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Crossrail
Environmental Statement

Non-technical summary

Prepared for The Department for Transport
d by Environmental Resources Management
Introduction

About this document

Crossrail is a proposal for a major new cross-London rail link. Powers are being sought by means of a hybrid Bill promoted by the Secretary of State for Transport to construct the Crossrail project and operate the railway. The Bill, if approved by Parliament, will become law following Royal Assent.

As part of the process of seeking powers for Crossrail, the project must be subject to an Environmental Impact Assessment (EIA). An EIA is a legal process and includes the identification of the significant environmental impacts that are likely to arise from a development. This was undertaken by a team of independent specialists, and the findings of the assessment are reported in an Environmental Statement (ES).

The ES will be submitted to Parliament with the Bill. The purpose of the ES is to help Parliament to make decisions about the project based on a full understanding of any impacts, positive or negative, that it may have on the environment. The ES also enables anyone with an interest in the project, including the general public, to understand how Crossrail will affect them and to express their views on the effects of the project. During the passage of the Bill through Parliament, individuals, groups or organisations that may be directly affected by the project will have the opportunity to have their concerns heard.

This non-technical summary provides an overview, in non-technical language, of the main findings of the ES. More specifically, it:

• sets out the background to Crossrail;
• describes the Crossrail route and the principal works;
• explains how these works will be constructed, including measures to minimise their environmental impacts;
• explains how the Crossrail services will operate;
• presents the alternatives that have been considered in developing the project;
• explains how the assessment has been carried out; and
• presents the significant impacts that have been identified.

London-wide and regional impacts are described first, followed by the impacts within each section of the route. Because this is a summary, impacts cannot be described in detail and reference cannot be made to every location.
The Crossrail project

Crossrail is being proposed because it will make a significant contribution to the transport needs and economic development of London and the South East region. The project comprises new tunnels running west-east through central London connecting directly with existing surface rail routes to Maidenhead and Heathrow in the west, and to Shenfield and Abbey Wood in the east. By connecting the major London rail termini of Paddington and Liverpool Street, Crossrail will also enable interconnecting mainline-sized train services to cross the centre of London via a number of new purpose-built stations.

The Crossrail project has been developed to date by Cross London Rail Links Limited (CLRL), a joint venture company owned by Transport for London (TfL) and the Secretary of State for Transport. It is expected that the Government will nominate an organisation or organisations (known as ‘the nominated undertaker’ or ‘nominated undertakers’) to take the project forward once consent has been received.
Need for Crossrail and objectives of the project

London is a World City and the leading financial centre within Europe. As the gateway to the UK for international investment and tourism, and the centre of national decision making, it is in many respects the driving force behind the British economy. In order to sustain these roles, London needs to invest in new transport infrastructure that will improve the integration of its business centres and enhance its accessibility.

London has changed dramatically in the last 20 years. The change has been largely in response to the globalisation of many economic sectors and to advances in technology. Along with an increase in population, there has been significant growth in employment in the finance and business services sector, which is primarily concentrated in the West End, the City and the Isle of Dogs.

London’s economy continues to grow. The Mayor’s development plan for London (the London Plan) anticipates that by 2016 the number of people living in London will have increased by 800,000, while the number of jobs will have risen by 636,000. A significant proportion of the population growth is likely to be housed in the east of the city, although substantial housing development is also identified for Southall, Hayes and West Drayton in the west. The majority of new jobs will be located within central London and in the Isle of Dogs, although significant growth is also envisaged for west London around Southall, Hayes, West Drayton and Heathrow.

Outside London, in the rest of the South East of region, significant growth in population and employment is planned for a number of designated growth areas including the Thames Gateway, the London to Stansted/M11 corridor and around Milton Keynes.

One of the key objectives of the various strategies that have developed to accommodate these increases in population and employment is the need to promote sustainable transport choices for people. In pursuing this, the London Plan emphasises the need to provide a high capacity, integrated public transport system to serve the areas earmarked for substantial population and employment increases.

London’s public transport system currently faces significant challenges in meeting demand during peak periods. Many mainline services operating into London are overcrowded, while sections of all London Underground lines within central London operate above their planned capacities.

This overcrowding is exacerbated by the legacy of the London rail network, including the fact that most of mainline London termini are located on the edge of central London and, with the exception of Thameslink, there are no cross-London links. This means that the majority of passengers must interchange onto the Underground, buses or taxis to reach their final destinations. This lengthens journey times for passengers and results in significant congestion at the London termini.
Even with planned improvements to London’s mainline and Underground services up to 2016 (excluding Crossrail), the increase in the number of passengers travelling will mean that future levels of overcrowding will get worse. On certain parts of the network, passenger flows are forecast to be higher than could be supported in reality. This increase in congestion therefore poses a threat to achieving the projected growth in jobs and economic activity that is forecast for London by the London Plan.

Crossrail is a considered response to the scale of the transport challenge facing London and the South East region. The project has been developed around three main objectives:

- to support the continued development of London as a World City and its role as the financial centre of Europe and the UK;

- to support the economic growth of London and its regeneration areas by tackling congestion and the lack of capacity on the existing rail network; and

- to improve rail access into and within London.

To achieve these objectives, Crossrail will do the following:

- Provide additional rail capacity into central London from the west, northeast and southeast. This additional capacity will allow employment growth to take place in areas with good public transport accessibility. It will result in 15,000 fewer car journeys being made within London during the morning peak period.

- Provide additional rail capacity between London and the Lea Valley by releasing platform capacity at Liverpool Street. This will allow additional trains to operate. Other growth areas outside London will benefit from better access to Heathrow Airport and improved cross-London connections.

- Improve accessibility within and across London by providing a high capacity west to east rail link. Crossrail will provide a direct link between London’s primary business centres (the West End, the City and the Isle of Dogs), as well as its main points of international access, including Heathrow Airport and Stratford. In southeast London, Crossrail will provide a new link across the River Thames and allow mainline rail services to serve the Isle of Dogs.

- Relieve overcrowding on Underground and mainline services by providing additional rail capacity between west and east London. Nearly all Underground lines will see a reduction in passengers following the opening of Crossrail, while the number of passengers using services into several of the mainline London termini will fall.

- Improve access to and from designated regeneration areas, particularly in east London and the Thames Gateway, but also around Hayes and Southall in the west. Improved public transport is one of the key prerequisites for attracting more jobs and residents into these areas.

- Boost the performance of the highly productive finance and business service sector by removing constraints on future employment in central London, thereby generating wider economic benefits for the UK.
Overview of the route

Crossrail’s route has four distinct sections: a central section, within central London, and western, northeastern and southeastern sections extending into outer London and parts of Berkshire and Essex.

The central section, and part of the southeastern section, will comprise new twin-bore tunnels.

These tunnels represent the main engineering element of the project. They will run from Royal Oak, west of Paddington, passing beneath Hyde Park, the West End, Holborn, Clerkenwell, Shoreditch and Stepney. At a point beneath Stepney Green, the route will fork. One set of tunnels will continue to the northeast before emerging to the surface at Pudding Mill Lane near Stratford. The other set of tunnels will head southeastwards, emerging adjacent to Victoria Dock Road in the Royal Docks. Twin-bore tunnels will also be constructed between North Woolwich and Plumstead to take the southeastern section of the route under the River Thames. In total, 46 km of tunnel will be built (equivalent to 23 km of twin-bore).

The tunnels will be constructed at about the same depth as London Underground’s Central line. Rail level will generally be 20 m to 25 m below street level through the West End and the City, with low points of 30 m or 35 m at some points. This level will increase to 40 m between Liverpool Street, Pudding Mill Lane and the Royal Docks, with a low point of 50 m just east of the Isle of Dogs.
New stations will be located along the central section at Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street, Whitechapel and the Isle of Dogs. Station platforms will be designed to accommodate the proposed 10-car Crossrail trains. However, the tunnels will be constructed to allow for a future upgrade of platforms to 245 m, for the operation of 12-car trains, should this be required in future.

The tunnels will be connected to the surface by shafts, in order to provide access, emergency escape routes or ventilation. Current safety standards indicate that these shafts should be no more than 1 km apart. Some shafts will be incorporated into the new station buildings, whilst others will be free-standing.

Outside central London, Crossrail will generally use existing railway corridors. New track will be laid at a number of locations in order to provide additional capacity or segregation between services, for example, between Plumstead and Abbey Wood on the southeastern section.

The western section of the route will run from Maidenhead along the Great Western main line, through Slough towards Westbourne Park and the tunnel entrance (portal) to the central section tunnels at Royal Oak. A new connection will be constructed west of Hayes to allow Crossrail services to access Heathrow using the existing rail tunnel into the airport.

From Stratford, the northeastern section of the route will join the existing Great Eastern mainline and continue through Ilford and Romford as far as Shenfield. A new depot will be built at Romford for maintenance of Crossrail trains.

The southeastern section of the route will join the North London Line corridor near Custom House station and continue to North Woolwich. It will run under the Royal Docks using the existing Connaught Tunnel. A new tunnel will then take the route under the Thames to Plumstead, where it will join the North Kent Line and continue to Abbey Wood.
Operation of the project

Crossrail trains
Crossrail will generally operate trains that are 200 m long and made up of 10 carriages. During weekends, and after 9.00 pm on weekdays, trains will comprise five carriages. The trains will be electric, with power delivered through overhead lines, and will have a top speed of 160 km/h.

Crossrail services
It is assumed that Crossrail services will begin to run during 2013. The busiest part of the route will be between Paddington and Whitechapel. The number of trains operating along this section during the morning and evening rush hours, Monday to Friday, will be 24 trains per hour in each direction. This is equivalent to a train in each direction every two to three minutes. At other times of the day and at weekends, 16 trains per hour will operate, equivalent to a train in each direction every three to four minutes.

Crossrail services will operate over a similar period to the Underground. On Mondays to Saturdays, the first trains will start at 5.45 am, continuing to about 12.30 am at night. On Sundays, services will start a little later, at 6.30 am and again finish at 12:30 am.
Passenger use
By 2016, it is forecast that 160,000 passengers will be using Crossrail during the busiest three hours in the morning, between 7.00 am and 10.00 am. Trains will be most heavily used between Whitechapel and Liverpool Street (forecast to carry 55,000 passengers), Liverpool Street and Farringdon (49,000 passengers), and Paddington and Bond Street (35,000 passengers).

Operational staff
Approximately 1,400 staff will be required to operate and maintain the Crossrail trains, stations and tracks. About 1,000 of these positions will be new jobs, while the remainder will be taken up by staff transferring from existing rail operations.

Figure showing the number of trains running in each direction during the busiest hour in the morning and evening
Construction of the project

Programme
Subject to the passage of the Bill through Parliament, the main construction works are expected to start in 2007 and will be undertaken over a six-year period. Works such as demolitions, or diversion of sewers or cables, will be undertaken first.

The precise duration of work at any one location will vary, and will in no case extend over the whole construction period. Typically, work within the central section will be of approximately three to five years duration, whilst work at major sites in the outer sections will last between around six months and two years. The principal exceptions to this are the construction of Romford Depot, Stockley Flyover and works at Abbey Wood station.

Tunnelling
The tunnels will be excavated using tunnel boring machines. Up to 13 of these will be working at any time, with two working in tandem within the twin-bore tunnels.

Approximately 8 million cubic metres of surplus material will be produced by tunnelling, from excavations for stations and shafts and from demolition works.

It is intended that material excavated from the tunnels will be removed at the tunnel portals at Royal Oak, Pudding Mill Lane and Plumstead, and at three other locations along the route: Pedley Street, the Limmo Peninsula and the Isle of Dogs.

This material will be removed by rail, river or road. Material removed at Pedley Street will be taken by conveyor to a holding site in Mile End Park prior to removal by rail.

Excavated material, together with construction and demolition waste, will be reused or recycled wherever practicable. For example, some of this material may be used within the project for landscaping or reused in other projects being constructed at the same time.

Where this is not possible, the material will be used in the restoration of landfill sites. There is sufficient and available landfill capacity within reasonable distance of Crossrail worksites to accept all of the material that will be produced by the project.

Some of the material arising from construction is likely to be contaminated. This material will be handled, managed and disposed of in accordance with the relevant statutory procedures.

The tunnel boring machines will be installed and removed through portals or shafts. Some of these shafts will only be used to provide access during construction and will be filled in afterwards. Others will become permanent structures, used for access, escape and/or ventilation.

Materials
The construction of Crossrail will require the use of many different materials, including over 1 million cubic metres of concrete, 140,000 tonnes of steel for structural works and 140 km of steel rails.
Workforce
Crossrail will employ up to 15,000 people on its construction during the most intensive phase of work. Many other people will be employed to supply the equipment, materials and services upon which the project’s construction will depend.

Working hours
Most above-ground works will be undertaken between 7.00 am and 7.00 pm on weekdays and 7.00 am and 2.00 pm on Saturdays. Work on Sundays will generally be limited to repair and maintenance of construction equipment between 8.00 am and 5.00 pm.
The removal of excavated material from the tunnels will be undertaken 24 hours a day, seven days a week.

Below-ground work, such as tunnelling and the fitting-out of stations, will be undertaken 24 hours a day, seven days a week.

Work on or very close to existing railways will in many cases need to take place during possessions, when normal train services are suspended. In order to minimise inconvenience to rail users, these possessions will usually occur at night or at weekends.

Deliveries will be arranged to minimise impacts on the road system as far as reasonably practicable. Abnormal loads may be delivered to work sites outside of the assumed normal working hours following approval by the relevant authorities. There may also be other exceptional circumstances in which work may need to be undertaken outside of the general working hours set out above.
Twin-bore tunnels will be excavated in tandem from different start and end points
Demolitions
Within central London and other urban areas, some buildings will need to be demolished to make way for the new station buildings, shafts and tunnel portals. Demolitions will be required at each of the main work sites in central London and at most of the locations to the west and east where substantial works are proposed. Demolition will be undertaken carefully in order to minimise disruption to people and the environment.

Replacement development
At several locations in central London, Crossrail will create an opportunity for redevelopment of the airspace above stations or shafts (that is, the space previously occupied by buildings that have been demolished). Powers to build any such “over-site development” are not included in the Bill and are not therefore dealt with in the ES.

The Secretary of State for Transport will give an undertaking to Parliament that outline planning applications for over-site development will be made to the appropriate local planning authorities within a reasonable period of time after the Bill has been submitted to Parliament.

The Bill contains provisions that modify the EIA Regulations, which are the statutory basis for EIA within the normal planning system. These provisions require that any over-site development will either be subject to an EIA (where the works are integral to the Crossrail proposals) or will require an EIA where the local planning authority determines that such development is likely to give rise to significant environmental impacts.
Alternatives

Introduction
A number of alternative ways of meeting the objectives of Crossrail have been explored and evaluated.

The London East-West Study, published in May 2001, recognised the benefits of constructing a new cross-London tunnel between Paddington and Liverpool Street, which would allow the through running of mainline rail services that currently terminate at the edge of central London.

Different route options, both through London and to its west and east, were explored in order to identify a preferred route. Each of these options was assessed against the government’s five appraisal objectives for transport: environment, safety, economy, accessibility and integration.

Once the preferred route had been selected, a process was undertaken to determine the best design solution for specific parts of the project, taking the Government’s appraisal objectives into account. Various options have been assessed for the location of stations, tunnel portals, shafts and maintenance and stabilising facilities, as well as for the designs of these structures once their location had been agreed. Options for the tunnel alignment have also been explored.

Whole route and central section alternatives
Route options through central London are constrained by the dense built environment and by the presence of Underground lines, sewers and deep building foundations. However three alternatives have been proposed.

The Residents Association of Mayfair (RAM) proposed an alternative which varied from the preferred route between Paddington and Farringdon by following a more northerly alignment via Marylebone, Baker Street, Euston and King’s Cross stations. To the east of Farringdon, the RAM alignment was similar to the preferred route. The RAM route was considered to have very significant disadvantages in terms of its transport case, greater environmental impacts and opposition from local authorities, and it was not developed further.

A further alternative, proposed by GB Rail Ltd, was called “Super Crossrail”. This proposal involved constructing much longer lengths of new railway through London and the surrounding Green Belt, using the River Thames corridor as the central London alignment. This alternative was rejected due to the difficulties of construction, excessive costs and environmental and planning impacts.

In December 2004, a variant of the “Super Crossrail” project, known as “Superlink”, was put forward by Superlink Ltd. This is broadly similar to “Super Crossrail”, but would involve the use of the preferred alignment or a more northerly route via King’s Cross through central London in place of the Thames corridor.
Although being on a different alignment, it is thought that “Superlink” would have similar operational and planning difficulties as “Super Crossrail”.

Alternatives for the western section
Six western corridors were considered for inclusion in the project. Five of these had been identified early on, and were the subject of discussions with interested parties and a comprehensive assessment and sifting process. The sixth option, Corridor F, was added later. The corridors were:

- Corridor A - Watford Junction Line
- Corridor B - Aylesbury Line via Amersham
- Corridor C - High Wycombe Line
- Corridor D - Uxbridge and Watford Metropolitan Line
- Corridor E - Great Western Line
- Corridor F - Kingston Line via Richmond

The Great Western Line was selected as the preferred route, with services to both Heathrow and Maidenhead. This route was found to provide significant journey time savings to the City and the Isle of Dogs, as well as crowding relief to London Underground lines in west London.

Alternatives for the eastern section
Five eastern corridors were considered during the development of Crossrail. These were discussed with interested parties and were the subject of a comprehensive assessment and sifting process. The corridors were:

- Corridor A - Great Eastern Line
- Corridor B - Tilbury Line via Forest Gate
- Corridor C - Tilbury Line via Royal Docks
- Corridor D - North Kent Line via Royal Docks
- Corridor E - North Kent Line via Charlton

Two corridors have been included in the preferred project. The first was the Great Eastern Line from Shenfield. Selection of this corridor was based on its contribution to crowding relief on the National Rail and London Underground networks, and its ability to free up capacity at Liverpool Street station to allow other train services to be expanded. The North Kent Line via Royal Docks corridor was selected on the basis of its role in assisting regeneration and economic development in the Thames Gateway, including the Isle of Dogs and Royal Docks.
Alternative routes for the western section
Alternative depot and stabling locations
The depot site to the west of Romford station was selected following consideration of existing depots and other sites. The use of an existing depot was not found to be feasible due to the need to displace their current activities. Of more than 20 other sites, Brentwood was evaluated in detail, but compared unfavourably with the Romford site due to impacts on Green Belt and visual amenity.

A number of locations for stabling sidings were examined. Existing stabling sites at Old Oak Common, Gidea Park and Shenfield were found to be suitable for use by Crossrail. Of the sites not currently used for stabling, Maidenhead was determined largely by its location at the end of the western section, and West Drayton was chosen after examining alternative sites at Southall.

Alternative electrification systems
The 25kV overhead electrification system was chosen because it is already used on the sections of the route between Pudding Mill Lane and Shenfield, and between Westbourne Park and Stockley Flyover. It is established practice that a third rail system should not be used on new railways for safety reasons.
Alternative routes for the eastern section
Assessment of environmental impacts

The scope of the assessment

To focus the assessment on the relevant issues, it was necessary to determine the correct ‘scope’ of the assessment. This meant agreeing the environmental topics that are to be assessed, the geographical area within which significant impacts are likely to occur and the duration of those impacts (whether they are temporary or permanent). The assessment team (the consultants involved in carrying out the work leading to the Environmental Statement) identified the scope of the assessment in consultation with relevant local authorities and statutory bodies.

The following environmental topics have been assessed:

- landscape and built heritage;
- visual amenity;
- archaeology;
- ecology;
- water resources;
- traffic and transport;
- noise and vibration;
- air quality and climate change;
- contaminated land and waste;
- electromagnetic effects;
- community; and
- socio-economics.

In addition, the project has been assessed with respect to its compliance with planning and other policies.

The assessment has been undertaken on the basis that construction will take place between 2007 and 2013, and that the first year of operation will be 2013.

Assessing significant impacts

A significant impact has been defined as one that, in the opinion of the assessment team, based on a consideration of recognised assessment criteria, should be taken into account in the decision-making process. The significant impacts of the project have been identified for each of the topics by comparing baseline environmental conditions (that is, the situation that is expected to occur in the absence of the project) with the conditions that are predicted to exist if the project is built and operating.

The assessment criteria have been based on relevant guidance and standards, and are generally consistent with those previously used for the assessment of other recent, large-scale railway projects.

Significant impacts have been reported at two levels. Most impacts are significant within a local context only. Some impacts, however, are significant at a London-wide or regional level or are only meaningful in decision-making terms across the project as a whole.
Mitigating impacts

Mitigation is the means by which the project will, where reasonably practicable to do so, avoid, reduce or remedy significant adverse impacts. Mitigation of environmental impacts has been a key consideration throughout the planning and design of the project. Development of the project, including consideration of alternatives, has taken account of environmental constraints and opportunities.

Many of the adverse impacts that will occur, will do so during the construction phase. Accordingly, a construction strategy has been developed with the following objectives:

- to meet the requirements of all relevant statutory legislation, codes of practice and standards;
- to limit adverse impacts upon local communities and the environment so far as reasonably practicable;
- to carry out the planning and delivery of the project in the most cost-effective manner;
- to limit impacts on passengers using Network Rail, London Underground and other transport routes;
- to implement a community liaison plan including a complaints helpline and an independently appointed complaints commissioner;
- to remove excavated material by rail and water transport, and to import construction materials by rail, where reasonably practicable; and
- to implement a travel plan for construction workers.

The project has defined a range of mitigation measures relating to the construction of the project and how this will be managed to ensure that impacts are controlled and mitigated. These measures represent a minimum level of mitigation that the project will be committed to providing. Physical mitigation measures that are integral to the project design are included in the scope of powers sought by the Bill.

With regard to the operational railway, the tunnel track form will be designed to mitigate potential impacts from vibration and ground-borne noise. Where necessary, for example where there are particularly sensitive receptors such as theatres above the route of the tunnels, increased resilience will be provided by using floating slab track or similar technology. Floating slab track comprises a concrete track slab supported on resilient mounts that reduce the transmission of vibration from the track to the tunnel structure.
The ES reports the impacts that are likely to remain even after mitigation has been applied, and which are considered to be significant.

In many cases, mitigation will ensure that significant adverse impacts can be avoided. This applies, for example, to impacts relating to archaeology, construction dust and contaminated land. For archaeology, for instance, there is potential for finding archaeological remains at many sites along the Crossrail route during below-ground excavations and other below-ground construction works. Crossrail will undertake archaeological investigations, where appropriate, so that any remains can be identified, recorded and removed before construction work starts. On this basis there will be no significant impacts.

In this summary, specific reference to such topics is made only where a location may be of potential sensitivity or where it is helpful to explain why the impacts will not be significant.
Crossrail has adopted a consultation strategy that has sought to involve major stakeholders at all stages of project development, starting with the route selection process in spring 2002. This consultation has included matters relevant to the EIA, and has involved:

- obtaining views at the outset on the scope of the assessment and assessment methodologies;
- obtaining relevant baseline information;
- identifying potential significant impacts that could then be addressed or mitigated as part of the design; and
- informing organisations and individuals about how adverse impacts will be reduced.
London-wide and regional impacts

Introduction

Crossrail will result in a number of impacts, many of them beneficial, that will be apparent across the project as a whole, or at a London-wide or regional level, rather than at specific locations. These include impacts relating to transport, socio-economics and community, ecology, built heritage and greenhouse gas emissions.

Transport impacts

Crossrail will represent a major improvement in accessibility and travel choice for London and the South East region. Its main transport impacts will relate to overcrowding relief, strategic links, travel choice and sustainability.

Crossrail will provide a significant reduction in overcrowding on Underground and mainline services. Capacity will be freed up on all but one Underground line (the Northern line). Overcrowding during the morning peak will be reduced by from 30% to 70% on many lines. By attracting passengers from other commuter services, Crossrail will also ease overcrowding and improve reliability on mainline routes.

Crossrail will achieve a significant improvement in the accessibility of London on several levels – locally, regionally, nationally and internationally. Its central route will provide a strategic link between London’s primary business centres (the West End, the City and the Isle of Dogs). As a result, rail capacity into the City will be increased by 20%, and into the Isle of Dogs by 50%.

International links will be enhanced by serving Heathrow Airport, by providing connections to other airports (for example, to Stansted via Liverpool Street station), and by connecting with Eurostar at Stratford.

Through a combination of new routes, better services and enhanced capacity, Crossrail will create a wide range of travel opportunities, particularly for commuters. For example, an additional 390,000 people will be brought within a one-hour journey of the West End. Across a typical sample of services, journey times will generally decrease by up to 40%. This impact will be felt in particular on services in southeast London due to the provision of a new rail link across the Thames.

Finally, Crossrail will encourage more sustainable travel patterns by offering a high degree of integration with other public transport services and by increasing their attractiveness relative to car travel. Although Crossrail will generate additional car trips, it is predicted to achieve a net shift away from car travel by 20,000 people during the morning peak.
Socio-economic and community impacts

Crossrail will bring particular benefits to the high value financial and business centres in the West End, the City and the Isle of Dogs. It will do so by significantly improving accessibility by public transport, thereby removing what would otherwise have become a deterrent to investment. As a result, the project is predicted to facilitate growth in these areas by up to 13,000 jobs in 2016 and up to 40,000 jobs in 2026.

The project will support national policy objectives aimed at reducing social exclusion and bringing about regeneration. Crossrail will provide important benefits for ‘regeneration areas’. These are designated areas that form a focus of central and regional government efforts to create employment and reduce social exclusion. In particular, Crossrail will achieve the following:

- An increase in public transport accessibility to regeneration areas, which will lead to an increase in the provision of jobs and homes within these areas.
- Improved accessibility, for those living in regeneration areas, to jobs elsewhere.
- An improvement in the image and perception of regeneration areas, which will raise their profile and increase commercial confidence. This will in turn bring further long-term benefits as land values increase and as the quality of the built environment improves.
Crossrail is expected to attract over 80,000 additional jobs to regeneration areas. As a result, approximately 9,000 people in these areas, who would otherwise have been unable to obtain employment, will have an opportunity to gain employment as a result of improved accessibility.

Crossrail will affect employment in other ways. In order to construct the project, a number of commercial properties will need to be acquired and demolished. As a result, an estimated 5,000 to 7,000 jobs could be displaced. However, this is very much a worst case estimate, and alternative premises or jobs are likely to be found in most cases.

New station and shaft sites will offer opportunities for future over-site development. As explained previously, such development does not form part of the project. Nevertheless, the dynamics of the property market are such that over-site development is highly likely to occur, in which case between 3,000 to 4,000 new jobs could be created.

Running the Crossrail service, maintaining the trains and tracks, and operating the stations, will generate around 1,000 new jobs excluding those that will be filled by transfer from other rail operators. A further 500 jobs will be created indirectly through increased spending and demand for goods and services. Although these jobs are not significant in numerical terms, they will contribute to the overall benefit that Crossrail will bring to the regional employment market.

Crossrail will help London’s financial centre to grow and prosper
Crossrail will serve regeneration areas
Crossrail will improve accessibility by public transport to regional hospitals, universities and major centres along the route.

The number of households that lie within 30 minutes travel time of regional hospitals along the route will increase by almost 10% thereby benefiting patients, visitors and employees.

Regional hospitals along the Crossrail route

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Nearest Crossrail Station</th>
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<tbody>
<tr>
<td>Royal London</td>
<td>Whitechapel</td>
</tr>
<tr>
<td>St Bartholomew’s</td>
<td>Farringdon</td>
</tr>
<tr>
<td>Ealing</td>
<td>Hanwell</td>
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<tr>
<td>Goodmayes</td>
<td>Goodmayes</td>
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<tr>
<td>Old Church</td>
<td>Romford</td>
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<tr>
<td>Harold Wood</td>
<td>Harold Wood</td>
</tr>
<tr>
<td>St Mary’s</td>
<td>Paddington</td>
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</tbody>
</table>

The number of 18 to 24 year olds living within 30 minutes travel time of universities along the route will increase by a similar proportion.

Universities within walking distance of Crossrail stations

<table>
<thead>
<tr>
<th>University</th>
<th>Nearest Crossrail Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>University College London</td>
<td>Tottenham Court Road</td>
</tr>
<tr>
<td>University of the Arts</td>
<td>Tottenham Court Road</td>
</tr>
<tr>
<td>Queen Mary College, University of London</td>
<td>Farringdon and Whitechapel</td>
</tr>
<tr>
<td>London Metropolitan University</td>
<td>Liverpool Street/Whitechapel</td>
</tr>
<tr>
<td>City University</td>
<td>Farringdon and Whitechapel</td>
</tr>
<tr>
<td>Thames Valley University</td>
<td>Ealing Broadway and Slough</td>
</tr>
<tr>
<td>Guildhall School of Music &amp; Drama</td>
<td>Farringdon</td>
</tr>
<tr>
<td>University of Westminster</td>
<td>Bond Street</td>
</tr>
</tbody>
</table>

Finally, Crossrail will increase the number of households without access to a car within the 30 minutes travel time of a major centre by about 11%. (Major centres are defined in the London Plan and local authority development plans). This increase in accessibility will significantly improve access to key shops, services and entertainment facilities for these people. Major centres that will experience the greatest level of improved accessibility include Southall, Slough, Romford and Ilford.
**Impacts on ecology**

Vegetation alongside railways can be of ecological value because it is relatively undisturbed. For example, most lineside habitat comprises a mix of vegetation types, including rough grassland, scrub and secondary woodland. Although railway habitats are not individually of high nature conservation value, they can be of importance where they occur in large areas.

Significant route-wide impacts will result from the cumulative loss of habitat:

- along the northeastern section at locations such as Pudding Mill Lane, Aldersbrook Depot, between Goodmayes and Chadwell Heath stations, and at Romford and Gidea Park;
- along the southeastern section between the Limmo Peninsula and North Woolwich, and
- between Plumstead and Abbey Wood station, due to the loss of vegetation for track-widening.

**Impacts on built heritage**

Most of the impacts on built heritage are specific to particular locations and are dealt with in the parts of this non-technical summary that describe the impacts that are specific to the route sections.

The historic remains of the Great Western Railway (GWR) have considerable historical associations with Isambard Kingdom Brunel and form part of the most complete railway of its date in the world. Parts of the GWR between Paddington and Bristol are included in the Tentative List of World Heritage Sites for Great Britain and Northern Ireland, which was submitted by the Government to UNESCO's World Heritage Committee in 1999. The works will require the demolition of, or physical changes to, a number of bridges that pass over the route. The bridges do not have any statutory protection and are not individually rare or unique. However, when considered as parts of the GWR as a whole, the group is considered to be of value. Their loss will represent a significant impact on the historic fabric of the GWR.

The feasibility of track lowering has been examined as an alternative to bridge demolition. Track lowering would cause severe disruption to the operational railway for the period of construction. Consequently, track lowering is not considered an appropriate solution for the retention of these bridges.
Electromagnetic effects

The levels of any electromagnetic emissions from the project will not be sufficient to give rise to any significant impacts on human health or any significant interference with electrical equipment.

Impacts on greenhouse gas emissions

The construction works will inevitably result in emissions of carbon dioxide. However, once Crossrail is operational, the assessment work undertaken indicates that it is likely that during any year the project will save more emissions than it emits.
The central section

Proposed works

The central section accounts for the majority of the construction works. The new twin-bore tunnels will extend between Royal Oak in the west and Pudding Mill Lane (near Stratford) and the Isle of Dogs, in the east.

New stations will be located at Paddington, Bond Street, Tottenham Court Road, Farringdon, Liverpool Street, Whitechapel and the Isle of Dogs. With the exception of the Isle of Dogs station and probably Whitechapel station, each of the new stations will have two entrances and ticket halls to provide access to the west and east ends of the platforms.

At each Crossrail station, connections will be made to existing stations to allow passengers to transfer to other services, such as the Underground, Docklands Light Railway, other mainline services such as Thameslink, and bus services.

Shafts connecting the tunnels with the surface will be provided at intervals along the route in order to provide emergency access and escape and/or ventilation. Some of these shaft structures will be near to the new stations, whereas others will be located on their own. In addition, some temporary shafts will be constructed for tunnelling purposes, and will be filled in once construction is completed.

The main works in the central section (in addition to the tunnels) may be summarised as follows:

- A reversing facility at Westbourne Park, the western portal of the central area tunnels at Royal Oak and a ventilation/access shaft at Westbourne Bridge.
- A new Crossrail station in a “box” structure beneath Eastbourne Terrace at Paddington station, including an above-ground glazed structure or “light spine”.
- Ventilation/access shafts west of Victoria Gate, Hyde Park, and in the central reservation of Park Lane, just south of Marble Arch.
- A new Crossrail station at Bond Street station, with ticket halls and ventilation/access shafts in Davies Street and Hanover Square.
- A new Crossrail station at Tottenham Court Road, with ticket halls at Centre Point Plaza and Dean Street, and ventilation/access shafts in Fareham Street and Goslett Yard.
- A ventilation/access shaft at Fisher Street.
- A new Crossrail station at Farringdon station, with ticket halls at Farringdon Road and Lindsey Street, and ventilation/access shafts at Farringdon Road and Charterhouse Street.
• A new Crossrail station at Liverpool Street station, with a ticket hall and ventilation/access shaft at Moorgate station and another shaft at Blomfield Street.

• A ventilation/access shaft at Hanbury Street, Whitechapel, with a temporary tunnel and shaft at Pedley Street, allowing removal of excavated material by conveyor to rail sidings at Mile End.

• A new Crossrail station at Whitechapel, with a ticket hall over the District line platforms, a concourse at Essex Wharf, a ventilation/access shaft at Durward Street and a ventilation/access shaft at Cambridge Heath Road, with provision for a ticket hall at Cambridge Heath Road, if this is needed.

• Two ventilation/access shafts on Stepney Green, beneath which the junction between the northeastern and southeastern sections will be located.

• A ventilation/access shaft at Lowell Street (Commercial Road) and an access shaft at Hertsmere Road.

• A new Crossrail Isle of Dogs station, located in a “box” structure beneath West India Dock North, including ventilation/access shafts and an entrance west of Great Wharf Bridge.

• Ventilation/access shafts in Mile End Park and at Eleanor Street.

• The eastern portal of the central area tunnels at Pudding Mill Lane, including changes to the Great Eastern mainline and reconstruction of the Docklands Light Railway Pudding Mill Lane station.

**Environmental impacts**

**Townscape and built heritage**

The Crossrail route through Central London generally passes beneath areas developed in the 18th and 19th Centuries. Much of the townscape has been designated as Conservation Areas, and hundreds of buildings are listed for their special architectural or historic interest.

Crossrail has sought to avoid demolishing or damaging listed buildings wherever possible. However, the route alignment is very constrained, for example by existing Underground lines, and it has not always been possible to avoid such buildings.

Significant physical impacts on listed buildings will occur at:

• Paddington station (a Grade I listed building), which will be affected by removal of the canopy at Departures Road (replaced by a new canopy), by demolition of the station retaining wall and railings on Eastbourne Terrace, and by alteration to the Underground station (Grade II);

• number 94 Dean Street and the pool and fountains at Centre Point (both Grade II), which will be demolished for construction of Tottenham Court Road station; and
Main works in the central section
Construction activities will significantly affect townscape, Conservation Areas and/or the setting of listed buildings at the following locations:

- Paddington station;
- Hyde Park (Victoria Lodge/Gates) and Park Lane (Royal Parks Conservation Area);
- Bond Street station (Hanover Square and Mayfair Conservation Areas);
- Tottenham Court Road station (Soho, Denmark Street, Hanway Street and Bloomsbury Conservation Areas);
- Fisher Street (Kingsway Conservation Area);
- Farringdon station (Smithfield Market and Charterhouse Square);
- Liverpool Street station (Finsbury Circus and New Broad Street Conservation Areas);
- Hanbury Street, Whitechapel station and Hertsmere Road; and
- Isle of Dogs station (West India Dock Conservation Area, setting of Grade I listed warehouses/dock structure and Grade II listed Cannon Workshops).

The character of several important squares and open spaces will be affected during construction, notably Hyde Park (a Grade I historic park and garden), Hanover Square Gardens, Finsbury Circus Gardens and Mile End Park. These areas will be restored to their existing condition as far as possible when the works are complete. The risk of ground settlement, which could damage historic buildings, will be minimised during construction through the adoption of a range of measures, and significant impacts will be avoided.

The permanent works have been designed as sensitively as possible so as to fit into their setting. However, long-term impacts will remain at the following locations:

- Paddington station;
- Hyde Park and Park Lane;
- Bond Street station;
- Tottenham Court Road/Fisher Street;
- Farringdon station;
- Liverpool Street station/Blomfield Street;
- Stepney Green; and
- Hanbury Street.

In several cases, these impacts are due to gaps in the built fabric resulting from demolitions. It is anticipated that such gaps would be filled appropriately by any over-site development that is likely to follow Crossrail.
Visual amenity

Construction work of substantial scale and duration will inevitably give rise to impacts on visual amenity in densely built-up areas. Temporary impacts on visual amenity will occur in particular at the following locations:

- Royal Oak portal;
- Paddington station;
- Hyde Park;
- Park Lane;
- Hanover Square;
- Davies Street;
- Fisher Street;
- Tottenham Court Road station and Soho Square;
- Farringdon station;
- Moorgate, Finsbury Circus and Liverpool Street;
- Hanbury Street, Pedley Street and Whitechapel station;
- Stepney Green;
- Hertsmere Road and Isle of Dogs station;
- Mile End Park and Eleanor Street; and
- Pudding Mill Lane/Bow Midland Yard.

Significant impacts on visual amenity will also occur at most of the locations where demolitions or new structures will affect townscape.
Ecology
Significant impacts on ecology will result from landtake from the Spitalfields Viaduct Site of Borough Importance. Significant impacts will also occur at Poplar Dock during construction of the Isle of Dogs station. This will impede access to the dock, which will affect fish breeding.

Traffic and transport
Once operational, passengers using Crossrail stations will benefit significantly from improved journey times and increased interchange opportunities. Many passengers will benefit from the direct services to destinations to the west and east of London offered by Crossrail. The additional facilities provided at Crossrail stations will improve accessibility, particularly for those with impaired mobility.

Construction work within a busy urban area will inevitably give rise to impacts such as road closures, diversions, loss of parking or delays due to lorry traffic. Significant temporary impacts will arise from the following:

- traffic delays at Harrow Road/Great Western Road;
- impeded access and loss of station parking at Paddington station;
- suspension of mainline train services at Paddington station during a two week blockade;
- width reduction at West Carriage Drive, Hyde Park;
- loss of parking at Hanover Square and bus diversions at Davies Street;
• closure of Fareham Street, loss of parking in Soho Square and delays around St Giles Circus;
• disruption to users of Tottenham Court Road station;
• loss of parking and street closures around Farringdon station, Aldersgate Street and Charterhouse Square;
• traffic diversions and delays around Moorgate and Liverpool Street station;
• loss of supermarket parking at Whitechapel;
• traffic delays around Whitechapel station;
• closure of Garden Street, Stepney Green;
• loss of parking at Cannon Workshops, Hertsmere Road;
• closure of Great Wharf Bridge, West India Dock;
• loss of boat access within West India Dock; and
• traffic delays on Blackwall Tunnel Northern Approach during sewer diversion works.

Permanent adverse impacts on traffic will remain around Paddington station, at Tottenham Court Road station (due to closure of Andrew Borde Street) and due to the loss of supermarket parking at Whitechapel. Pedestrians using St Giles Circus will benefit from improvements to its layout and amenity.

**Noise and vibration**

The contractors will be required to obtain agreements under the Control of Pollution Act, in advance, from the relevant local authority. These agreements will control working methods, times and on-site mitigation of impacts.

However, significant noise impacts will be unavoidable at several locations, since many of the work sites are close to noise-sensitive properties. Where noise levels are likely to exceed specified thresholds, noise insulation and/or temporary re-housing will be offered to eligible parties.

Construction noise impacts will affect the occupants of 568 residential properties. It is estimated that 392 of these properties are likely to qualify for insulation. In addition, the occupants of 83 of the 568 properties may need to be temporarily rehoused. The majority of the properties that are likely to qualify for noise insulation and/or temporary rehousing are located close to the work sites at Paddington station, Farringdon station, Hanbury Street, Whitechapel, Mile End and Lowell Street.

A number of community facilities will also be affected. In exceptional cases, the Secretary of State will consider providing additional assistance to affected properties.

In addition, there are a number of proposed developments for which planning permission has been granted. Some of these developments may be significantly affected by construction noise from Crossrail works.

Once operational, there will be no significant noise and vibration impacts. This is because the underground railway will run on continuously-welded rail and resilient track support systems. Where necessary, other track form designs, such as floating slab track,
will be incorporated along specific sections of the track where the resilient system does not provide sufficient mitigation on its own.

Air quality
Increases in ground level concentrations of pollutants emitted by traffic generated by Crossrail, both during construction and once it is operational, will be insufficient to prejudice the strategies adopted by local authorities to meet the National Air Quality Objectives in their Local Air Quality Action Plans.

Community resources
Communities at several locations along the route will experience significant adverse impacts during construction. These impacts will be associated with the following.

- Possible temporary rehousing of a substantial number of residents in the vicinity of the work sites for Bond Street and Whitechapel stations, and at Hanbury Street and Pedley Street, during the noisiest period of the works. In some cases, where the temporary rehousing is for a duration of more than three months, the impacts on the community are taken, for the purposes of assessment, to be permanent.
  - Landtake at Finsbury Circus Gardens, Swanlea School (Whitechapel), Stepney Green, Stepping Stones Farm, Mile End Park and Eleanor Street, together with displacement of a barge used as a place of worship in West India Dock, and displacement of boats from Poplar Basin and Blackwall Basin.
  
- Disturbance due to lorry traffic at Hyde Park, Bond Street station, Hanover Square, Fisher Street/Catton Street (Tottenham Court Road station), Finsbury Circus, Hanbury Street and around Whitechapel station.
  - Closure of footpaths at City Mill River/River Lea and Great Wharf Bridge (West India Dock).
  - Cumulative construction impacts around Paddington station, Bond Street station, Tottenham Court Road station, Lindsey Street/Charterhouse Square, Moorgate/Finsbury Circus, Hanbury Street/Pedley Street/Whitechapel station, Mile End Park and Stepney Green.

Permanent impacts will result from the demolition of community facilities such as:

- the University of Arts/London College of Fashion (at Bond Street station);
- three night clubs, several residential properties, part of the Central St Martin’s College of Art and Design, and the Centre Point snooker club (at Tottenham Court Road station);
- the Lindsey Hotel (at Farringdon station); and
- landtake of a travellers’ caravan site at Eleanor Street (in Mile End).
Beneficial impacts will result from the new arrangements for pedestrian movements in St Giles Circus and the pedestrianisation of Cowcross Street at Farringdon.

**Employment**

Construction of the project will require the acquisition of a number of commercial properties and associated land along the route. In most cases, the employment impacts will not be significant, since alternative jobs or premises are likely to be found. However, significant impacts have been identified at two locations:

- loss of niche employment due to demolition of the Great Western Studios at Royal Oak; and
- displacement of 800 to 1300 jobs due to construction of the Pudding Mill Lane portal.

In the long term, the project will have a major beneficial effect on the continued development of London’s primary finance and business service activities, and on areas of growth and regeneration (see the section on London-wide and regional impacts).
The western section

Proposed works

Crossrail will require changes to the existing Great Western mainline between Maidenhead and Paddington, such as new or realigned track. In addition, overhead electrification will be installed along the route west of Stockley Road (Hayes). This will involve the erection of steel gantries at about 50 m intervals. It will also require the demolition and/or reconstruction of a number of bridges in order to provide the necessary clearance for the overhead wires.

Major engineering works will be required at Stockley to construct a flyover allowing access for Crossrail trains to and from Heathrow Airport. New sidings for stabling Crossrail trains will be provided at Maidenhead, West Drayton and Old Oak Common.

The stations at Maidenhead, Slough, West Drayton, Hayes & Harlington, Southall, West Ealing, Ealing Broadway and Acton Main Line will be remodelled to varying degrees in order to accommodate Crossrail trains and to provide improved facilities for passengers such as new ticket halls, escalators, bridges and lifts. At a further five stations, platform extensions will be required to serve the Crossrail trains.

Environmental impacts

Landscape and built heritage

The works will generally not change the existing character of the railway corridor or the surrounding landscape/townscape along this section of the route. However, the scale of construction work will temporarily affect landscape/townscape character at locations such as the Carp Ponds (Stockley Flyover), Hanwell station, Ealing Broadway station (including the character of the Haven Green Conservation Area) and Acton Yard (due to the loss of open space). At Acton Yard, the loss of open space will also give rise to a permanent impact.

Maidenhead bridge, which carries the railway over the River Thames, is Grade II* listed. New overhead electrification masts will be fixed to it in a way that avoids damage to the structure. Although the masts and overhead lines have been carefully designed and located, they will adversely affect the setting of the bridge and important views along the river.

Work is proposed to Grade II listed Slough station, including the construction of a new footbridge. These works have been designed as sensitively as possible. Nevertheless, the footbridge will have a significant adverse impact on the setting of the station, although there will be a significant beneficial impact from removing the modern station canopy.
Main works in the western section
Visual amenity
During construction, significant impacts will arise where residential properties directly overlook the worksites. This will be the case at Maidenhead station and sidings, Burnham station, Wexham Road bridge and Middlegreen Road bridge (both in Slough), Chequers bridge and Dog Kennel bridge (both east of Langley), Iver station/Thorney Lane bridge, West Drayton station, Kingston Lane and Old Stockley Road bridges (in Yiewsley), Stockley Flyover, at Hayes & Harlington, Southall, Hanwell, West Ealing and Ealing Broadway stations and at Acton Yard.

Permanent impacts on visual amenity will result from the proximity of new, large-scale structures to residential properties, as at West Drayton station, Stockley Flyover, West Ealing station and Acton Yard.

Ecology
The Crossrail works will generally affect land that is of little ecological interest. However, areas of greater interest will be affected at two locations, resulting in a significant loss of habitat at each.

Construction of the Stockley Flyover will require the erection of piers within ponds forming part of the Carp Ponds and Broad Dock Site of Metropolitan Importance. This will give rise to both temporary and permanent impacts. The widened embankment for new track between Chequers bridge and Dog Kennel bridge near Langley will occupy part of a Wildlife Heritage Site.

Water resources
Construction of a sewer diversion close to Maidenhead station will require tunnelling through the chalk aquifer. Despite the adoption of appropriate mitigation, this is considered to represent a significant temporary risk to water quality at a nearby groundwater abstraction.

Traffic and transport
Temporary impacts will be experienced at several locations during construction. Significant loss of station parking will occur at Maidenhead and Hayes & Harlington stations, and significant loss of private parking at Leigh Road, Farnham Road, Stoke Poges Lane and Wexham Road bridges, and at Ealing Broadway station.

Users of Ealing Broadway station will be inconvenienced, and Acton Main Line station will be closed, during the two week ‘blockade’ of services to and from Paddington station that will be required to allow trackwork to take place. Further inconvenience may be caused due to the need to reduce the number of services into Paddington for one week either side of the two week ‘blockade’ period.

Temporary closure of Leigh Road bridge will adversely affect accessibility in the local area.
The permanent transport impacts will be largely beneficial, due to the enhanced services, accessibility and amenities to be provided at the stations that will be served by Crossrail. The improvement in journey times will be significant at nearly every station on this section of the route. In addition, the replacement of Leigh Road bridge will represent a significant improvement in local access.

Permanent adverse impacts that are considered to be significant will relate to the demolition of Dog Kennel bridge, which will not be replaced, and the loss of parking at Maidenhead station.

Noise and vibration
The contractors will be required to obtain agreements under the Control of Pollution Act, in advance, from the relevant local planning authority. These agreements will control working methods, times and on-site mitigation of impacts.

However, significant noise impacts will be unavoidable at several locations, since many of the worksites are close to noise-sensitive properties. Where noise levels are likely to exceed specified thresholds, noise insulation and/or temporary rehousing will be offered to eligible parties.

Construction noise impacts will affect the occupants of 835 residential properties. It is estimated that 270 of these properties are likely to qualify for insulation. In addition, the occupants of six of the 835 properties may need to be temporarily rehoused. The majority of the properties that are likely to qualify for noise insulation and/or temporary rehousing are located close to Slough Station/Wexham Road bridge and Acton Main Line station/yard. In exceptional cases, the Secretary of State will consider providing additional assistance to affected properties.

In addition, there are a number of proposed developments for which planning permission has been granted. Some of these developments may be significantly affected by construction noise from Crossrail works.

Once operational, there will be no significant noise and vibration impacts.
Community resources
Temporary impacts on local communities will arise during construction from the closure of Leigh Road, Middlegreen Road and Trenches bridges and from lorry traffic at Manor Road (West Ealing) and Noel Road (Acton).

There will be a cumulative impact on the community during construction at Acton Main Line station and Ealing Broadway station.

Permanent adverse impacts will result from demolition of Dog Kennel bridge, Langley, which connects public footpaths, and for which there is no alternative crossing point nearby, landtake from allotments at Stockley Flyover, the displacement of dental surgeries at Hayes & Harlington station and landtake from open space, allotments and playing fields at Acton.

Permanent beneficial impacts will result from the realignment of Thorny Lane and bridge at Richings Park (Iver) and from the possible provision of a new canalside footpath at West Drayton station.

Employment
A number of commercial properties will need to be acquired for construction of the works. The largest loss of such property will be due to construction of the Stockley Flyover at the Aberglen Industrial Estate (Hayes). This will displace 250 to 400 jobs and result in the temporary loss of protected employment land.
The northeastern section

Proposed works

The proposed works in the northeastern section can be summarised as follows:

- remodelling of Romford and Ilford stations;
- platform extensions at nine other stations;
- a new depot and sidings west of Romford station, together with an underpass to provide access for trains;
- new sidings for construction purposes at Aldersbrook and Pitsea;
- new sidings for stabling trains at Gidea Park and Shenfield; and
- a new freight loop (a single track dedicated to freight trains) between Goodmayes and Chadwell Heath, to replace an existing loop at Manor Park.

Environmental impacts

Landscape and built heritage

The works will generally not change the character of the landscape/townscape along this section of the route. The only exceptions will be where work takes place in green spaces or requires the loss of important vegetation, as at Romford Depot and Gidea Park sidings. At Romford, this impact will be mitigated once replacement planting matures. At Gidea Park, such planting is not possible, and a permanent impact will remain.

Construction of the depot at Romford will require the relocation of a Grade II listed coal tax post. This feature will be reinstated as close as possible to its original location, and no longterm impact will result.

Visual amenity

Temporary visual impacts due to construction works will occur in the vicinity of Forest Gate station, Ilford station, Seven Kings station, Goodmayes station, Chadwell Heath station, Romford station and depot, Gidea Park stabling sidings, Shenfield station and Pitsea.

Permanent impacts will occur at Ilford station, Goodmayes station, Chadwell Heath station, Romford depot, Gidea Park sidings and Shenfield station.
Ecology
Work at the majority of sites will result in the loss of habitat within the railway corridor. In most cases, this loss will be minor. However, substantial areas of designated habitat would be lost due to the new freight loop between Goodmayes and Chadwell Heath, and at Aldersbrook sidings, Romford depot and Gidea Park sidings. Although these losses will not be individually significant, they will contribute to a cumulatively significant impact.

In addition, there is a potential for reptiles (such as Common Lizards and Slow Worms) to be disturbed at the proposed Romford depot. Because of the difficulty of moving them, this is regarded as a significant impact.

Traffic and transport
Temporary impacts on accessibility will occur at some stations during the construction phase. These will be due to impeded passenger access at Ilford station, loss of private parking at Goodmayes station and Romford station, and loss of station parking at Brentwood station, Harold Wood station and Shenfield station. Construction traffic is not anticipated to give rise to any significant adverse impacts.

The permanent transport impacts will be largely beneficial, due to the enhanced services and amenities to be provided at the stations served by Crossrail. The only significant adverse impacts will be due to the withdrawal of off-peak services at Maryland station and the loss of parking at Harold Wood station.

Noise and vibration
The contractors will be required to obtain agreements under the Control of Pollution Act, in advance, from the relevant local planning authority. These agreements will control working methods, times and on-site mitigation of environmental impacts.

However, significant noise impacts will be unavoidable at several locations, since many of the worksites are close to noise-sensitive properties. Where noise levels are likely to exceed specified thresholds, noise insulation and/or temporary rehousing will be offered to eligible parties.

Construction noise impacts will affect the occupants of 850 residential properties. It is estimated that 530 of these properties are likely to qualify for insulation. In addition, the occupants of 56 of the 850 properties may need to be temporarily rehoused. Most of the properties that are likely to qualify for noise insulation and/or temporary rehousing are located in the vicinity of Ilford station, Shenfield station and Romford station. A number of community facilities will also be affected. In exceptional cases, the Secretary of State will consider providing additional assistance to affected properties.
Main works in the northeastern section
In addition, there are a number of proposed developments for which planning permission has been granted. Some of these developments may be significantly affected by construction noise from Crossrail works.

Once operational, there will be no significant noise and vibration impacts.

Community resources
A number of residents around Ilford station and Shenfield station may need to be temporarily rehoused during the noisiest period of the works. In some cases, where the temporary rehousing is for a duration of more than three months, the impacts on the community are taken, for the purposes of assessment, to be permanent.

At the proposed Romford depot, the works will result in the temporary loss of open space, a gymnasium and the all-weather pitch of West Ham Football Club. It will also require landtake from the sports pitches at Westlands Playing Fields, three of which may be required permanently. The community in this area will also be adversely affected by the temporary closure of Whalebone Lane, a public footpath. There will also be a significant increase in lorry traffic at Hunter Avenue and Crossways in Shenfield.

Construction works will result in a number of impacts on local communities in the vicinity of Romford, Gidea Park and Shenfield stations which, cumulatively, will be significant.

Employment
Once operational, Crossrail will create around 390 permanent jobs at Romford station and depot. This will represent 3% of the total number of jobs in the local area, amounting to a significant positive impact.

Some jobs will be lost due to demolitions at Ilford station and Romford station, but the number will not be significant.
The southeastern section

Proposed works

East of the Isle of Dogs, the twin-bore tunnels from the central section will continue under the River Lea, before emerging on the North London Line at a portal near Victoria Dock Road and Custom House station. New shaft structures will be built at Blackwall Way and the Limmo Peninsula.

New twin-bore tunnels will be driven beneath the Thames to link North Woolwich with Plumstead station on the North Kent Line. New portals will be located at each site and shaft structures will be constructed at Warren Lane and Arsenal Way, in Woolwich.

Two new tracks will be provided beside the North Kent Line between White Hart Road in Plumstead and a point about 1,200 m east of Abbey Wood station, to serve up to 12 Crossrail trains per hour in each direction. This will require works to two road bridges and replacement of two footbridges.

Custom House station and Abbey Wood station will be reconstructed. Silvertown station, which is likely to have been closed already under powers to construct the Docklands Light Railway extension to Stratford International, will be demolished. Passive provision will be made for a new Crossrail station at Silvertown, should this become desirable following redevelopment of nearby sites.

New overhead electrification will be required throughout this section. In order to accommodate this, the existing Connaught Tunnel, which runs between Royal Victoria Dock and Royal Albert Dock, will be reconstructed.

Manor Wharf, in Belvedere, will be refurbished and used to load excavated material onto barges.

Environmental impacts

Landscape and built heritage
Temporary impacts on townscape will arise during construction of the North Woolwich portal, and due to construction work and vegetation loss at Abbey Wood station.

Permanent impacts on townscape will arise from the cumulative loss of vegetation due to the provision of additional tracks between Plumstead and Abbey Wood. Replacement planting is proposed, where this is compatible with railway standards, and some of these impacts will not be significant in the long-term.

Work will take place close to a number of listed buildings (such as North Woolwich station) and within the Royal Arsenal Conservation Area, but will not give rise to significant impacts.
Visual amenity
Temporary visual impacts will arise due to construction work at the Blackwall Way shaft, Custom House station, Connaught Tunnel, North Woolwich portal, Warren Lane (Woolwich), Arsenal Way, Plumstead portal and Abbey Wood station. Properties located near the bridge works at Church Manor Way, Bostall Manorway and Eynsham Drive, together with the intervening sections of track where vegetation will be removed, will also be affected.

Permanent visual impacts will affect properties close to the Plumstead portal, the Church Manorway, Bostall Manorway and Eynsham Road bridges, and Abbey Wood station, together with properties overlooking the intervening sections of widened track. As replacement planting matures, some of these impacts will cease to be significant.

Ecology
The works will result in the loss of non-designated lineside habitat at several locations, although these impacts will not be individually significant. Cumulative significant impacts will result from habitat loss due to track widening between Plumstead and Abbey Wood, and from the loss of habitat on underused railway land between the Limmo Peninsula and North Woolwich.

Work at the southern entrance to the Connaught Tunnel will involve the removal of long-established ferns, which will be difficult to translocate successfully.

Traffic and transport
Temporary impacts will be experienced at several locations during construction. Loss of parking or service areas will occur at Blackwall Way (Reuters), the ExCel Centre, Arsenal Way and Abbey Wood station. Significant traffic delays are likely to occur on Harrow Manorway (close to Abbey Wood station).

Route closures and/or diversions will affect traffic on Felixstowe Road (Abbey Wood station) and pedestrians on White Hart Road near the Plumstead portal. Bus interchange will be affected by diversions and by the relocation of bus stops at Abbey Wood station.

During the course of the works, rail services between Plumstead and Abbey Wood will be interrupted, which will adversely affect passengers using this route.

The permanent transport impacts will be largely beneficial, due to the enhanced services and amenities to be provided at the stations served by Crossrail. In addition, the new footbridges at Church Manorway and Bostall Manorway will facilitate access for the mobility-impaired (which is currently not provided). However, adverse impacts will remain due to loss of lorry parking capacity at the ExCel Centre, Arsenal Way and Abbey Wood station, and loss of garage access at Abbey Wood station.
**Noise and vibration**

The contractors will be required to obtain agreements under the Control of Pollution Act, in advance, from the relevant local planning authority. These agreements will control working methods, times and on-site mitigation of environmental impacts.

However, significant noise impacts will be unavoidable at several locations, since many of the worksites are close to noise-sensitive properties. Where noise levels are likely to exceed specified thresholds, noise insulation and/or temporary rehousing will be offered to eligible parties.

Construction noise impacts will affect the occupants of 746 residential properties. It is estimated that 461 of these properties are likely to qualify for insulation. In addition, the occupants of 85 of the 746 properties may need to be temporarily rehoused. The majority of the properties that are likely to qualify for noise insulation and/or temporary rehousing are located around Abbey Wood station. Three community facilities will also be affected. In exceptional cases, the Secretary of State will consider providing additional assistance to affected properties.

In addition, there are a number of proposed developments for which planning permission has been granted. Some of these developments may be significantly affected by construction noise from Crossrail works.

Noise from the operational railway will result in adverse impacts at an estimated 20 properties in the long term. Seven of these properties will be eligible for noise insulation. The majority of the properties are located around Abbey Wood station.

The residents of 55 properties will experience significant reductions in noise. The majority of these properties are located along the route just east of Abbey Wood station.
Main works in the southeastern section
Community resources
A number of residents around the worksites for Custom House station and Abbey Wood station may need to be rehoused during the noisiest period of the works. In some cases, where the temporary rehousing is for a duration of more than three months, the impacts on the community are taken, for the purposes of assessment, to be permanent.

Residents close to Custom House station and the Warren Lane shaft will be affected by increases in lorry traffic on local roads. The community will be affected by the temporary closure of the Church Manorway footbridge, which is an important link between local schools and residential areas. Pedestrian access at White Hart Road and Manor Wharf will also be closed temporarily during construction.

The Warren Lane worksite, in Woolwich, will temporarily occupy a skateboarding area for about four years. Since no alternative sites exist nearby, this will represent a significant impact on the local community.

Work at Custom House station will require acquisition of the former Barge Hotel, which provides bed and breakfast accommodation for the homeless. This will be a significant impact.

There will be a cumulative impact, during construction, on local communities around Custom House station, North Woolwich portal, Church Manorway and Abbey Wood station.

Employment
The works to construct the North Woolwich portal will result in the displacement of 120 to 220 jobs. In combination with the loss of industrial floorspace at Pudding Mill Lane, which is also located in the London Borough of Newham, this will have a significant impact.
Crossrail and interaction with other projects

Construction of a number of other major projects could be underway in the London region at the same time as Crossrail, thereby giving rise to a potential for cumulative impacts to occur. The following projects have been identified on the basis of their status within the planning process and the availability of environmental information:

- Thameslink 2000;
- the East London Line Extension;
- the Lower Lea Valley Olympics and Legacy Developments;
- Stratford City;
- the Thames Gateway Bridge; and
- the Docklands Light Railway, Woolwich Arsenal Extension.

The potential interaction between these projects and Crossrail has been examined, and cumulative impacts are summarised below.

The works for Thameslink 2000 could overlap with construction of Crossrail for about three years at Farringdon station, resulting in additional construction noise, visual impact and traffic.

The works for the East London Line Extension could overlap with construction of Crossrail for about three years at Pedley Street/Whitechapel station, resulting in additional construction noise and visual impact.

The Lower Lea Valley Olympics and Legacy project could overlap with construction of Crossrail for about five years in the vicinity of Pudding Mill Lane. This would require Crossrail to use an alternative worksite, resulting in additional transport impacts. In addition, the Olympic Masterplan proposes to restore the Pudding Mill River along Marshgate Lane, which conflicts with the Crossrail proposals to open up Marshgate Lane to traffic. These issues will be addressed further in a Supplementary Environmental Statement if the Olympics bid is successful. Overall, the two projects would deliver cumulative benefits from the clean-up of contaminated land.

Construction of the Stratford City project could overlap with the Crossrail works in the vicinity of Stratford station, but no cumulative impacts are envisaged.

Construction of the Thames Gateway Bridge could overlap with the Crossrail works for 26 months in the vicinity of Plumstead. Traffic serving both projects would use Eastern Way, but its cumulative impact would not be significant.

The works for the Docklands Light Railway Woolwich Arsenal Extension could overlap with construction of Crossrail for two years at North Woolwich. However, the works will be geographically separate and cumulative impacts will be unlikely.
Planning policy assessment

The environmental impacts of Crossrail have been assessed against the planning policies of central government, the Mayor for London, the regional assemblies for the South East and East of England, and each of the affected local authorities. Where conflicts may occur between the proposed works and these policies, they have been reported in the Environmental Statement.

At both strategic and local levels, the transport and socio-economic benefits of the project will support planning policies that aim to:

- sustain employment and population growth in London;

- overcome constraints on the ability of Central London to continue to compete as a world-class financial centre;

- improve accessibility by public transport and promote sustainable development; and

- support regeneration, particularly in East London and the Thames Gateway.

Some of the environmental impacts associated with Crossrail will conflict with local planning policies, for example, where residential amenity may be affected by construction noise, where listed buildings may need to be demolished or where open space may be occupied by worksites. As the project is taken forward, such conflicts will be mitigated wherever possible through detailed design and construction planning.
The assessment team

The ES and summary have been prepared by Environmental Resources Management (ERM), who, in addition, provided advice on the strategy and approach to undertaking the assessment. The assessment was undertaken by a number of specialist consultancies, each with a particular area of expertise.

**Environmental topic**  
Lead environmental consultants  
Landscape and Visual, and Lighting  
Built Heritage  
Archaeology  
Ecology  
Water Resources  
Traffic and Transport (construction)  
Traffic and Transport (operation)  
Noise and Vibration  
Air Quality and Climate Change  
Contaminated Land  
Electromagnetic Effects  
Socio-economics  
Community  
Planning  
Excavated Material

**Consultant**  
Environmental Resources Management  
Chris Blandford Associates, DPA lighting consultants and NEP Lighting Consultancy  
Alan Baxter and Associates  
Museum of London Archaeology Service  
Carter Ecological  
Mott MacDonald  
Mott MacDonald, Scott Wilson, Faber Maunsell  
Halcrow and Faber Maunsell  
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