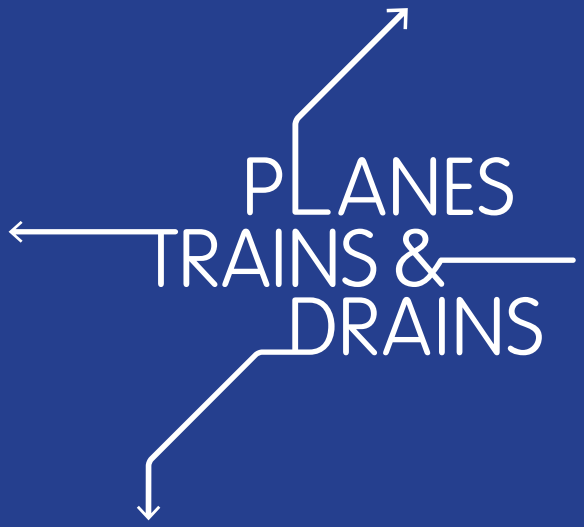
LONDON'S CENTRE FOR THE BUILT ENVIRONMENT



London's Booming Infrastructure Business

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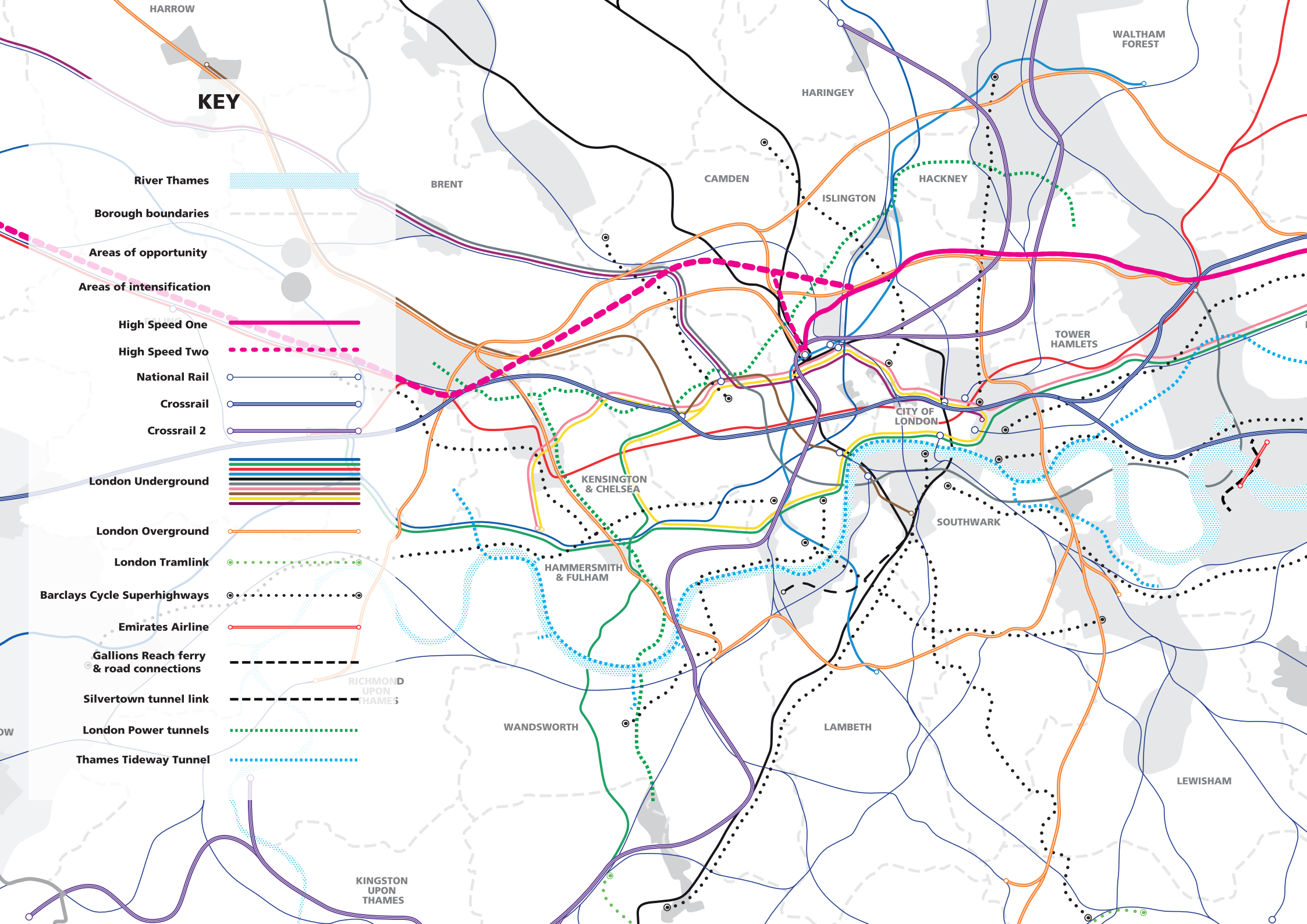
KEY
River Thames
Borough boundaries
Areas of opportunity
Areas of intensification
High Speed One
High Speed Two
National Rail
Crossrail
Crossrail 2
London Underground
London Overground
London Tramlink
Barclays Cycle Superhighways
Emirates Airline
Gallions Reach ferry & road connections
Silvertown tunnel link
London Power tunnels
Thames Tideway Tunnel
HARROW
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KENSINGTON & CHELSEA
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LEWISHAM
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KINGSTON UPON THAMES

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Introduction

London's roads, river and rails are the arteries that keep our great city alive. Our Tube, buses and trains together carry over 10 million Londoners every day. Our roads are some of the most intensively used in Europe. Our transport system is the lifeblood of our city."

— Boris Johnson, Mayor of London

Infrastructure is the key to a well-functioning city, and London is fantastically well served by its infrastructure. It could hardly be so pre-eminent a global city were that otherwise. As the Mayor of London points out, over 10 million rely on its transportation to go about their daily lives. International businesses base themselves here knowing they can rely on all aspects of London's infrastructure to compete efficiently. And our high-standard of living, though of course under pressure since the recession, is built on and sustained by the enormously sophisticated systems that deliver our utilities and which guarantee that our journeys, wherever we chose to make them, can run to a reasonably reliable timetable.

Of course, difficulties occur. Road congestion is often crippling, trains run late and tubes are delayed. And the bottom line with infrastructure is that unless it is consistently maintained through long-term investment, today's accelerated pace of change can quickly expose deficiencies in even the most impressive systems. Certainly, the problems are well known. Report after report indicts Westminster politicians for failing to make long-term investment in London's infrastructure, and dire warnings are issued over our faltering competitiveness.

These warnings have not gone unheeded. That is why so much money is currently being invested in London's infrastructure on magnificent projects like Crossrail and the many station upgrades, and why so much investment is being planned for new transport links, sewage systems and possibly a new airport for London. And the value of investment is not confined purely to the supported project — vast swathes of the capital including Stratford and King's Cross are benefitting enormously from the regeneration that improved transport links can deliver.

Many will argue that still not enough is being done, and that we must not rest on the laurels of Crossrail, for example, but must commit now to Crossrail 2 if we're to cope with the increases in the city's population and other pressures.

What's undeniable is that there is always more that can be done to make a city truly fit for modern purpose. But at a time like this in London's history when so much investment is being made, it seems right to acknowledge it and the people who are transforming the city in front of our eyes.

The purpose of this NLA publication (and the exhibition it accompanies) is to highlight the wealth of activity taking place at this moment in London. The range and scope of current infrastructure development, spurred in part by hosting the 2012 Olympic Games, is on a scale that has rarely been seen before, and is compared by some commentators to the achievements of the Victorians.

There is an element of truth in that, which we explore in this report, and it's certainly the case that the Victorian engineering triumphs were built on a long-term vision that many of the projects we feature also share.

That vision can take many different forms, and there are some working in the built environment today who have grand visions of how much better London could be as a city if certain schemes were adopted. The discussion around London's airports has inspired several *grand projets* that could transform the city in exciting ways. The railway building programmes are opening up neighbourhoods of London to the possibility of superb new public spaces, freed from traffic, in a style that would be applauded by a Nash or Haussmann.

Many of these projects have a long way to go before they can be realised. And given the difficulties of funding them, or even the sheer practicalities of building them, many never will proceed beyond the drawing board.

But they serve as an inspiration of what London could be like, and that is valuable in itself. And they also serve as a reminder to all of us that infrastructure investment can unlock and create great wealth for the citizens of London.

Infrastructure investment has historically been seen by governments as ways to create jobs and spur economic growth, and the current Government has declared its commitment to kick-starting major schemes across the nation but also in London to achieve precisely that. Over 30 mega infrastructure projects, some of them in London, are now being closely monitored by a Cabinet committee to ensure they are delivered as speedily as possible.

However, the parlous state of the public finances does not allow Government to fund all these schemes itself, as it would have done in times gone by. Money needs also to be injected by the private sector, and much discussion is taking place over how best to marry the interests and resources of Government, developers and utilities companies. New hybrid financial models are emerging, and the cross-fertilisation of cash achieved on Crossrail and now also with the planned extension to the Northern line give hope that the barriers to new investment are not insuperable.

It is then a question of how quickly the chosen projects can navigate their way through Britain's notoriously dilatory planning regime — another issue we examine. Changes have been instituted in the way large infrastructure projects can proceed, but this is uncharted water and no certainty of delivery yet exists.

Whatever the pace and progress of future schemes, London can be proud of the steps it is taking to address its ongoing infrastructure requirements. It's our hope that this publication and exhibition do them full justice.

02
How infrastructure underpins London's global status
and how we compare to the Victorians

London ranks consistently as the second most important global city in the world. It sits just behind New York in terms of political, economic and cultural influence on international affairs.

Underpinning this elevated status is the city's infrastructure. In the most fundamental way, over 8 million Londoners' standard of living and the lives they lead depend on it. Just as importantly, without reliable and up-to-date rail, road and air links, utilities and communication systems, leading international companies would not be based here. Nor would our own financial services sector or our arts and media industries have grown so powerful and created so many jobs. If London's infrastructure failed to perform its crucial role properly, the capital's, and the country's, wealth and international influence would suffer drastically.

Adjusting to the future

Yet however well infrastructure copes with current needs, it must constantly adapt to future demands. In London's case, these are daunting. By 2031, there are forecast to be around 1.25 million more people in the capital (taking the population to 9.2 million) and over 750,000 new jobs in the capital, generating at least three million additional trips each day. By 2031, road congestion is forecast to rise by 17 per cent and London's waste by 55 per cent.

All this places new pressures on London's infrastructure that must be addressed if quality of life, productivity and international competitiveness are not to suffer. In addition, low-carbon targets must be met — which requires new approaches to energy usage and sustainability — and communication links needed to be strengthened and made more robust to achieve superfast connectivity and to pave the way for the industrialisation of the internet.

Infrastructure drives social and geographic change

To its credit, London grapples with these issues unceasingly. Given that agreement on the best way forward is hard to establish, progress is not always smooth. But there have been impressive achievements in urban regeneration in areas such as Stratford, the Thames Gateway and King's

Cross, where new rail links have opened up major opportunities that embrace homes, offices and retail developments. At King's Cross, the decaying industrial landscape is being transformed into one of Europe's largest-ever urban regeneration projects.

Stratford has benefitted enormously from staging the Olympic Games. Although the area was due for regeneration, the preparations for the Games accelerated the investment. £200 million was spent on the upgrade of Stratford International station and its links to the City, London City Airport, the emerging Royal Docks area and High Speed I, the link to the Continent. When Crossrail is complete, the journey from Stratford to Heathrow will take just 49 minutes.

The Olympic Village is now known as East Village, a development of nearly 3,000 private and public tenure housing with world-class health centres, schools and the largest new urban park created in Europe in the past 150 years. Up to 20,000 new homes are planned in the next phases of development. And Westfield Shopping Centre is a state-of-art retail palace.

Stratford's impressive transformation is part of an ambitious masterplan for regenerating East London's Thames Gateway. Over £9 billion of public money is planned for investment in the Thames Gateway project, which incorporates a series of public-private sector developments planned across 16 different local government districts on both sides of the Thames in an area that is home to 1.6 million people, including many areas of high social deprivation. The area is split into numerous development zones, one of which takes in the London Gateway, a major international port now under construction near Thurrock which comprises a new deep-water container-ship port and a logistics centre that will be linked to the key transport arteries of Britain and the Continent.

Another major east London project on the drawing board is Wood Wharf, a redevelopment project adjacent to Canary Wharf that has been approved by Tower Hamlets for the creation of 460,000 sqm of office space and 1,500 homes. Public consultations on how the scheme should proceed are currently being held.

The Victorian builders — a golden age?

Because of the time scales involved in building major infrastructure, long-term planning is essential to forestall city chaos. Politicians, business and administrators need to share a vision of what needs to be done. And they must have the drive, the single-mindedness and the financial resources to realise their vision.

At difficult times like today, when badly needed new infrastructure projects all too often become embroiled in politicking and red tape, we often look back to the Victorian era and admire the revolutionary *grand projets* of the day — the overhaul of London's sewers, the explosion of railway building and the creation of the world's first underground transportation system. We applaud these extraordinary schemes and hold them as templates for what today's arguably less bold and courageous city planners should be emulating.

The truth is, though, that in many ways the Victorians took just as long to create their splendid schemes as we do now; visionaries had to fight just as hard to persuade politicians to back them; and investment was as hard to come by as it is today.

The Golden Age of Infrastructure it may well have been, and we are endebted to Victorian visionaries for how well they built their projects, many of which we still rely upon today. But at difficult times like these, it's as well to remember there have always been difficult times, and 19th century Britain was no different.

How it was — and the difficulties of transformation

In 1810, London was a city of 200,000 cesspits, with soil workers removing sewage at night. It stayed that way until the Great Stink of 1858 brought the city to a near-standstill and Joseph Bazalgette was given £3 million to perform the Herculean task of cleaning up London's water and sewage system.

The great railway schemes of Brunel and others were fought all the way by canal and coach operators. Parliamentary debates over whether to grant permission for the lines regularly took 50+ days at Committee stage. "So many irons in the fire and none of them hot" was a constant refrain from the young Brunel.

Terrible congestion dogged the city throughout Victorian times. The horse was the dominant mode of transport up until the 1880s. Commuters walked miles to work. London was pock-marked by appalling slums. And the population increased from 1 million at the start of the century to 4 million by the end.

Reformers, engineers and politicians were acutely conscious of the failings of London's infrastructure. Doing something about them was, in many ways, far more difficult than it is now. There was no planning in the modern sense, and housing, office and transport development was determined by the brutal interplay of competing commercial interests and market forces.

In the words of LTC Rolt, there was "an orgy of commercial opportunism and wild speculation" with competing entrepreneurs viewing railways, water supply and housebuilding as get-rich-quick schemes.

Transport growth was frenetic, and market-driven

Railway building was driven and financed by businessmen who promised shareholders healthy returns. Joint-stock companies allowed them to raise capital, and railway mania led to bubbles of speculation with money flooding in. New banks like Lloyds, Barclays and the Midland were set up partly to help channel money from the public into infrastructure investment.

Parliament had to grant permission for a new line, and poorer areas of London were targeted as compensation could be minimal, even nil. Once granted, housing around areas such as Euston, St Pancras and King's Cross was demolished to make way for the track. A Royal Commission of 1840 drew a boundary line across the north that would keep stations out of central London until the arrival of the Tube. Lines from the south could establish railway termini closer in to the city, such as Fenchurch Street, because the land was cheaper.

New housing sprung up along the lines into London, with the so-called "march of bricks and mortar" leading to the growth of the suburbs built by speculators and the transformation of many areas of the city. Social divides were created between the fashionable west and the less well-off east. Slums were created by the march of the railway builders, and it was left to philanthropic bodies such as the American millionaire George Peabody's housing association to care for their denizens as best they could.

Municipal government was yet to control London's growth — it caused a Great Stink.

Unlike other major conurbations from 1835 onwards, London had no municipal government for most of the century. It was only when the Metropolitan Board of Works (MBOW) was set up in 1855, following the Royal Commission on Health in 1847, that the first recognisable local government for London emerged. Hundreds of local bodies, that were responsible for streets, lighting and other services, were amalgamated into 38 districts with responsibility for health, lighting and highways. The MBOW was handed the sewers, and gradually additional civic duties including the building of new streets to ease congestion.

Once Parliament had given the order to clean up London's fetid water, the Board's chief engineer Joseph Bazalgette spent the next seven years constructing the 100 miles of sewers and new drainage that we are only now coming round to upgrading with proposals for the Thames Tideway Tunnel.

03
Planning and time frames

Infrastructure projects have an elephantine-plus gestation period. The concept of Crossrail, for example, was first proposed in the late 1940s, and it was given that name in a 1974 report from the Greater London Council (GLC) and the Department of the Environment (DoE). Nothing happened then but in 1989 the idea was revisited and a Private Bill, promoted by London Undeground and supported by the Government, was debated in Parliament before being rejected. Not until 2001 was it revived once more, and seven years later it finally received Parliamentary approval. Operating begins in 2018 — over 60 years after Sir Patrick Abercrombie championed it in his Greater London Plan.

The 1974 GLC-DoE report also contained proposals for the Jubilee line extension and the Chelsea-Hackney line, or Crossrail 2. Again, inertia was the order of the day. Nothing was done about taking the Jubilee line from Green Park out to Stratford until the late 1980s when the Canary Wharf developers agreed to contribute one-third of its cost (a figure that, thanks to massive cost overruns, turned out to be just 5 per cent). It took a further 10 years for the line to be built and operating. As for Crossrail 2, it remains in limbo at present, although its suit is being pressed hard by those who would link it to Euston and the High Speed Two (HS2) developments.

The HS2 line itself is not due to begin operating until 2033, 24 years after Prime Minister Gordon Brown set up High Speed Two Limited to consider the case.

So why does it take so long for major infrastructure projects to get built, especially when we recall that 152 miles of the Great Western Railway were built by Brunel and operating within seven years of initial proposal? The comparison with Brunel, although illuminating and inspiring in many respects, is unfair. Today's regimes for feasibility, planning, financing, debating, compensating, designing and constructing reflect a more democratic age, as well as a more congested, densely populated country. And 150 years ago, environmental and health and safety concerns were negligible. Nowadays, all these issues have to be consulted on endlessly, many of them requiring long-drawn out public inquiries. It has made building large infrastructure projects inevitably protracted affairs.

Government is determined, however, to make them less protracted. It addressed the problem with the 2008 Planning Act, which set up the Infrastructure Planning Commission (IPC). Its role was to examine, and in some cases decide on, proposed Nationally Significant Infrastructure Projects (NSIPs). These projects were to be put forward after Government

produced 12 National Policy Statements (NPSs), which set out its policy on different types of major infrastructure areas, against which the proposed projects must be assessed. The areas covered by NPSs are energy, transport, water, waste water and waste, and NSIPs include HS2 and the Thames Tideway Tunnel. The NPSs must be drawn up in the light of wide public consultation and be laid in draft form before Parliament for scrutiny and debate, which must then be taken into account by the sponsoring Department before receiving Parliamentary approval. Even then, an NPS can be challenged in the courts.

Under the Localism Act 2011, the IPC was abolished, and its work transferred to the Planning Inspectorate. At the same time, ministers took back the ultimate decision-making power. In every other respect, though, the Government's plans for speeding-up infrastructure delivery are in place. And they are being monitored by Infrastructure UK, a division of the Treasury charged with working with the Economic Affairs Committee of the Cabinet to help delivery of the projects that Government has prioritised in the annual spending review.

The aim is to get away from interminable public inquiries by making the system "front-loaded" — that is, going through an exhaustive early consultation. This way, Government believes that planning decisions on approving NSIPs can be reduced from an average of two years to 15 months and under.

However, obtaining planning consent or a Development Consent Order (DCO) is only one of the crucial stages a major infrastructure project must pass through. Before submitting an application to the Planning Inspectorate, the project's promoter must carry out extensive consultation on their proposals. This can still be a very lengthy process — certainly 18 months, perhaps as much as three to four years. It requires the promoter to provide in-depth information about the proposal to various statutory and non-statutory bodies and the wider community. The promoter must answer questions and listen to suggestions and take them all into account when compiling its application. This doesn't mean the promoter has to accept every comment, but it must give them proper consideration.

Statutory consultees include: the Health and Safety Executive, the relevant Strategic Health Authority, Natural England (the Government's advisor on the natural environment), the Environment Agency, the relevant police, fire and rescue authorities, the relevant parish council, the Equality and Human Rights Commission, the Civil Aviation Authority, the Highways Agency and the relevant highways authority, Transport for London and the Forestry Commission.

During the Planning Inspectorate's examination stage, all interested parties are invited to provide further written evidence if they wish, and all interested parties can comment on the representations of others. The hearings are held in public and anyone can attend.

Weighing up its decision on whether to award a DCO, the Planning Inspectorate must make its recommendations to Government in accordance with the NPS, except where it believes the adverse impacts of a proposed project would outweigh its benefits.

However, although planning experts believe the new system will streamline the progress of major projects, the irony is that the very biggest projects — such as HS2 — will not be able to use it. Government has decided that these, which are invariably the most controversial, must go through Parliament. Consultation will be carried out beforehand, but a Hybrid Bill must be debated and voted on before the project can go ahead. Crossrail took three and a half years to receive approval. HS2 will have to be debated too.

While planning is holding projects up, the process of securing funding, from a mixture of public and private sector sources, can also add to the delay. With HS2, Government is reported to want to spread the costs over a longer period to reduce each year's financial burden. Then there's haggling with private sector backers over how much they and Government should contribute.

Part of the money will be used as compensation to people who have to give their homes and land to the route of the railway. Again, more haggling.

In many ways, the construction itself is the most straightforward part of the project — even though incredible feats of civil engineering are undertaken. But costs here can rise way beyond budget if there are unforeseen delays. Possible skills shortages can also drive up costs, as well as delay the timetable. With so much civil engineering planned over the next decade in London, this is a very real possibility.

04
Funding issues

Major infrastructure projects are expensive. Many rely heavily, though not always entirely, on state funding. All require state involvement.

With numerous London projects competing for investment at any one time, selecting those with the best case for investment is a difficult and complex decision. All the more so during a time of recession when public finances are under great strain, along with the country's international credit-worthiness.

To help Government decide on whether to proceed with any particular publically funded project is the Treasury's role. It assesses whether the scheme's rationale is supported by its economic justification — essentially, do the jobs it creates, the development revenues it generates and the purpose it fulfills make it good value for money.

As long-term cost-benefit analyses can never be 100 per cent objective nor indeed 100 per cent accurate; deciding what is an efficient use of public money is inevitably problematic and often controversial. The Treasury historically errs on the side of caution: its primary concern is "annuality" — balancing the current budget — rather than investing in a long-term infrastructure strategy. Maintenance expenditure — to keep a current system in relatively decent working order — is easier to justify than capital expenditure aimed at growing or expanding the system.

The Treasury is also understandably nervous of cost overruns. For reasons not always of its own making — clients must share some culpability — the UK construction industry has a poor track record in delivering projects on time and to budget.

These historic attitudes explain why Britain's approach to infrastructure investment can be characterised as stop-go, fragmented and piecemeal.

A new approach to infrastructure

Things, however, are changing, and seemingly for the better. In a significant policy step change in 2011 that was part of a major growth stimulus package, Government devised a national infrastructure plan which listed a pipeline of 300 projects of strategic importance to the country, costing £300 billion.

In the Chancellor's Autumn Statement of that year, 40 of these infrastructure projects were identified as those most critical to promoting growth. To ensure they progress as speedily as possible, they were to be monitored by a Cabinet Committee. Included on this A-list are HS2, Crossrail and the Thames Tideway Tunnel — crucial London projects.

The Government's decision to back new and long-term infrastructure investment has come after several years' attempts to stimulate growth have stalled. By committing to major projects, Government sees the opportunity to create new jobs and pump money into the economy, thereby creating economic momentum and consumer confidence.

After several years of austerity, spending its way out of recession offers Government a more positive course of action, a slighter yet still hopefully potent version of President Roosevelt's New Deal of the 1930s. But how quickly a drawing board scheme can translate into jobs on the ground will ultimately be determined by the appetite of financiers to invest alongside Government as well as the planning system being able to fast track major projects in the way a recent Government amendment intends.

More holistic approaches to funding

What has become clear is that more imaginative, holistic approaches to funding are required. Rather than simply relying on 100 per cent state investment or 100 per cent private investment (such as for the Channel Tunnel and London Underground's partnership with the private sector), the Government and the private sector are devising new financial models that can deliver future investment projects on time and budget and at the best value for the public purse.

These more holistic, hybrid-finance approaches are what have already given schemes in London like Crossrail and the Northern line extension the green light. The financial packages underpinning them are a mixture of public and private money — and offer a blueprint for adoption by planners and developers for all future schemes.

By identifying who will benefit from a new infrastructure project, and linking it to the regeneration it can bring to an area, the jobs it can create and the taxes and GDP it delivers, Government can tap into a wide funding network of groups that benefit from the scheme.

The £14.8 billion funding for Crossrail, for example, is predicated on financial contributions from developers, a Community Infrastructure Levy to be paid by new developments, a Business Rates Supplement, the sale of land and property raising £545 million, plus £230 million from BAA and £200 million from the Corporation of London.

Public money still makes up the majority of the investment, but without £4.1 billion worth of funding from London's businesses, the scheme could not have proceeded. It is, of course, to London's great advantage that its

blue-chip property status means that schemes throughout the capital can exploit high real estate values as a way of securing investment.

To help fund the delivery of these types of project, Government has also begun looking to leverage investment by pension funds and has given local authorities more flexibility to support major schemes via soft loans from the Treasury. The Northern line extension is a good example of what is known as Tax Increment Financing (TIF), whereby a public body, in this case the GLA, helps pump prime a regeneration scheme that might otherwise not have proceeded and is repaid by increased tax receipts when the development is up and running. The Government is also keen for London boroughs to borrow against future tax streams in order to kick-start developments.

Theory meets practice

These new funding packages, and other private sector investments, still need to be secured in order for schemes like HS2, Crossrail 2 and the Thames Tideway Tunnel to proceed in timely fashion.

At the moment, none has financial backing in place to complement the Government's investment promises. To make these projects "bankable", that is to secure the backing of financiers, pensions companies and even sovereign fund holders, Government guarantees of cost, commencement and timing are needed. These certainties are notoriously hard to pin down in the world of mega infrastructure schemes, and deter investors. And the Government's tough targets for carbon reduction combined with a lack of policy certainty are also complicating long-term investment decisions in the energy field and the provision of smart-grid technology. In the face of uncertainty, the pricing of risk becomes a much harder task and financiers look elsewhere.

Water industry a good model for developers

Because there is a secure, guaranteed revenue from the bills of customers, the water industry is well used to funding its projects through debt and equity. Thames Water has recently appointed the banker UBS to assemble the £4.1 billion package required to build the Thames Tideway Tunnel. The funding will come from a mixture of equity and debt, though if securing the funding proves too difficult, there are suggestions Government will fund the "super sewer" itself. Whoever funds the tunnel, Thames Water's 13.8 million customers will pay for the project through higher water bills, at a rate yet to be agreed by the industry's regulator, Ofwat. And there is confidence that investment partners will soon emerge — some of them possibly pension funds or sovereign funds. BT Pension Scheme bought a 13 per cent stake in Thames Water last year, and a Hong Kong company now owns Northumbrian Water.

The Government's case for HS2 is that it will support economic growth across Britain — the monetised benefits of the network to business are forecast to be approximately £34-45 billion, thanks to faster journeys allowing businesses to be more productive, new commercial and domestic developments being opened up by access to the line and the creation of 40,000 construction jobs.

The Northern line extension, to which Government has pledged a loan of up to £1 billion, will unlock major regeneration in the Vauxhall/Nine Elms/Battersea area as well as help underpin the redevelopment of Battersea Power Station. Over 17,500 new homes are forecast for the area alongside 25,000 new jobs. A new business zone is to be created, and the expected uplift in business rates generated by the redevelopment, alongside developer contributions, will pay back the Government's loan.

05.1
Rail

Across London and the south east, more trains make more journeys than ever before, placing an enormous strain on the infrastructure. That's why billions of pounds are currently being spent on upgrading all the links into London and on creating Crossrail, the ambitious pan-London line that for the first time since the Central line was opened in 1900, links central locations in the capital.

The links and upgrades being put in place will not only accelerate travel times and ease over-crowding, they will transform the social and economic geography of the capital and support development in key parts of London, including the West End, Canary Wharf / Docklands and the Thames Gateway.

New journey-to-work times from outlying regions should translate into an uplift in land and property values, which can regenerate previously less well-off areas. Newham, with five Crossrail stations, and Greenwich, with two, are forecast to be the London boroughs which derive the greatest economic benefits from the new line — with annual benefits of £100 million and £85 million respectively. Hillingdon (£59 million annually) and Ealing (£57 million per annum) are the best placed of the western boroughs. More distant areas will benefit too, with Croydon for example, predicted to see economic activity rise by £30 million a year. And it is estimated that every London borough, not just those on the Crossrail route, will see an annual boost to its economy of at least £15 million.

In central London, Crossrail will deliver substantial commercial over-site development opportunities at stations like Bond Street, Tottenham Court Road, Farringdon and Liverpool Street. Major landowners, including Grosvenor, Great Portland Estates, Derwent London and Aviva are working in partnership with Crossrail to unlock new commercial and retail activity from their portfolios at or near underground stations on the route. At Tottenham Court Road, the over-site development includes the first new West End theatre in over a decade at the former Astoria, a new public piazza around Centrepoint and a new pedestrian space linking Soho Square and Charing Cross Road.

Construction work on rail infrastructure is currently underway and clearly visible to travellers at the main line stations, with the most ambitious programme of all at London Bridge. And the £14.8 billion Crossrail and the £6 billion Thameslink upgrade may be joined in a few years by Crossrail 2, a Northern line extension to Battersea, and most controversially, High Speed 2 (HS2). If the Government sticks to

its plans in the face of fierce opposition, the new £34 billion line will start operations in 2026 from a rebuilt Euston station and travel to the Midlands and eventually the North.

With the Thameslink upgrade project, the aim is to increase suburban capacity and improve connectivity on Great Northern routes by enabling many services to continue through the Thameslink tunnels rather than being forced to terminate at London King's Cross.

All this above and below ground activity takes place as London Underground celebrates its 150th anniversary. The inspired and revolutionary concept of a subterranean tunnel from Paddington's Praed Street, west London to Farringdon in the City has come a long way since then.

CROSSRAIL

Cost: £14.8 billion
Status: Construction work started in 2009; services from 2018

Crossrail is the largest building project in Europe today and the most technically ambitious. When services commence in 2018, it will increase London's total rail-based transport network capacity by 10 per cent across the city.

The 118 km line will run from Abbey Wood and Woolwich Arsenal in the east to Maidenhead in the west via central London. And it will link the Kent route into London with services to Canary Wharf and Heathrow airport, providing passengers with more journey options and quicker travelling times to key locations across London and the south east.

To create the new line, eight tunnel boring machines, each 148m long, are weaving their way between existing underground lines, sewers, utilities and building foundations at depths of up to 40m.

Crossrail will run through 21km of new twin-bore tunnels under central London, connecting 37 stations, nine of them new — Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street, Whitechapel, Canary Wharf, Custom House and Woolwich.

The railway will operate 24 trains per hour in each direction through central London during peak times, which will provide substantial new passenger capacity and crowding relief, particularly on the Central and Piccadilly lines.

Each Crossrail train will be around 200 metres long and be able to accommodate up to 1,500 passengers; around 200 million passengers will travel on Crossrail each year.

Passengers will be able to travel in the 10-car trains from Heathrow to Tottenham Court Road in under 30 minutes and Paddington to Canary Wharf in 16 minutes. Abbey Wood passengers will see their commute into central London cut from about 50 minutes to 20 minutes.

Thanks to the new line, an additional 1.5 million people will be brought within 45 minutes' commuting distance of London's key business districts. And Crossrail will deliver substantial economic benefits for all of London and the south east: the latest forecasts suggest it will add £42 billion to the economy, resulting in a £17 billion tax boost for the Treasury.

Crossrail will employ 30,000 throughout the programme. Up to 14,000 people will be employed at the peak of construction in 2013/2015, with an estimated further 7,000 jobs created indirectly.

How Crossrail is being paid for

Crossrail is being delivered by Crossrail Limited (CRL), a wholly owned subsidiary of Transport for London, which is jointly sponsored with the Department for Transport.

The City of London Corporation is making a direct contribution of £200 million. In addition, it will seek contributions from businesses of £150 million, and has guaranteed £50 million of these contributions. BAA is contributing £230 million towards the project. Of Crossrail's £14.8 billion funding package, DfT is responsible for £4.7 billion of funding with the Mayor, via Transport for London and the Greater London Authority, responsible for £7.1 billion of funding. Canary Wharf Group and Berkeley Homes will also contribute through the construction of new stations in the Docklands and Woolwich respectively. Network Rail is also delivering £2.3 billion of improvement works across the rail network. There is also a system which will levy contributions to the cost of Crossrail from most new developments in the capital, which will form part of London's share of the funding package for the project. New powers given to the Mayor under the 2008 Planning Act allow him to use the planning system to raise money for infrastructure improvements needed to develop an area through the setting of a 'Community Infrastructure Levy'. It will be collected on new developments which gain planning approval from the spring of 2012 and aims to raise £300 million.

Excavated material (earth from stations and tunnels)

At least two-thirds of all Crossrail excavated material, more than 4.5 million tonnes, will be used to create a new RSPB nature reserve at Wallasea Island, creating Europe's largest man-made coastal reserve. Earth from under central London is being carved out by 148 metre long,

tunnel boring machines (TBMs). Eight TBMs will be used to build the new rail tunnels under London.

85 per cent of earth will be transported by rail and water. This strategy has prevented the need for more than 270,000 lorry movements.

Tunnelling

A total of eight tunnel boring machines will construct twin tunnels. Each tunnel will be 21 kilometres (13 miles) long. Each TBM is a 1,000 tonne, 148 metres long underground factory. It is operated by a 'tunnel gang' comprising of about twenty people — twelve people on the TBM itself and eight people working between the rear of the machine and the tunnel entrance.

The TBMs will run nearly 24 hours a day, seven days a week, stopping for maintenance and certain public holidays.

The tunnelling machines carve a tunnel with a 7.1 metre diameter. Pre-cast concrete rings are then put in place behind the cutterhead to line the tunnel. The final diameter of the tunnel is 6.2 metres.

250,000 tunnel segments will be used to line the 42 kilometres of Crossrail tunnels, which are being manufactured at Old Oak Common and Chatham Dockyard.

Six million tonnes of excavated material will be removed — enough soil to fill the equivalent of Wembley Stadium to the roof three times. The movement of soil and segments via water has removed the need for an estimated 100,000 lorry movements.

Tunnelling statistics:

- Diameter of Crossrail tunnels: 6.2 metres
- Cutter head diameter: 7.1 metres
- Typical average progress rate: 100 metres a week
- Typical average excavation rate: 7,500 tonnes per week
- Cutter head rotation speed: up to 3.19 rotations per minute
- Nominal thrust force: approximately 58,000 kN - the equivalent force needed to lift 2,900 London taxis
- A total of 84 kilometres of conveyer belts will be used to transport the excavated earth from the TBM cutterheads to the tunnel entrances
- On board welfare facilities include toilets and a kitchen
- Surface control room will monitor progress in real-time and use GPS
- Ten hydraulic steering rams near the front of the machine steer the TBM within millimetre precision of its designated alignment

CROSSRAIL 2

Cost: £10-£15 billion
Status: TfL review under way

Though Crossrail and the Thameslink upgrades will ease congestion greatly, forecast demand shows that over-crowding will remain a significant issue along the north-east to south-west corridor across central London. By 2031, even without HS2, passenger levels at Euston are likely to be 30 per cent higher than now, almost nullifying the easing-value of the investment of the previous two decades. The problem becomes all the more acute after HS2 is planned to come into operation. Crossrail 2 — a long-debated new line between Chelsea and Hackney — would offer a significant step change in capacity.

In preparation for future investment, a route along this line has been safeguarded across London since 1991. TfL is currently undertaking a review of the route to ensure it provides the maximum benefits, and will report to the Mayor by the middle of the year.

There are two options under consideration: a shorter metro line costing an estimated £10 billion that would go as far south as Wimbledon, and north to Alexandra Palace; or a full-scale regional rail line, similar to Crossrail, that would connect with mainline services at Tottenham Hale in the north and Wimbledon in the south with a spur to Alexandra Palace, at a cost of about £15 billion. The extended version would connect to the suburban lines at both ends to allow for through-running of suburban trains. Either option would divert from the previously safeguarded route to connect with Euston and the new HS2 line.

As with other major new rail schemes, significant economic benefits are forecast for the areas connected to Crossrail 2, particularly in the Upper Lee Valley, which encompasses Stratford and the 2012 Olympic zone.

In February, London First unveiled its preferred route for the line, the regional option. This route would run from Surrey in the south-west to Hertfordshire, passing through Victoria, Tottenham Court Road and Euston-St Pancras.

THAMESLINK

Cost: £6 billion
Status: Construction on the current upgrade began in 2007; due to complete 2018

More than £6 billion is being spent on the Government-funded Thameslink programme, including the redevelopment of London Bridge station, which the client Network Rail describes as the single most

ambitious and challenging redevelopment of any station in Britain. It is one of the most technically demanding engineering projects ever undertaken on the railway — the station will be completely transformed while more than 50 million passengers continue to use it every year.

Phase two of the Thameslink programme will involve construction work on the track and signalling on seven miles of railway in south east London around London Bridge station and entirely rebuilding several bridges. This phase also includes creating a link at St Pancras to services from Cambridge, Peterborough, and builds on the success of phase one of the scheme that has seen Blackfriars and Farringdon stations rebuilt, new services introduced, and the first longer trains introduced on the Thameslink route.

The redevelopment will also improve the capacity and reliability of services across the south east of England. Up to 24 trains an hour will be able to travel through central London, linking Bedford, Luton Airport, Peterborough and Cambridge with East Croydon, Gatwick Airport and Brighton.

Network Rail is upgrading track, signalling and stations on the Thameslink route between Bedford and Brighton, through central London. The work is allowing First Capital Connect to run 50 per cent longer 12-carriage trains, and will enable a metro-style 24 trains per hour to run on the route in each direction from 2018.

Taken together, Thameslink and Crossrail will deliver 20 per cent more seats during London's morning peak hour. So there will be 539,300 seats into London across all routes during peak morning hours in 2014 and by 2019 there will be an extra 115,000, bringing the total up to 654,300.

HIGH SPEED TWO

Cost: £34 billion
Status: Royal Assent due spring 2015; construction to begin 2017; first leg operating 2026

The controversial £34 billion HS2 network has been designed to provide direct, high capacity, high speed links between London, Birmingham, Leeds and Manchester, with intermediate stations in the East Midlands and South Yorkshire. There will also be direct links to Heathrow Airport and to the continent via the HS1 line. The aim is to upgrade and increase capacity on Britain's main rail routes and drive development in the Midlands and the North.

The completed Y-shaped network would bring the West Midlands within about half an hour of London and would allow journey times of around 80 minutes from Leeds and Manchester to the capital (cutting each journey by about an hour). Connections onto existing tracks would create direct high speed train services to cities including Glasgow, Edinburgh, Newcastle and Liverpool.

A direct link to Britain's existing high speed line, High Speed 1 — which runs from London St Pancras to the Channel Tunnel — would open up easier travel to the continent from across Britain. And building a direct link to Heathrow airport from Euston would enable direct high speed services to run to and from the airport. The West Coast Mainline would also benefit.

If it receives Parliamentary approval, and secures the funding, HS2 will be built in two phases. The line from London to the West Midlands and the connection to HS1 are expected to open in 2026, followed, in 2032-33, by the onward legs to Manchester and Leeds and the connection to Heathrow. The capital cost at 2011 prices of building the complete Y network is £33.1 billion (not including the spur to Heathrow).

Although there is fierce opposition to HS2 from many quarters, Government is firmly committed to the project. It intends to submit a Hybrid Bill to Parliament (for the London-West Midlands line) towards the end of the year (2013), with Royal Assent in spring 2015.

LONDON BRIDGE

Cost: £500 million
Status: Current upgrade began in 2009; new phase, including concourse work, started 2012/13 and will complete in 2018

London Bridge is London's oldest station, first built in 1836. It is a key part of the Thameslink line and its 55 million users make it the country's fourth busiest station with 50 per cent more passengers than Gatwick Airport and more than twice the number it was designed for. Since 2009, the Thameslink development project has seen London Bridge embark on an ambitious £500 million masterplan for redevelopment of the station and surrounding areas. Integral to the development are new tracks, new public spaces and new entrances. Integrated in with the redevelopment has been the creation of the iconic Shard, Europe's tallest building, which shares the huge new concourse area with the station and is at the heart of a new commercial district, London Bridge Quarter, being developed in the station's environs.

The Shard comprises offices, residences, a 5-star hotel, restaurants and public viewing galleries. Nearby will be The Place, a 40,000 sqm commercial development. Both will be set within the Quarter's new public realm, with its art installations and mature planting, which is linked to a new bus station and the London Bridge concourse, which has been funded by the London Bridge Quarter developers.

When completed in 2018, London Bridge will have the biggest concourse in the UK. Lifts or escalators will take the annual 90 million passengers to every platform, while new entrances on Tooley Street and St Thomas Street will mean better access to cycling, walking and bus routes.

Congestion on the Northern line at London Bridge Underground station will be reduced and the capacity for train services stopping at the station between 8am and 9am will increase from 70 to a maximum of 88.

As part of the redevelopment of London Bridge station, Thameslink services which run through the centre of London will be diverted away from London Bridge between 2014 and 2017, running instead via Elephant and Castle. To prepare for this, £8 million will be spent in the area to increase the resilience of the infrastructure to cope with the additional trains.

As well as the redevelopment of London Bridge station, the programme includes major surgery on miles of outdated track and signalling, with upgrades from Bedford to Brighton and on other rail routes that serve London Bridge and ultimately a fleet of new state-of-the-art trains.

BLACKFRIARS

Cost: £635 million
Status: Underground station completely rebuilt 2009-12; Mainline rail station work almost complete

Work to construct the largest solar panel array in London is nearly completed now on the roof of Blackfriars station. It is the last part of a major redevelopment of the station, which began in 2008 and is an integral part of the Thameslink upgrade programme.

Blackfriars became fully operational for passengers last summer, after a major renovation over four years which has delivered two new entrances, four new platforms and a new London Underground station (the tube station was closed for nearly three years while the work was being carried out). A mixture of new residential, commercial and retail developments is being created around the station site.

Network Rail has rebuilt the station on top of Blackfriars' 125-year-old rail bridge to provide more space for passengers and longer, more frequent trains. The new station roof above the Victorian bridge houses 4,400 solar panels, which generate up to 50 per cent of the station's energy needs. It will make Blackfriars the largest solar bridge in the world. The panels are expected to generate 900,000 kWh of electricity every year, saving over 500 tonnes of CO2 annually. It has been described as one of the world's great solar power installations. Blackfriars Bridge was stripped to its foundations and reconstructed wider to house platforms, a 250 metre-long roof and the world's largest bridge-based solar array. The work forms part of a wider upgrade of the Thameslink route, running from Bedford to Brighton through central London. First Capital Connect customers on this route will benefit from longer trains and more frequent services, with a metro-style train every 2.5 minutes through central London during peak times.

Blackfriars is the first bridge over the Thames since the 13th century London Bridge to generate its own power. The old London Bridge used waterwheels to drive water pumps and grain mills. The only other solar bridge known in the world is in Brisbane, Australia, built in 2009.

Since reopening, an extra 727 trains serve Blackfriars every week — a 40 per cent increase in the number of trains using the station.

WATERLOO

Cost: £25 million
Status: First phase completed

The first stage of a £25 million improvement project at Waterloo, Britain's busiest station, was completed last year. It's brought improved access and less congestion for 300,000 passengers each day — 90 million each year. Waterloo's new 220m balcony runs almost the full width of the station, removing the long-standing bottleneck. Commuters passing between Waterloo and Waterloo East stations will be able to use the four new escalators connected to the balcony which runs almost the full width of the station.

KING'S CROSS & ST PANCRAS

Cost: £2.5 billion over the past ten years
Status: St Pancras completed 2007, and final phase of King's Cross this year

Redevelopment work has been taking place at King's Cross since 2007 and the final phase — a 7,000 sqm public square — opens in August this year. Work is progressing on remodelling the green canopy that has overshadowed the historic frontage of King's Cross station since the 1970s. Once removed it will reveal, for the first time in 150 years, Lewis Cubitt's Grade I listed Victorian station facade and will lead to the creation of London's newest public space — King's Cross Square, an area bigger than Leicester Square.

Over the last 10 years almost £2.5 billion has been spent on the transport infrastructure in King's Cross and St Pancras, where the new international station for operating Eurostar services opened in 2007. Linking the two stations is an easily accessible interchange.

The final phase of works follows the opening of the impressive glass and steel western concourse in March 2012, providing three-times more space for passengers than the old concourse, with improved links to both the London Underground network and St Pancras International station.

More than 45 million passengers a year — travelling through London and to and from destinations including Cambridge, Peterborough, York, Newcastle and Edinburgh — now have improved facilities including better lighting, larger destination boards, clearer station announcements and more shops and restaurants.

The redevelopment at King's Cross and St Pancras has been the catalyst for transforming the local environment into one of the largest regeneration schemes in Europe. Nearly 70 acres of brownfield land will be redeveloped to create eight million sq ft of offices, retail and housing. In 2011 Central Saint Martins College of Art and Design moved into renovated railway buildings to the north of the station. There are plans for 25 new office buildings, 20 new streets, 10 new major public spaces, refurbishment and restoration of 20 historic buildings and structures and 2,000 residential dwellings.

PADDINGTON

Cost: £303 million
Status: Hammersmith and City works completed 2012 with further works due to complete in 2014 and Crossrail station ready by 2018

At Paddington Station (Hammersmith and City Line) a number of improvements were completed in time for last year's Olympics: a new station entrance from Paddington Basin; a new station concourse; two new stairways where there was originally only one; and extended platforms to accommodate new, longer air-conditioned trains.

Work continues on additional improvements including a new ticket office, ticketing machines and ticket gates (including wide aisle gates), lifts to the platforms and an additional stairway, all scheduled to finish in early 2014. Work is also underway on the construction of the new Crossrail station, which will be ready for operation in 2018.

EUSTON

Cost: £1.2 billion
Status: HS2's London terminus, requiring major redevelopment of the station and surrounding area; schedule of building to be submitted in the Hybrid Bill later this year; aiming to start construction in 2017

Euston is designated as the London terminus of the planned High Speed 2 rail line, and will be rebuilt to accommodate the increase in passenger throughput. Arup and Grimshaw have been selected to design the new station, which will include a new terminus for HS2, a new London Underground ticket office, office, retail and public spaces and many community facilities.

The £1 billion project will transform and regenerate Euston and the surrounding area including Somers Town. It will be included in the draft legislation for HS2 which will be put before Parliament this autumn. The Euston Trust is lobbying for a replica of the original Euston Arch to be erected between the two stone lodges on Euston Road. Nearly 60 per cent of the original arch, which was built in 1837 and demolished in 1962, is locatable for re-use.

Alongside the Euston redevelopment, there are proposals from the architect and planner Farrells to transform the Marylebone-Euston Road into what it describes as "one of London's greatest assets, with street life, attractive landscaping, major squares and green spaces." Central to its plan is the need "to shift perceptions of this area as an urban motorway serving through traffic to a distinctive 'place'".

NORTHERN LINE EXTENSION

Cost: Up to £1 billion
Status: Full planning permission yet to be granted; aiming to start construction in 2015 and operating from 2020

The much-debated Northern line extension project received the green light in the Chancellor of the Exchequer's Autumn Statement in December last year. The Government has guaranteed to support up to £1 billion of soft loans to the Mayor of London from the Public Works Loan Board.

Work is expected to start on the extension in 2015, with the first trains running by 2020.

The plan is to extend the Charing Cross branch of the Northern line from Kennington to Battersea via Nine Elms. New stations at Nine Elms and Battersea will be built. The boost this will deliver to local property values is the key to unlocking the regeneration of Nine Elms redevelopment as well as the redevelopment of Battersea Power Station. The Greater London Authority will designate a new business zone for the area, from which increased business rates will help it repay the Government loan that will fund the extension. Battersea's new Malaysian owners will be contributing £203 million towards the tube line extension.

It is projected that the extension, along with the regeneration of Vauxhall and Nine Elms, will provide 17,500 homes and 25,000 jobs. The new stations would mean reduced journey time to the City and West End,

New platforms at London Bridge — part of the ambitious redevelopment of the station due for completion in 2018

© Grimshaw

as well as easing the strain on Vauxhall station and the existing Northern line south of Kennington. From 2020, it will take 15 minutes to travel from here into central London and the City.

The Government's backing has boosted the £8 billion, 39-acre Battersea Power Station development, which was given outline planning permission in August 2011. Construction starts in September this year, with the first properties available for occupation in 2016. The Malaysian owners and developers report strong interest in the scheme, and expect all 800 properties — some valued at more than £6 million — to be sold in the next six months. In order to safeguard against damage to the four iconic chimneys, each will be dismantled and rebuilt over a three-year period. The entire redevelopment will take a decade.

LONDON OVERGROUND

Cost: £1.4 billion
Status: Opened and running from 2012

The final link in the Outer London Rail Orbital — a near-seven mile rail line between Surrey Quays and Clapham Junction costing £75m — opened last December. The London Overground, or "The M25 of Rail" as Mayor Boris Johnson calls it, connects tracks in the suburbs all round London that were not previously linked. Some small new lines have been built — 1.3km on this section — but utilising existing track has made the project quicker to build and less expensive than new build.

The orbital network consists of the lines serving Richmond to Stratford, Willesden Junction to Clapham Junction via Olympia, Gospel Oak to Barking, Euston to Watford Junction and now Surrey Quays and Clapham Junction. A full round trip lasts about 90 minutes, with changes required at Clapham and Highbury & Islington. Over 12 million passengers a year are forecast to use the service.

BAKERLOO LINE EXTENSION

Status: Unscheduled

Southwark Council is petitioning the GLA to include an extension of the Bakerloo line south of Elephant & Castle to Camberwell and Peckham in the next 10 Year Transport Plan.

UNDERGROUND UPGRADES

Government is committed to upgrading the Underground with grant payments of £10.8 billion over the next four years. This will help fund infrastructure investments across the capital, such as increasing capacity on the Jubilee, Northern and Victoria lines, improving the reliability of Underground journeys by investing in signalling, trains, bridges and tunnels, and expanding London's automated intelligent traffic control system. The programme will deliver 30 per cent more capacity across the network, with new trains, track and signalling so Tube services can run faster, more reliably and more frequently.

Key interchanges are being rebuilt at Victoria, Tottenham Court Road, Bond Street and Paddington to make them bigger and less congested and improve accessibility. Tottenham Court Road station is now underway to be completed in 2016; the Bond Street upgrade will be completed in 2015; and at Bank, redevelopment will increase capacity by re-tunnelling the Northern line, developing a new entrance on King William Street and providing lifts to the Northern line platforms. If the necessary approvals are received, work is scheduled to start in 2015 and will be complete by 2021.

The entire Northern line is also being upgraded, with completion planned for 2014. The most complex on the Underground network, it carries more than 900,000 passengers a day. A new control centre, computerised signalling and Automatic Train Control system will be installed enabling trains to run closer together and at higher speeds, reducing journey times by 18 per cent and increasing capacity by 20 per cent.

SUB-SURFACE LINES UPGRADE

Status: Planned completion 2018

The sub-surface upgrade for the Circle, District, Hammersmith & City and Metropolitan lines is currently the largest investment TfL is making on the Underground. It consists of 191 new trains, a new signalling and Automatic Train Control system, a new control centre, power upgrades and extensive train depot improvements.

Serving all four lines, the new trains have walk-through carriages and, for the first time on the Tube, air conditioning throughout.

Following the successful roll-out to the Metropolitan line, roll-out on the Circle, Hammersmith & City and District lines will be completed by 2016 and on the Circle and Hammersmith & City lines, trains will be longer than today's vehicles, increasing capacity by 17 per cent. In addition, they will be fitted with CCTV throughout and better customer information systems.

TfL is developing a programme for the next generation of line upgrades, which will focus on the Piccadilly, Central, Bakerloo and Waterloo & City lines. On these lines steady performance is enabled through rigorous maintenance, but the lines rely on out-dated infrastructure. Piccadilly line

signalling dates back to the 1960s, and the Bakerloo and Piccadilly lines operate with 40-year-old trains. The development of a new train which will be common to all lines, combined with new signalling, provides the opportunity to achieve increased capacity to keep pace with growth. Victoria line infrastructure works have been completed and a timetable change in early 2013 will enable a peak service of 33 trains per hour. This will provide a 21 per cent increase in peak capacity and significantly reduce journey times.

The works are the Victoria line's first major investment in 40 years with the original train and signalling equipment replaced by modern, reliable technology and a fleet of 47 new trains now in service, better ventilation and CCTV in every carriage.

The continuing upgrades will provide massive capacity increases when complete — the Metropolitan line by 27 per cent; Circle and Hammersmith & City lines by 65 per cent; and the District line by 24 per cent.

05.2
Roads, routes and crossings

Strategically, London's 13,800km of roads are vital to the capital's economy. More than 28 million journeys are made in the city every day and roughly 80 per cent of all passenger trips and most freight trips are made by road, whether by bicycle, car, freight vehicle, motorbike, bus, taxi or on foot.

But despite being crucial thoroughfares that keep the City moving, many of London's most heavily-used road routes have become semi-hostile to users and have blighted their localities. To ameliorate these environments, while at the same time smoothing traffic flow, the Mayor of London aspires to double spending on London's roads, from £1.9 billion to £3.8 billion over the next decade.

What's particularly exciting about the plans is that they include a new vision for civilising the streets by transforming "the public realm" in certain major road interchanges and introducing a better balance between transport and pedestrian use of the space. Of these schemes, one of the most ambitious is the Vauxhall Nine Elms and Battersea project, which aims to take an area that's been described as "disconnected, discordant and lacking integration" and remodel it in ways that will be greener and more friendly to users, particularly pedestrians and cyclists.

Camden Council has plans for a £10 million two-way gyratory scheme that will improve traffic flow in the Tottenham Court Road and Gower Road environs and create large pedestrianised areas and paths for cyclists. TfL has committed £2 million to the scheme and discussions are ongoing with Crossrail developers over a possible contribution to the scheme. In the City of London, plans have been approved for the Aldgate Western Gyratory scheme, which will also create a much more pedestrian-friendly environment.

There are many projects in London driven by local authorities where railings and road barriers have been removed and pedestrians now cross streets more freely, without serious disruption to traffic flow, perhaps the best examples being the work done at Exhibition Road and Oxford Circus. At Exhibition Road, home to some of the great world's great museums and institutions, a traffic-dominated street has been transformed to create an exciting new space that works for both pedestrians and traffic. The plans for the Vauxhall Gyratory and surrounding areas hold out a similar prospect of transforming the traffic routes and human geography of the area, in a way that has proven successful in pioneering projects in Holland and also pays tribute to British architect George Cullen's

The diagonal crossing at Oxford Circus has transformed the pedestrian experience

© Atkins

townscaping influence. The Mayor's London Plan identifies the locale as an Opportunity Area (OA), one of the city's "few opportunities for accommodating large scale development to provide substantial numbers of new employment and housing, each typically more than 5,000 jobs and/or 2,500 homes, with a mixed and intensive use of land and assisted by good public transport accessibility."

What this mega-upgrade might mean for the area is a continuous riverside path from Lambeth Palace Gardens to Battersea Park with substantial public realm improvements along its length and development along its edges; road improvements along Albert Embankment and Nine Elms Lane, including two-way segregated cycle routes – part of the new cycle superhighway planned across London – and wide, well surfaced pavements with extensive tree planting; a new park in Nine Elms, which will act as a focal point and recreational facility for the new community in Nine Elms; strategic river links to connect the currently segregated residential hinterland; and a new pedestrian/cycle bridge connecting Nine Elms to Pimlico. A central part of the project involves removing the gyratory and reintroducing a two-way traffic stream, which alone could cost £20 million.

How the money will be raised for this and other projects is currently under review by the Mayor's London Road Taskforce, which will report its findings this summer. The question of introducing road tolls has been ruled out by the Mayor in this term of office, which ends in 2016, but is likely to be discussed seriously by his successor. One of the most likely projects to be paid for by the public users is a new Thames crossing at Silvertown (see below). If a toll is introduced here, then the currently free-to-use Blackwall Tunnel would be changed to become a tolled route. In the 2012 Autumn Statement the Government gave £150 million to back improvements to the junction of the A13 and the M25 (Jct 30, at Thurrock) — a notorious pinch point — which is a gateway route to the Thames Gateway region that is currently being regenerated. The scheme should help speed up the area's growth over the next decade.

The bulk of the London roads investment programme will be spent on local upgrade and widening projects all round the capital, typically of around £3 million.

Road crossing made easier

As an integral part of the new investment programme, technology is to be harnessed that will ease road congestion while also catering for pedestrians and cyclists. TfL will equip 1,500 more traffic lights with Split Cycle Offset Optimisation Technique (SCOOT) technology, an intelligent traffic control system with the ability to reduce delays by 13 per cent — and at some locations by 20 per cent. SCOOT directs traffic signals to respond to real-time traffic conditions, and further

planned enhancements will allow the system to take account of pedestrians and cyclists. Currently, 40 per cent of London's 6,000 traffic signals are using SCOOT and TfL is planning to expand it to half of the signals by spring 2014 and to 4,500 out of 6,000 by 2019.

TfL is also looking to introduce new pedestrian crossings that tell how much time remains to cross the road after the green man light has gone out. Trials have proved them popular with the public, and an aid to smoothing traffic flow.

THAMES TUNNEL CROSSINGS

Status: Unscheduled

There are six times as many road crossings to the west of Tower Bridge as there are to the east. This imbalance disadvantages businesses and people who travel in east London. To counter this, and encourage more development in London's eastern corridor, the Government is working with the Mayor of London and TfL to explore options for proposed additional river crossings. A new tunnel between the Greenwich Peninsula and Silvertown, along with a new £150 million ferry at Gallions Reach, which could potentially replace the Woolwich Ferry, are being proposed by TfL. The cost of the tunnel is estimated at £600 million, and TfL is currently consulting on the options and funding methods for this scheme, which could open in 2022. The case for the tunnel is strengthened by its value in boosting regeneration in the Royal Docks and Greenwich Peninsula areas.

Additional options are also put forward, including replacing the ferry with a fixed road bridge, which would put up the total cost by another £450 million to a grant total of £1.2 billion.

CYCLE ROUTES

The Mayor of London wants to encourage a significant increase in cycling in the capital. He is aiming to double the current levels, so that it accounts for at least 5 per cent of modal share by 2026. Already, more than 540,000 cycle journeys are made every day in the city and this continues to increase.

Transport for London's new business plan, published in December last year identifies 12 cycle superhighways that lead into the centre of the city, including a super corridor along the Embankment from Westminster Bridge to Tower Hill.

To achieve this, TfL plans to double spending up to 2015 from £135 million to £268 million. Over and beyond this, the mayor wants to spend another £640 million on cycling in addition to the 10-year plan of £273 million. It would be spent on cycling lanes, bike parks and road improvements.

In March this year the Mayor published his Vision for Cycling in London, promising a budget of nearly £1 billion to deliver:

A new network of cycle routes in central London

A 'Bike Grid' of high-quality, high-volume cycle routes, using a combination of segregation and quiet shared streets, along with some innovative use of existing infrastructure.

A Crossrail for the bike

A fast, segregated cycle superhighway stretching 15 miles west-east from the western suburbs to Canary Wharf and Barking. The route will follow existing, but improved, segregated tracks alongside part of the surface stretch of the A40. A bi-directional cycle track will be created by removing one of the six traffic lanes from the Westway flyover. There will be new segregated tracks along the Victoria Embankment and through the City. Peak-hour cycle journey times along the route will often be comparable to, or quicker than, their rail or car equivalents.

Better Cycle Superhighways

All future Superhighways will be delivered to higher standards. There will be more mandatory cycle lanes, which cannot be entered by motor vehicles, semi-segregated from the rest of the traffic with means such as cats' eyes and rumble strips. More use will be made of secondary roads for the Superhighway programme. The remaining Barclays Superhighways will be complete by 2016.

New Quietways

A cross-London network of high-quality guided Quietways will be created on low-traffic back streets and other routes.

The report suggests that segregation is not always necessary or appropriate. In some places the Mayor prefers filtered cycle permeability, as used in Hackney, where the number of cycling trips is the highest in London.

The Quietway network will also include new off-road greenway routes through parks and along waterways. Quietways will become sites for new trees and greening, making many of them verdant corridors, even linear parks, part of the Mayor's vision of a 'village in the city'. Johnson hopes to open the first Quietways in 2014.

‘Mini-Hollands’ in the suburbs

Between one and three boroughs will be selected for investment in the creation of ‘mini-Hollands’. The idea is that these places will become as cycle-friendly as their Dutch equivalents. A good route will be provided for commuter journeys to central London, but the main focus will be on replacing short car trips within the target borough(s).

A Tube network for the bike

Routes will be a network that will join up and align with the maps Londoners carry in their heads, the most common of which is the Tube map.

The boroughs

TfL only owns five per cent of the roads in London, most of the rest are owned by the 33 borough councils. The Mayor hopes to encourage them all to make cycling improvements on their roads.

Another example of TfL’s commitment to encouraging cycling by making it safer is the newly redesigned Bow roundabout in East London. A traffic light dedicated to an enlarged cyclists’ zone allows “early start” facilities, thus allowing cyclists to move safely on to the roundabout ahead of other traffic when the cycling light turns green.

05.3
Energy

Energy provision in London is intimately connected with environmental concerns over climate change, and all future developments in energy infrastructure revolve upon the need to tackle this issue.

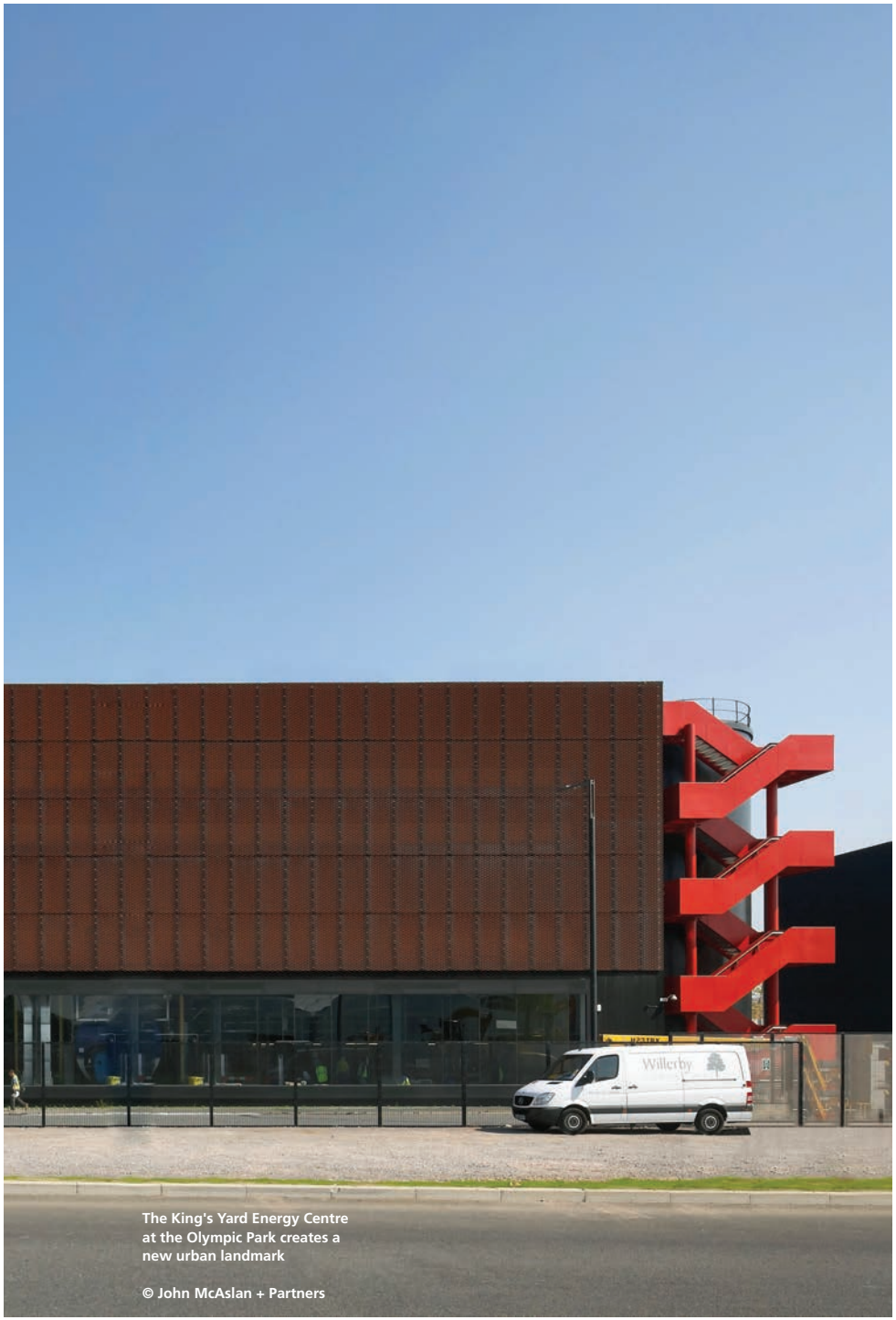
The Mayor of London has set out his aim of London becoming a world leader in environmental improvement. This goal informs policy across all infrastructure programmes including transport, water management, the economy and living spaces.

The city’s plan for energy is to move as much as possible away from reliance on the national grid and on to local, low carbon energy supply, including combined cooling heat and power (CCHP), energy from waste (EfW), and on site renewable energy technologies (often termed ‘decentralised energy’).

Currently, 65 per cent of the energy consumed in London is in the form of heat supplied by the gas utility infrastructure and 32 per cent of energy is electricity from the National Grid. Today, only 3 per cent of London’s heating demand is met through local CHP generation. The carbon intensity of grid-supplied electricity is higher than that of gas, thus electricity accounts for over half of the CO2 emissions from energy consumption even though it only meets 28 per cent of London’s energy demand. The Mayor is seeking to reduce London’s carbon dioxide emissions by 60 per cent (that is, below 1990 levels) by 2025.

To achieve these goals, London must use less energy, energy must be supplied efficiently and there will need to be more use of renewable energy.

Planners are aiming by 2025 for 25 per cent of London’s heat and power to be supplied by localised decentralised energy (DE) systems — saving up to 2.57 million tonnes of carbon dioxide a year. DE will come in the main from gas-fired combined heat and power (CHP) stations. The onus is on London boroughs to create these systems, and work with adjoining boroughs to set up shared networks. Some boroughs have already undertaken technical and financial feasibility work to progress district-wide heat and power schemes, and it is expected all boroughs will actively promote DE in their LDFs. This will enable systematic identification of key opportunities across London for different types of DE systems. The scale of opportunity can vary from CHP systems on specific development sites, through town centre wide district energy projects such as Elephant and Castle and the Olympic Park/Village schemes, to connecting into large scale infrastructure such as the London Thames



The King's Yard Energy Centre at the Olympic Park creates a new urban landmark

© John McAslan + Partners

Gateway Heat Network. This could ultimately extend to 23 kilometres and supply the heat requirements of 120,000 homes and properties, saving approximately 100,000 tonnes of carbon dioxide each year.

Boroughs are being encouraged to identify opportunities for developing renewable energy systems in their areas, including large scale systems. Where land is needed for the provision of renewable energy technologies, such as anaerobic digesters and biomass plants, boroughs are being told to encourage this provision through their inclusion in development briefs and area action plans. There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20 per cent through the use of on-site renewable energy generation wherever feasible.

Twenty-five projects are currently being supported by the GLA's Decentralised Energy Project Delivery Unit, including Crystal Palace's CHP scheme and a heating network extension in the Olympic Park district.

This chimes with the Government's plans for community energy schemes, such as, for example, the community-led project that is being implemented in Brixton, which is installing solar panels in the Loughborough Estate. An update on the Government's community energy strategy is to be published this spring.

Capacity concerns

Developers have expressed concerns that London's energy infrastructure will soon prove inadequate for the city's future growth. Their fears have been outlined in a report from the British Council of Offices, which talks of a perceived lack of capacity in district heating networks in central London. Additionally, it notes developers' doubts over whether the combined heat and power systems that new buildings must incorporate will prove adequate for the energy needs of future occupiers. The fact that the larger CHP schemes are currently unable to sell electricity at retail prices, or prices that are better than wholesale prices, "presents a major barrier to the development of medium-sized decentralised energy projects." In order to create new, timely capacity, real estate professionals believe UK Power Networks, the distribution network operator for London, should be permitted to invest in the network "ahead of need."

LONDON CABLE TUNNELS

UK Power Networks is investing £14 million in providing a new power connection between substations in Whitechapel, in the East End, and Finsbury Market, in the City, to increase the capacity and resilience of electricity supplies in the capital.

The 2.6 metre-wide tunnel will be lined with brackets supporting 132,000 volt electricity cables 25 to 35 metres below ground, connecting substations between the East End and the City. Most of the work is underground, avoiding roadworks at the time of installation and when cables are repaired or replaced. There will also be room inside the tunnel to accommodate more cables to meet future demand. The project is the second stage of a cable tunnel scheme which will eventually carry electricity supplies 6.1km between New Cross and Finsbury Market.

Last November's tunnel breakthrough at the 1.1km point was a key milestone in the construction of the 2.6km tunnel. Tunnelling started in Whitechapel last May and is expected to reach Finsbury Market this spring. The contract for the third stage of the tunnel has not been awarded yet.

A similar project is being carried out simultaneously in west London — tunnelling from Brentfield Park to Willseden, with the 1.5km-long project costing around £15 million. It's due for completion later this year.

Project factfile

- *The tunnel boring machine is 30 metres long and weighs 50 tonnes*
- *It arrived in Whitechapel in sections last year and was put together underground*
- *The machine burrows at a speed of approximately 50 metres per week*
- *The chamber diameter is 50mm bigger than the machine so the engineering has to be incredibly precise*
- *23km of 132,000 volt cables will line the sides of the tunnel*
- *23 specialist staff are working shifts inside the tunnel*
- *The miners reach the cutting face by train, taking around 25 minutes*
- *There will be extra space in the tunnels to accommodate future cable capacity*
- *The London clay removed from the tunnel is impermeable and is used for lining landfill sites*
- *2,815 concrete rings will line the interior of the tunnel*
- *5,000 brackets will be used to support the new cables to the walls of the tunnel*

CASE STUDIES

Wembley's decentralised energy masterplan

The London Borough of Brent and GLA have recently commissioned Ramboll Energy to develop a decentralised energy masterplan for the Wembley Regeneration Area. The aim is to assess and influence individual developers' energy strategy proposals and ensure that the full carbon reduction potential for the area will be delivered. The planners hope to be able to integrate energy from waste into the heat network.

Islington's Decentralised Energy project – the Bunhill Estate

The Bunhill Energy Centre and the district-wide heat network is providing cheaper, greener heat to homes on several estates and buildings in the Bunhill Ward of the London Borough of Islington.

The heat network is fed by the local energy centre on Central Street, designed by Tim Ronalds Architects, which produces both electricity and heat. The Bunhill Heat and Power system uses otherwise wasted heat to heat homes, the Finsbury Leisure Centre and Ironmonger Row Baths. Gas-fuelled combined heat and power technology is used to run the energy centre and there is strict monitoring of the air quality.

The energy centre brings cheaper energy to over 700 homes in the south of the borough. Hot water is piped from the energy centre to homes on the Stafford Cripps, Redbrick and St Luke's estates, as well as the leisure centre and baths. The network has over one kilometre of heat network in the roads around the energy centre.

LONDON NATIONAL GRID TUNNELS

In February 2011 National Grid embarked upon a £1 billion seven-year project to rewire the capital via two deep underground tunnels, in order to meet increasing electricity demand and help London access the renewable energy of the future. Its design life is 100 years.

London currently accounts for 20 per cent of the UK's electricity usage — a demand that is increasing by between three and five per cent every year. The Shard alone consumes the same amount of energy as a small town.

In order to supply the city's substations with the necessary energy to keep up with demand, National Grid and Costain are constructing more than 30km of underground tunnels that will carry the 400,000 volt transmission line cables needed. One of the two tunnels will also carry additional 132,000 volt cables to supply the distribution networks and so will need to be a metre wider.

The 3m and 4m-wide tunnels will connect substations in Wimbledon in the south, Hackney in the east and Willesden in the west with St John's Wood, just north of central London. They will run underneath the Thames, Regent's Park and some of the most densely populated residential areas — and most expensive real estate — in the country.

National Grid hasn't attempted a project of this size and complexity since installing the SuperGrid in the 1960s.

Instead of digging up and replacing the old cables that are buried under the roads — adding years of roadworks to London's already chaotic transport network — the infrastructure company is creating an easily accessed space that will allow cable installation and maintenance to be carried out without any disruption to the public. It will also have room for additional cables that could be laid to meet future demand.

The tunnels will be deep enough that no noise or vibration will be heard or felt on the surface, meaning the crew will be able to work 24 hours a day, five days a week, to get the job done.

The depth of the tunnels will vary between 12m and 60m. It will be 2016 before the first tunnel is energised and 2018 before the project is complete.

WASTE MANAGEMENT AND ENERGY

Londoners produce 22 million tonnes of waste per year. Over half of this is sent to landfill sites — enough to fill Canary Wharf tower every two days.

This is both environmentally and economically unsustainable. As Londoners begin to reduce further their levels of waste that go to landfill, there will be more opportunities to produce both energy and heat for the benefit of local communities.

London's prime waste management aim is to reduce the amount of waste that arises in the first place. However, given waste will not be eradicated even with a more disciplined approach to minimising it, the GLA's policy is based on the waste hierarchy that emphasises re-use, and then recycling and composting, before energy recovery and disposal. This should achieve the greatest carbon dioxide equivalent savings. A further aim is to manage as much of London's waste within London as practicable, working towards managing the equivalent of 100 per cent of London's waste within London by 2031.

London's current annual output of 22 million tonnes of waste is forecast to rise to approximately 34 million tonnes in 2031. There are three major types of waste produced in London:

- *municipal household waste (MSW) is the waste generated by London's households, collected by or on behalf of local authorities, amounting to approximately 4.2 million tonnes in 2008 (19 per cent of all waste)*
- *commercial & industrial waste (C&I) is waste generated by industry in London, collected largely by the private sector, amounting to approximately 7.5 million tonnes in 2008 (34 per cent of all waste)*
- *construction, excavation and demolition waste (CE&D) is the waste generated by development activity in London (for example, old buildings being demolished, new ones being constructed), primarily dealt with by the private sector and amounting to approximately 10.4 million tonnes in 2008 (47 per cent of all waste).*

The GLA wants to see a step change in London's recycling performance. Although there have been recent improvements in municipal waste recycling rates (up from 8 per cent in 2001 to 21 per cent in 2008), the authority wants to see a doubling to 45 per cent by 2015 and then 50 per cent by 2020.

To achieve this, there are numerous new technologies, from non-thermal processes like anaerobic digestion (AD), mechanical biological treatment and advanced thermal treatment (ATT) technologies like gasification and pyrolysis that are beginning to make themselves available.

Their potential impact is huge both environmentally and economically. It is estimated that if all London's waste going to landfill were used to generate energy, it would heat up to 625,000 homes and supply electricity to up to 2 million homes.

The Mayor and London Councils are now working towards a "zero waste to landfill" goal over the next 20 years. Waste to energy conversion is a recognised approach to resolving two issues in one — waste management and sustainable energy. The rising costs of waste disposal and incentives to reduce landfill plus long term increasing energy prices from fossil fuels makes the economic argument of using waste to generate energy even stronger. For example, if London's food waste was treated by aerobic digestion and converted into electricity, it would provide enough power for approximately 75,000 homes.

To illustrate the potential of this form of energy, the Mayor is aiming to set up an anaerobic digestion facility that will convert 30,000 tonnes of London food waste into vehicle fuel (or energy) and compost as soon as possible.

SMART METERS

Smart meters are the next generation of gas and electricity meters. They are part of the Government's plan for upgrading the UK's energy system. The aim is for all homes and small businesses to have smart meters by 2019. Energy suppliers will be required to install smart meters and take all reasonable steps to install them for everybody. Consumers with smart meters will be offered an in-home display (IHD) that lets them see how much energy they are using and what it will cost. This will let them have more control over their energy use and help them save energy and money.

Between now and 2019 energy suppliers will be responsible for replacing over 53 million gas and electricity meters. This will involve visits to 30 million homes and small businesses.

05.4 Water

Sir Joseph Bazalgette would surely be immensely proud, and not a little surprised, to discover that over 150 years after it was built, his visionary and city-saving drainage system is still performing so successfully. The Combined Sewer Overflows system (CSOs), which discharged via six main interceptor sewers to the Thames when the drains overflowed, was designed and built to cope with a burgeoning city population. And it saved the citizens of the capital from untold physical horrors, not least the scourge of cholera.

But Bazalgette's 100 miles of new sewers were designed for a population that he foresaw would one day rise to 4 million — quadruple that of his time. Now, with London's population exceeding 8 million, new sewerage infrastructure is urgently required. It requires little excess rainfall for raw sewage to be discharged into the Thames. Each year, 18 million tonnes enters the river — an indictment that shames a modern city with London's claims to global leadership. Currently, discharges into the River Thames can occur with as little as 2mm of rain and, in future, sewage may overflow into the River Thames even on dry days unless the situation is managed.

THAMES TIDEWAY TUNNEL

Cost: £4.2 billion
Status: Finance and go-ahead yet to be finalised; aiming to start construction in 2015 and operating by 2023

The proposed answer comes in the form of the £4.2 billion Thames Tideway Tunnel project, an ambitious Bazalgette-type scheme. It comprises a new 32km long tunnel that will substantially reduce the amount of untreated sewage discharged to the River Thames and its tributary the River Lee after heavy rainfall via 57 Combined Sewage Outfalls (CSOs). The tunnel would run under the Thames — at depths from 35 metres to 75 metres — from the west of the city to Beckton treatment works, although the precise route is yet to be determined.

How the Thames Tideway will be financed has also yet to be decided. An "Infrastructure Provider" has to be found to fund, build and operate the project: Thames Water is not allowed to perform this role, even though its customers are the ones who will ultimately pay through higher water bills — £70-80 a year, in perpetuity. The bank UBS has been appointed by Government to source funding of the scheme, for which the Government has said it will underwrite the project risks (see Funding section).

The Lee Tunnel will prevent 16 million tonnes of sewage entering the River Lee each year

© Thames Tideway Tunnel

Once planning approval has been granted, it is hoped later this year, the aim is to begin construction in 2015 and have the tunnel operating by 2023.

In a separate but linked project, the 7km Lee Tunnel is currently being built from Stratford to Beckton sewage treatment works. It will isolate the Combined Sewage Outfalls, discharging from Abbey Mills Pumping Station, and half the total volume of discharges that currently enter the River Thames. Construction began in 2009 and will finish in 2014. Improvements to five sewage treatment works (Beckton, Crossness, Long Reach, Riverside and Mogden) are also being carried out now. The improvements to Beckton involve a major extension to the works, which includes capacity to meet future dry weather flow requirements and to treat the contents of the Thames and Lee Tunnels, and to generate renewable energy from the sludge resulting from the treatment process.

Why not a SUDS?

Thames Water is aware that some commentators would prefer more emphasis had been placed on employing a Sustainable Urban Drainage System (SUDS), rather than new tunnels at all. Its response is that it is making use of SUDS to tackle sewer flooding in some areas of west London and that it will be deployed increasingly in future retrofit schemes. But it refutes the idea that SUDS on their own, in such a heavily urbanised city, could tackle today's problems with sewer discharge.

Thames Water acknowledges that if a new city was being built today, it would make total sense to provide separate sewers and drainage to ensure they do not mix, as they have done for centuries. That way, rainwater could be captured and treated to satisfy the increasing demand for drinking water. But it says the cost and difficulty of replacing the vast existing system, with its enormous volume of heavily polluted rainwater, argues against such a radical solution.

However, many sceptical observers are mounting a strong case for a more environmentally complete solution to London's sewer and drainage problems. Leading the way, and with strong support from Greenwich MP Simon Hughes and ex-water regulator Sir Ian Byatt, is a group called Blue Green UK, which links urban water infrastructure (blue) to urban vegetation (green) in ways that combat climate change.

Blue Green UK says Thames Water has not made a convincing strategic or economic case for the Thames Tideway Tunnel, nor considered alternative approaches. Its cause was strengthened in the European Courts recently when the British Government was found guilty of non-compliance with the Urban Waste Water Treatment Directive in relation to its consultations and technical assessments on the Tunnel. Engineering experts, some of whom were instrumental in designing the original project, now agree with Blue Green UK's view that the proposed super-sewer is unnecessary as well as an inadequate response to London's environmental problems. Instead, they argue for local storage and stormwater attenuation systems, of the kind now being implemented in several major American cities, including Portland and Philadelphia.

The planning application for the Thames Tideway Tunnel was submitted to the Planning Inspectorate for consideration in March. A decision by the Government is expected sometime in 2014.

THE THAMES BARRIER

The effects of climate change on both rainfall intensities and sea level rise pose serious flood risk concerns for Londoners. The Thames Barrier is expected to reach its design life in 2030 owing to the unanticipated increasing rate in sea level rise. In addition, the flood defence walls will no longer be high enough to contain the river during extreme storm events. Thames Estuary 2100 (TE2100) is an Environment Agency (EA) project to develop a tidal flood risk management plan for the Thames estuary through to the end of the century. Construction on this scheme started in 2009 and will complete in 2020. A fresh injection of £16.1 million for protection work across London was announced by the Government in February this year.

TE2100 covers the tidal Thames from Teddington in west London, through to Sheerness and Shoeburyness at the estuary mouth in Kent and Essex. The key driver for the project was that tidal flood risk is increasing in the Thames estuary due to:

- Climate change and sea level rise (the Thames is predicted to rise by between 20-90cm by the end of this century)
- Ageing of the current flood defence infrastructure
- More people living and working in the defended floodplain

Reassuringly for the capital, Environment Agency studies have shown that the current flood defences — already of a higher standard than elsewhere in the country — provide a much greater degree of protection to predicted water levels than previously understood.

This means that the Thames Barrier, with continued maintenance and planned improvements, and with later modification, can continue to provide protection to London and the estuary through to the end of the century. However, economic assessment and analysis into the risk of Thames Barrier failure suggests it may prove safer and more cost beneficial to construct a new barrier further downstream at Long Reach before the end of the century (to become operational around 2070). Upgrading the current system of associated tidal defences will be required from around 2035.

05.5
Air

London's six airports are under pressure as never before. With nearly 130 million passengers a year passing through Heathrow, Gatwick, Stansted, Luton, City and Southend, London handles more journeys than any other international city on the planet. Heathrow alone has nearly 70 million passengers a year. As passenger numbers continue to rise and create even greater pressures on the airports' infrastructure, runway expansion is essential if London is to maintain its global position as a business hub, cultural centre and tourist destination.

This much is agreed by most politicians, businesses and members of the public. What is fiercely dividing opinion, however, is the best way to provide the fresh capacity, and recently prominent architectural practices have weighed strongly into the debate, unveiling a slew of ambitious new airport blueprints.

Arguments have raged for years over the merits of building a third runway at Heathrow or a new airport somewhere in south east England. The previous Government approved the Heathrow option, but the present administration overturned the decision, on the grounds of its impact on the environment and local communities.

To help arrive at an acceptable solution, the Government set up an Airport Commission last November, chaired by Sir Howard Davies, which will assess the UK's capacity issues and make recommendations on future airport expansion. An interim report will be issued at the end of this year, with the full report due by the summer of 2015.

Mayor of London, Boris Johnson, has stated that London must take urgent action to increase the capital's airport capacity but strongly opposes further expansion at Heathrow due to its severe environmental consequences. Instead, he believes London needs a new four-runway hub airport away from populated areas; his work to date suggests that a location to the east of London, such as at Stansted or in the Thames Estuary, has the most potential.

The Mayor has recently appointed Atkins, together with Pascall & Watson and Zaha Hadid Architects, to assist Transport for London as it undertakes its own detailed airports study. This is due to report in Autumn 2013 and will inform the Mayor's submission to the Davies Commission.

Among the 15 potential solutions to be considered by the Commission will be the following schemes, some of which are more developed than others:

Weston Williamson + Partners' proposal for Luton Airport is one of many architect-led solutions to London's air capacity problem

THAMES HUB

Foster + Partners has submitted plans for the Thames Hub, a £50 billion four-runway hub airport on a new Thames Estuary terminal, and a 20,000 town or "aerotropolis" nearby, with the main terminal for the airport at Ebbsfleet.

The Hub proposal has been developed by Foster + Partners in conjunction with Halcrow and Volterra Partners. Its masterplan envisages a new Thames Estuary airport on reclaimed land off the Isle of Grain capable of handling 150 million passengers a year. Alongside would be a rail terminus linked to London by a new four-track high speed railway, which would circle north London and feed into existing main line national tracks to the Midlands and the North, as well as to the Continent.

Also envisaged is a freight depot and port, and a new Thames Barrier. As well as generating clean, renewable energy for the South East by harnessing tidal power, the barrier would create new flood-protected land on which tens of thousands of new homes could be built. Although the cost is higher than many other proposals, the scheme's architects estimate that the regenerative effects, in particular on the Thames Gateway development, and the boost it would deliver to Britain's economy, could be worth £150 billion.

STANSTED

Architect Make's multi-billion Stansted plan is for a four-runway mega-hub at the expanded airport, which would be linked to London and therefore Heathrow too by extending Crossrail further east to the Essex site. Then just 25 minutes from the capital, London's new main airport would be capable of handling 150 million passengers a year. It would be cheaper and quicker to build than the London Hub say its backers, who describe it as "perhaps the least worst of all the options".

Make's plans are at an early stage, and it is still considering whether Heathrow and the new Stansted could continue to operate in tandem. It is also looking at whether it can link the airport to High Speed 1 and out to the Continent.

Despite the Mayor's support for the London Hub proposal, there are recent suggestions he is also interested in the Stansted option.

LONDON BRITANNIA AIRPORT

The London office of American architectural practice Gensler has proposed a £60 billion floating airport in the Thames as its solution to

London's airport issues. Four 5km runways, manufactured in British steel yards, would be tethered to the sea bed. Two further runways could be added later to accommodate future growth demands.

The airport would supersede Heathrow airport, and replace it with a new eco-city called Heathrow Gardens housing 300,000 residents. Accessed by jet-foil from the mainland, the Thames airport would be connected to London by high-speed underground rail link. Power would be generated from marine turbines situated along the floating runways, harnessing wave energy to offset airport energy use.

LUTON

Weston Williamson Architects has submitted a plan for Luton Airport's transformation. Its scheme would bring Crossrail 2 into the heart of a new, four-runway Luton — with a journey of 25 minutes to the capital.

A NETWORKED STRATEGY FOR LONDON

Terry Farrell & Partners has argued that London is just too big for one answer. Instead, the practice suggests we need a full study to establish whether we can use existing and proposed transport infrastructure to incrementally form a networked answer to the call for airport capacity. It believes that the answer should respond to demand, rather than call for a 'big bang project' that will take years to deliver. It should be affordable, low risk and provide a sustainable and appropriate solution, consolidating and growing existing employment and infrastructure.

LONDON: HUB CITY

Grimshaw has also come at the problem of airport capacity from a different angle. Instead of a new super airport, it takes the more holistic approach of proposing an integrated set of transport links that accelerates journey-connection times between all of London's existing airports. In this scheme, London itself becomes the hub airport.

The proposal relies on enabling passengers to disembark, clear baggage handling and passport control and be in the city centre in less than 30 minutes, from where they could travel quickly to their ongoing flight at another of London's airports.

Grimshaw also envisages that many of the transfer passengers would take the opportunity to break their trip with an overnight stop-off in London, which would boost the capital's economy.

The proposal is not mutually exclusive of any of the other current proposals for airport expansion or new build, and Grimshaw is understood to favour expansion at Heathrow.

How will the decision be made?

The Aviation Commission has been charged by Government with examining, "the scale and timing of any requirement for additional [aviation] capacity". It will produce its final report in June 2015, a month after the next general election, but Sir Howard Davies, who is leading the inquiry, says its interim report later this year will narrow down the options for airport expansion to those it considered feasible. It will then be up to the Government to take the final decision, balancing the political problems of adding to any one airport's existing capacity against the costs of a new, radical solution.

Many groups will be attempting to influence the Commission's findings. Among them will be opponents of any new airport capacity for London, who will be freshly armed with new air traffic forecasts from the Department of Transport that are lower than previous predictions. The DfT says that 7 per cent fewer passengers than anticipated will be using UK airports by the end of the next decade. It now predicts demand will grow at between 1 per cent and 3 per cent a year, down from a previous assumption of 5 per cent, thanks to the general economic slowdown and an end to the era of cheap flights.

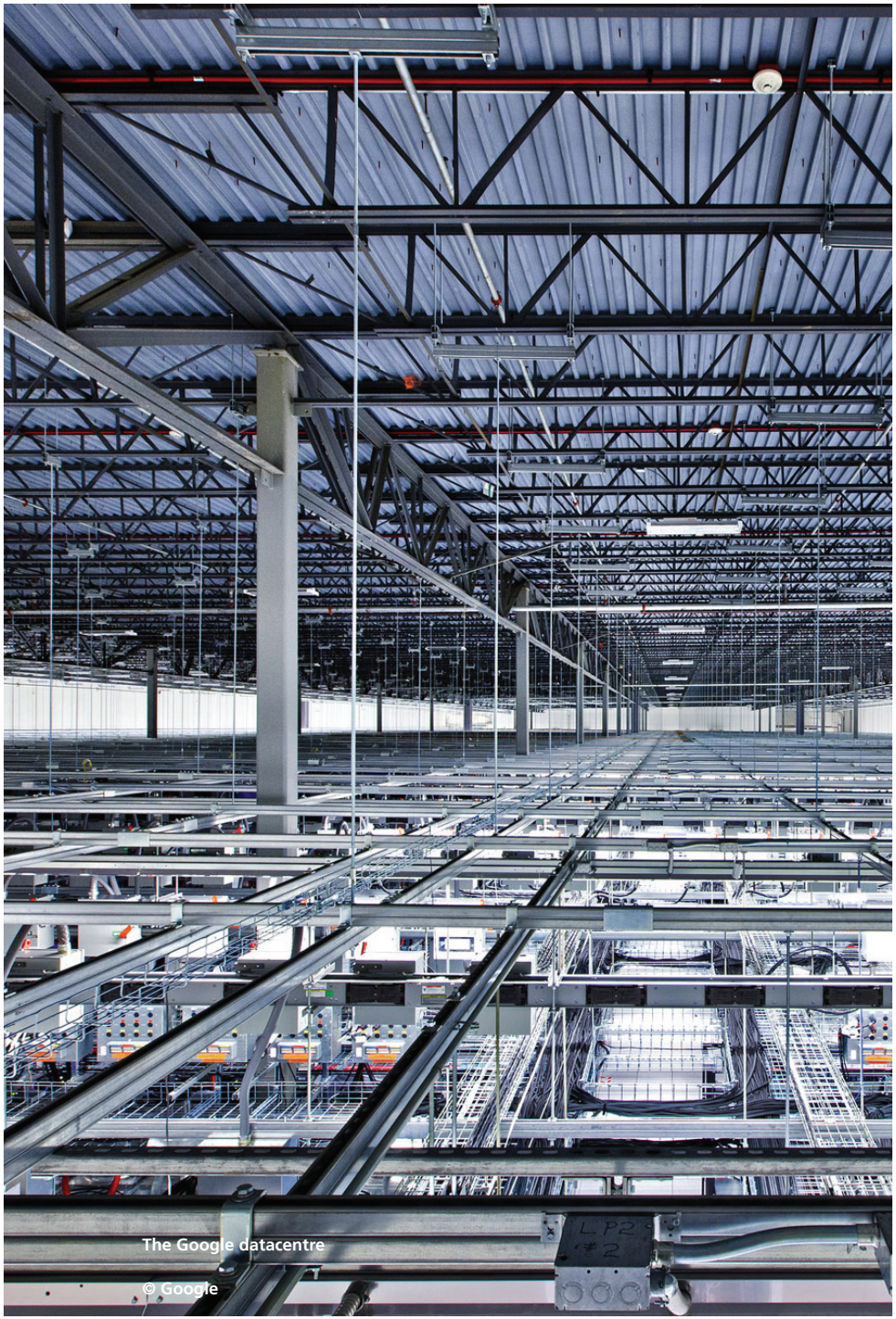
However, the DfT says the figures still mean all London's airports are likely to be at full capacity at sometime between 2030 and 2040.

The Greater London Authority will be making a submission to the Commission, exploring options for the short, medium and long term. It believes that London's airports are already operating at close to full capacity, and will reach that level by 2030.

The GLA acknowledges that many people believe it is in London's economic interest to avoid more environmental damage from aviation: they point to airports creating noise and air pollution and want air travel constrained and more sustainable modes of transport introduced. These views will be carefully considered by the GLA.

There are other opponents of airport expansion who argue more rational use could be made of existing airport capacity. One suggestion is to restrict short-haul flights to free up capacity for more long-haul flights.

Following public consultations, the GLA's Aviation Committee will submit its report on the issues for consideration to the Airports Commission by May this year.



The Google datacentre

© Google

05.6
The next utility

To achieve the best superfast broadband service in Europe by 2015, the Government is supporting the expansion of network infrastructure across the UK. For instance, it is accelerating national roll-out of superfast broadband by deregulating overhead deployment and publishing advice notes on streamlining streetworks and micro-trenching. This will assist and support both public and private investment plans including BT's £2.5 billion fibre broadband roll-out programme.

In contrast to the highly visible transportation projects taking place across London at present, broadband upgrades mostly occur in existing tunnels and ducts and do not require extensive building work beyond digging up roads in certain areas. Two-thirds of the cost of replacing copper with fibre optic cable is workmen's labour. A new network of masts will be required for 4G, but these can be discreetly accommodated on existing or new buildings.

The next phase for London's development is through use of "Smart City" technologies to deliver upgraded data and information to enable long term planning of new infrastructure. This will allow London's demand for energy, transport and public services to be monitored and managed to optimise the capacity and efficiency of the city. The London Datastore, created by the GLA to provide free access to London's data, is the first step toward a truly smart city.

Building on the success of the London Datastore, the GLA is now participating in the EU-funded iCity project, with the aim of opening up the infrastructure that we use to run our cities for private sector development.

The ambition is for "Smart City" technologies to help create a city that is an easier and more attractive place to live and work. Over 85 per cent of Londoners have internet access, and over half of those via their Smart Phones; with access to data and information at any point across the capital, our demand on energy, transport and public services can be collectively monitored and managed to improve the capacity and efficiency of our city.

The benefits are massive — rich data sources will enable long term planning of new infrastructure, optimise where best to place services and minimise journey times using real-time data. "Open Infrastructure" together with "Open Data" will be the next utility.

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Here in London we have been involved with some of the most exciting infrastructure projects ever undertaken in the UK. We are currently engaged as Crossrail's delivery partner providing engineering, construction management, procurement and sustainable development services as part of an integrated management team with Crossrail Ltd.

11 Pilgrim Street
London EC4V 6RN
020 7651 7777
bechtel.com

Crossrail

Crossrail is among the most significant infrastructure projects ever undertaken in the UK. From improving journey times across London, to easing congestion and offering better connections, Crossrail will change the way we travel around the capital.

Crossrail will, for the first time, produce a direct connection between all of London's main business centres, linking Heathrow with Paddington, the West End, the City and Canary Wharf. An estimated 200 million people will travel on Crossrail each year. Through the new transport links and significant over-station developments being delivered, Crossrail will support regeneration by adding up to £42 billion to the economy.

As Europe's biggest construction project, Crossrail is also creating thousands of jobs and training opportunities as well as tens of thousands of business opportunities through its supply chain.

25 Canada Square
Canary Wharf
London E14 5LQ
0345 602 3813
crossrail.co.uk

iCity

The Greater London Authority is participating in a European Commission funded initiative with Barcelona, Bologna and Genoa. The iCity project is exploring what further use could be made of the infrastructure that the public sector invests in to run our cities if it is opened up to the private sector.

London has already made some inroads into this with the Wi-Fi network in tube stations that was installed for operational purposes being opened up to the public by working in collaboration with Virgin. The iCity platform has also opened up access to the London Air Quality network.

The iCity project intends to open up a wider market for developers. If you have ideas that you would like to develop with us then we would love to hear from you.

Intelligence Unit
Greater London
Authority City Hall
The Queen's Walk
London SE1 2AA
0207 983 4922
icityproject.com

REHAU
Unlimited Polymer Solutions

REHAU delivers "Unlimited Polymer Solutions" and is the premium worldwide brand for polymer-based innovations and systems in building solutions, automotive and industry. The company generates continuous growth through its expertise and innovative capabilities in materials development, systems design and surface technology.

We are already directing our developments toward such future-significant topics as energy efficiency, renewable energy, water management, mobility and future living. Over 17,000 employees at over 170 locations around the world ensure the success of the independent and privately held company.

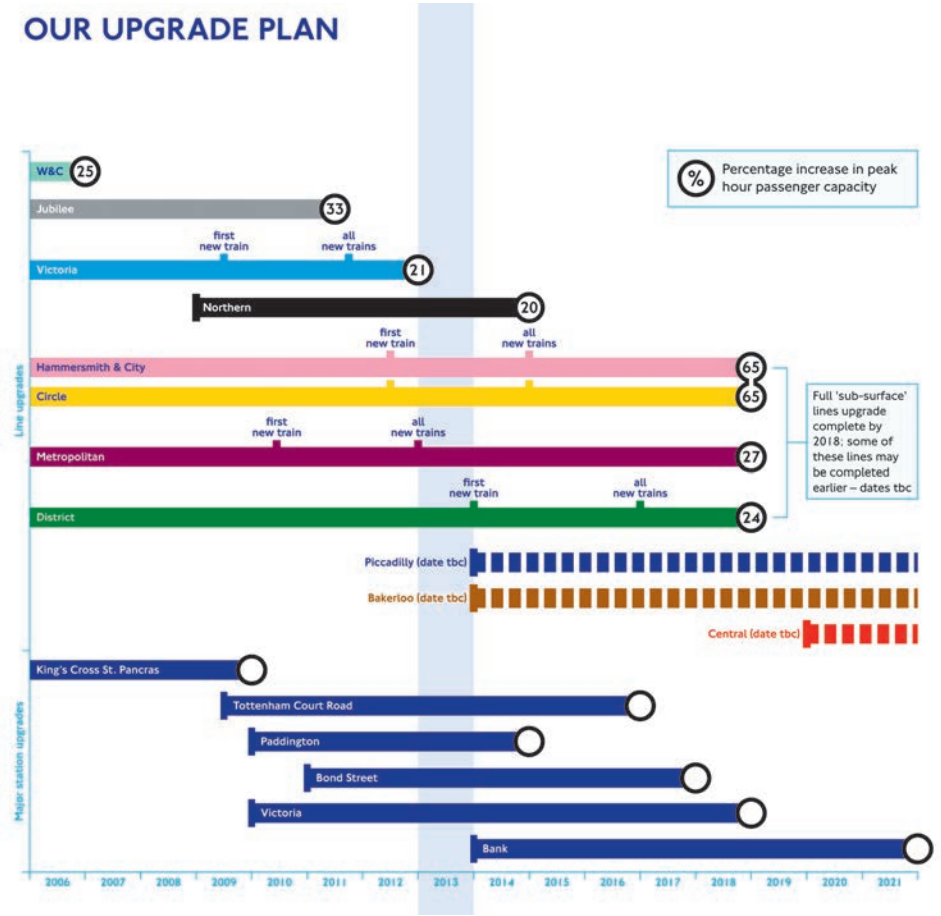
The Building Centre
26 Store Street
London WC1E 7BT
020 7580 6155
rehau.co.uk

Project Showcase

PLANES TRAINS & DRAINS

On the following pages we present a variety of infrastructure projects being delivered by Partners of NLA across London. The schemes reflect the full range of sector and scale that are vital to the lifeblood of the city.

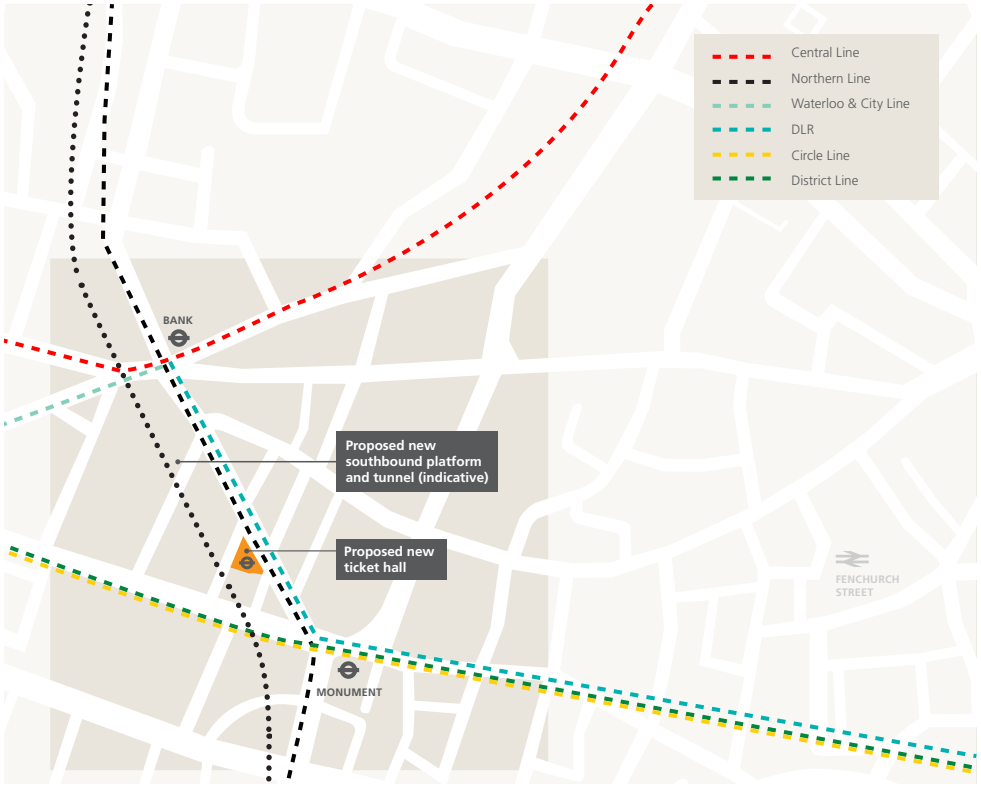
London Underground Upgrade
London-wide



The London Underground is 150 years old this year. Major investments are needed to accommodate ever rising numbers of passengers and ensure that the Underground is able to fulfil its role at the heart of London's social, cultural and economic life. With the Jubilee and Victoria lines already upgraded and running services that rival some of the best in the world, the focus is now on the Northern line and Sub-Surface lines. However, the contrast between old and new has never been so stark and to keep pace with demand and maintain London's profile as a world-class city, it is vital that the next phase of planned improvements also goes ahead to upgrade the Bakerloo, Piccadilly, Central and Waterloo & City lines.

Status Ongoing
Client Transport for London

Bank Station Upgrade
Princes Street, EC3



Bank, interlinked with Monument, is the fourth busiest station on the London Underground, serving 96,000 passengers in the morning peak. Located in the heart of the City, it is one of the network's most important interchanges. Future forecasts show that demand is growing and congestion, without relief, will be severe. TfL is therefore developing a scheme that will include a new running tunnel for the Northern line and extra platform space to relieve congestion, provide step free access and improve fire evacuation. The work is being procured using a new process called Innovative Contractor Engagement (ICE), aimed at reducing construction times and improving the business case.

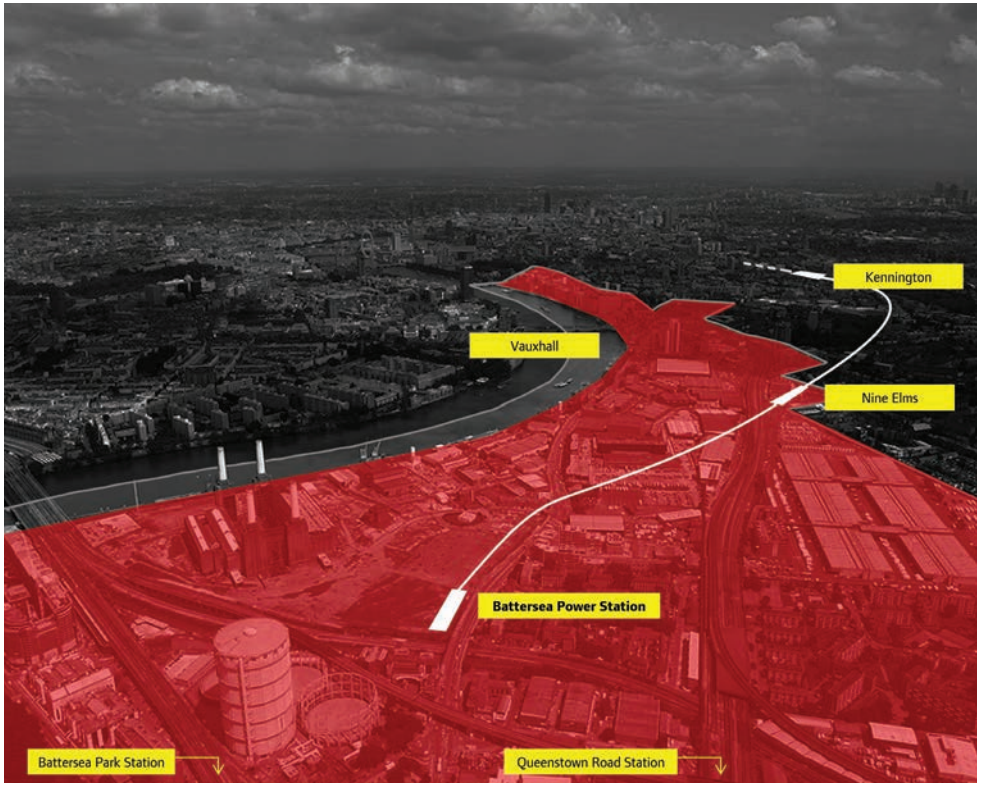
Borough City of London
Projected Date of Completion 2021
Status Design stage
Client Transport for London
Other Funding Partners
City of London Corporation

Bond Street Station Upgrade
Bond Street, W1

Bond Street Underground Station provides an interchange between the Central and Jubilee lines. Daily passenger numbers are set to increase from 155,000 at present to 225,000 when Crossrail is completed in 2018. Major expansion is therefore necessary at this station which serves the heart of the West End. Above ground, the most noticeable change will be the new entrance in Marylebone Lane, giving access to a new ticket hall. This will be accompanied by new escalators and lifts, improving capacity and providing step free access from street to platform.

Borough City of Westminster
Projected Date of Completion 2017
Client Transport for London
Contractor Costain / Laing O'Rourke JV

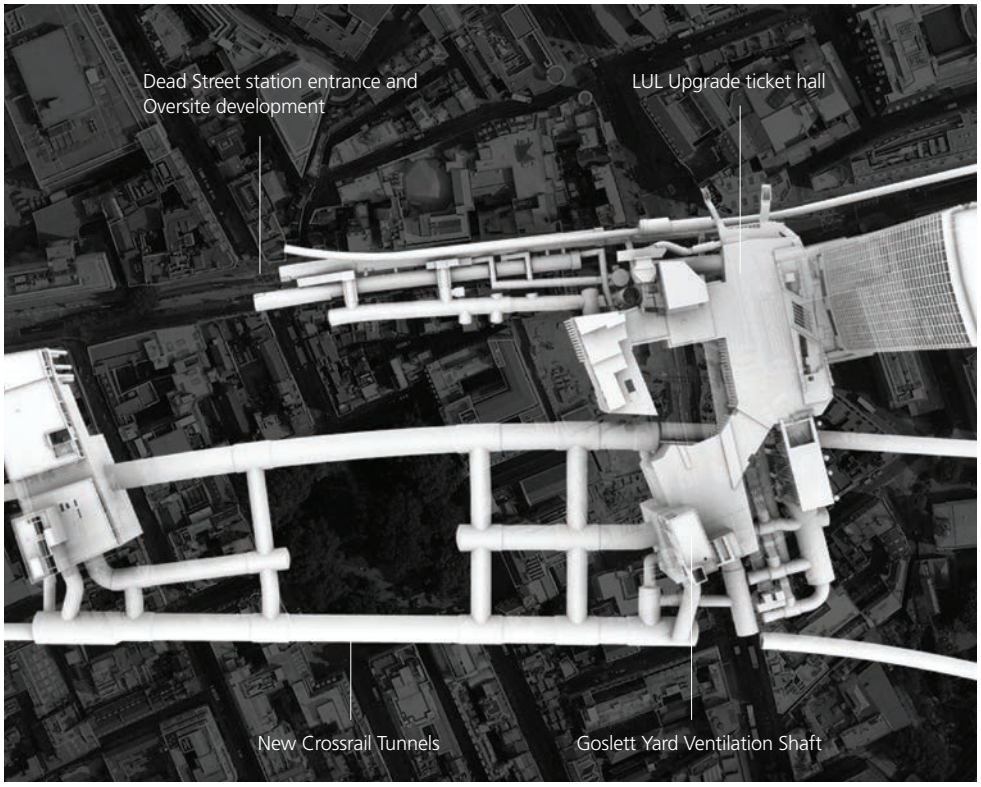
Northern Line Extension
Nine Elms and Battersea, SW8



The Northern line extension forms part of wider plans to regenerate the Vauxhall, Nine Elms and Battersea region of the South Bank. The extension will improve transport links to support the transformation of this designated Opportunity Area. Up to 25,000 jobs and 16,000 new homes could be created and journey times to the West End or the City will, in some cases, be less than 15 minutes. The extension is supported by the Mayor of London, Wandsworth, Lambeth and Southwark councils as well as key landowners in the area. The extension will be funded through the largest Tax Increment Financing (TIF) package in Europe – the expected uplift in business rates generated by the redevelopment, alongside developer contributions, will pay back the Government's £1 billion loan.

Borough LB Lambeth, LB Wandsworth and LB Southwark
Earliest Date of Completion 2020
Status Design stage
Size 2.8 km
Client Transport for London
Architect Studiodare Architects, John McAslan + Partners
Consulting Engineer Halcrow
Planning Consultant Quod
Landscape Architect John McAslan + Partners
Other key project team members Bircham Dyson Bell, Ardent Management, Steer Davis Gleave, URS, Buro Happold

Tottenham Court Road Station Upgrade
17-23 Oxford Street, W1



Tottenham Court Road is one of London's busiest Underground stations, serving the Central and Northern lines and handling around 35 million passengers per year. The station is undergoing major rebuilding in preparation for the arrival of Crossrail in 2018, which will increase passenger demand substantially. Tottenham Court Road will be a key interchange between London Underground and Crossrail services, as well as the proposed Crossrail 2 route.

Borough City of Westminster and LB Camden
Projected Date of Completion 2016
Status Under construction
Client London Underground
Architect Hawkins\Brown (Underground), Stanton Williams (Underground Entrances)
Urban Realm Gillespies
Tunnelling Design Halcrow Group
Contractor Taylor Woodrow / BAM Nuttall JV

London Overground Orbital Network

© John Sturrock

Serving 20 of London's 33 boroughs, London Overground is an orbital network which facilitates direct journeys between different areas of outer London as well as integrating fully with interchanges to all London's other transport modes. The network comprises a number of entirely refurbished suburban rail routes as well as newly constructed lines and a completely new train fleet with increased service frequencies. A fifth car will be added to every train by the end of 2015. The upgraded network also provided a substantial enhancement in transport capacity in east London ahead of the 2012 Olympic and Paralympic Games.

Cost £1.4bn
Date of Completion December 2012
Size 86 km
Client Transport for London

Other Funding Partners
Network Rail, Olympic Delivery Authority, Department for Transport & DfT CIF, London Development Agency, Crossrail, LB Lewisham, Bishopsgate Goods Yard Redevelopment Ltd

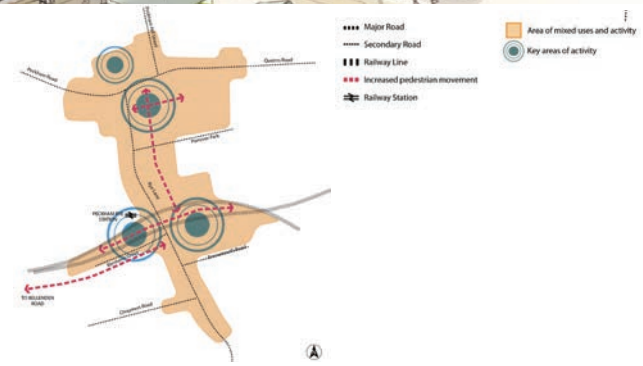
Key Partners Balfour Beatty / Carillion Joint Venture supported by Scott Wilson, Carillion, Network Rail, Atkins, Mott MacDonald, Birse Metro, Invensys and Balfour Beatty Engineering Services,
J Murphy & Sons / Taylor Woodrow

East London Line Extension
East London

As part of London Overground's programme to extend the East London line AECOM designed the replacement and refurbishment of 22 bridges, totalling 170 brick arches and numerous retaining walls. The works were carried out under a £36 million design and build contract. The new structures vary in span and skew requiring case-by-case analysis. Undertaking careful analysis of both permanent and temporary local conditions, modifications to existing structures were kept to a minimum.
The extension of the East London line, together with a number of other newly refurbished routes, forms part of the London Overground orbital network.

Cost £36m
Date of Completion 2007
Status Completed
Client Transport for London
Lead Designer AECOM
Contractor VINCI (Taylor Woodrow)

Peckham Rye Station Upgrade
Peckham Rye, SE15



Improved connectivity resulting from the Overground extension will be accompanied by significant investment at Peckham Rye Station. Proposals for the station and surrounds focus on the creation of a public square to show off the high quality heritage asset that is the station. This will provide an attractive point of arrival that aims to be a catalyst for the economic regeneration of the area. With 86 per cent of local people supporting the proposal there is a strong desire for a project that provides travellers with an aesthetic, safe and comfortable experience when arriving to or departing from the station.

Borough LB Southwark
Cost £12m
Projected Date of Completion April 2016
Status Phase 1 under construction
Size 10,000 sqm

Client Network Rail
Other Funding Partners Transport for London
Concept Design Landolt and Brown

Crossrail Architectural Components

Grimshaw and Atkins are developing a line-wide approach for the common components to be used within eight new underground Crossrail stations. The design proposes a prefabricated cladding system that celebrates the engineering feat of sprayed concrete directly behind. Equipment is concealed within the cladding build-up to create environments which are calm, safe and intuitive. The design responds to passenger needs, introducing lighting and digital media at key wayfinding points. A separation between the permanent cladding system and elements with a shorter lifespan means that the stations can be refreshed as new technologies emerge.

Cost £16m
Projected Date of Completion 2019
Status Design stage
Client Crossrail Ltd
Architect Grimshaw

Structural Engineer Atkins
M&E Engineer Atkins
Cost Consultant Faithful+Gould
Contractor VINCI
(Mock-ups and Prototypes)

Crossrail Western Spur, Modular Stations
West London

© Bennetts Associates

As part of the Crossrail programme, Bennetts Associates has been given responsibility for all 14 surface stations to the west of the central core. New station buildings at the likes of Hayes & Harlington and West Ealing, adopt a 'modular' concept that responds to the varied townscape contexts within a language of elegant, prefabricated steel structures. By contrast Ealing Broadway involves the substantial reworking of the existing station to create a new ticket hall that gives spatial clarity and makes a confident addition to the townscape.

Cost circa £50-60m
Projected Date of Completion circa 2017
Status Grip 4 (Scheme Design) completed
Client Crossrail Ltd, Network Rail
Architect Bennetts Associates **Lead Consultant and Multidisciplinary Engineer** Scott Wilson (to Grip 3), AECOM (Grip 4)
Cost Consultant and Quantity Surveyor EC Harris (to Grip 3), AECOM (Grip 4)
Signaling and Electrification Scott Wilson (to Grip 3), AECOM (Grip 4)

Paddington Crossrail Station
Praed St, W2

© Crossrail Ltd

The station will provide a major new gateway for London serving local, national and international passengers. To create a world-class pedestrian space alongside the Network Rail buildings, the proposal considers design issues of heritage and conservation, provision of onward transport facilities, way-finding, servicing and security. The design preserves the integrity of Brunel's Grade I listed building while responding to recent developments of the Goods Yard and Canal Basin sites. The Crossrail station creates a dramatic space that responds to Brunel's original 'great interior' with an elegant glass canopy that also encloses a new public realm adjacent to the historic station.

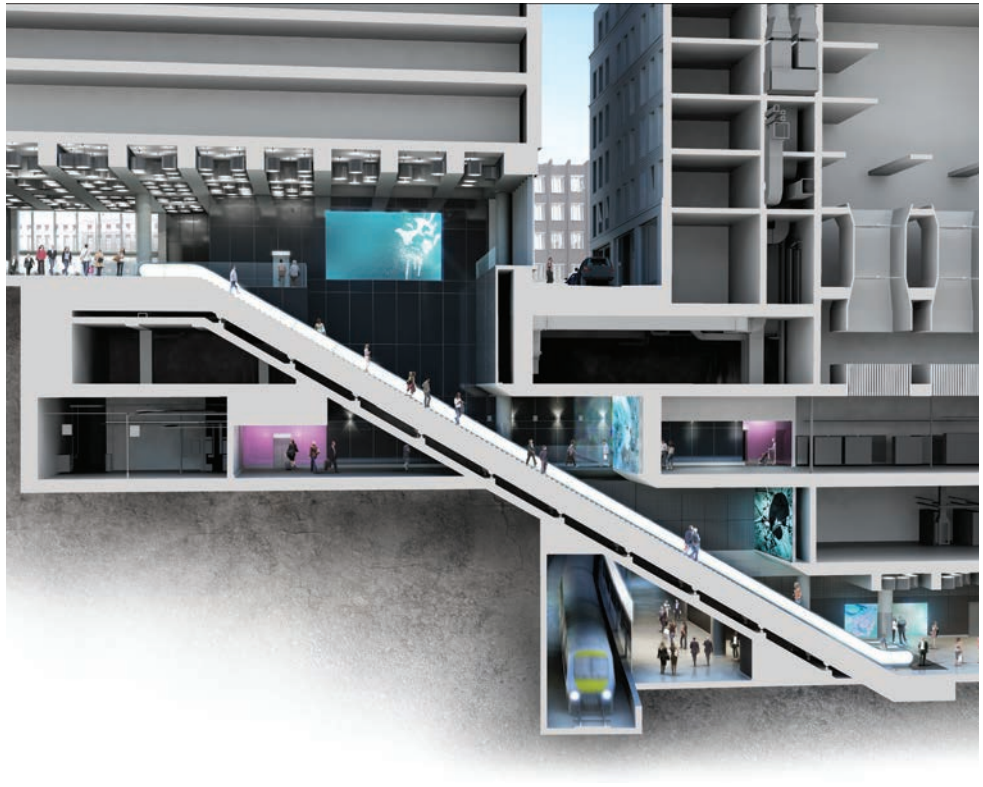
Borough City of Westminster
Cost £150m
Projected Date of Completion 2018
Status Under construction
Client Crossrail Ltd
Architect Weston Williamson + Partners
Structural Engineer Ramboll
M&E Engineer WSP
Planning Consultant Schofieldlothian
Contractor Costain / Skanska JV
Landscape Architect WSP
Bomb Blast Specialist MMI

Bond Street Crossrail Station
Davies Street and
Hanover Square, W1

More than 155,000 passengers use the existing Bond Street Underground Station daily. When Crossrail arrives in 2018, passenger numbers are anticipated to grow to over 220,000 daily. In order to cater for this increase two new ticket halls are being constructed – a western ticket hall at Davies Street and an eastern ticket hall on the corner of Hanover Square and Tenterden Street. Step free access will be provided to the station platforms 26 metres beneath the south side of Oxford Street. In addition to this a step free passenger link tunnel will connect the Crossrail platforms to the existing London Underground station.

Borough City of Westminster
Projected Date of Completion 2018
Status Under construction
Client Crossrail Ltd
Architect John McAslan + Partners
Structural Engineer WSP

Tottenham Court Road Crossrail Station
Dean Street, Soho, W1



Alongside the upgrade of the existing tube station at Tottenham Court Road, Crossrail is building a new station. Including a new eastern ticket hall on Dean Street, the station box extends five levels below ground at a depth of around 25 metres to provide access the Crossrail platforms. The project includes provision for a mixed use over-site development of two city blocks bounded by Dean Street to the east and Oxford Street to the north, responding sensitively to the historic context of Soho and the eclectic commercial context of Oxford Street, with a different architectural approach to each building.

Borough City of Westminster
Projected Date of Completion 2018
Status Under construction
Client Crossrail Ltd
Other Funding Partners
Transport for London
Lead Architect Hawkins\Brown
Multidisciplinary Engineer and
Lead Designer Arup / Atkins
Cost Consultant George Corderoy & Co
Contractor VINCI / BAM Nuttall JV (Goslett Yard Box), BAM / Ferrovial Kier (Tunnels and Passages), Laing O'Rourke (Station Fit Out)
Landscape Architect
Hawkins\Brown, Atkins

Centrepoint Plaza Underground Entrances
St Giles Circus, W1

© Gillespies

As part of the redevelopment of Tottenham Court Road Station, the brief was to regenerate the area around the Centrepoint tower by creating a new world-class public space for London.
Stanton Williams' design unlocks the potential of this key junction and transport interchange, offering a significantly improved experience for pedestrians and station users. Dramatic entrances to the new station create a strong sense of place with two prismatic glass volumes.
Gillespies' design for St Giles Plaza creates a fully integrated urban realm while work by Hawkins\Brown and Acanthus LW provides a new ticket hall and further upgrades to the Underground station.

Borough LB Camden
Projected Date of Completion 2016
Status Under construction
Size 525 sqm (Underground Entrances),
4,500 sqm (Plaza)

Client Transport for London in association with LB Camden
Architect Stanton Williams
Public Realm Design Gillespies
Structural Engineer Expedition Engineering

M&E Engineer Max Fordham
Contractor VINCI / BAM Nuttall
Other key project team members Halcrow (Multidisciplinary Engineering Consultant), BMT Fluid Mechanics Ltd (Wind Tunnel Specialist), Pinniger & Partners (Lighting Consultant)

Number One Oxford Street
Oxford Street, W1

Two nine storey buildings will vertically connect the Tottenham Court Road Crossrail and London Underground stations to a new public plaza at one of London's busiest corners. The active edges of both volumes have been configured to better fit the context, line new urban vistas to St. Patrick's Church and provide an alternative pedestrian route to Oxford Street. The buildings will deliver 36,100 sqm of mixed use space, including retail, office and a 350 seat theatre. Integrating urban regeneration with major infrastructure, the project forms a significant component of the revitalisation of Oxford Street's eastern end.

Borough City of Westminster
Cost circa £120m
Status Planning granted
Size 36,100 sqm
Client Derwent London, Crossrail Ltd
Architect Allford Hall Monaghan Morris

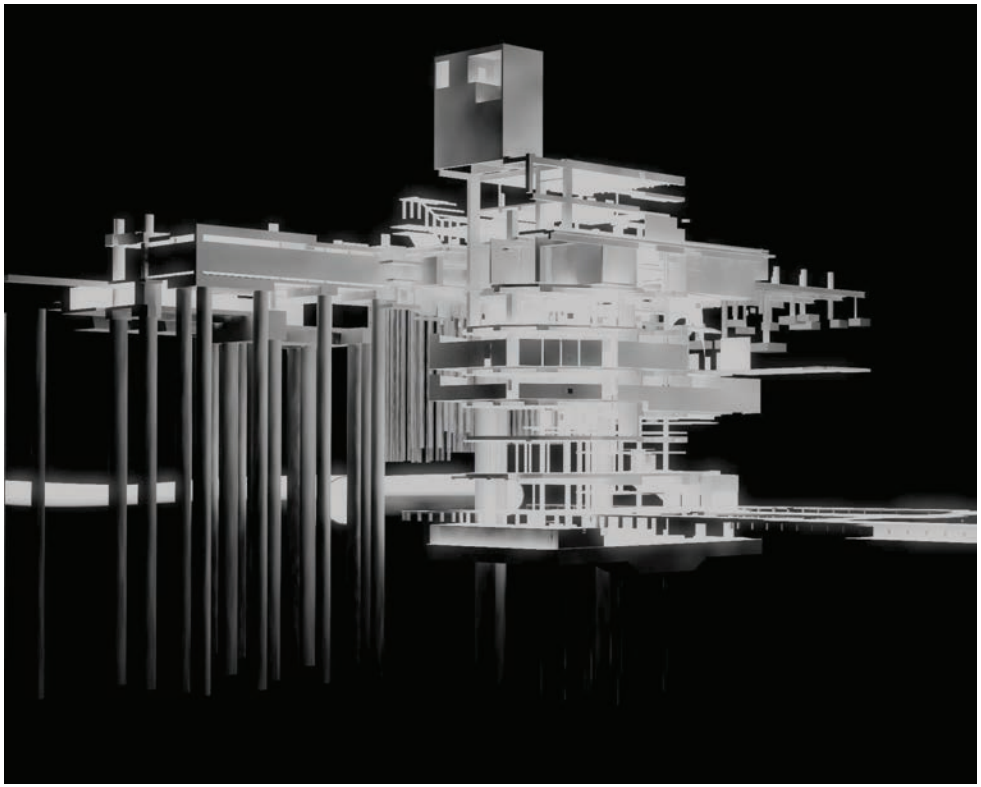
Structural Engineer Arup
M&E Engineer Arup
Planning Consultant Gerald Eve
Project Manager Davis Langdon
Cost Consultant Davis Langdon

Farringdon Crossrail Station
Cowcross Street and
Lindsey Street, E1

When complete, it is planned that over 140 trains per hour will flow through the Farringdon interchange. Situated at the intersection of a new east-west and north-south axis, it will become a link between Thameslink, Crossrail and London Underground services making it possible to directly connect with three of London's five airports. Farringdon will be the only station from which passengers will be able to access all three networks. Farringdon will become one of Britain's busiest train stations, and will be a key link in bringing passengers from outer London to the business hubs in the City and Canary Wharf.

Borough LB Islington
Cost £300m
Projected Date of Completion 2018
Status Under construction
Client Crossrail Ltd
Architect Aedas
Structural Engineer URS Scott Wilson

Liverpool Street Crossrail Station
Moorgate, EC2

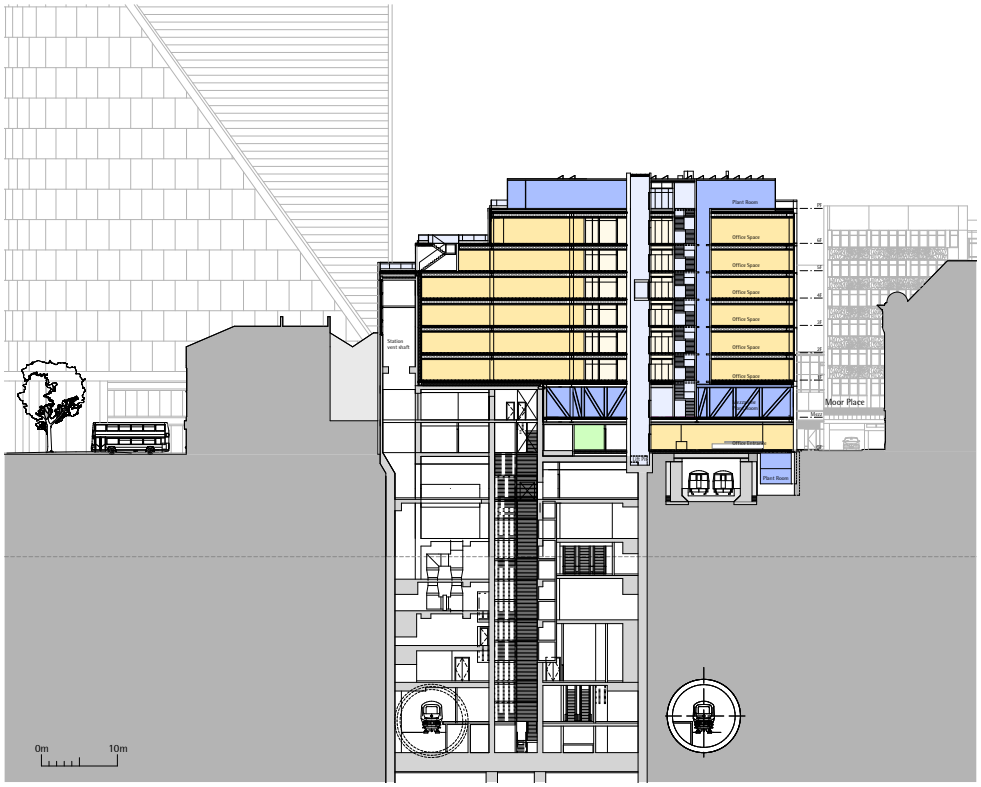


Crossrail's Liverpool Street Station will serve the City of London and provide interchanges with London Underground services, connections to Stansted Airport and National Rail services at Liverpool Street and Moorgate. It will be located below the existing stations with both providing access to the Crossrail station.
At the eastern end, a new ticket hall will be constructed providing step free access from street level to the platforms. Nearby, a 40 metre deep box structure will accommodate ventilation, electrical, mechanical and systems equipment. At the western end, a further new ticket hall will be built by developing the existing Moorgate Station ticket hall.

Borough LB Tower Hamlets
Projected Date of Completion 2018
Status Under construction
Client Crossrail Ltd
Architect Wilkinson Eyre
Structural Engineer Mott Macdonald

101 Moorgate Crossrail Over-Site Development

101 Moorgate, EC2



The over-site development at 101 Moorgate will comprise six floors of office space over the western shaft of Crossrail's Liverpool Street Station. A new office entrance is located at the north end of the site with access from both Moorgate and Moorfields. Retail accommodation is accessible from Moorgate, Moorfields and Moor Place.

Borough City of London
Cost £18m
Projected Date of Completion 2019
Status Planning granted March 2011
Size 8,050 sqm (GEA), 4,830 sqm (NIA Offices), 235 sqm (NIA Retail)

Client Crossrail Ltd, Aviva Investors
Architect John Robertson Architects
Structural Engineer Mott Macdonald
M&E Engineer AECOM
Planning Consultant Savills
Project Manager WT Partnership

Whitechapel Crossrail Station

277 Whitechapel Road, E1

BDP's design for Whitechapel Station includes a host of upgrades which will benefit passengers and local residents whilst delivering substantial savings on previous proposals. The emphasis shifts from a below ground solution to an above ground station bridge which creates more opportunities for the Whitechapel area. The plans incorporate natural light, improving the passenger experience while enhancing the historic features and character of the existing station. The main entrance has been reinstated on Whitechapel Road, and a new walkway alongside the concourse will provide a pedestrian route over the railway cutting between Durward Street and Whitechapel Road.

Borough LB Tower Hamlets
Cost £110m
Projected Date of Completion 2017 / 2018
Status Under construction
Client Crossrail Ltd

Architect BDP
Structural Engineer Hyder Consulting
M&E Engineer Hyder Consulting
Contractor BBMV Consortium: Balfour Beatty, ALPINE BeMo Tunnelling, Morgan Sindall and VINCI Construction

Canary Wharf Crossrail Station

North Dock, Canary Wharf, E14

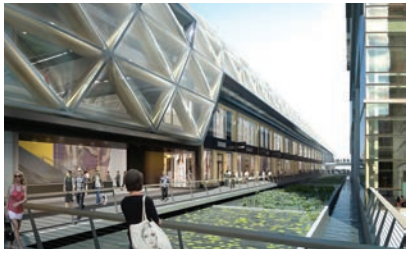
Canary Wharf will be one of the largest Crossrail stations. Like the nearby Canary Wharf Tube station, the new Crossrail station will be built in dock water, in this case the North Dock of West India Quay. The station and proposed retail and park areas will be six storeys high; approximately the size of One Canada Square laid on its side. The station development will provide a link between Canary Wharf and Poplar, currently severed by the North Dock.
It also includes links with the Canary Wharf Estate, via Adam's Place and the Jubilee Line and DLR Stations.

Borough LB Tower Hamlets
Cost £500m
Projected Date of Completion 2018
Status Under construction
Client Crossrail Ltd
Project Design Architect Foster + Partners

Station Design Concept and Operations Architect
Tony Meadows Associates
Retail Mall and Project Executive Architect Adamson Associates
Structural Engineer Arup
Landscape Architect Gillespies

Retail and Park Development, Canary Wharf Crossrail Station

North Dock, Canary Wharf, E14



Canary Wharf Group is developing four levels of retail and a roof garden above the Canary Wharf Crossrail Station in the waters of North Dock, Canary Wharf. Foster + Partners was commissioned to design a scheme above the new station which unifies the retail development with the station itself. The design features an elegant, semi-enclosed timber lattice roof. The building provides enhanced pedestrian and vehicle links to and from the north of Canary Wharf.

Borough LB Tower Hamlets
Status Under construction
Size 34,374 sqm
Client Canary Wharf Group plc
Design Architect Foster + Partners
Executive Architect Adamson Associates

Landscape Architect Gillespies
Structural Engineer Arup
M&E Engineer Arup
Planning Consultant DP9
Project Manager Canary Wharf Contractors Ltd
Contractor Canary Wharf Contractors Ltd

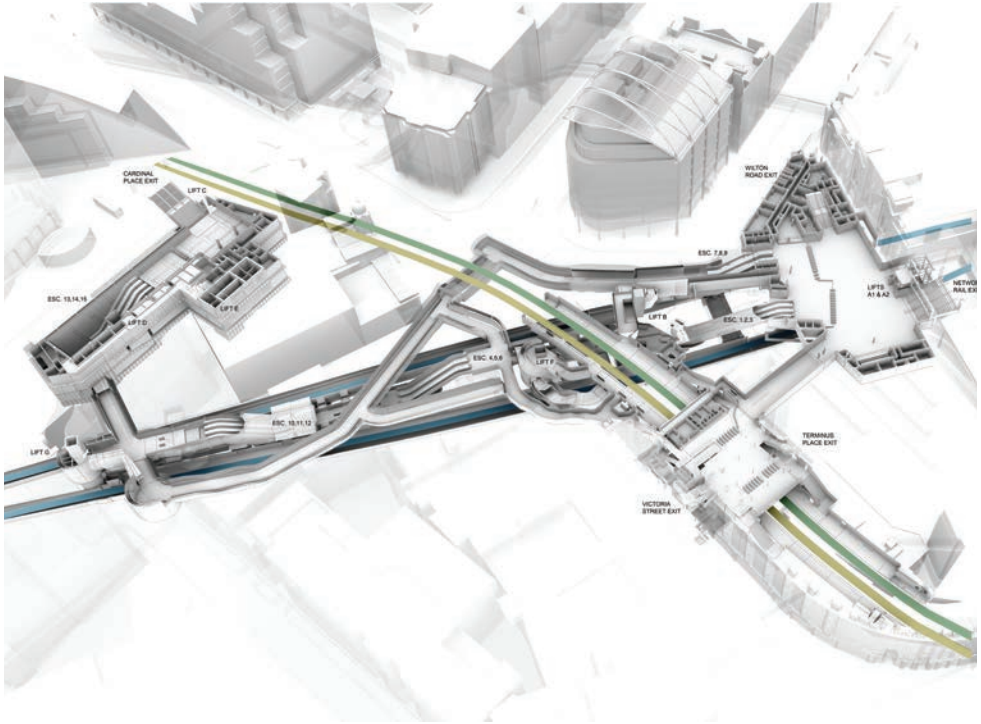
Other key project team members
Maurice Brill Lighting Design (Lighting Consultant), Steer Davies Gleave (Traffic and Movement Consultant), Leicht (Facade Consultant), Reef (Facade Access Consultant), Atkins (Bridge Engineers)

Pudding Mill Lane Station
Pudding Mill Lane, Stratford, E15

The relocation of Pudding Mill Station is an enabling project for Crossrail's eastern portal intended to serve the Olympic Park beyond 2012 and form part of the legacy masterplan.
The design and development of the station is a direct response to the immediate surroundings and will play a central role in the wider requirements for the public realm.
The concept proposes a simple and crisply detailed envelope that partially encloses the station facilities whilst presenting a clean and unfussy outward appearance.

Borough LB Newham
Cost £100m
Projected Date of Completion 2013
Status Under construction
Client Crossrail Ltd
Architect Weston Williamson + Partners
Structural Engineer URS
M&E Engineer URS (to stage E) and Morgan Sindall
Planning Consultant URS, Crossrail Ltd and LB Newham
Cost Consultant Crossrail Ltd
Contractor Morgan Sindall
Landscape Architect Urban Initiatives, Weston Williamson + Partners

Victoria Station Upgrade
Terminus Place, SW1



Serving over 82 million passengers per year, Victoria is one of the busiest Underground stations in London and overcrowding is already a major problem. A major upgrade is underway that will increase capacity, allow for future growth and act as a catalyst for TfL's longer term vision to transform the quality of interchange between all modes of transport in Victoria. The design has been developed 'hand in glove' with the full range of engineering disciplines and with static and dynamic passenger flow models. The above ground works include a new public space in front of the existing station.

Borough City of Westminster
Cost £700m
Projected Date of Completion 2018
Status Under construction
Size 6,300 sqm
Client London Underground
Architect Weston Williamson + Partners
Multidisciplinary Consultant
Engineer Mott MacDonald
Contractor Taylor Woodrow / BAM Nuttall JV
Other key project team members Keller (Jet Grouting)

East Croydon Station Bridge

East Croydon Station,
George Street, Croydon, CR0

This new footbridge represents the initial phase of a broader masterplan commissioned by Croydon Council in 2009 that was the winner of the New London masterplan award in 2012.
The bridge forms both a new station entrance and a pedestrian link, providing much needed congestion relief at one of London's busiest stations.
The primary structural element of a double 'Vierendeel' truss in a crisp white finish instantly creates a major new landmark and gateway into the area. The truss forms a spine housing retail kiosks, waiting areas and ticket machines.

Borough LB Croydon
Cost £20m
Projected Date of Completion July 2013
Status Under construction
Size 1,000 sqm

Client Network Rail, LB Croydon
Architect Hawkins\Brown, Studio Egret West
Structural Engineer Mott MacDonald
M&E Engineer Mott MacDonald
Planning Consultant Hawkins\ Brown

Project Manager Mott MacDonald
Cost Consultant Mott MacDonald
Contractor BAM Nuttall
Landscape Architect Hawkins\Brown, Studio Egret West

London Bridge Station Redevelopment

Station Approach, SE1

The redevelopment of London Bridge Station is a critical part of the Thameslink Programme, a £6 billion Government investment in rail.
The station redevelopment project is vital to unlock the capacity needed to operate up to 24 trains an hour through central London.
Providing additional capacity for around two thirds more passengers to the station, the project will also develop a vital new link between the riverside regeneration projects and the heart of the borough.
A new concourse will be built at street level, and the number of tracks going through the station will be increased from six to nine.

Borough LB Southwark
Cost £400m
Projected Date of Completion 2018
Status Under construction
Size 51,000 sqm
Client Network Rail

Other Funding Partners Department for Communities and Local Government (DCLG)
Architect Grimshaw
Structural Engineer WSP (GRIP 4), Hyder / WSP JV (GRIP 5)

Planning Consultant CgMs (GRIP 4), Costain (GRIP 5)
Cost Consultant Faithful+Gould seconded to Network Rail
Contractor Costain
Landscape Architect Grimshaw, Hyder, WSP

Borough Viaduct
Multiple sites, SE1

© Adam Parker

Part of the Thameslink Programme of rail infrastructure improvements, this project comprises 400 metres of new viaduct to the south west of London Bridge Station including an iconic bridge spanning 70 metres across Borough High Street. Running through a Conservation Area, there have been interventions to many existing buildings, some Listed, as well as three new retail and office buildings.
The proposal includes a lightweight roof structure over a temporary public market space and the reconfiguration of historic market roofs over the Borough Market site.
A new market structure on Borough High Street has been completed.

Borough LB Southwark
Cost circa £50m
Projected Date of Completion April 2013
Status Under construction
Client Network Rail
Architect Jestico + Whiles
Structural Engineer WS Atkins
M&E Engineer WS Atkins
Planning Consultant Network Rail
Project Manager Network Rail
Cost Consultant Network Rail
Contractor Skanska
Landscape Architect Novel Tullett
Lighting designers Pinniger and Partners

Paddington Integrated Project
Praed St, W2

© Crossrail Ltd

The Paddington Integrated Project (PIP) was established to deliver an integrated proposal for the north of Paddington Station incorporating the aspirations of Crossrail, London Underground, Network Rail and Transport for London. The proposals, which include step-free access between all the critical levels on site, will enable the station to meet present and forecast demand.
Consultation with English Heritage and Westminster City Council has informed the design for this Grade I Listed Building.
The result is a co-ordinated and robust proposal that encompasses functional efficiency, structural integrity, constructability, lifetime costing and programme as well as responsiveness to site and setting.

Borough City of Westminster
Cost £120m
Status Under construction
Client Crossrail Ltd
Architect Weston Williamson + Partners
Structural Engineer Mott MacDonald
M&E Engineer Mott MacDonald
Cost Consultant Corderoy
Landscape Architect
Weston Williamson + Partners

EVSTAT Rapid Electric Vehicle Charging Station

The EVSTAT station has been developed to serve the fast emerging electric vehicle market. The station can fully charge an electric vehicle in under 20 minutes while providing Club Class relaxation areas that impart essential business services for on-the-go lifestyles.
EVSTAT stations also employ an underground battery bunker facility consisting of 'half-life' batteries, which captures then stores electrical energy from the grid at off-peak tariff cycles. The stored energy is then used for powering the facility during peak hours.
EPR Architects and EVOASIS are leading the development of this technology to create off-grid buildings, sustainable developments and cleaner cities for the future.

Projected Date of Completion 2014
Status Design stage
Client EVOASIS
Architect EPR Architects Ltd

Coda Street Furniture

Coda is an integrated range of street furniture designed to create a coherent visual environment. The shapes are soft yet functional with a distinctive conical motif, supported on minimal bases so as to reduce the clutter of the urban realm. The system can be configured to respond to the needs of particular public spaces and the requirements of the communities that populate them. The materials in the Coda range consume as little energy in manufacture as possible.
Manufactured entirely in the UK, all timber is FSC certified and all concrete products have been given a BREEAM A/A+ rating.

Projected Date of Completion 2013
Status Prototype stage
Client Woodhouse plc
Designer Lifschutz Davidson Sandilands
Manufacturer Woodhouse plc

Cycle Superhighways, Routes 5 and 8
Central London

Cycle Superhighways are a key part of the Mayor of London's plan to make commuting by bicycle a more attractive option. AECOM was appointed as lead designer responsible for the feasibility, preliminary design, detailed design and site supervision for the Cycle Superhighways Routes 5 and 8.
The project combined AECOM's expertise in the design of cycle amenities with corridor-based traffic improvement plans as well as some urban landscape development and improvement techniques. Routes 2, 3, 7 and 8 of TfL's Cycle Superhighways programme have already been launched and the remaining eight will be introduced by 2015.

Cost £2.9m
Projected Date of Completion
November 2013
Status Starting on site May 2013
Size 11.9 km
Client Transport for London
Lead Designer AECOM

Ealing Broadway Cycle Hub
Haven Green, W5

Ealing Council successfully bid for £286,500 of TfL funding to deliver the first Cycle Hub in outer London. Previously a deteriorating taxi shelter, the original site was cluttered. The new low profile shelters were designed to provide clear, unobstructed views of the green and sit happily under the crowns of the tree line while creating spaces for better cyclist and pedestrian movement through the site.
The freestanding shelters incorporate a new taxi shelter (the first new cabmen's type shelter to be built in London for nearly 100 years) and a WC.

Borough LB Ealing
Cost £286,500
Date of Completion July 2012
Size 232 sqm
Client LB Ealing

Other Funding Partners
Transport for London
Architect H-B Designs & Associates
Structural Engineer
Paul Carpenter Associates

Contractor Murrill Construction
Other key project team members
FOA Ecology (Ecological Consultant), WH Landscape Consultancy (Landscape and Arboriculture Consultancy), Brunel Surveys (Land Surveyor)

Wellesley Road Crossings

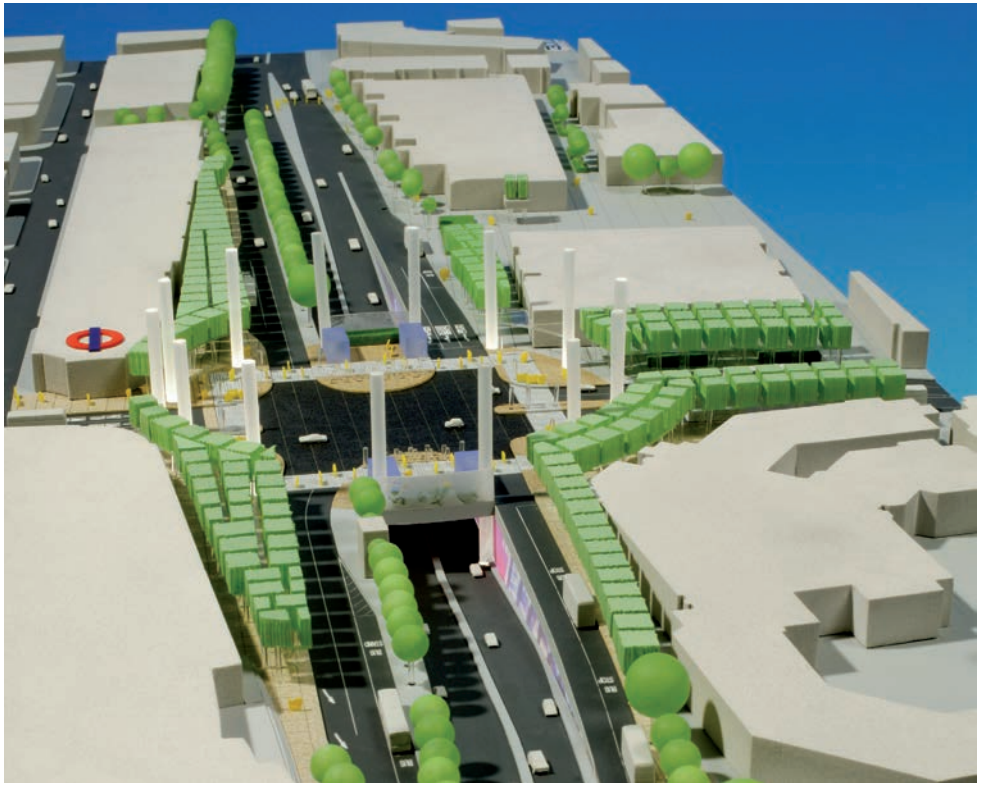
Wellesley Road and Park Lane,
Croydon, CR9

Connected Croydon is a £50 million investment programme of coordinated public realm projects and transport improvements that will transform Croydon Metropolitan Centre into a more walkable and liveable place.
One of the priorities of the programme is to overcome barriers to walking and cycling and make easier routes between key destinations. The Wellesley Road project aims to break down the obstructive 1960's road infrastructure by providing a series of new surface level crossings on Wellesley Road and Park Lane.
Existing subways will be supplemented by surface level crossings and associated soft landscape.

Borough LB Croydon
Cost £5.63m
Date of Completion November 2012 (Crossings 1 and 2)
Status Under construction (Crossings 3 and 4)
Client LB Croydon
Other Funding Partners GLA
Structural Engineer PBA
Project Manager LB Croydon, PBA
Cost Consultant George Brownlee and Partners
Contractor Rineys
Landscape Architect OKRA

Euston Circus

Intersection of Euston Road and
Hampstead Road, NW1



As part of the masterplan for Regents Place, Farrells came up with the concept and detail design to create a 'place' along the Marylebone-Euston Road and to make this traffic dominated junction a pedestrian friendly connection between Fitzrovia and the north. Retaining the existing underpass, the proposal creates a new London square incorporating public art and landscaping. The circus is 'traffic neutral', facilitating the forthcoming two-way flow on Tottenham Court Road, while at the same time dramatically transforming and enhancing the pedestrian environment in terms of clarity, space and safety.

Borough LB Camden
Cost £4m
Projected Date of Completion Mid 2013
Status On site
Client Transport for London
Other Funding Partners British Land PLC, LB Camden
Architect Terry Farrell & Partners
Structural and Traffic Engineer Hyder Consulting
Project Manager M3 Consulting
Cost Consultant M3 Consulting
Landscape Architect EDCO Design London

Chobham Pedestrian Footbridge
Stratford City, E15

Crossing Stratford's busy Temple Mill Lane, this bridge provides a key pedestrian link between Chobham Academy's Specialism Building and the playing fields on the other side.
Two double-v support 'trees' transfer its loads, while a rhythm of vertical fins brings a human scale to the 95 metre long horizontal ribbon. Acting as a gateway from the north east, the bridge connects the school and its Stratford Athletes Village setting not only to the playing fields but beyond to Leyton's growing residential population.

Borough LB Stratford
Date of Completion 2012
Status Completed
Size 95 m
Client Lend Lease
Architect Allford Hall Monaghan Morris
Structural Engineer AKT
M&E Engineer Lend Lease
Planning Consultant Quod
Project Manager Lend Lease
Cost Consultant Gardiner & Theobald
Contractor Osborne
Landscape Architect KLA
Steelwork Fabricator Brittons

Legible London
London-wide

Legible London is a pedestrian wayfinding system designed to provide a consistent visual language across the capital. It reduces congestion on the road and public transport networks by making it easier to walk for short journeys. A distinctive product family of informative maps and signs has been developed for use across London.
Legible London is extremely adaptable – while initially developed as a walking tool, its versatility means it has been adapted to meet London's wider information needs. Legible London is now used on Barclays Cycle Hire docking stations, Cycle Superhighways and within Tube, Bus, DLR and rail stations.

Date of Completion 2010
Status Ongoing
Client London Boroughs
Other Funding Partners
Transport for London
Wayfinding Specialist T-Kartor
Designer Applied
Manufacturer Lacock Gullam (Prototype), Trueform (Final Product)

North Lewisham Links Strategy

New Cross, SE16
and Deptford, SE8

© The Landscape Partnership

North Lewisham Links is an ongoing programme by Lewisham Council to develop new walking and cycling routes in the north of the borough. Redevelopment of underused industrial land provides opportunities to address local and strategic needs in the planning of new routes and spaces.
Working with developers and partners, the Council is taking a holistic approach to the delivery of new places, transport and public realm infrastructure. 'Route One' – extending east-west through a series of open spaces from Kender to Deptford Creek – is largely complete.

Borough LB Lewisham
Cost circa £76m
Status Partially completed
Size circa 392 ha
Client LB Lewisham
Other Funding Partners Homes & Communities Agency, GLA

Architect HKR Architects (Phase 1)
Planning Consultant Longboard Consulting
Landscape Consultant The Landscape Partnership

Heathrow Airport Terminal 2B

Heathrow Airport, TW6

© Timothy Soar

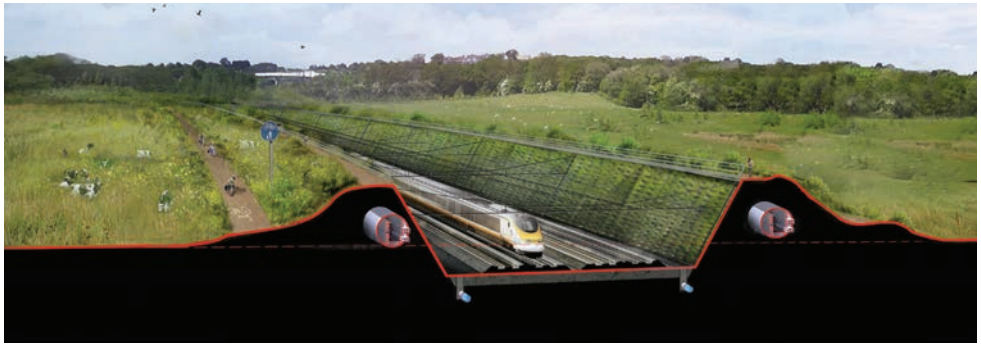
Terminal 2B is a new satellite terminal forming the first part of Heathrow's Eastern Campus redevelopment. The first phase entered into operation in 2010 and, with a second phase due for completion in 2014, the building will total over half a kilometre in length and provide a total of 16 aircraft stands. A suspended timber-clad arrivals corridor, maximising the height of the departure lounges below, separates passengers arriving from those departing. A central, naturally lit space with food, retail and executive lounge facilities enables vertical circulation into a passenger tunnel leading to the new Terminal 2 (T2A).

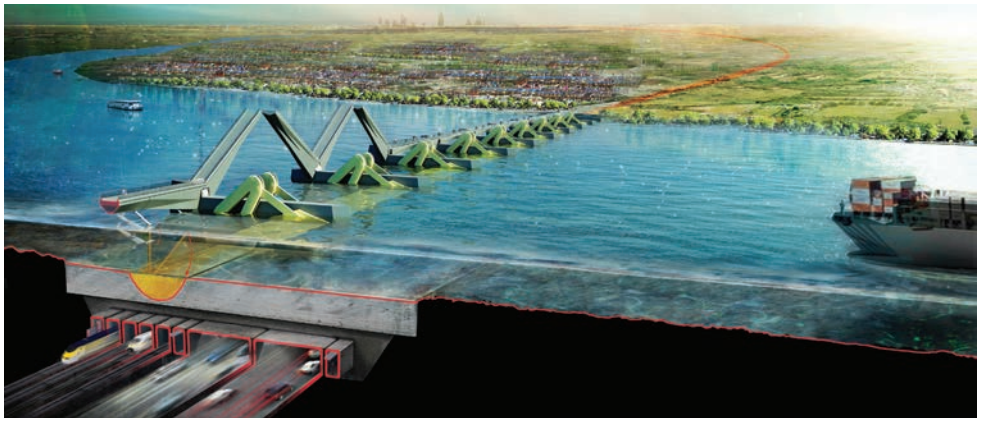
Borough LB Hillingdon
Cost £450m
Projected Date of Completion Summer 2014 (Phases 1 and 2)
Status Under construction
Size 14,750 sqm
Client BAA (Phase 1), HAL (Phase 2)
Architect Grimshaw

Structural Engineer Ramboll / Buro Happold (Phase 1), Mott MacDonald (Phase 2)
M&E Engineer Hoare Lea / DSSR (Phase 1), Hoare Lea / WSP / Balfour Beatty (Phase 2)
Planning Consultant BAA (Phase 1), HAL (Phase 2)

Managing Contractor Balfour Beatty Group
Cost Consultant Turner & Townsend
Other key project team members Exova Warringtonfire (Fire Engineering), Jacobs (Passenger Flow Modelling), Siemens UK (Baggage Consultant), Mott MacDonald (TTS Consultant)

Thames Hub
Isle of Grain



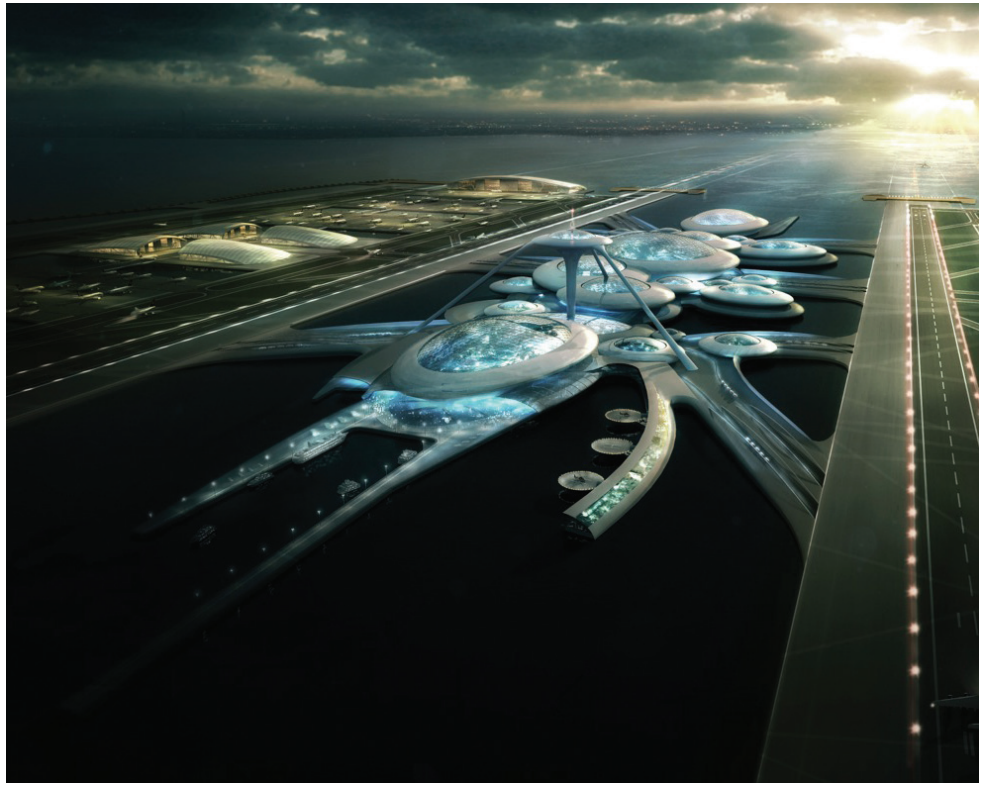


The Thames Hub vision is a bold new approach to future infrastructure development in Britain. Bringing together rail, freight logistics, aviation, energy and its transmission, flood protection and regional development, it aims to deliver major economic, social and environmental benefits through their integration.
The plans include a new four-runway, 150 million passenger capacity airport on the Isle of Grain in the Thames Estuary, connected to London and the rest of the UK by a new rail orbital.
As well as addressing the issues of noise and delays that plague Heathrow, this move can deliver the long-term hub capacity Britain needs.

Borough Medway Council
Cost £20bn (Airport), £4bn (Associated Infrastructure)
Status Design stage
Architect Foster + Partners
Structural Engineer Halcrow
M&E Engineer Halcrow

Other key project team members
BLP (Legal Financing, Structuring and Regulatory Advisor), Hambalt (Strategy and Economic Advisor), Davis Langdon (Cost Management Advisor), Bircham Dyson Bell (Planning and Consenting Advisor), Forster Associates (Funding Strategy and Aviation Advisor)

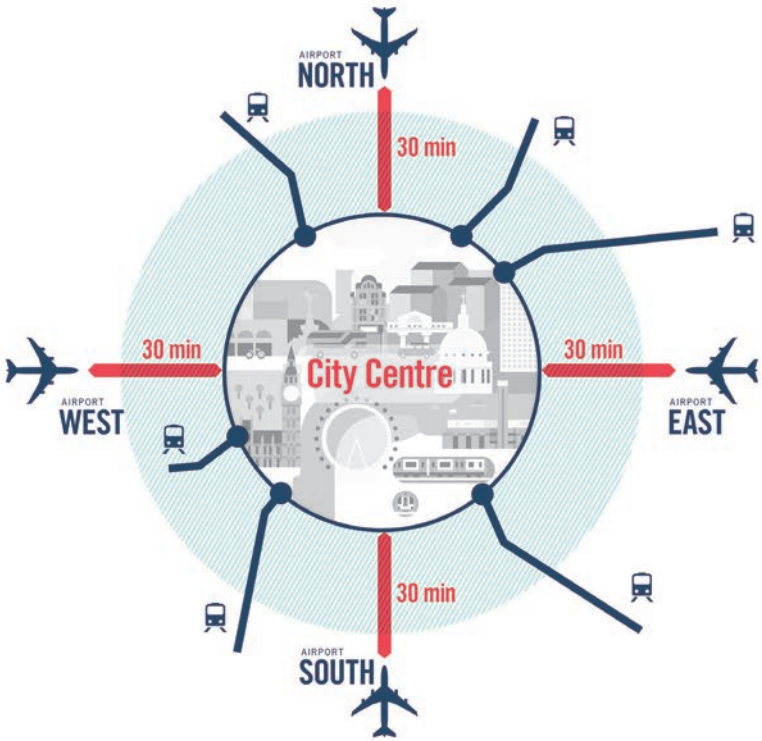
Britannia Airport
Thames Estuary



Situated on the waters of the Thames Estuary, the proposed airport would minimise disruption to London residents, affording the capital an opportunity to expand beyond its land locked airports, and offering global travellers a European hub airport able to operate around-the-clock. The concept positions the airport for future expansion, incremental growth, and even adaptability to new aircraft. The proposed airport would generate power from marine turbines situated along the floating runways, harnessing wave energy to offset airport energy use. Passengers would be able to access London Britannia via high-speed underground rail, while vehicular access would be dispersed to three new land-based terminals.

Status Concept stage
Architect Gensler

London: Hub City



The 'London: Hub City' vision prioritises fast and reliable transport connections between London's airports and the city centre so that as many transferring passengers as possible are able to enjoy the capital. Transforming London into a Hub City requires a co-ordinated and integrated approach by a number of agencies, with major investment across London's transport systems. This strategy would make continued and better use of existing and planned infrastructure work within a renewed vision for our capital city.

Status Concept stage
Architect Grimshaw
Placemaking Consultant Futurecity

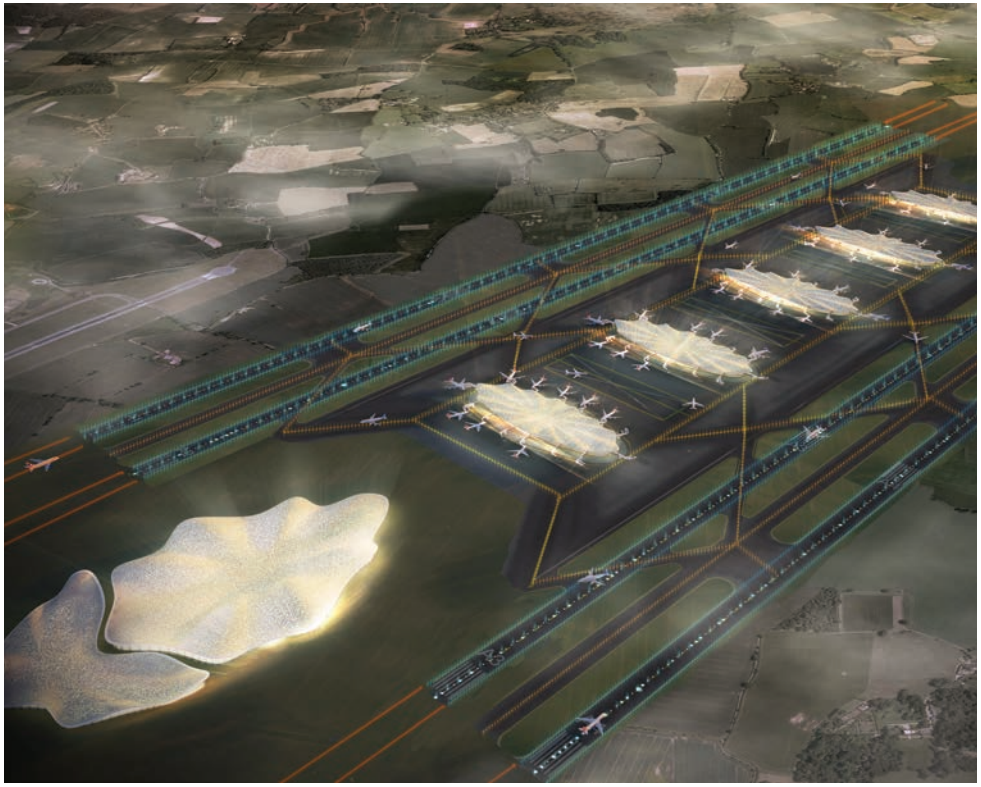
Stansted Airport
Bassingbourn Road,
Essex, CM24

Make's airport team is currently reviewing possibilities around the expansion of Stansted Airport to help alleviate the UK's aviation capacity problems. Increase runway capacity from one to up to four with a new terminal that has the potential to handle up to 150 million passengers per year; use and improve existing infrastructure; ensure that Heathrow does not have to close. Make's position is independent and looks at the longer term strategic aviation capacity and connectivity not just for the South East but for the UK and beyond.

Status Concept stage
Architect Make

Luton Airport

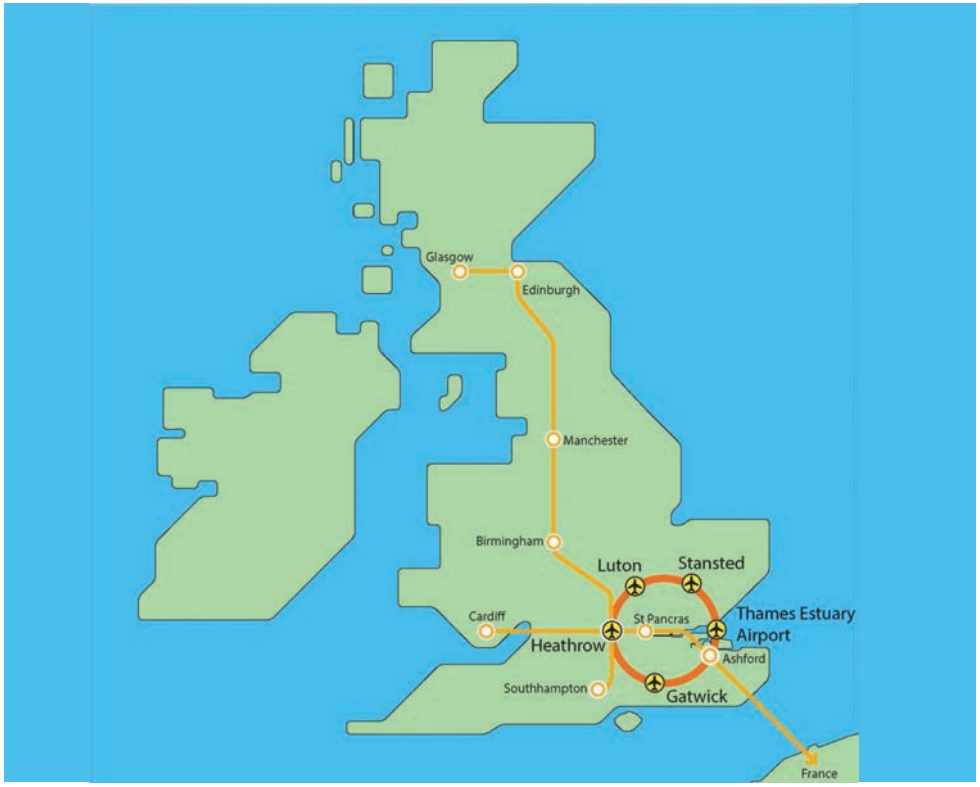
Airport Way, Luton,
Bedfordshire, LU2



Recently the Government think tank, Policy Exchange, has said that Luton is the second best option to expanding Heathrow but when balanced against environmental impact, the new four runway airport at Luton is by far the best solution. Weston Williamson + Partners believes that a new airport would provide London with essential world-class facilities and stimulate the South East and the whole of the UK.
The site also offers opportunities for alternative spaces not normally associated with airports. It would be served by the newly upgraded West Coast line and the East Coast line, while Thameslink services would provide connection to central London within 30 minutes.

Status Concept stage
Client Luton Airport
Architect Weston Williamson + Partners

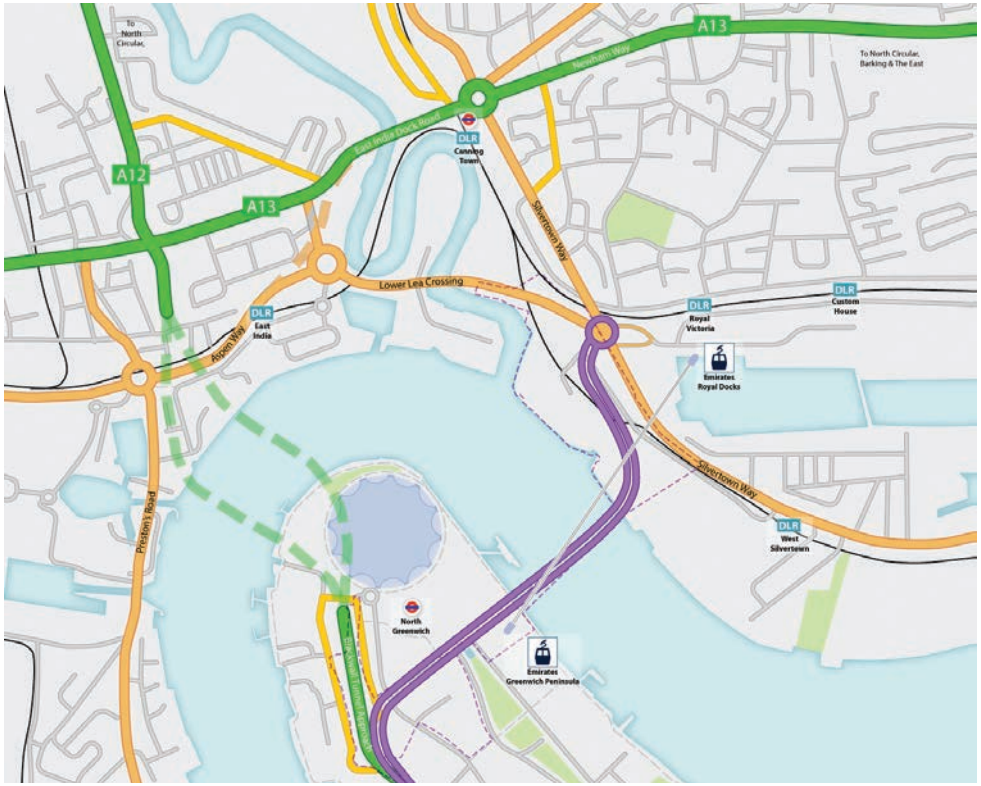
Aviation Strategy



Farrells believes that London, a world region and metropolis, needs a networked strategy – it's too big for one answer. The practice suggests we need a full study to establish whether we can use existing and proposed transport infrastructure to form an answer to the call for airport capacity. It believes that the answer should be provided incrementally, responding to demand, rather than a silver bullet that will take years to deliver. It needs to be an affordable, low risk investment that nevertheless offers an optimum performance level in terms of capacity and connections. It should be a sustainable and appropriate solution, consolidating and growing existing employment and infrastructure.

Status Concept stage
Architect Terry Farrell & Partners

River Crossings
East London



East London's river crossings are currently operating close to capacity. The Blackwall Tunnel can be highly congested and the Woolwich Ferry is nearing the end of its working life. London Mayoral Policy is focussed on supporting the national Plan for Growth through investment in new infrastructure. The Silvertown Tunnel has been designated as a nationally significant infrastructure project (NSIP) by the Secretary of State for Transport. Along with the Gallions Reach Ferry, it will link two major Opportunity Areas. This complements public transport investment in the area, including the DLR, Crossrail, the Jubilee Line and the Emirates Air Line.

Borough RB Greenwich and LB Newham
Cost £150m (Gallions Reach Ferry), £630m (Silvertown Tunnel)
Projected Date of Completion 2017 (Gallions Reach Ferry), 2021 (Silvertown Tunnel)

Status In consultation
Client Transport for London
Planning Consultant Transport for London

Emirates Air Line
East London

The Emirates Air Line is the UK's first urban cable car, linking North Greenwich with the Royal Docks. It provides a direct link between two of London's major event venues, ExCeL and The O2, provides a further link between the Jubilee line and DLR and improves local connectivity for pedestrians and cyclists. This new link will become increasingly important in years to come, as further development takes place at the Greenwich Peninsular and Royal Docks. The Emirates Air Line is an important part of a package of river crossings to be delivered in east London over the coming years, supporting the area's growth and development.

Borough RB Greenwich and LB Newham
Cost £60m
Date of Completion June 2012
Status Completed
Size 1 km span
Client Transport for London
Other Funding Partners European Regional Development Fund, Emirates

Architect Wilkinson Eyre, Aedas
Structural Engineer Expedition Engineering, Buro Happold
Planning Consultant URS
Contractor Mace
Cable Car Specialists Doppelmayr

River Action Plan
The Thames

TfL and the Mayor of London are seeking to bring about transformational change in London's passenger river services. The Mayor and TfL will focus their efforts to develop river services to achieve the target of 12 million passenger journeys on the river by 2020. TfL's Business Plan has allocated £10 million over the lifetime of this plan to help finance the measures, with further funding anticipated to come from partners and commercial development. The measures include better, more attractive piers, clearer information and better promotion of services, coupled with closer working between TfL and other partners.

Cost £10m+
Projected Date of Completion 2020
Status Published February 2013
Client Transport for London

Other key project team members
Port of London Authority, River Concordat Steering Group, River Service Operators, Riparian London Boroughs, River Concordat Forum Members

Lee Tunnel
Stratford, E15

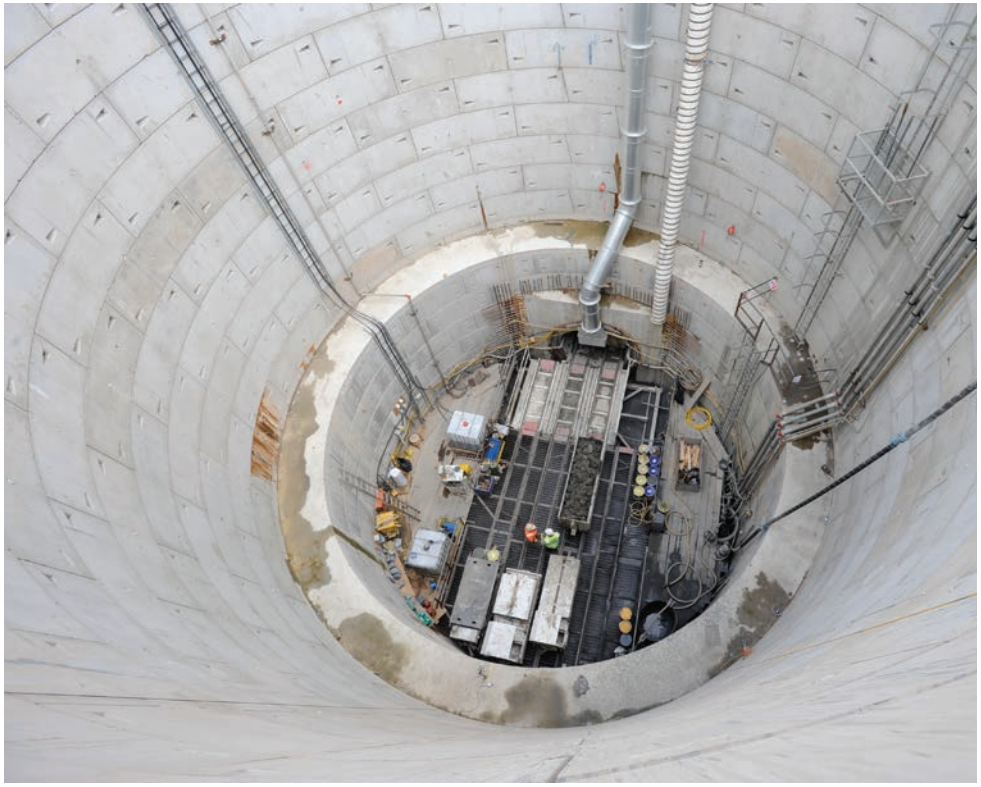
This Thames Water scheme will prevent 16 million tonnes of sewage entering the River Lee each year. Adding over 380,000 cubic metres of capacity, the design consists of a 7.2 metre internal diameter tunnel with a segmental concrete primary lining and a cast-in-place concrete secondary lining. It also includes two wet shafts at Abbey Mills where the sewage will be captured, two wet shafts and one dry shaft at Beckton where it will then be treated, as well as associated culverts and connections. The shafts are constructed with diaphragm walls up to 100 metres deep and cast-in-place concrete secondary linings.

Borough LB Newham
Cost £635m
Projected Date of Completion 2014
Status Under construction

Size 7 km
Client Thames Water
Lead Designer and Structural Engineer AECOM

West Ham Strategic Flood Alleviation Scheme

Stratford, E15



The West Ham Strategic Flood Alleviation Scheme has removed the threat of combined sewer flooding for approximately 650 homes and businesses in east London. Completed in 2010, the scheme was Thames Water's largest ever network sewerage project, involving the construction of 8.3 kilometres of new sewers, the main element of which was a 3.3 kilometre long, 2.8 metre diameter tunnel. Extensive community liaison minimised disruption to the local area and environmental impact was mitigated by diverting 82 per cent of spoil from landfill and reducing ongoing power requirements for pumping.

Borough LB Newham
Cost £80m
Date of Completion 2010
Size 8.3 km
Client Thames Water
Lead Designer and Structural Engineer AECOM / Halcrow

Deephams Sewage Treatment Plant

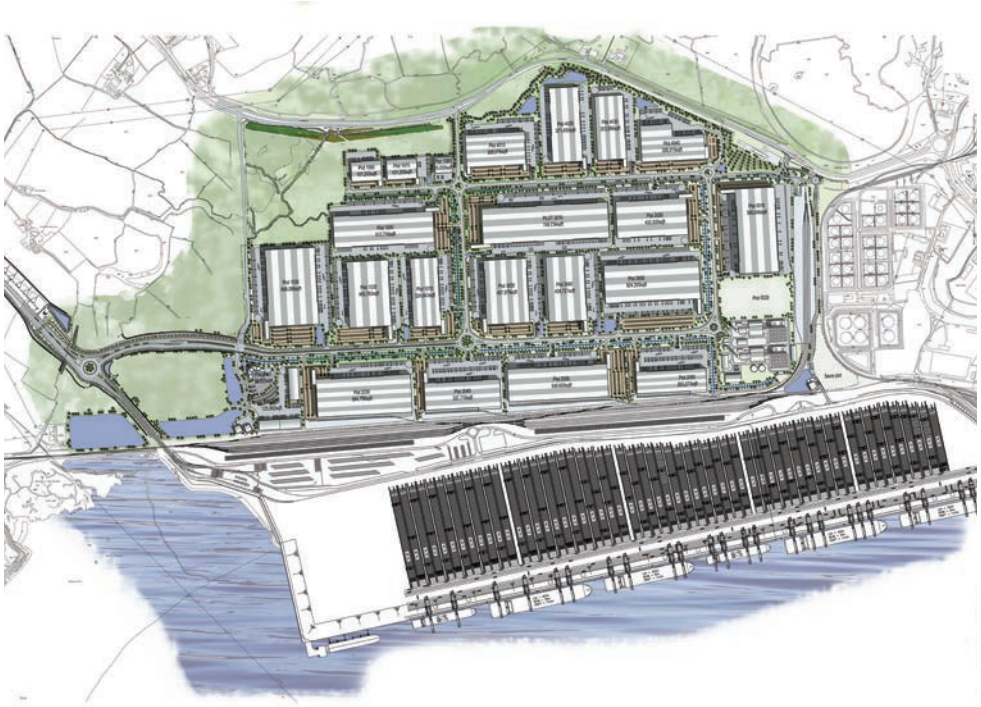
Picketts Lock Lane, N9

Deephams is the ninth largest sewage treatment plants in the UK, serving a population of almost one million people across north London. The £40 million upgrade, undertaken by Thames Water Utilities and J. Murphy & Sons with AECOM as hydraulic, civil and structural designer, has provided a new treatment stream with improved fine and storm screening and additional storm storage facilities to cope with future flows and storm events. As well as improving storm storage and treatment facilities, the project will also improve the water quality of the River Lea in Edmonton, north London, making it a healthier environment for aquatic life and improving the riverside environment.

Borough LB Enfield
Cost £40m
Date of Completion 2010
Size 8.3 km
Client Thames Water Utilities, J. Murphy & Sons
Lead Designer and Structural Engineer AECOM

London Gateway

The Manorway, Stanford-le-Hope,
Thurrock, Essex SS17 9PD



© DP World London Gateway

Situated on the north bank of the River Thames, London Gateway will be the UK's first 21st century major deep-sea container port and Europe's largest logistics park. The development will also offer individual units up to and in excess of one million square feet.
In doing so, London Gateway will offer global brands the opportunity to move away from conventional distribution methods.
The location of the port will ensure trade does not have to travel far, which means fewer road miles, costs and vehicle emissions.
This concept of integration is known as PortCentric logistics.

Cost £1.5bn
Projected Date of Completion Late 2013
Status Under construction
Client DP World

Architect Chetwood
Multi-disciplinary Support Services AECOM
Planning Consultant DPP

Harrow's Green Grid

Various sites

Harrow's Green Grid Project aims to establish a network of green corridors to connect Harrow's open spaces with its town centres, public transport hubs and suburban areas. Proposed initially to offset the continued urbanisation of the borough and to encourage greater use of these links and the diverse open spaces they connect, the project has engaged a wide range of stakeholders including private landowners and the voluntary sector.
A key to its success has been the relative ease with which the initiative can be incorporated within other programmes and projects, adding green credentials and strategic visibility at little additional cost.

Borough LB Harrow
Cost £200k per annum
Status Ongoing
Client LB Harrow
Other Funding Partners Heritage Lottery Fund, English Heritage
Project Manager LB Harrow

The All London Green Grid
London-wide

The All London Green Grid aims to promote the concept of green infrastructure, and increase its delivery by boroughs, developers, and communities.The ALGG extends through the capital from the Thames to the Green Belt along key landscape corridors. It incorporates established open spaces and identifies opportunities for new ones, connecting across administrative boundaries. Delivered alongside existing infrastructure, an enhanced network of integrated green and open spaces can serve to shape and improve new and existing communities, support economic development, respond to the challenges of climate change, protect the natural environment, and thereby deliver an improved quality of life for all Londoners.

Status Ongoing
Client GLA
Other funding partners: Heritage Lottery Fund (Parks for People and Landscape Partnerships), The Environment Agency

King's Cross
King's Cross Station
Euston Road, N1

© Hufton & Crow

The multi-phased project for King's Cross Station comprises both restoration and refurbishment within the existing main train shed, eastern and western ranges. The centre-piece is the new departures concourse; the 16 steel tree-form columns radiating from a tapered central funnel are structurally independent of the sensitive historic buildings. The redevelopment improves passenger facilities and operational activities, interchange facilities with St Pancras Station, Eurostar and Thameslink, as well as with London Underground, buses and taxis.
Demolition of the old concourse and construction of the southern square is underway, with completion scheduled for Autumn 2013.

Borough LB Camden
Cost £547m
Date of Completion March 2012
Status Completed
Size 80,000 sqm
Client Network Rail
Architect and Masterplanner John McAslan + Partners
Structural Engineer Arup (Western Concourse), Tata Steel Projects (Roof Refurbishment, Platform Refurbishment and Footbridge)
M&E Engineer Arup
Fire Engineer Arup
Urban Realm Designer Arup
Cost Consultant Network Rail
Contractor VINCI Construction (Platform refurbishment, Footbridge, Service Yard, Western Range and New Concourse), Kier Rail (Roof Refurbishment), Laing O'Rourke / Costain JV (Eastern Range), Carillion (Platform 0)

King's Cross
King's Cross Square
Euston Road, N1

© Network Rail

King's Cross Square will provide a new public space as a focal point at the heart of the wider King's Cross development. The space also functions as a vital part of the major transport interchange at King's Cross / St Pancras. Stanton Williams' design responds to these multiple challenges by creating a number of distinct spatial zones, defined by landscaping elements that incorporate existing London Underground structures and reveal Cubitt's 1852 station facade for the first time in 150 years.

Borough LB Camden
Projected Date of Completion
Autumn 2013
Status Under construction
Size 7,000 sqm
Client Network Rail

Architect Stanton Williams
Structural Engineer Arup
M&E Engineer Arup
Project Manager Network Rail
Cost Consultant Network Rail
Contractor Murphy

Landscape Architect BHSLA
Other key project team members
Studio Fractal (Lighting Consultant), Hayes Davidson (Visualisations)

King's Cross
The Masterplan
King's Cross, N1

In Victorian times, King's Cross was an industrial heartland. But by the late 20th century, the area had become a series of disused buildings, railway sidings, warehouses and contaminated land. In 2008, Argent, London & Continental Railways and DHL formed a joint partnership: Kings Cross Central Limited Partnership. Since then, the partnership has invested over £300 million, mostly in key infrastructure such as roads, bridges and utilities. Only now, with the opening of the University of the Arts London, Granary Square, King's Boulevard, and key streets and spaces are we beginning to see the impact the development will have on the area.

Borough LB Camden
Projected Date of Completion
Estimated 2020
Status Under construction
Size 67 acres
Client King's Cross Central Limited Partnership
Architect Allies + Morrison, Weedon Partnership

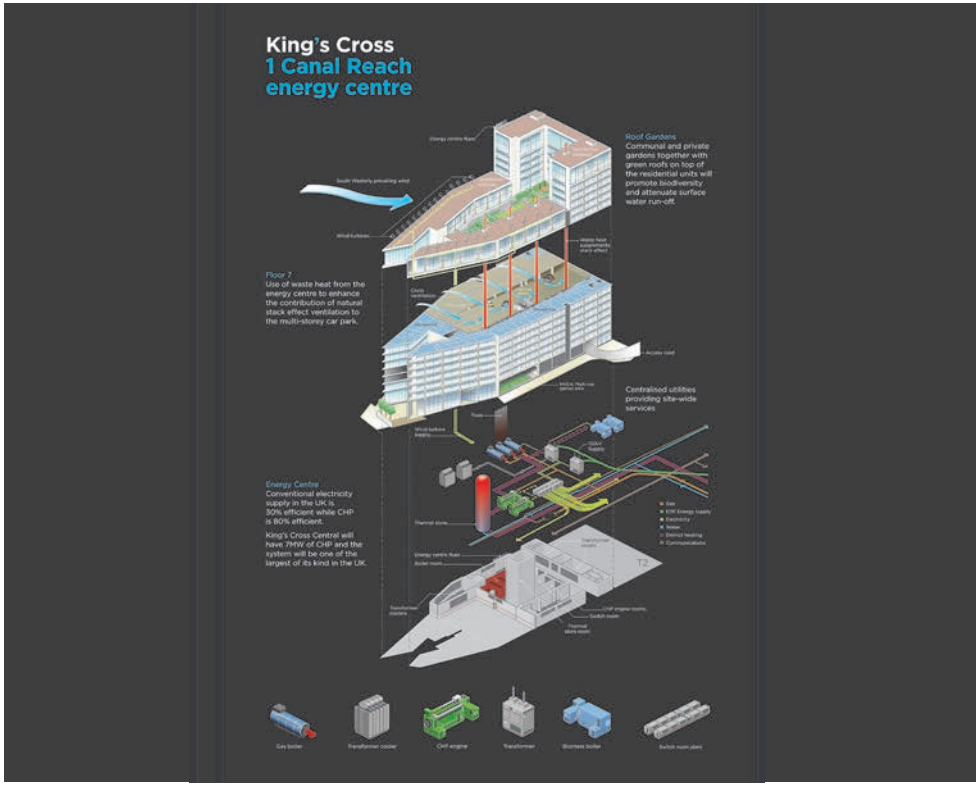
Other Funding Partners
Hypothekenbank Frankfurt AG London Branch, Deutsche Postbank AG, HSBC
Structural Engineer Peter Brett Ass.
M&E Engineer Peter Brett Ass. Rush Construction Services
Planning Consultant Argent
Project Manager King's Cross Central Limited Partnership
Cost Consultant Davis Langdon (AECOM)
Contractor BAM Nuttall, Carillion, Kier
Landscape Architect Townshend Landscape Architects, Applied Landscape Design
Other key project team members
The Fountain Workshop, Speirs and Major, Miller Druck, Willerby

King's Cross
Sustainability
King's Cross, N1

Opportunities like King's Cross do not come around often. That's why, when they do, it is vital to create a sustainable place. At King's Cross this has included everything from promoting energy efficiency to encouraging green transport, from reuse of heritage buildings to a massive program of tree planting, from sustainable building design to ensuring social and cultural diversity. The very latest technologies will reduce running costs and minimise environmental impact, and where possible, roofs will be used for allotments, gardens and lawns. Orientation, solar shading, the use of thermal mass for cooling and passive ventilation systems all contribute to energy efficiency.

Borough LB Camden
Projected Date of Completion
Estimated 2020
Status Under construction
Size 67 acres
Client King's Cross Central Limited Partnership
Planning Consultant Argent

King's Cross
Energy
King's Cross, N1



The focus for energy efficiency and sustainability at King's Cross is an on-site Energy Centre. The centre houses a Combined Heat and Power (CHP) plant. In time, the CHP plant will provide 100 per cent of the development's heat and hot water needs and 80 per cent of its electricity. Each building at King's Cross will be connected to the Energy Centre through a hot water distribution network.
The cooling needs of the buildings will also be met in part by absorption chillers fed from the CHP plant. Energy usage at King's cross will be at least 39 per cent less than industry norms.

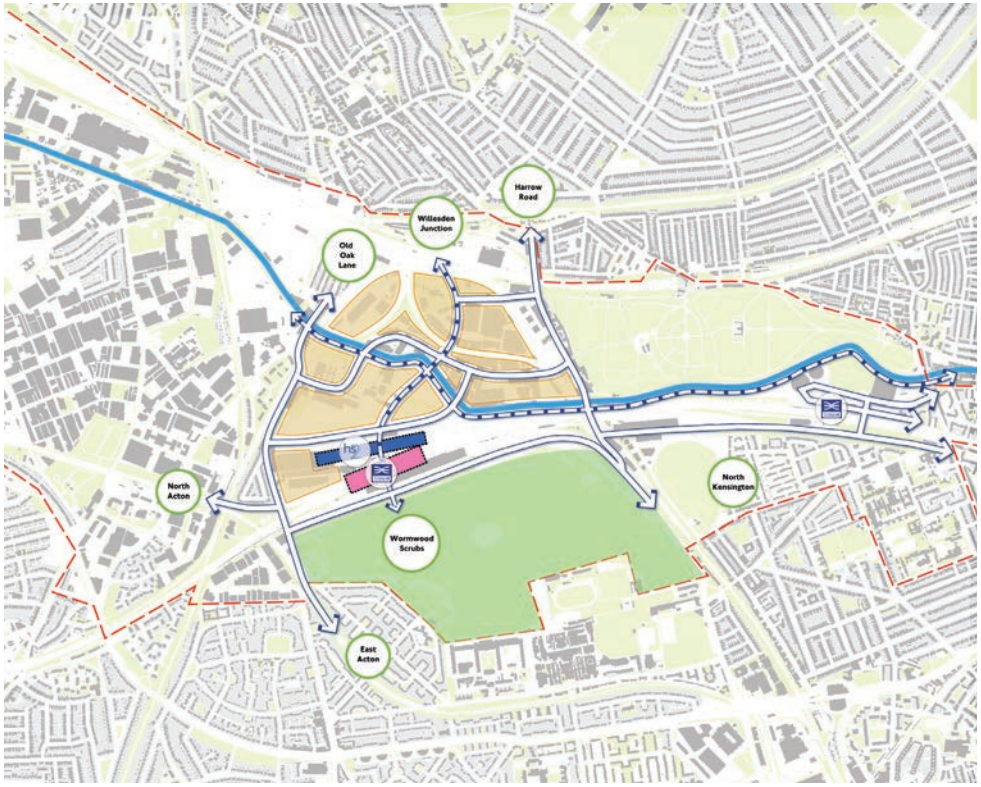
Borough LB Camden
Projected Date of Completion
Estimated 2020
Status Under construction
Size 67 acres
Client King's Cross Central Limited Partnership
Planning Consultant Argent

King's Cross
Communications
King's Cross, N1

A site-wide network of pipes, cables and fibre optics has already been laid at King's Cross. Spare capacity is designed in from the start and empty ductwork will be available to future IT providers.
This will allow buildings to simply 'plug in' to all required utilities.
Every effort has been made to build in adaptable and flexible technologies that will hold in the future.
With this infrastructure already in place, there will be no need to dig up pavements and close roads for infrastructure upgrades. In addition, there is free site wide Wi-Fi throughout King's Cross.

Borough LB Camden
Projected Date of Completion 2020
Status Under construction
Size 67 acres
Client King's Cross Central Limited Partnership
Planning Consultant Argent

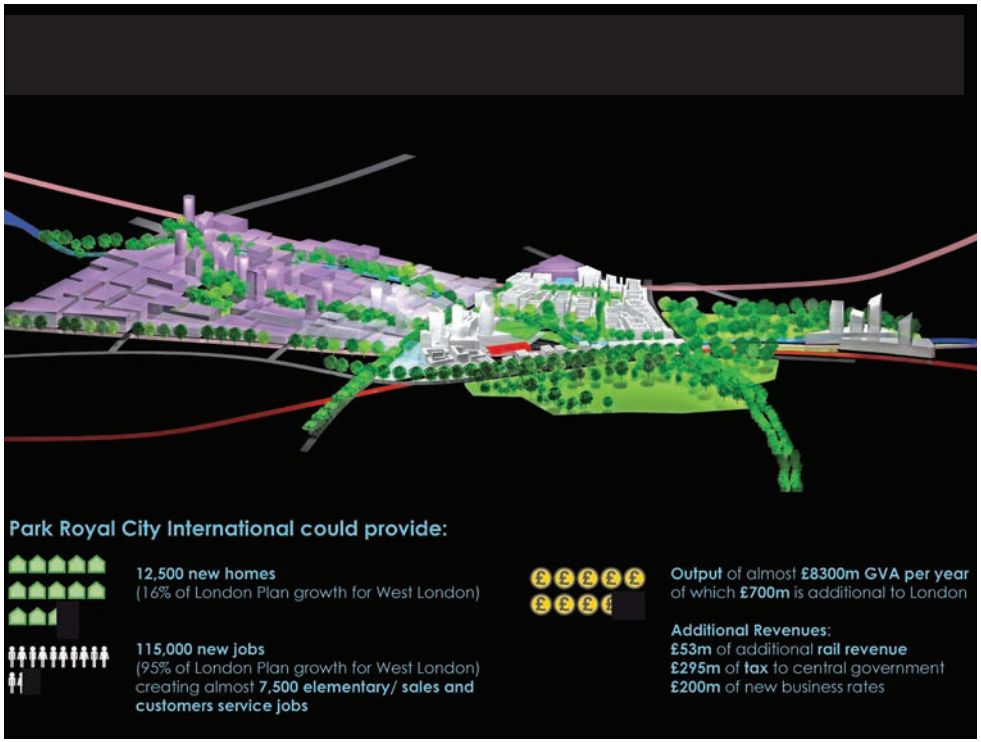
Old Oak Common
Old Oak Common Interchange
Old Oak Common, NW3



In January 2012, the Government approved the progression of plans for a new high speed railway linking (in its first phase) London and the West Midlands. This includes an interchange at Old Oak Common with the potential to link Overground, Crossrail and HS2 services,as well as local bus connections, walking and cycle routes and the Underground.
TfL is seeking to ensure that Old Oak Common is able to offer these benefits while functioning as a coherent feature of the HS2 line.
It will also reduce pressure on the HS2 terminus at Euston and catalyse regeneration in one of west London's more deprived areas.

Borough LB Hammersmith & Fulham
Projected Date of Completion 2026 (Phase 1), 2033 (Phase 2)
Status Planning pending
Size 500+ sqm
Client HS2 Ltd
Architect Weston Williamson + Partners
Structural Engineer Mott MacDonald
Planning Consultant Transport for London
Cost Consultant Transport for London

Old Oak Common
Park Royal City International
Old Oak Common, NW10



Rivalling the scale of Stratford or Canary Wharf, Farrells' vision for over 500 hectares of west London focuses on the proposed integrated Crossrail / High Speed Rail 'super-hub'. Farrells' vision demonstrates the clear potential of this central and accessible site, with the 'super-hub' interchange becoming a powerful driver for growth and regeneration. Based around a new canal side park and a rapid transit system, the vision could generate an estimated 12,000 homes and 115,000 jobs – a significant new opportunity for London.

Borough LB Hammersmith & Fulham, LB Brent, LB Ealing and RB Kensington & Chelsea
Cost £1bn (Infrastructure), circa £1bn (Regeneration)
Projected Date of Completion 2045

Status Design stage
Size 500+ ha
Client LB Hammersmith & Fulham, LB Brent, LB Ealing and RB Kensington & Chelsea
Other Funding Partners Crossrail Ltd

Architect Terry Farrell & Partners
Other key project team members Jonathan Roberts Consulting and SKM Buchanan (Transport Planning), SKM Buchanan (Economics), CBRE (Property and Economics)

Euston
Euston Area Plan
Euston environs, NW1

The Euston Area Plan is being prepared by Camden Council, the GLA and TfL as a joint planning framework for the area around Euston Station. The plan is being developed to respond to HS2 proposals for a redeveloped station and additional track capacity that will result in the loss of homes, open spaces and businesses in the vicinity.
While Camden Council oppose HS2 for this reason, the plan is an opportunity to work proactively with HS2, in conjunction with GLA and TfL, to shape emerging HS2 proposals to better meet plan objectives and community priorities.

Borough LB Camden
Projected Date of Completion 2026
Status Design stage
Size 85 ha
Client HS2 Ltd

Other Funding Partners GLA, Transport for London
Local Planning Authority LB Camden
Cost Consultant GVA / AECOM
Historic Area Assessment Allies and Morrison Urban Practitioners

The Olympic Park
Queen Elizabeth Olympic Park
East London

A myriad of infrastructural barriers meant that the site of the Olympic Park was one of the most isolated and difficult to access parts of London. Proposals for the site have not only included built interventions but also capitalised on existing, but broken, infrastructural networks. An understanding of the role waterways, parklands and access routes play in the creation of well-connected neighbourhoods have informed the scheme from the onset. An approach that focuses on working from the inside out and the outside in will ensure that this piece of London will be seamlessly integrated with its adjacent environment – spatially, socially and economically.

Borough LB Hackney, LB Tower Hamlets,
LB Newham and LB Waltham Forest
Status Partially completed
Client London Legacy Development Corporation

Designer Atkins (North Park), Arup (South Park)
Project Manager MACE
Cost Consultant LLDC
CDM Co-ordinator Atkins
Contractor BAM Nuttall

The Olympic Park
Enabling Works
Stratford, E20

Transforming this derelict brownfield site into an accessible and sustainable amenity has been an ongoing project for a vast multidisciplinary team of designers, consultants and engineers. With a focus on legacy and sustainability, this team has met targets in areas such as waste, water, energy, and reuse of materials on site.
As well as infrastructure design and structural engineering, the project involved site-wide enabling works, landscaping and security planning.
Today, the transformation of the Queen Elizabeth Olympic Park into an exciting new destination for visitors and the wider community is already underway.

Borough LB Newham, LB Tower Hamlets, LB Hackney and LB Waltham Forest
Cost circa £8.921bn
Date of Completion Phased throughout 2012 and 2013
Status Partially completed
Size 246 ha
Client Olympic Delivery Authority

(Enabling Works, Utilities), LOCOG (Overlay), LLDC
Designer Atkins (Enabling Works, Utilities, Overlay)
Infrastructure and Landscape Designer Atkins (North Park), Arup (South Park)
Structural Engineer Arup (Aquatics Centre, ArcelorMittal Orbit, Copper Box, Olympic Village, Eton Manor)

Planning Consultant Arup (Site Wide)
Project Manager Atkins (Enabling Works), CLM (Utilities) LOCOG (Overlay)
Cost Consultant Gardiner & Theobald (Enabling Works), CLM (Utilities), LOCOG (Overlay)
Contractor Morrison Construction, BAM Nuttall, Barhale, McNicholas, Skanska, Balfour Beatty, ISG

The Olympic Park
Bow Riverside
By the Bow Roundabout, Stratford High Street, E15

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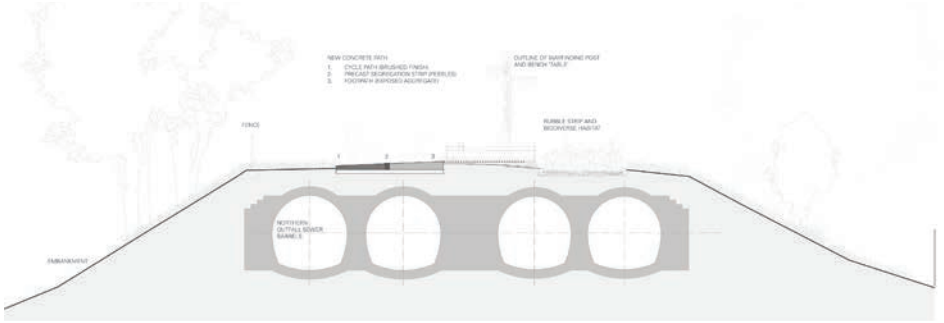
This new footbridge and suspended walkway completes the River Lea Walk, a 28 mile walking and cycling route from the Thames to Hertfordshire. Previously, pedestrians or cyclists had to leave the towpath and cross five lanes of hazardous carriageways to resume their riverside journey. Creating a sequence of distinct but connected spaces orientated to the river, the project includes improvements to an existing wharf and a new path through marginal woodland.
The result is a safe commuter route, a recreational environment and an additional point of access to the Olympic Park.

Borough LB Tower Hamlets
Contract Value £2.4m
Date of Completion September 2011
Client British Waterways
Principal Funder London Thames Gateway Development Corporation
Other Funders Walk London, Transport for London, Olympic Delivery Authority

Key Stakeholders Design for London, Leaside Regeneration Ltd
Architect Adams & Sutherland
Structural Engineer Halcrow Group Ltd (to Stage D), May Gurney Ltd (post Stage D)
Contractor May Gurney Ltd

Landscape Architect JCLA
Other key project team members Sutton Vane Associates (Lighting Design), CTS Bridges (Specialist Steel Sub-Contractor)

The Olympic Park
Greenway
Wick Lane to West Ham, E15



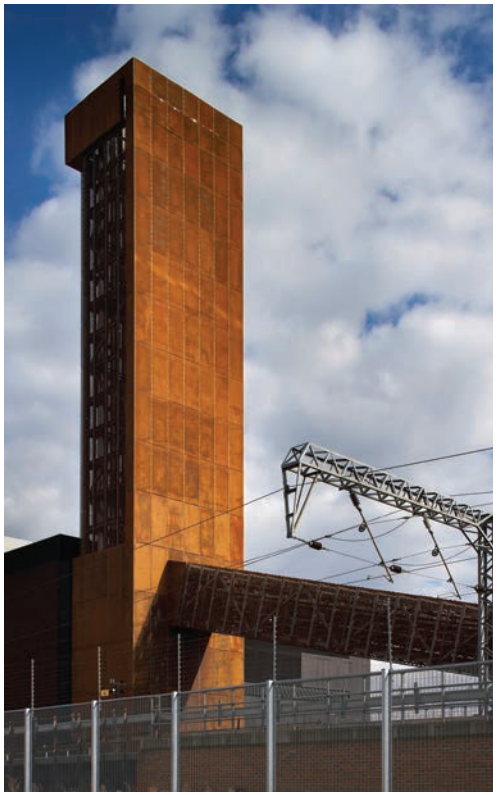
This project is a refurbishment and upgrade of part of the Greenway, a linear park, footpath and cycling route, which runs for seven kilometres on top of the Northern Outfall sewer. The new space provides a safe, welcoming route for pedestrians and cyclists and a key access point into the Olympic Park. Complementing the new Olympic landscape, the scheme remains a place of semi-wilderness within the city. Materials from the Olympic site – including cobbles, setts, tiles and manhole covers – were reused, enriching new concrete surfaces and creating brownfield habitats.

Borough LB Tower Hamlets and LB Newham
Contract Value £4m
Date of Completion Summer 2011
Size 2.5 km
Client Olympic Delivery Authority

Key Stakeholders LOCOG, LB Newham and LB Tower Hamlets, Thames Water Utilities Ltd, Sustrans, Cyclists Groups, Walk London, Walkers Groups
Architect Adams & Sutherland

Structural Engineer Arup
Landscape Architect JCLA
Project Manager Arup
Contractor Volker Fitzpatrick
Other key project team members CLM (Contract Administration), Belinda Moore (Graphic Design)

The Olympic Park
King's Yard Energy Centre
King's Yard, E9



The new Energy Centres for the 2012 London Olympic Park site are technically advanced and environmentally considerate. Embedded in the community, rather than hidden from it, they are important new landmarks in the urban mix – architectural gateways on the eastern and western boundaries of a huge tranche of east London that will be subject to further regeneration after the London 2012 Games.
A key element of the brief was that the facilities should add to the design legacy of the Olympic Park, and contribute strongly to the developing urban character of the Lea Valley as a whole.

Borough LB Hackney
Date of Completion December 2011
Size 7,500 sqm
Client COFELY East London Energy Ltd
Architect John McAslan + Partners
Structural Engineer AKT II
M&E Engineer Parsons Brinckerhoff
Planning Consultant
Parsons Brinckerhoff
Quantity Surveyor
Solent Project Management
Contractor Careys
Access Consultant Buro Happold
Fire Consultant Arup

Credits

Curators
Peter Murray, Debbie Whitfield

Research and text
Denise Chevin, Andrew Pring

Design
Pipers Design

Exhibition Co-ordinator
Elisabeth Dearden

Event programming
Catherine Staniland

NLA would like to thank Rehau for generously supplying the pipework used in the exhibition and London Communications Agency for its contribution of *Crossrail — The Long Journey*

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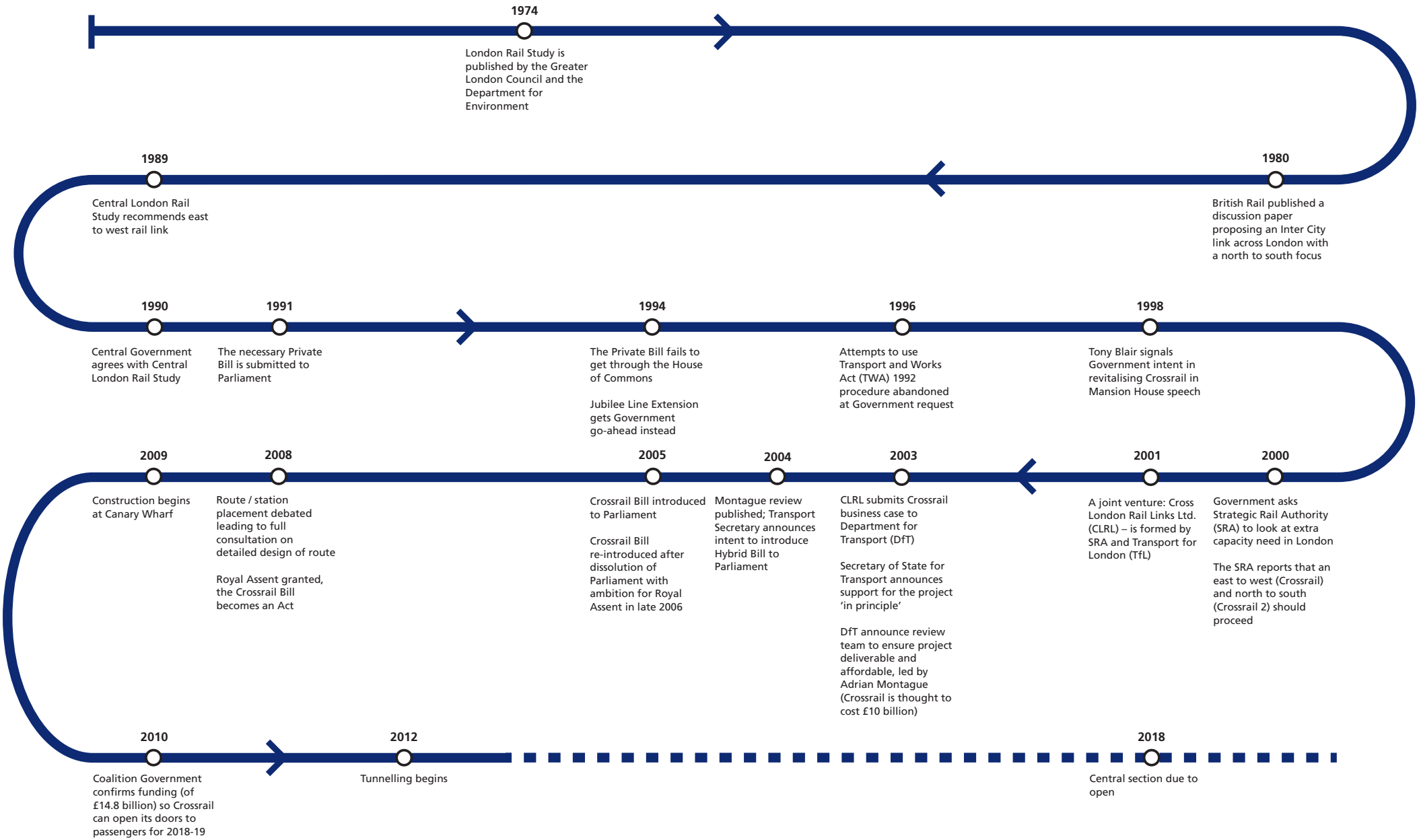
Crossrail — The Long Journey



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