team to refine our assessment criteria and met with the LSIR Utility Group – including UKPN, National Grid and Scottish and Southern to identify relevant issues.










3. Scoring approach

Our scoring approach is presented in the table opposite. It concentrates both on the needs and the deliverability of projects by analysing:

- If there is a significant need for infrastructure, represented by the extent of reinforcement that could be required to existing UKPN capacity to cope with the projected demand in 2050. The criteria shows the estimated percentage of substations within the corridor with overcapacity by 2050. For the Heat assessment we extrapolated these results since they are mainly population driven.
- If the needs are being planned for, represented by whether UKPN or National Grid are implementing reinforcement projects

- If the projects identified are deliverable, represented by whether project sponsors have been identified and funding secured.

Scoring approach for electricity and heat infrastructure needs assessment

Category	Criteria	
Is there a significant need to 2050?	Modest requirement (<50%)	
	Considerable requirement (50% - 60%)	
	Significant requirement (>60%)	
Are needs planned for?	UKPN/National Grid are implementing reinforcement projects	
	UKPN/National Grid have plans for reinforcement	
	UKPN/National Grid have no plans for reinforcement	
Are projects deliverable?	Sponsor identified and funding secured	
	Sponsor identified, no funding secured	
	No project sponsor, no funding	

Appendix 2 Strategic Infrastructure Needs Assessment approach Water supply and water management

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability in the water sector.

Water supply (potable and non-potable), stormwater and sewerage

In general, water supply (potable and non-potable) is not a local issue and is managed by regional and sub-regional water companies. Therefore, it is challenging to identify needs at a spatial level by growth corridor. Our general approach is to identify strategic opportunities and challenges at a London-wide level, and to assess if there are particularly acute issues in any of the growth corridors by reviewing Thames Water's flow capacity map.

1. Data and document review

In addition to the general approach, we have reviewed water resource management plans and sewerage resource management plans from Thames Water and Affinity Water and the London Sustainable Drainage Action Plan.

2. Engagement

GLA Environment meetings

Utility Group meetings

3. Scoring approach

Our scoring approach is presented in the table opposite. It concentrates both on the needs and the deliverability of projects by analysing:

- If there is a significant need for infrastructure, represented by heat map status in Thames Water capacity models
- If the needs are being planned for, represented by whether UKPN or

National Grid are implementing reinforcement projects

- If the projects identified are deliverable, represented by whether project sponsors have been identified and funding secured.

Scoring approach for water supply and water management

Category	Criteria	RAG
Is there a significant need?	Thames Water flow capacity model to 2050/Thames Water water supply model to 2050 - green heat map status for majority of growth corridor	Green
	Thames Water flow capacity model to 2050/Thames Water water supply model to 2050 - amber heat map status for majority of growth corridor	Yellow
	Thames Water flow capacity model to 2050/Thames Water water supply model to 2050 - red heat map status for majority of growth corridor	Red
Are needs planned for?	Water company are implementing projects	Green
	Water company have plans to implement projects	Yellow
	Water company has no plans to implement projects	Red
Are projects deliverable?	Sponsor identified and funding secured	Green
	Sponsor identified, no funding secured	Yellow
	No project sponsor, no funding	Red

Appendix 2 Strategic Infrastructure Needs Assessment approach

Flood risk

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability by sector.

Flood risk

(i) Data and document review

In addition to the general approach, for flood risk we have reviewed Environment Agency Flood Risk maps and plans.

(ii) Engagement

GLA Environment meetings









Utility Group meetings

(iii) Scoring approach

Our scoring approach is presented in the table opposite. It concentrates both on the needs and the deliverability of projects by analysing:

- If there is a significant need for infrastructure, represented by heat map status in the Environment Agency flood risk map
- If the needs are being planned for, represented by whether there are flood defences in place
- If the projects identified are deliverable, represented by whether project sponsors have been identified and funding secured.

Scoring approach for flood risk

Category	Criteria	
Is there a significant need?	Environment Agency flood risk map - green heat map status for majority of growth corridor	
	Environment Agency flood risk map - amber heat map status for majority of growth corridor	
	Environment Agency flood risk map - red heat map status for majority of growth corridor	
Are needs planned for?	Flood risk is defended	
	Flood risk is undefended	
Are projects deliverable?	Sponsor identified and funding secured	
	Sponsor identified, no funding secured	
	No project sponsor, no funding	

Appendix 2 Strategic Infrastructure Needs Assessment approach Digital

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability by sector.

Digital

(i) Data and document review

We are using digital access data at a postcode level, available from OFCOM. Our data sources and respective caveats are detailed on PX.

(ii) Engagement

We have consulted with the GLA Senior Policy Officer for Technology and held a digital consultation session with BT, Virgin and Optimity held at City Hall on 15th March 2017.

(iii) Scoring approach

Our scoring approach is presented in the table opposite. It concentrates solely on the need for projects as currently we do not have data on the pipeline projects or deliverability of those projects.

The availability of digital infrastructure:

- Superfast Broadband (SFBB)
- Next Generation Access (NGA)
- Ultrafast Broadband (UFBB)

At present we do not have data on 4G availability across London.

Scoring approach for digital

Category	Criteria	RAG
Is there a significant need?	>90% have access	Green
	80-90% have access	Yellow
	<80% have access	Red

Appendix 2 Strategic Infrastructure Needs Assessment approach Digital

Data

We are using data available at a postcode level from OFCOM which have then been aggregated into the growth corridors that we are analysing as part of the LSIR.

Data caveats

CAVEATS: OFCOM data likely to overestimate availability of SFBB because it is not affected by density. When one property in a postcode has availability it is sufficient for that postcode to be treated as 100% available when this may not be the case. The converse is true for UFBB for which availability is likely to be underestimated. At present, OFCOM only measures BT and Virgin availability but will not measure leased line availability by specialist providers such as Hyper Optic (which currently delivers FTTP connections within Southwark, London Riverside, and will provide all connections to Battersea Power Station development). Currently much of Westminster's UFBB is provided by Venus Fibre.

Growth corridor	UFBB availability (% premises)	NGA availability (% premises)	SFBB availability (% premises)
Central London	3.44	92.72	68.24
Crossrail1 East	11.13	94.24	82.78
North Thames Gateway	5.89	94.5	88.41
South Thames Gateway	0.36	90.09	89.44
CR2 North	3.69	95.31	91.3
HS2	1.78	94.74	92.64
Bakerloo	2.39	91.47	87.57
Tramlink	1.91	94.66	92.27
Heathrow	0.14	91.65	91.28
CR2 Delta	0.32	95.16	94.08

Source: OFCOM

Appendix 2 Strategic Infrastructure Needs Assessment approach

Open space

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability by sector

Open space

(i) Data and document review

We are using data from the Greater London Authority (2015) Greenspace information for Greater London. Data is described on PX.

(ii) Engagement

We have met with the GLA environment team to discuss our assessment approach and identification of strategic opportunities and challenges.

(iii) Scoring approach

Our scoring approach is presented in the table opposite. It assesses the ranking of growth corridors by access to open space with each of the growth corridors ranked 1 to 10 by their level of access. This was chosen as the preferred approach as there is no set level or target of access to open space across London.

RAG scoring approach for open space infrastructure

Category	Criteria	RAG
Is there a significant need?	Household-level access to open space is ranked 1, 2, 3 out of all growth corridors	Green
	Household-level access to open space is ranked 4,5,6,7 out of all growth corridors	Yellow
	Household-level access to open space is ranked 8,9, 10 out of all growth corridors	Red
Are needs planned for?	Projects are being implemented	Green
	Projects are in the pipeline	Yellow
	No projects are in the pipeline	Red
Are projects deliverable?	Sponsor identified and funding secured	Green
	Sponsor identified, no funding secured	Yellow
	No project sponsor, no funding	Red

Appendix 2 Strategic Infrastructure Needs Assessment approach

Open space

Data

We are using data from the Greater London Authority (2015) Greenspace information for Greater London. The data available is household-level accessibility of open space which measures access by distance to type of open space:

- Open spaces accessibility to public: 400 metres
- Local, small and pocket parks: 400 metres
- District parks: 1.2 kilometres
- Metropolitan parks: 2.4 kilometres
- Regional parks: 5 kilometres

Growth Corridor	Percentage of households with access to Open space	Rank
Bakerloo	49%	5
Crossrail 2 Delta	51%	4
Crossrail1 East	44%	7
HS2	43%	8
Heathrow	37%	10
Central London	70%	1
South Thames Gateway	74%	2
Tram Link Triangle	43%	9
Crossrail 2 North	63%	3
North Thames Gateway	49%	6

Appendix 2 Strategic Infrastructure Needs Assessment approach Housing

Assessment of infrastructure needs and delivery status

The following provides an overview of our approach to assessing infrastructure needs and deliverability by sector

Open space

(i) Data and document review

We have used the residential development pipeline from the IMA application (data collected by Barbour). The projected additional housing demand is based on GLA population projections by MSOA (2015-based) divided by the housing demand factor (2.29).

(ii) Engagement

GLA Economics and London Plan team

(iii) Scoring approach

Our scoring approach is presented in the table opposite. It concentrates solely on the gap between demand and supply over the projected time period (to 2031). The projected housing gap shows the difference between the housing development pipeline and estimated additional demand to 2031 (based on population growth).

RAG scoring approach for housing development

Category	Criteria	RAG
Is there a significant need?	Projected housing gap below 10,000 homes	Green
	Projected housing gap between 10,000 and 30,000 homes	Yellow
	Projected housing gap above 30,000 homes	Red

Appendix 2 Strategic Infrastructure Needs Assessment approach Housing

Data

In order to estimate future housing provision for each growth corridor, we have considered the residential development pipeline from the IMA application (data collected by Barbour). Almost 100% of these developments are planned to be completed by 2031.

We estimated additional housing demand to 2031 based on GLA population projections. In order to transform population growth into housing requirements, we used a population yield calculator factor of 2.29 (residents per dwelling). This factor is used across a large number of DIFS (e.g. Upper Lea Valley, Old Oak Common and Park Royal, Kensal Canalside, etc.) to estimate future housing demand.

By calculating the difference between estimated projected additional demand and residential pipeline we projected the housing gap for each growth corridor to 2031.

Growth Corridor	Residential pipeline units	Estimated projected additional demand to 2031	Projected gap 2031
Bakerloo	12,207	29,503	17,296
Central London	63,105	100,631	37,526
CR2 Delta	14,835	15,805	970
CR2 North	15,331	44,362	29,031
Crossrail1 East	15,215	51,731	36,516
Heathrow	13,660	28,722	15,062
HS2	25,446	59,897	34,451
North Thames Gateway	16,655	31,709	15,054
South Thames Gateway	6,441	23,156	16,715
Tramlink	7,775	22,438	14,663

Source: Barbour (residential pipeline units), GLA MSOA population projections (central estimate), Arup analysis

London's strategic infrastructure requirements – an evidence base for the London Plan

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