Lower Thames Crossing
Construction update

July 2021
Community impacts consultation

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Introduction

1.1 About the Construction update

This document sets out our plans for constructing the Lower Thames Crossing, should our proposed Development Consent Order (DCO) be granted. It builds on the feedback we have received from our statutory consultation (October 2018), supplementary consultation (January 2020) and design refinement consultation (July 2020). Our plans have also been informed through continuing engagement with stakeholder organisations, such as local authorities and statutory bodies, as well as businesses, landowners and community groups.

Once appointed, our contractors would develop our construction plans for the Lower Thames Crossing. As a result, some of the construction methods and timings may differ to those outlined in this document. However, we would need confirmation from our contractors that any change in the methods proposed would not materially affect the proposals set out in our DCO application.

This Construction update should be read alongside the Operations update, which provides information on the effects of the Lower Thames Crossing once it is completed and open. Our Ward impact summaries describe how the construction of the project and its operation would affect each local authority ward area. The summaries also describe the mitigation measures we would adopt in each area to manage the effects of construction.

Our proposals are set out in a series of map books, which show information about the new road in A3 format. The map books are:

Map Book 1: General Arrangements

These show the proposed layout details of the project, including: permanent works; new roads, earthworks and roadside features;

construction compounds; environment mitigation; landscaping and tree planting; utilities diversions; Order Limits (previously known as the development boundary); and open space and replacement land.

Map Book 2: Land Use Plans

The land use plans show the areas where we would seek powers to compulsorily acquire land or permanent rights. They also show the land we require temporary rights to use for the construction and operation of the project. Areas we may need to purchase include the land required for our permanent works, temporary works and compensation land.

Map Book 3: Engineering Plans

These show plan and profile drawings detailing the vertical and horizontal road alignment. They also show junction arrangements with the proposed layout and cross-sections throughout the route, including the lanes and earthworks.

Later in this chapter, we refer to the control documents that will form part of our DCO application. These documents describe how we would manage any impacts associated with construction. Where indicated, drafts of those documents are also provided as part of this consultation, offering more information on specific aspects of our plans.

Chapter 2 describes the methods we would use to build the Lower Thames Crossing, including associated structures such as bridges and viaducts.

The project has been divided into four construction sections, and chapters 3 to 6 describe the works required in each section. They also provide information on construction compounds and utility works.

Chapter 7 provides a project-wide summary of the construction impacts and how they would be effectively managed, including traffic management measures and environmental mitigation.

At the end of the document, in chapter 8, we provide a set of computer-generated images of the construction works described in this consultation. These provide an indication of how those works would appear within the existing landscape.

1.2 Your feedback

We would like your feedback on our proposals to build the Lower Thames Crossing, including our proposed measures to control any negative impacts associated with its construction.

Our response form for this consultation contains four questions relating to the Construction update.

The deadline for sending us your response to the consultation is 23:59 on 8 September 2021.

Following this consultation, we will consider all your feedback before we submit our DCO application to the Planning Inspectorate later this year. We will publish an update on how this feedback has led to any changes in our proposals.

See chapter 9 to find out how you can give your feedback on these proposals.

1.3 Further information

If you have any questions about the information presented as part of this consultation, see the Guide to community impacts consultation, or visit our consultation website: www.highwaysengland.co.uk/ltcconsultation

This will explain how to get in touch and find out more.

The Guide to consultation also provides background details on the consultation process and our DCO application, along with a project overview and other links to information about the consultation.

1.4 Outline of the construction programme

Subject to construction starting in 2024, our target date for the road opening is 2029/30, but for the purposes of construction and traffic modelling the opening date is assumed to be 2029 throughout this consultation.

As with all large infrastructure projects, our proposed schedule for construction would be refined and become more certain once our contractors are appointed and the detailed design further developed.

Applying for development consent

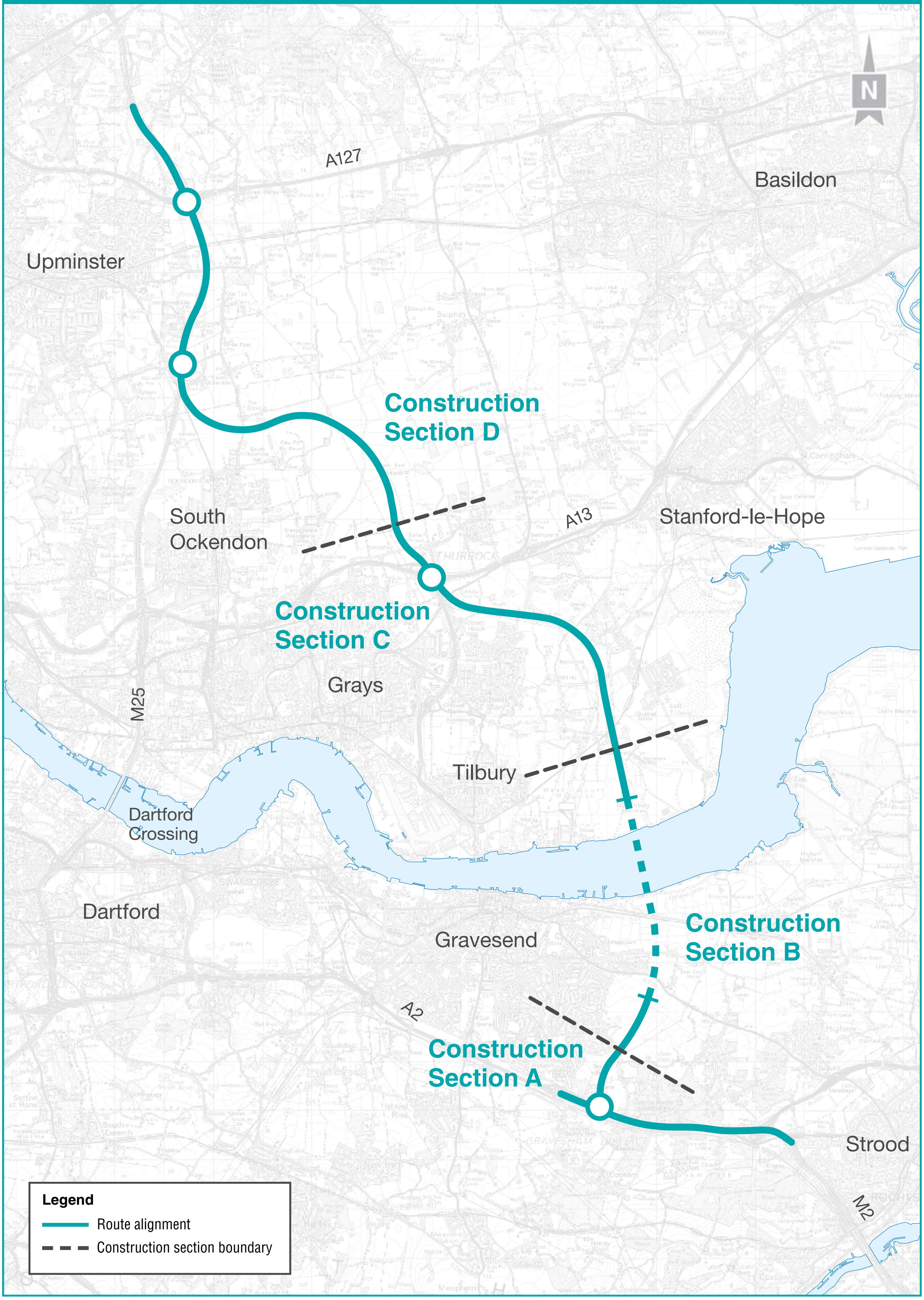
The Lower Thames Crossing is identified as a Nationally Significant Infrastructure Project (NSIP) and therefore, permission will need to be granted to build and operate the road through an application for a DCO. Highways England's application for a DCO will be examined by an authority appointed by the Planning Inspectorate (the Government's agency responsible for operating the planning process for NSIP projects). It will report its findings to the Secretary of State for Transport who would make the final decision on granting a DCO.

Building of the new road would include:

- initial works ahead of construction, such as surveys and other investigative works
- utility infrastructure works
- establishing construction compounds
- new junctions connecting the new road with the M25, A13 and A2
- new carriageway in cuttings, on embankments and viaducts
- multiple crossings of roads, rail lines and watercourses
- approach structures
- the tunnel and cross-tunnel passages
- testing and commissioning
- environmental mitigation
- temporary works to carry out the above

A project-wide overview of our construction activities is provided in chapter 2.

Figure 1-1 Location of our construction sections



Given the complex nature of building the Lower Thames Crossing, the works would be divided into four construction sections. This would help to make sure they are completed on time, and would minimise any impact on local communities, the environment and road users:

- Section A: Covering the area of the A2/M2 corridor and the proposed M2/A2/Lower Thames Crossing junction and carriageways to (and including) the proposed Thong Lane bridge over the project.
- Section B: Covering the area from the north of Thong Lane to the proposed Tilbury Viaduct structure. This includes the areas required for above and below ground construction of the tunnel.
- Section C: Covering the area from (and including) the proposed Tilbury Viaduct to (and including) Green Lane, north of the proposed A13 junction.
- Section D: Covering works north of Green Lane to the M25 corridor extending beyond junction 29.

Construction programme

The timeline below sets out the indicative programme for construction of the Lower Thames Crossing.

Figure 1-2 Construction programme for the Lower Thames Crossing

Overall

	2024				2025				2026				2027				2028				2029			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Section A: South of the River																								
Section B: Tunnels																								
Section C: North of the River (1)																								
Section D: North of the River (2)																								

Please refer to chapters 3-6 for more detailed information on the proposed phasing of our construction activities in each of the four sections.

Leaving a positive legacy

New skills and opportunities for local communities and businesses

To build the Lower Thames Crossing, around 10,000 people will be needed at the peak of its construction. More than 22,000 roles will be supported over the six-year construction period, ranging from highly skilled engineers, architects, and designers, to other essential roles such as caterers, sign makers and IT support.

Highways England, in partnership with its local stakeholders, is currently developing a skills, employment and education strategy that not only enables delivery of the project but supports the long-term skills and employment needs of the local community. This includes the development of a skills and employment working group with an immediate focus on creating a plan to upskill local residents before construction starts. Longer term, the working group will become a main consultee to the delivery of the skills, education and employment strategy.

We are also creating hundreds of apprentices and places for graduates, and are bringing together local schools, colleges, businesses and local authorities to shine a light on the many and varied opportunities available in the area. We want to help secure the future of local businesses, their employees and young people at the start of their careers and create a diverse workforce that will not only deliver this project but support the long-term strategic needs of the local community.

The government has a target that a third of the spend on projects like the Lower Thames Crossing goes to small and medium-sized businesses. We are aiming to beat this target and are looking at a range of ways to support local businesses to win work on this, and other, infrastructure projects. This includes:

- free training on topics that will support their growth
- the development of a Small Medium-sized Enterprise directory to build ties between local businesses and major contractors
- events and workshops to provide specific information and support in bidding for work on the project

1.5 Control documents: securing mitigation for the project

Within our DCO application documents, we will present our proposed measures to reduce any adverse effects of the project. These measures will be included in what we refer to as 'control documents'. If our application is successful, contractors would build on our current proposals as part of a detailed design process. The project would be required to introduce these control documents as they are linked to the DCO.

Drafts of the control documents are provided as part of this consultation. They will inform consultees how adverse impacts would be managed throughout the construction phase, as well as an opportunity to give feedback on them. To reflect this feedback, control documents may be updated ahead of submitting the DCO application.

Most environmental mitigation measures are contained in the draft Code of Construction Practice (CoCP). Attached to the CoCP is the draft Register of Environmental Actions and Commitments (REAC). This provides a summary of the mitigation proposed in our Environmental Statement, including the mitigation and controls to be introduced during the construction and operational phases of the new road.

The only control documents not provided as part of this consultation are the Environmental Masterplan and the Draft Archaeological Mitigation Strategy – Outline Written Scheme of Investigation. These documents are in development and will be submitted as part of our DCO application.

Should our DCO application be successful, our contractors would produce management plans that would comply with the outline plans presented in our DCO application.

The process for how these measures would be implemented would be outlined in part of the DCO: the Schedule 2 Requirements. We would submit updated versions of the control documents to the Secretary of State for Transport for approval in consultation with the relevant statutory bodies.

The control plan

The following control documents will form part of our DCO application when it is submitted. Draft copies of these documents show how impacts would be controlled and mitigated during the construction and operation of the new road. More information on the documents that control the design and operational effects of the project are detailed in the Operations update, provided as part of this consultation. It can be downloaded from the consultation website: www.highwaysengland.co.uk/ltcconsultation

These documents form part of our control plan, which is the mechanism through which we ensure that our various commitments (as set out in the control documents) would be delivered. If our DCO application is successful, the control plan would make sure that we would be legally obligated to carry out these commitments.

Table 1-1 Control documents for our DCO application

Application documents that control the design and contain embedded mitigation	Application documents that control construction impacts	Application documents that control operational impacts
Book of Plans†	Code of Construction Practice	Register of Environmental Actions and Commitments
Environmental Masterplan*	Register of Environmental Actions and Commitments	Outline Landscape and Ecology Management Plan
Design Principles	Outline Site Waste Management Plan	Wider Network Impacts Management and Monitoring Plan
	Materials Handling Plan	
	Outline Traffic Management Plan for Construction	
	Framework Construction Travel Plan	
	Draft Archaeological Mitigation Strategy – Outline Written Scheme of Investigation*	

† Copies of the general arrangement drawings and land plans are provided in Map Book 1: General Arrangements and Map Book 2: Land Use Plans as part of this consultation.

* These documents are currently being updated and will not be available for reference as part of this consultation.

The contractors building the Lower Thames Crossing would be required to adhere to the controls within the following documents:

- The **Schedule 2 Requirements**, which are similar to conditions for planning permission. These requirements set out the conditions we would be obliged to follow when proceeding with development authorised by the DCO. This includes reference to the documents detailed below.
- The **Code of Construction Practice** (CoCP), which provides a framework to manage construction and operational activities. The CoCP ensures that environmental mitigation commitments are met and necessary consents and licences are obtained. Before construction starts, our contractors would develop more detailed documents called the 'Second Iteration of the Environmental Management Plans' (EMP2), which must accord with the CoCP. Each EMP2 would cover the works to which they relate. These EMP2s should follow appropriate industry-standard practice and reflect the mitigation measures set out in the REAC. The EMP2s would:
  - set out procedures for monitoring compliance with the mitigation measures outlined in the REAC
  - develop additional environmental management plans for environmental aspects that require further measures and controls during the construction phase. This would include plans for managing air quality, ecology, soils, contaminated land, substances hazardous to health and pollution prevention controls

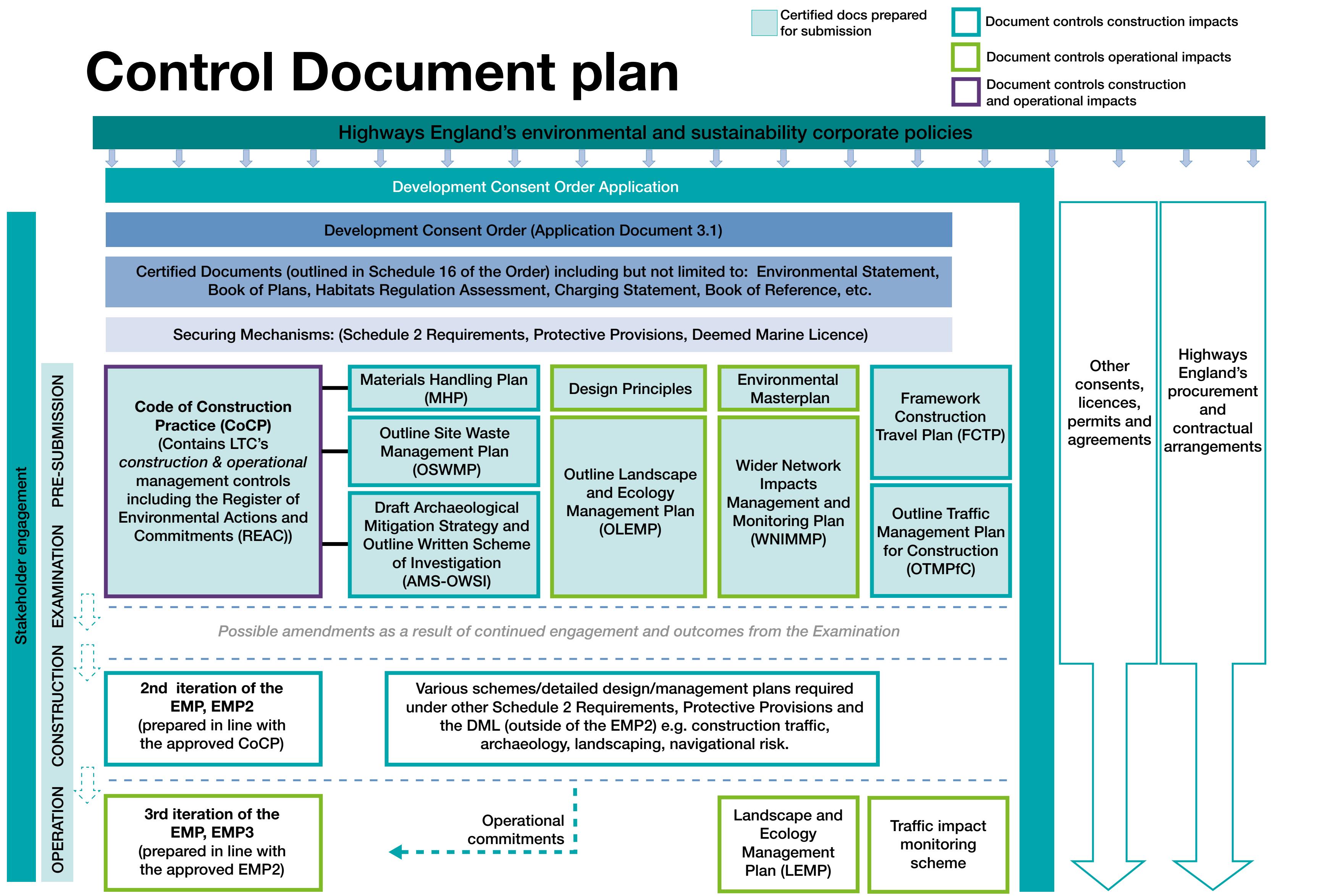
We would submit the EMP2s and these additional environmental management plans to the Secretary of State for Transport for approval after consultation with the relevant local authorities and Natural England.

Following construction, we would prepare a third update of the EMP (EMP3). This would set out the approach to environmental management once the new road is open, and be managed by Highways England. The EMP3 would outline existing and future environmental commitments and objectives that need to be honoured, and actions and risks to be managed. It would include information covering the operational phase of the new road and other details in a form that can be used for long-term operational management.

- The **Register of Environmental Actions and Commitments** (REAC) would be attached to the CoCP. The register identifies all good practice and essential mitigation within the Environmental Statement to be carried out during construction or operation of the new road, and would be included in our DCO.
- The **Outline Site Waste Management Plan** (OSWMP) sets out the key principles and procedures for managing waste during the construction of the new road. The plan also defines specific roles and responsibilities to ensure waste is managed effectively and covers all phases of work (enabling, demolition, highways and tunnelling) within the Order Limits during construction. Our contractor would produce a Site Waste Management Plan (SWMP) in accordance with this document once appointed and more detail is known, and this would be attached to the EMP2.
- The **Materials Handling Plan** (MHP) would be a companion document to the OSWMP, providing further details on material movements associated with the new road. It would cover the flow of materials into the Order Limits and materials out of it, and how this is likely to affect the local transport infrastructure. Our contractor would produce a MHP in accordance with this document once appointed and more detail is known, and it would be appended to the EMP2.
- The **Outline Traffic Management Plan for Construction** (OTMPfC) outlines the approach to carrying out temporary traffic management for the safe construction of the new road. It would also explain measures available to our contractor to reduce the impact on the local community (including journey time reliability, access, severance and safety). The OTMPfC has been produced following our work with the relevant local authorities, businesses and emergency services. Once appointed, our contractors would produce a plan in accordance with the OTMPfC for their use when working on the new road.

- The **Framework Construction Travel Plan** (FCTP) sets out a framework to reduce the impact of the project's construction workforce on the road network as a result of travel to and from construction areas and compounds (including Utility Logistics Hubs). The FCTP sets out proposed ways in which this would be done, including by reducing single occupancy vehicle trips and encouraging sustainable and active travel. Before starting construction, contractors would develop Site Specific Travel Plans (SSTPs) in accordance with the FCTP for the sites they are responsible for, following the latest policy advice and best practice documents. This would apply to individual compounds, or several where they are closely located with similar levels of accessibility.
- The **Draft Archaeological Mitigation Strategy – Outline Written Scheme of Investigation** (Draft AMS-OWSI) document sets out the strategy for essential mitigation for heritage assets. It describes the embedded and good practice mitigation measures relevant to cultural heritage. Written Schemes of Investigation (WSI) would be prepared for areas of archaeological interest provisionally identified as requiring mitigation in this AMS-OWSI. Our contractor would produce a plan in accordance with this document once appointed and more detail is known.

Figure 1-3 Control plan for our DCO application



Adapted from the Wylfa Newydd application as a case study in NIPA Insights II

1.6 Sustainable construction

The carbon impact of construction

We have calculated the project's likely greenhouse gas emissions in a detailed carbon model, which is being refined as the preliminary design develops. We will continue to investigate ways to reduce these emissions during the detailed design process. Our carbon reduction effort is focused on the areas we can control during construction and influence during the operation and maintenance of the new road.

Measures we have considered in the design and construction planning of our project include:

Removing and reducing the size of assets

As part of our ongoing design refinement, we have reduced the size of some sections of the proposed route and, in some cases, removed them from our plans. As an indirect effect, this has reduced our material requirements and consequently our greenhouse gas emissions. Examples include:

- removing the bridge at Hornsby Lane
- reducing the number of lanes on the new road south of the M25
- reducing the span of the Tilbury Viaduct from 1,200 metres to 600 metres
- removing the A226 junction
- removing the A128 junctions with the new road and A13

Lower carbon concrete

Concrete, one of our main construction materials, has a relatively high carbon footprint and is one of the main emission sources for the new road. It would account for around 19% of all construction emissions.

Options include the use of steel-fibre reinforced concrete in the tunnel lining, which has lower overall carbon levels than traditional rebar-reinforced concrete. This intervention alone will save around 30,000 tonnes of greenhouse gas emissions.

In addition, our carbon model assumes the use of a low-carbon cement replacement (65% ground granulated blast-furnace slag) in the most commonly used concrete types across the project. This would reduce greenhouse gas emissions by approximately 160,000 tonnes.

Hybrid or electric plant

Our carbon model also assumes the use of the following proportions of hybrid and electric equipment to reduce emissions:

- 5% of articulated 40 tonne and 55 tonne dump trucks
- 20% of tracked cranes (55 tonne and 60 tonne)
- 20% of dumpers (5 tonne and 9 tonne)
- 50% of excavators
- 50% of dozers
- 50% of forklifts/telescopic handlers
- 50% of lorry mounted cranes
- 50% of telehandlers
- 75% of 4x4 vehicles

Reuse of material on-site

We would re-use topsoil, vegetation and excavated material on-site, wherever possible, to reduce carbon emissions from transport and waste treatment. We expect that most of this type of material would be reused saving approximately 190,000 tonnes of greenhouse gas emissions.

Renewable energy for construction

Our contractors would be obliged to procure renewable electricity at compounds (including for the tunnel boring machine and concrete plant). Its use forms part of our carbon model and would save approximately 90,000 tonnes of greenhouse gas emissions.

Carbon management

We would require that our contractors reduce their emissions beyond the carbon model total reported in our Environmental Statement (ES). Carbon reduction would be one of the evaluation criteria used during the contractor procurement process. The selected contractor would need to specify a challenging reduction target that would then become a contractual commitment.

Our contractors are required to adhere to PAS 2080, which is the approved standard for carbon management in infrastructure. They would develop a detailed plan of how greenhouse gas emissions reductions would be identified, prioritised, implemented and monitored throughout the supply chain. As early action is critical in minimising carbon emissions, contractors must present their plan for approval within three months of appointment and we would review these plans annually.

Environmental product declarations

In addition to carbon emission reduction processes, contractors would need to identify their top 10 emission-producing materials and provide environmental product declarations for them. These declarations set out the environmental performance or impact of any product or material over its lifetime.

2

Project-wide construction

2.1 Construction overview

We previously presented our proposals for how we would construct the Lower Thames Crossing, and carry out utility diversions and installation, as part of our supplementary consultation in January 2020. In July 2020, we consulted on a number of design refinements to the project, including changes to our construction and utilities proposals.

We have continued to develop our proposals using the feedback from these consultations, alongside our ongoing engagement with local authorities, statutory bodies, utility providers, businesses, landowners, local residents and community groups.

This chapter sets out what construction methods we would use to build the Lower Thames Crossing. It explains how we would make sure our work is carried out in a safe, efficient and sustainable way, in line with industry best practice. We have tried to avoid and minimise impacts on the environment and local communities. It also outlines how we would keep communities up-to-date, so that people have a better understanding of what to expect.

Construction in each section would involve:

- initial works, including setting up the main works compounds
- main works covering the construction of the highways north and south of the Thames, and all elements of the tunnels and their approaches, as well as utilities and environmental mitigation works

2.2 Initial works

These would cover the following activities to allow construction to begin:

- the early stages of ecological mitigation, such as preparing habitats and moving species (this would continue through later phases of construction)
- securing the construction sites, including diverting or closing temporary public rights of way
- constructing the main works compounds, including utility diversions and connections

2.3 Main works – constructing the roads and highways

To construct the roads and highways, we would use methods typically associated with major infrastructure projects. This chapter provides further information on the following construction methods:

- temporary traffic management
- topsoil removal
- temporary soil storage
- earthworks
- management of excavated material and earthworks
- temporary lighting
- site fencing and hoarding
- culverts
- drainage
- flood compensation
- bridge construction

- box jacking
- viaduct construction
- retaining walls
- gantry and signage foundations
- road surfacing construction
- road widening works
- tie-in works
- finishing works
- reinstatement

While much of the construction of the new road would take place away from the existing road network, the project's route would cross a number of existing roads. We plan to build new bridges and underpasses, which would need both temporary and permanent changes to the horizontal alignment of the existing roads. Where sufficient space is available, these would be constructed offline, to allow traffic to continue using the existing roads during construction. We refer to these as offline works, as they are off the existing road network.

Figure 2-1 Construction machinery moving aggregate into place

Figure 2-2 Ground beside carriageway prepared for works and new carriageway under construction

Temporary traffic management

We would need temporary traffic management to make sure that the construction of the new road and associated utility works can be carried out safely for the workforce and road users. Our traffic management plan aims to reduce the impacts on road users and local communities, while ensuring a safe working environment for construction.

Proposed traffic management measures include:

- use of narrow lanes, with speed restrictions
- traffic light systems
- crossing points with traffic lights
- temporary road realignment
- speed restrictions without narrow lanes
- hard shoulder closures
- an exclusion zone between the live carriageway and construction or utilities works for safety purposes
- temporary lane or road closures, typically during off-peak periods or night-time hours. A small number of temporary closures would be required at other times
- full closures with an appropriate diversion route in agreement with the relevant authorities

The Outline Traffic Management Plan for Construction (OTMPfC) provides further information on our approach to carrying out temporary traffic management for the safe construction of the new road.

Figure 2-3 Temporary lane and hard shoulder closure

Figure 2-4 Traffic lights and lane restrictions in operation on a single-lane road

Topsoil removal

Topsoil removal is one of the first steps for construction, and involves stripping the top layer of soil. Its removal would be necessary from various areas, including:

- the main construction worksites
- utility diversion worksites
- temporary construction site areas, including compounds and Utility Logistics Hubs
- temporary haul routes and construction zones

Typically, replacing topsoil would take place at the end of each section of construction works. It would follow the completion of all main construction activities before the opening of the new road.

Temporary soil storage

Storage areas would be used to stockpile soil so it can be re-used, or to store soil that has been brought to the worksite. Temporary soil stockpiles would be needed along the route and would be fenced appropriately.

Topsoil would be stored following best practice measures to allow for its sustainable re-use. Stockpiled topsoil would be used to reinstate temporary working areas, such as compounds and haul routes when they are no longer required. Soil would also be reused for restoration, landscaping or habitat provision.

We would also use soil stockpiles to screen areas such as welfare facilities, offices and workshops. Soil stockpiles may act as temporary noise or sight barriers during works.

Earthworks

The construction of earthworks, such as cuttings and embankments, mostly involves filling and cutting (building up the ground level or excavating). This would be carried out after the stripping and storing the topsoil for reuse. The road surfacing or pavement can then be built at the required level.

Soil and other material for embankments would be brought to the site using heavy machinery, and then be added in layers and compacted. Cutting would involve excavating and shaping using excavators with hydraulic attachments.

Figure 2-5 Construction machinery being used to form an embankment

Figure 2-6 A digger being used to excavate a cutting

Management of excavated material and earthworks

As a result of excavating the tunnels and preparing the ground, the construction of the Lower Thames Crossing would generate a large amount of excavated material, such as earth and rock. Managing this excavated material, and re-using it for earthworks, would play a significant role in reducing the amount of construction traffic using the road network to transport this material to worksites. Effective management of excavated material would also help to minimise potential delays to the construction programme.

We assume that most of the fill material can be sourced from within the Order Limits – our project boundary – however, some would need to be imported to meet design requirements. We would give priority to local suppliers, where possible, according to mitigation measures summarised in the REAC. Imported fill would be supplied within an 80km radius via the road network.

If onsite material from the cutting operation needs treatment before use, it would be moved to designated soil storage areas where it would be processed.

Temporary lighting

We would install site lighting and signage at construction compounds and Utility Logistics Hubs to ensure the safety and security of the sites. It would be at the appropriate brightness to provide safe working conditions. Where needed, we would provide sufficient lighting to site boundaries and this would offer a safe route for the passing public. Precautions would be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas. Where appropriate, lighting would be activated by motion sensors to prevent unnecessary use.

Lighting would be designed, positioned and directed to prevent or minimise light disturbance to nearby residents, habitats and wildlife, motorists, rail users and river traffic. This provision would apply to sites where night-working or security lighting would be necessary.

The control measures for lighting are detailed in the CoCP.

Site fencing and hoarding

We would carry out site-specific security risk assessments to determine the type of perimeter fencing or hoarding to be installed.

We would make sure that hoarding and other materials used are appropriate to the location and to the activities within the compound/worksite that would affect noise levels at the boundary.

Fencing may be used in areas of low security risk to lessen the visual impact on the environment and help security manage the area. Heras fencing may be used as a temporary measure to secure a site or adapted site boundary before installing permanent hoarding, or likewise when demobilising from an area.

Hoarding will be erected to the boundary of higher-risk activity sites or where visual screening is necessary. Hoarding would typically be 2.4 metres high but could be more in the higher security-risk areas.

The CoCP provides more information on the control measures for site fencing and hoarding.

Culverts

These are drains or pipes that allow water to flow under a road or other structure. They are typically made of concrete, plastic or steel. These are placed in an excavation that is then backfilled and compacted on top with gravel or soil.

Temporary culverts

Temporary culverts may be used during the construction and formation of work sites and haul roads.

Permanent culverts

Permanent culverts are used for the duration of construction works, depending on the sensitivity of the watercourse and subject to consultation and agreement with the relevant Lead Local Flood Authority and the Environment Agency. Permanent culverts may be used when a watercourse is diverted via a ditch, or when a temporary dam is created upstream of the works to allow water to be pumped to the downstream side.

Drainage

We would install drainage systems to remove surface water from worksites and haul roads, and to minimise the impact of run-off on the surrounding environment. Worksite drainage systems would incorporate pollution control systems designed in line with industry good practice guidance.

The methods for removal and treatment include:

- discharging directly into an existing sewer using pipework to the nearest sewerage connection point
- sustainable drainage systems – slowing waterflows associated with surface run-off to allow settlement, natural filtration and other treatment before discharging
- disposal of water offsite using tankers – water would be stored onsite in temporary ponds or, where possible, permanent drainage ponds. The water would then be transported by tankers
- settlement ponds and lagoons – as above, a temporary or permanent pond would be used for this purpose
- filtration system (including mechanical filtration) – aggregate, straw or similar material would be used as a filter
- irrigation of crops and grassland where appropriate

Temporary drainage

Temporary drainage systems may be used during the construction and set up of work sites and haul roads.

Permanent drainage

We would use permanent drainage systems for the duration of construction works. These may consist of pipes, ditches, channels, filter drains and carrier drains, which are typically constructed to follow earthworks. Drainage would also include ponds, excavated before earthworks where possible, to meet temporary drainage requirements and allow reuse as the fill material. The construction materials needed would be delivered to site by road.

Where necessary, we would install culverts before the construction of the required earthworks.

Flood compensation
Flood compensation would typically be built ahead of works on the floodplain.

It involves lowering the finished ground level to store flood water. Flood compensation is normally carried out in phases to minimise the amount of land used and to make sure an agreed volume of water is available. The sequence comprises:

- stripping topsoil, which is usually stockpiled near or on the flood compensation area, using a scraper, bulldozer or a similar machine
- material is removed to the designed level. Flood compensation areas are relatively shallow (up to two metres deep)
- reinstating the land by replacing topsoil, using a bulldozer or a similar machine

Bridge construction
Various methods may be used to build bridges and these are described below.

The sequence in which a bridge is built is determined by its location. For example, if the bridge crosses an existing road, the need to keep traffic flowing would require a more complex construction plan to minimise delays and disruption to road users and the local community.

The four main bridge construction elements are:

- foundations
- abutments
- piers
- deck

The main elements of a bridge structure are usually made of steel, concrete, or a combination of both. Concrete may be cast in situ where it is poured into forms and cast on site, or the bridge may include precast units transported to the site.

The exact form and materials used on each bridge are specific to individual locations. These would depend on the bridge type, the alignment of road it carries, and distances between the piers and abutments (spans). Abutments are formed to support the ends of the bridge deck; piers are formed in the central reserve or verge to support the inner parts of the deck. The deck is the surface structure of the bridge that is covered by the road.

Bridge foundations for the abutments and piers may be either concrete pad or piled, depending on ground conditions and associated design.

Pad footings are generally made from concrete with steel reinforcements and extend from an excavation. Steel reinforcement is fixed to allow abutment and pier construction on top of the foundation slab.

Piled foundations are constructed by installing piles to the designed depth, by driving these in with a hammer, or removing material to create a space and then pumping in concrete.

Bridge abutments are constructed at each end of the bridge to support the bridge beams and deck.

Bridge piers are not always needed (depending on design). Where necessary, bridge piers are constructed between the abutments to act as an intermediate support for the bridge beams and deck.

Bridge decks can take many forms. The two most common are concrete in situ, and beam and slab. For beam and slab deck, beams are usually precast steel and concrete, and the deck would be made from concrete cast in situ. The precise form of bridge decks will be determined during our detailed design of the project.

Box jacking

This is a trenchless method of construction that allows a shallow underground space to be created. It is intended to avoid disruption and minimise the impact on the surrounding environment. Box jacking normally involves a site-cast box structure, which is placed next to the embankment, using high-capacity hydraulic jacks.

Box jacking involves excavation equipment, ventilation fans and ducting, essential services and rear access for personnel. This is all contained within the space created by the box-jack. First, the face is excavated to create space, then the box structure is jacked forward to the face and into the ground. This carefully controlled phased sequence continues with excavations and progressive, incremental, advancements of the box-jack.

On the exit side of the embankment, a temporary artificial ridge (sometimes called a 'berm') would be constructed to reinforce the embankment during the final stages of jacking. When the structure reaches its final position, all equipment is dismantled, and normal road construction can begin. It may be necessary to build entrance wings and parapets to support the face of the embankment.

Viaduct construction

Standard viaduct construction

The standard construction methods for a viaduct are like those for bridge construction, with foundations, abutments, piers and a deck. Similarly, the use of precast concrete elements and steel beams would also need lifting equipment for placement.

Incremental launching method

Alternative methods of viaduct construction may be used where site constraints prevent using standard methods. An example is the Tilbury Viaduct, where the new road alignment rises to cross the Tilbury Loop railway line.

The proposed incremental launching method for the Tilbury Viaduct crossing would require setting up a launching yard behind the end abutment of the structure, with associated equipment to guide pre-assembled girders into place.

Retaining walls

As with bridges, retaining walls can take varying forms depending on ground conditions, other constraints and the contractor's preferred working methods. The more common forms are piled walls, and reinforced concrete walls and earth walls.

Gantry and signage foundations

Foundations for gantries and signage are normally concrete pads. The steel frame gantry or signage post is then fixed to the foundation.

Gantries are usually steel and arrive in sections at site. This includes super span gantries that stretch across both carriageways of a road. These are then lifted using cranes and bolted together. They are generally installed during night closures on the roads such as the M25. For the offline sections of the Lower Thames Crossing, they are likely to be installed during the working day. Once the steel frame gantry has been erected, signage and cabling can be connected.

Road surfacing construction

The road surface is made up of several layers and each layer must be laid, compacted and in some cases allowed to set before laying the next. This requires the use of heavy machinery such as compactors and road rollers.

Road widening works

We would use temporary traffic management when widening a road, allowing space for construction work and to separate traffic from the working area.

Widening works involve earthworks to raise or lower the adjacent ground to the designated height using excavators, bulldozers and compactors, followed by road surfacing works. Typically, a small amount of demolition to the edge of the existing carriageway is needed to allow the new road surfacing to be connected to the existing surface.

Widening works may include activities such as laying and repairing the existing road surface.

In some cases, widening works will involve diverting any utilities installed in the existing road verges.

Road resurfacing

Resurfacing requires removing the existing road surface to inspect the underlying layers, and carrying out any necessary repairs. A fresh surface layer would then be laid down. Resurfacing works would involve working on the existing carriageway, and traffic management measures would be necessary.

Tie-in works

These involve connecting the new carriageway into the existing one and may be temporary or permanent.

First, the new carriageway would be built offline as close to the existing carriageway as possible with minimal disruption to traffic using existing highways. We would then use temporary traffic management, usually a night or weekend closure to allow the new road to be tied into the existing one. Earthworks, road surfacing works, drainage and finishing works would all be included.

Finishing works

These would take place following or during road surfacing works and require safety barriers, signs and cabling, and other intelligent transportation system equipment such as cameras. Sign installation works would involve excavation for concrete foundations before putting up the posts. The sign faces would then be fixed to the posts. Some signs may be lit and so require cabling to be passed through the service ducts. Lighting columns would also be installed and connected where needed.

Any debris would be removed and road markings would be sprayed on to the surface using specialist lorry-mounted equipment. Following finishing works, testing and commissioning, the road would be ready for public use.

Reinstatement

Areas of land that we would need temporarily during construction would be reinstated to their previous condition, where practical, on completion of construction.

2.4 Utilities and utility works

Along the proposed Lower Thames Crossing there are a number of existing utilities, including overhead power lines, high-pressure gas pipelines, electric cables and substations, gas mains, water pipes, sewers and fibre-optic and telecoms cables. To build the new road safely, protect existing supplies, and enable future maintenance, utility diversions would be required.

Works would also be needed to connect utilities such as communications, water, electricity and wastewater to construction sites along the route and the service buildings at the southern and northern tunnel entrances.

Table 2-1 provides a summary of the major utilities works expected in each section. Chapter 1 includes a map of the construction sections. Chapters 3 to 6 also provide maps and more information on individual sections.

Table 2-1 Summary of major utility works proposed in each section

Section	Summary of major utility works
A	Diversions: ■ National Grid (NG) high-pressure gas pipelines ■ National Grid Electricity Transmission (NGET) 400kV overhead power line network ■ UK Power Networks (UKPN) 33kV, 11kV, and pilot cable networks, substations and switchgear equipment ■ Southern Gas Network medium-pressure gas pipeline and associated assets ■ Southern Water foul sewers and water mains ■ Openreach and other utility companies' strategic telecommunication cable routes
B	■ Installation of new 33kV supplies and construction of a new primary substation south of the A226 ■ Construction and connection of UKPN 132/33kV power grid site for tunnel boring machine (TBM) power ■ Connection of Essex and Suffolk Water to supply TBM water
C	Diversions: ■ NGET 400kV overhead power line network ■ Two UKPN 132kV overhead power line networks ■ UKPN 33kV and 11kV networks including substations ■ Two NGET (400kV and 275kV) overhead power line networks. The 275kV network continues into Section D ■ Three Cadent high-pressure gas pipelines and the construction of a new gas valve compound along Stanford Road ■ UKPN 33kV and 11kV networks including substations ■ Openreach and other utility companies' strategic telecommunication cable routes
D	Diversions: ■ NGET 275kV overhead power line network. This is a continuation of the NGET 275kv works from Section C ■ UKPN 33kV and 11kV networks including substations ■ Four Cadent gas pipeline networks ■ UKPN 132kV overhead power line network ■ UKPN 33kV, 11kV and pilot cable networks including substations ■ Two Cadent high-pressure gas pipelines ■ Multiple Essex and Suffolk trunk water mains
A high-pressure gas pipeline to Barking Power Station would either be diverted or capped at the Order Limits and removed.	

Further information on these utility diversions can be found in chapters 3-6. of the Construction update and in Map Book 1: General Arrangements.

Methods for utility works

Some of the typical techniques and methods which are likely to be used for utility works are described below.

Open-cut trench technique

One of the most common techniques for utility works includes open-cut trenching methods. These works involve excavation for a trench, laying pipes or ducts and back-filling.

Trenchless techniques

Trenchless techniques are often used for utility works that need to cross beneath railway lines, roads and watercourses. Common types of techniques include horizontal directional drilling and thrust-bore or pipejacking. These methods require few trenches, or none, as they involve either drilling or pulling pipes and cables below the road, railway line or watercourse.

Restringing overhead power lines

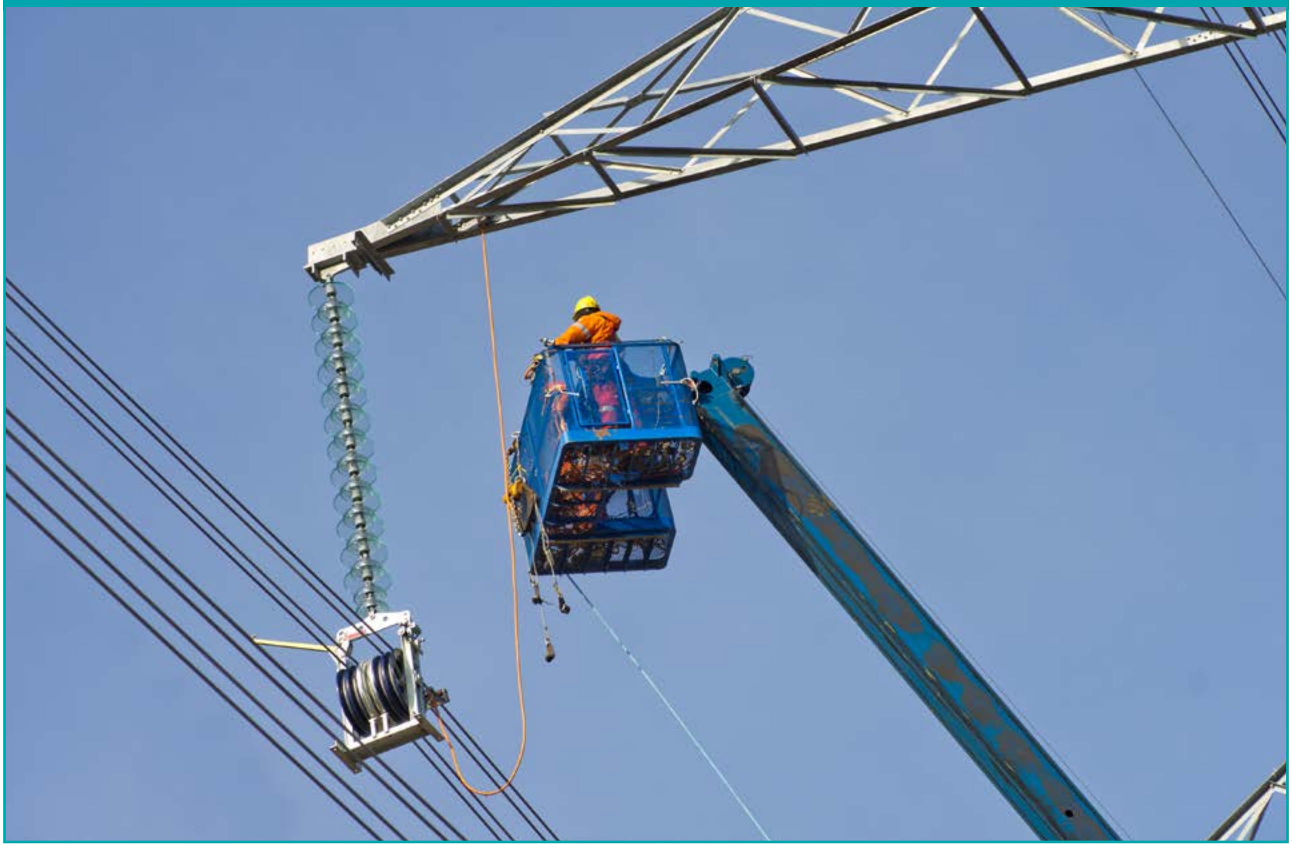
Where power lines are being moved, we would require working areas for removing existing pylons and setting up and pulling new overhead power lines through newly installed temporary and permanent pylons. This involves pulling the overhead power lines into position under tension with vehicles such as tractors. Temporary access routes would also be required to these working areas.

Constructing pylons

Pylons are usually between 30 metres and 55 metres tall, and need large foundations to be laid. Once the foundation is completed, the pylons would be erected with the help of a mobile crane. The components of the pylon would be delivered to site and assembled into larger sections. These would then be lifted into place to form the pylon structure.

Figure 2-7 Electricity pylons

Figure 2-8 Electrical worker building an electricity pylon



2.5 Construction of the tunnels and approach structures

The Lower Thames Crossing would take the form of twin-bored 2.6 mile (4.3km) tunnels crossing beneath the Thames, one for southbound traffic and one for northbound traffic. The tunnel bores would be constructed from the northern entrance site.

To complete the work as early as possible and reduce construction risk and local disruption, we would propose that underground construction activities take place 24/7. It is standard practice to introduce noise reduction measures, such as closed-board fencing around construction compounds to provide screening, selecting low-noise equipment where possible. We would also locate noisy activities as far away as possible within the confines of the project from noise-sensitive receptors, such as people's homes.

Figure 2-9 Tunnel entrance during construction

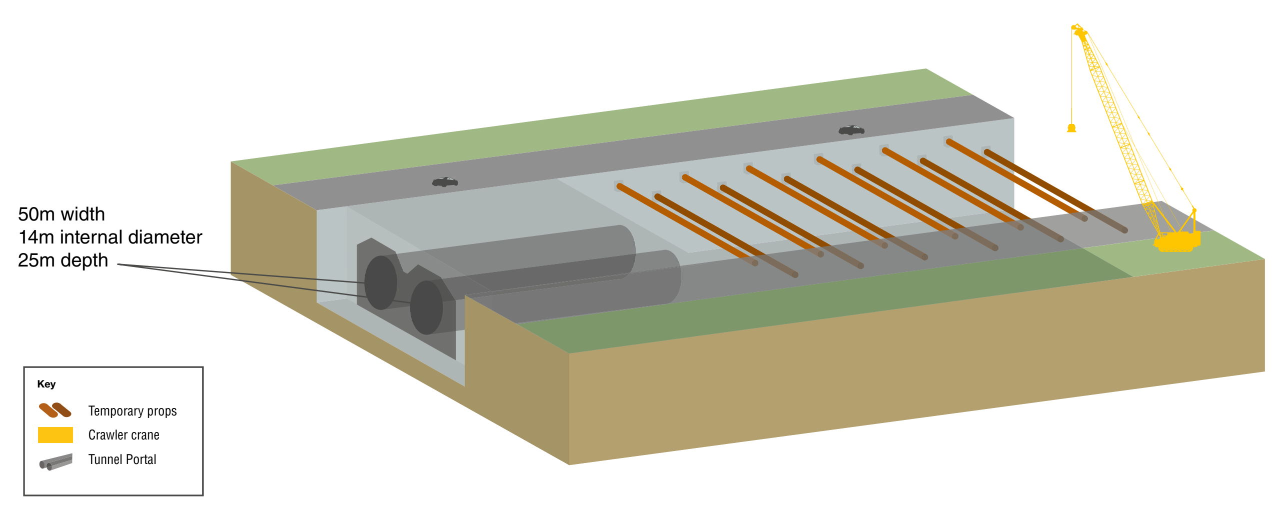
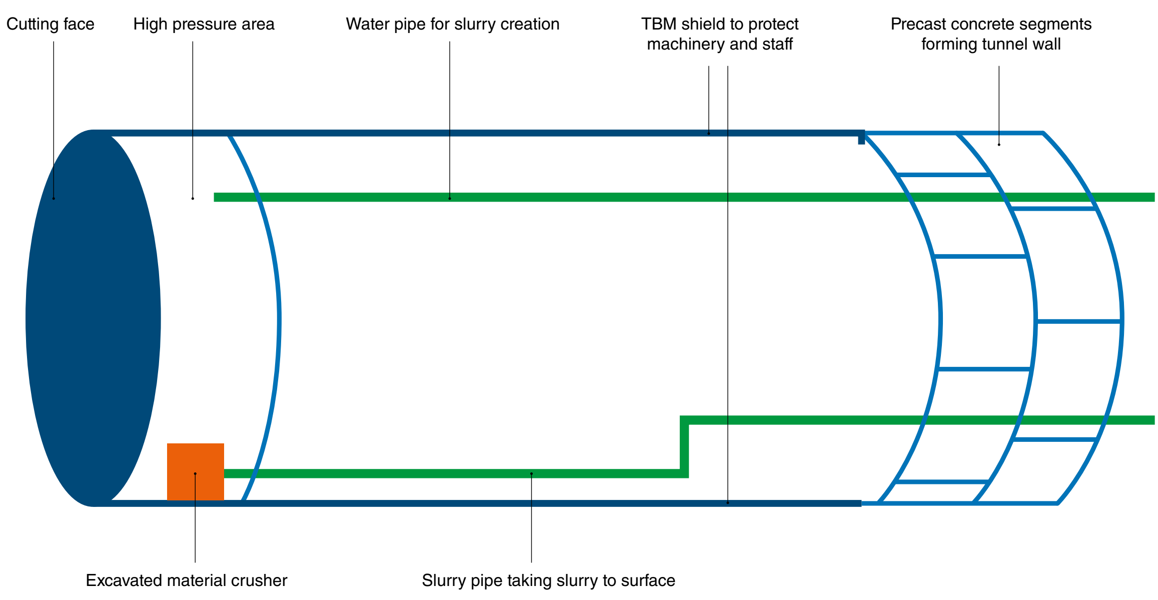


Figure 2-10 Cutaway diagram of a tunnel boring machine



Tunnel boring machines

Construction of the twin-bored tunnels and approach ramps is expected to take up to six years using slurry tunnel boring machines (TBMs). This type of TBM has a 'closed face' to reduce groundwater impact, and potential stability and settlement issues.

A TBM functions as a mobile factory as it moves forward to safely excavate the ground ahead. It also protects the workforce, builds the tunnel lining and controls the excavated ground movement and groundwater flows to minimise settlement of the surface ground level.

For slurry TBMs, excavated material is mixed with water to form a pumpable medium (slurry), which is pumped to the surface in pipes within the tunnel. Two machines would excavate the tunnels, which would then be lined with precast concrete segments at the same time.

Figure 2-11 Segment transportation vehicle

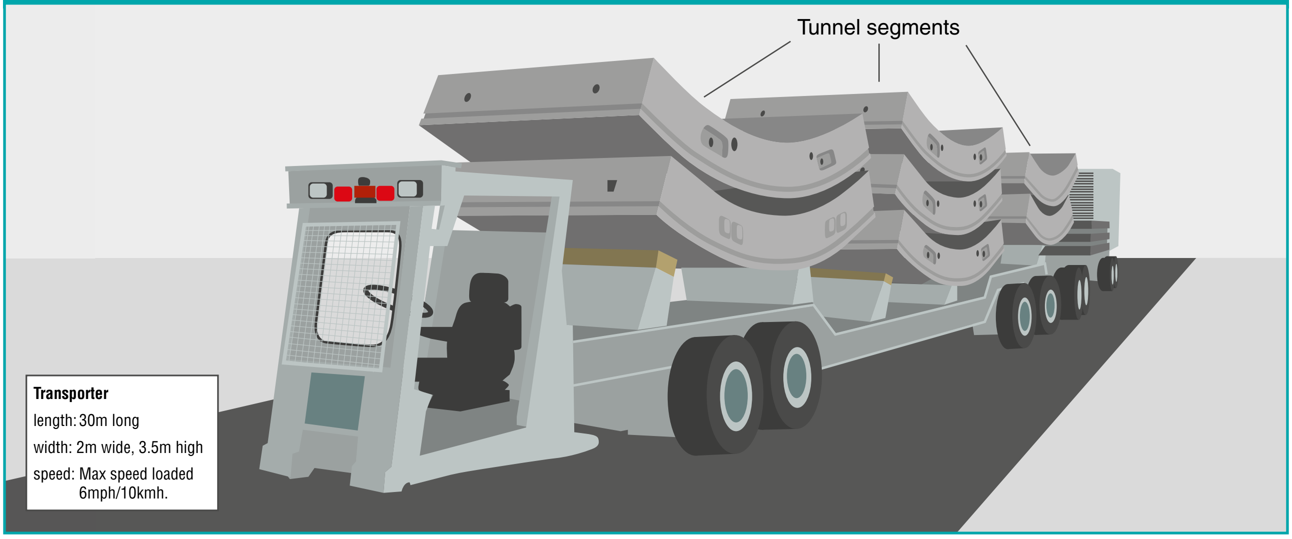
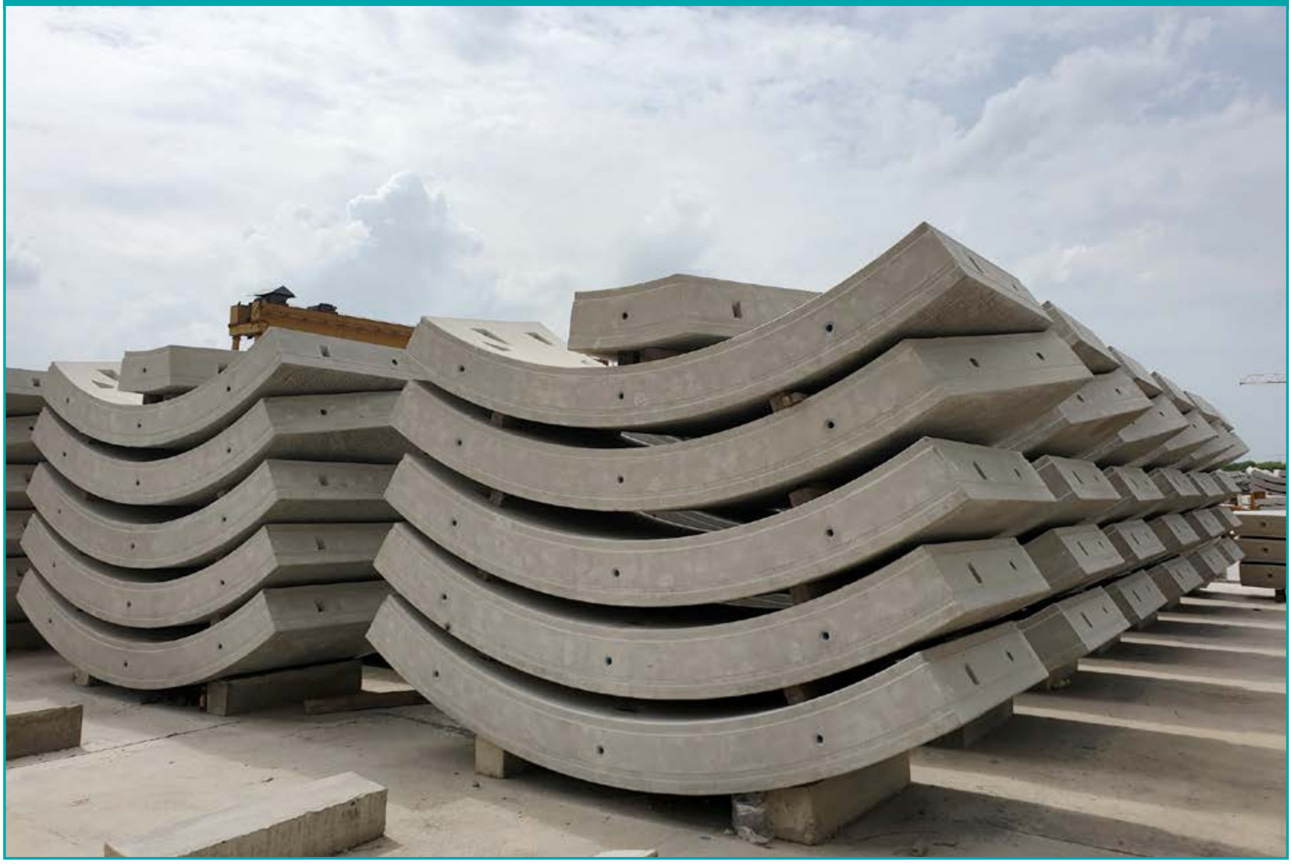


Figure 2-12 Precast concrete tunnel segments



Tunnel construction risk mitigation

On the south side of the Thames, the changing ground conditions present potential risks to TBM operation. To reduce these risks, the contractors may opt for ground treatment such as grouting or a ground protection tunnel before the arrival of the TBM.

A detailed description of the tunnel construction process and the ground protection tunnel is provided in chapter 4.

2.6 Construction compounds and Utility Logistics Hubs

We anticipate up to 18 site compounds would be needed for the construction of the new road, tunnel and structures. We would also need up to 16 temporary compounds for specific utility works, known as Utility Logistics Hubs (ULHs).

The following sections provide more information on our plans for construction compounds and ULHs.

Construction compounds

Where practical, our construction compounds would be located to avoid or minimise environmental and community impacts, provide the best access for personnel and deliveries in relation to major structures and worksites, and meet other construction requirements of the project. To allow the tunnel to be built, large construction compounds would be located at each of its entrances.

We would use a range of construction compound types, depending on their location and use. The table below describes the three types of compounds and their uses.

Table 2-2 Construction compound types and descriptions

Compound type	Primary use
Main compound	For overall project and area management, which could include: ■ materials and aggregates storage ■ parking ■ plant management ■ project offices ■ workshops ■ refuelling ■ security control ■ segment factory (box structures, tunnelling and viaducts) ■ sleeping accommodation (for the northern tunnel entrance compound only) ■ stockpiling and treatment (soil, excavated material, slurry etc) ■ welfare facilities ■ vehicle and wheel wash These sites would generally be in place throughout construction and would be used as the main hub for the respective sections of works.
Satellite compound	For delivery of the works, which would include: ■ local site office ■ local welfare facilities ■ refuelling ■ security and access control ■ vehicle and wheel wash ■ storage area for plant and material ■ workshops ■ parking These sites would be similar to main compounds but are smaller and generally not used for the full duration of construction, as they would be needed for specific works within a section. Once those works are complete, the satellite compounds would be demobilised.
Welfare site	Localised facilities along the route: ■ site agent office ■ welfare facilities These sites would be smaller than satellite compounds and would be located where required. They would provide basic facilities (such as a welfare cabin and toilets) and would be set up and taken down as necessary.

Table 2-3 below provides a summary of the identified compounds, their type and proposed total areas. Hardstanding – as in the fourth column of the table – refers to the proportion of each compound where the ground would be resurfaced to make it ready for vehicles to park there.

Table 2-3 Construction compound names and areas

Compound name	Project construction area	Compound type	Approximate area of hardstanding (m^2)	Approximate total area of compound (m^2)
Marling Cross Compound	Area A	Main	3,000	3,000
A2 Compound	Area A	Main	27,000	50,000
Southern Tunnel Entrance Compound	Area B (south)	Main	44,000	1,635,000
A226 Gravesend Road Compound	Area B (south)	Satellite	20,000	55,000
Milton Compound	Area B (south)	Satellite	3,400	32,700
Northern Tunnel Entrance Compound	Area B (north)	Main	614,000	2,695,000
Station Road Compound	Area C	Satellite	26,000	347,000
Brentwood Road Compound	Area C	Main	33,000	45,000
Stanford Road Compound	Area C	Satellite	21,000	110,000
Long Lane Compound A	Area C	Satellite	4,000	5,000
Long Lane Compound B	Area C	Satellite	0	42,000
Stifford Clays Road Compound West	Area C	Satellite	8,000	15,000
Stifford Clays Road Compound East	Area C	Main	11,000	40,000
Mardyke Compound	Area D	Satellite	20,000	67,000
Medebridge Compound	Area D	Satellite	13,000	30,000
M25 Compound	Area D	Main	17,000	33,000
Ockendon Road Compound	Area D	Satellite	22,000	220,000
Warley Street Compound	Area D	Satellite	13,000	33,000

In the first map below, we show the locations of the construction compounds in sections A and B. In the second map, we show their locations in sections C and D. In each case, we also show the route alignment and construction access routes.

Figure 2-13 Construction compounds: Sections A and B

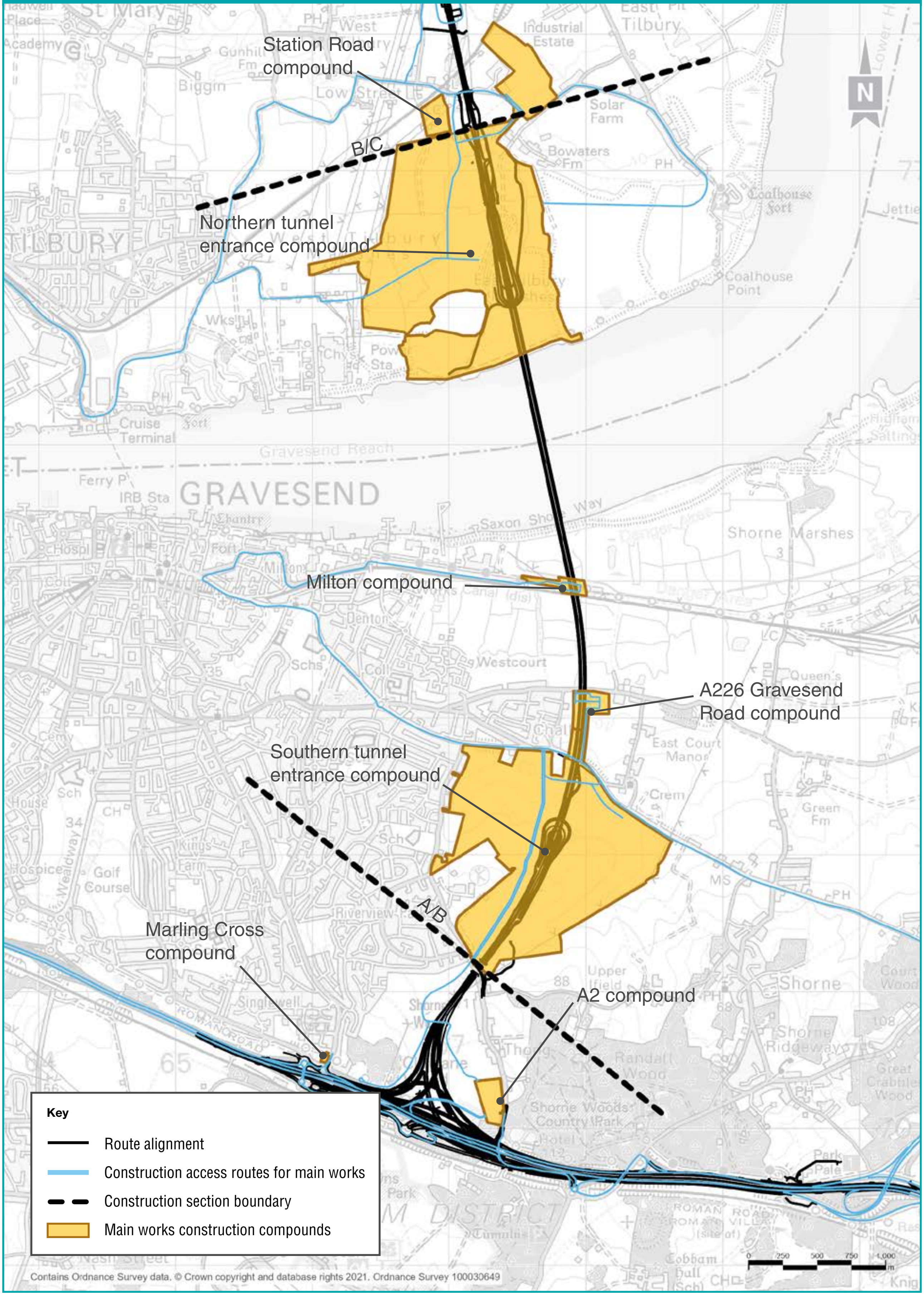
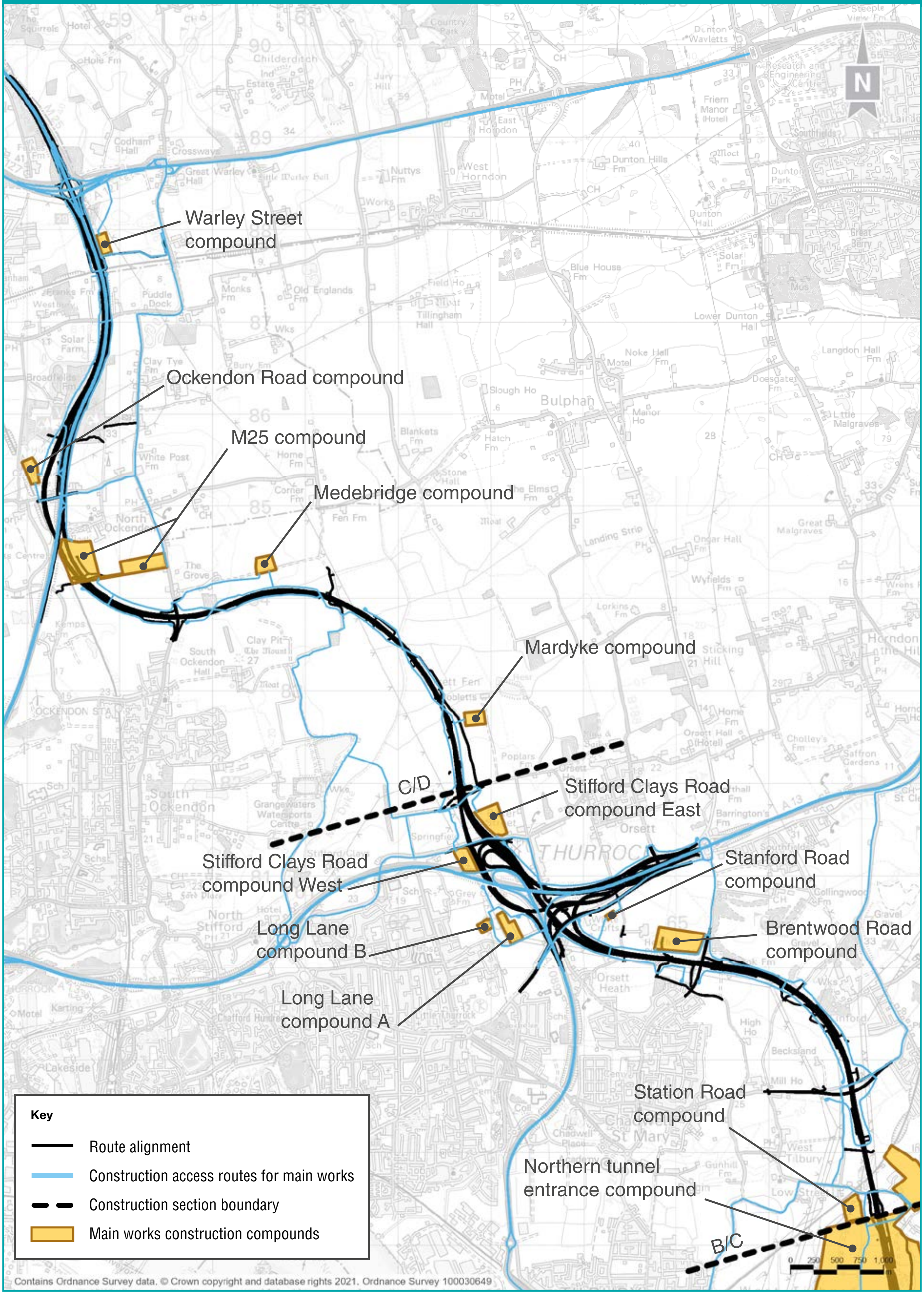
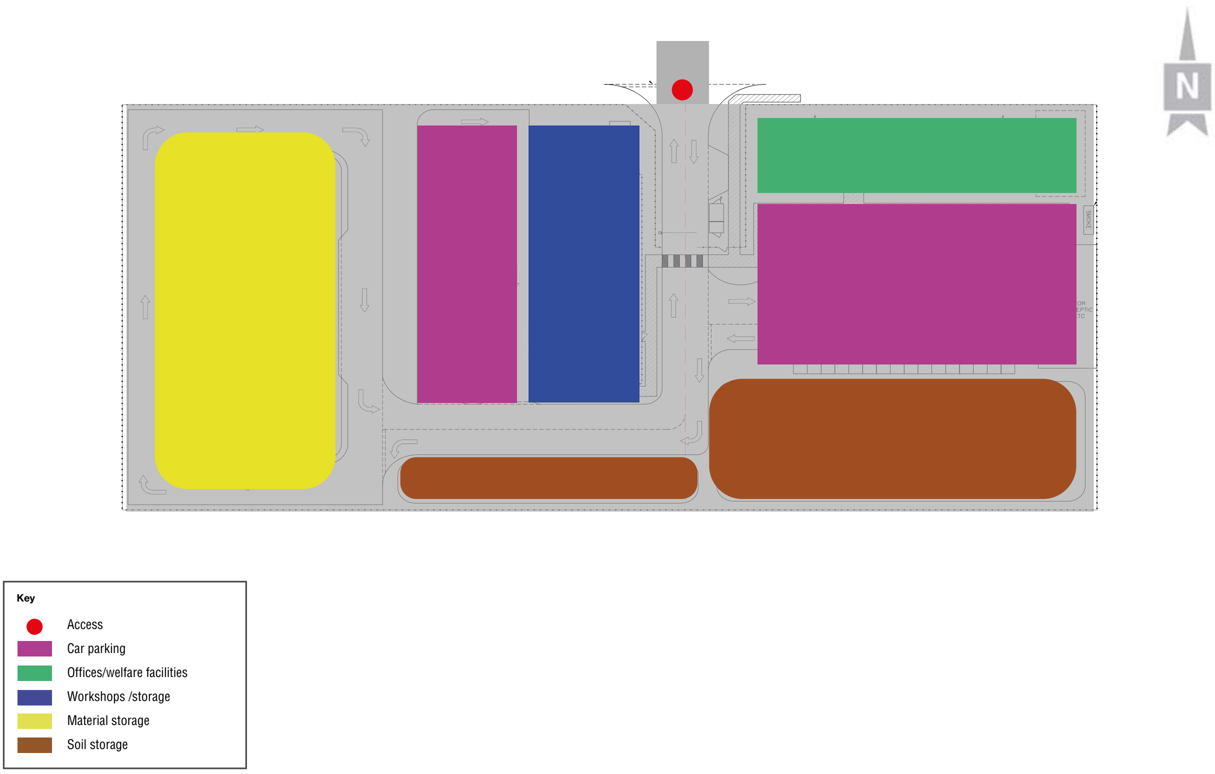


Figure 2-14 Construction compounds: Sections C and D



The figure below provides an indication of how a typical construction compound would be laid out, with space allocated for different functions.

Figure 2-15 Construction compound indicative layout



2.7 Utility Logistics Hubs

Specific utility works would need temporary compounds, known as Utility Logistics Hubs (ULHs).

The ULHs would receive, store and distribute the plant machinery and materials for specific utility works. They may include offices, welfare facilities, refuelling stations, security hubs, vehicle/wheel washing sites and parking areas similar in size to the main works satellite compounds. Some ULHs would be bigger than the satellite compounds to accommodate materials storage for the work and space for depositing and picking-up materials safely.

As the ULHs would only be needed for specific utility works, they would operate for shorter periods within the overall construction programme. Once the specific works are completed, the ULHs would be dismantled. Areas of land that would be temporarily needed during construction would be reinstated to their previous condition, where possible, on completion of construction.

The two maps below show the locations of the ULHs in sections A and B (the first map) and in sections C and D (the second map), along with the route alignment and construction access routes.

Figure 2-16 Utility Logistics Hubs: Sections A and B

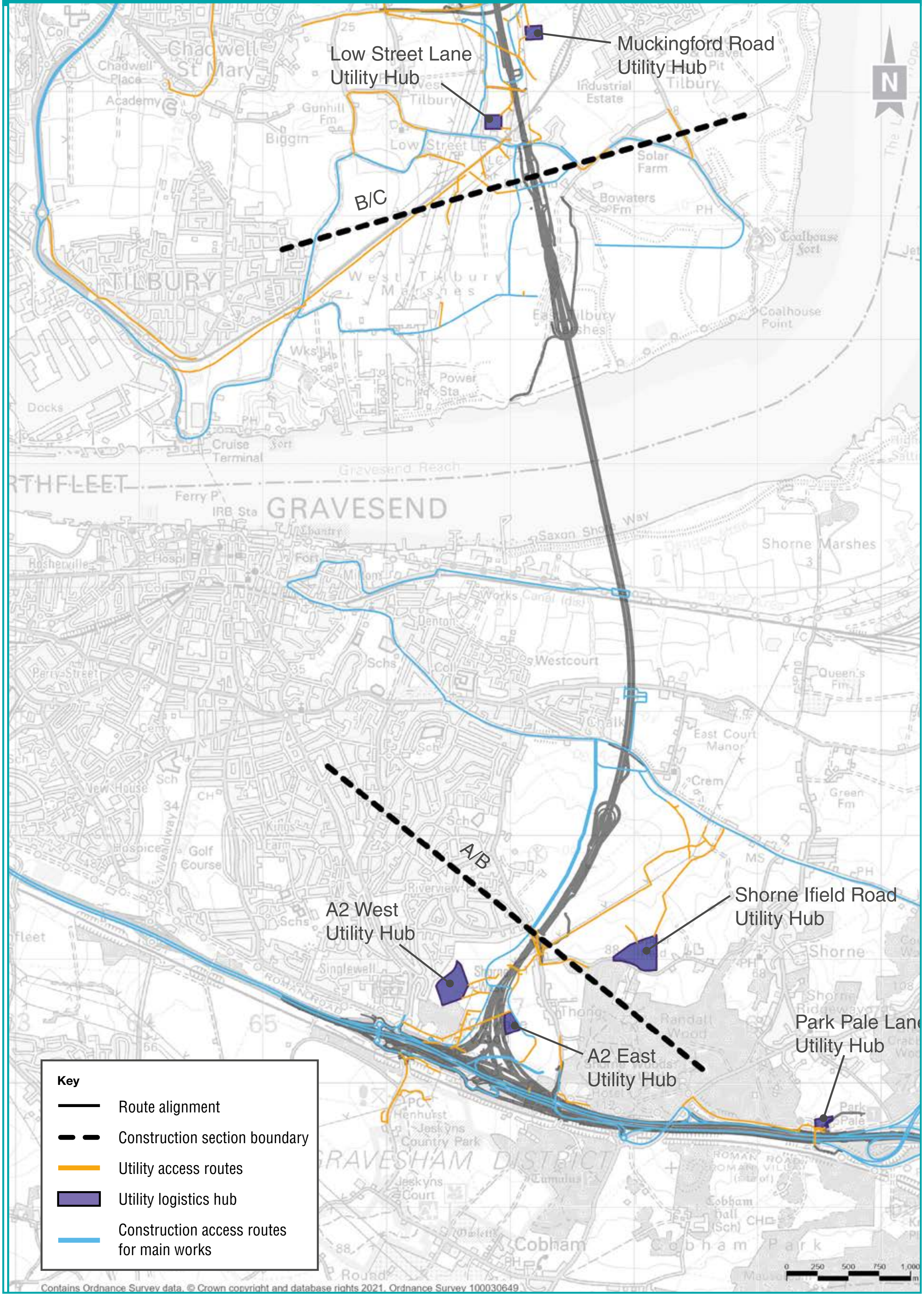


Figure 2-17 Utility Logistics Hubs: Sections C and D

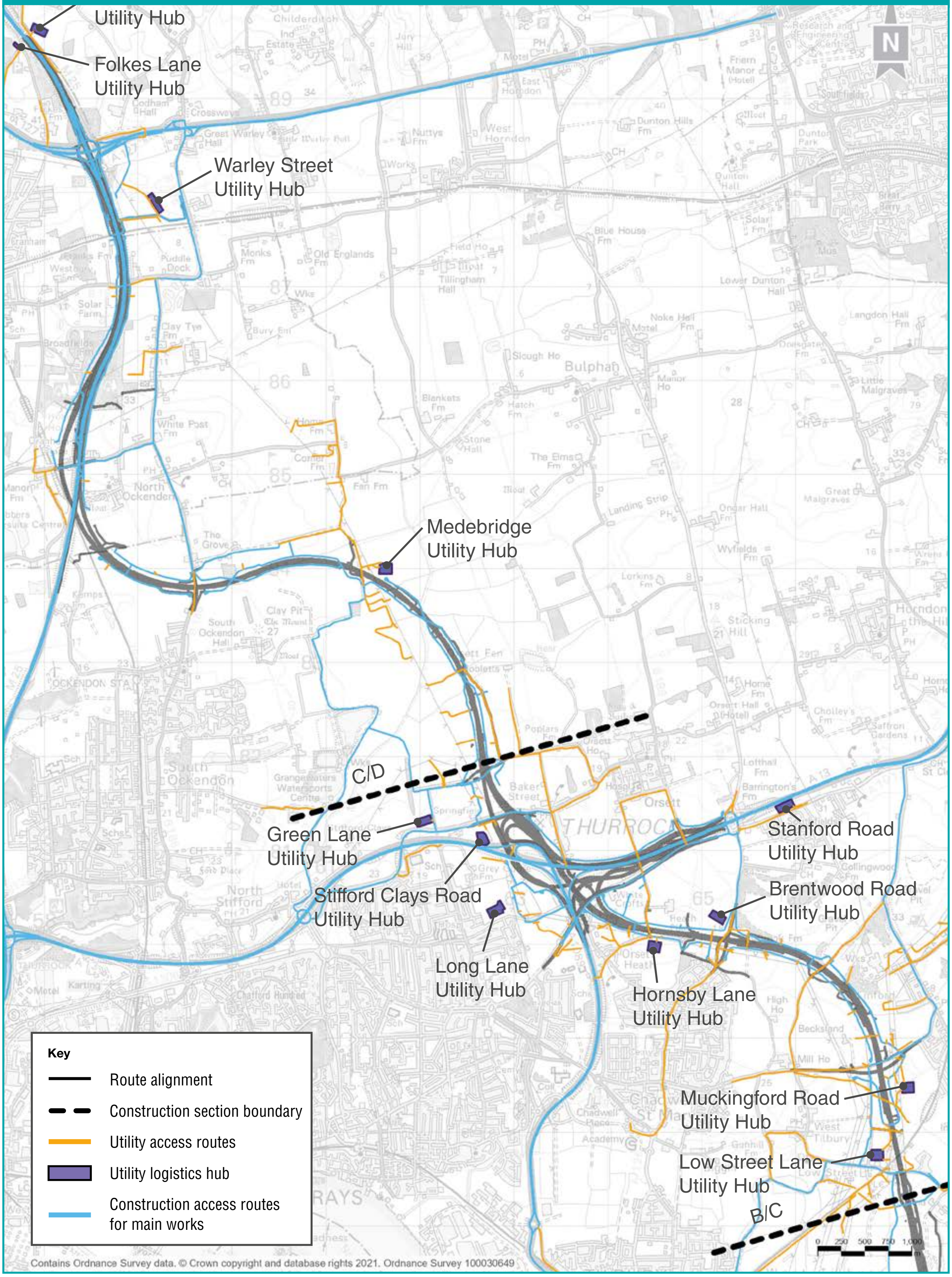


Table 2-4 below sets out the details of all planned Utility Logistics Hubs across sections A – D.

Table 2-4 Utility Logistics Hubs

Section	ULH name	Utility company	Specific works	Size (m^2)	Duration required (months)
A	Park Pale Lane	Southern Gas Networks	Gas pipeline diversions: Marlin Cross to Park Pale	9,400	15
	A2 East	National Grid Electricity Transmission	Overhead electricity network modifications: south of HS1 to the A226	15,600	24
	A2 West	National Grid Gas	Gas pipeline diversions: Claylane Wood to Thong Lane	52,700	24
	Shorne Ifield Road	National Grid Gas	Gas pipeline diversions: Claylane Wood to Thong Lane; and Thong Lane to the A226	60,800	24
C	Low Street Lane	National Grid Electricity Transmission	Overhead electricity network modifications: East of Tilbury to north of Linford	14,300	13
	Muckingford Road	National Grid Electricity Transmission	Overhead electricity network modifications: East of Tilbury to north of Linford	14,300	13
	Brentwood Road	Cadent	Gas pipeline diversion: Brentwood Road	13,200	12
	Hornsby Lane	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke to Hornsby Lane	14,300	33
	Long Lane	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke to Hornsby Lane	18,000	33
	Stifford Clays Road	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke to Hornsby Lane	13,300	33
	Stanford Road	Cadent	Gas pipeline diversion: A13 Junction	14,800	26
	Green Lane	Cadent	Gas pipeline diversions: A13 Junction and Green Lane	13,200	26

Section	ULH name	Utility company	Specific works	Size (m²)	Duration required (months)
D	Medebridge	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke	14,300	33
	Folkes Lane	Cadent	Gas pipeline diversion: M25 Folkes Lane	2,100	12
	Warley Street	Cadent	Gas pipeline diversion: south-east of M25 junction 29	13,200	11
	Beredens Lane	Cadent	Gas pipeline diversion: M25 Folkes Lane	13,200	12

The two images below provide an indication of how typical Utility Logistics Hubs and overhead line compounds would be set out.

Figure 2-18 Utility Logistics Hub indicative layout

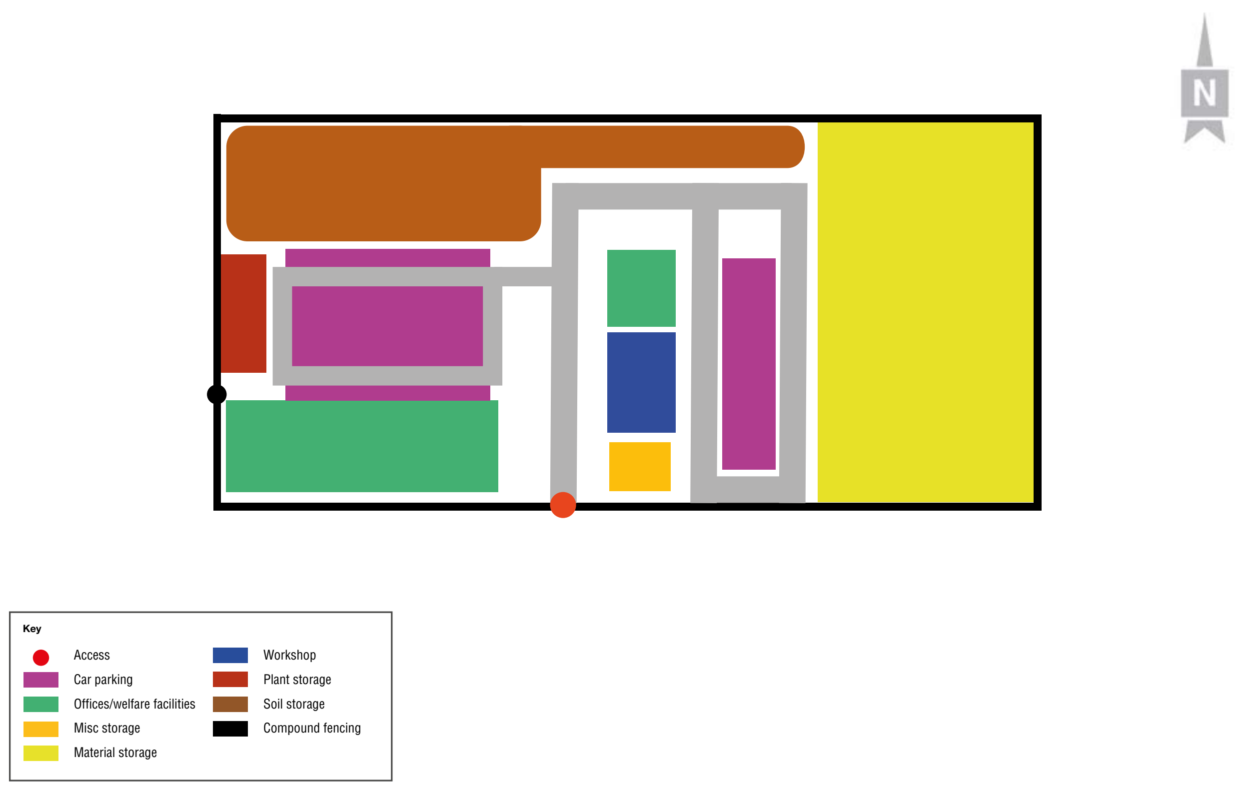
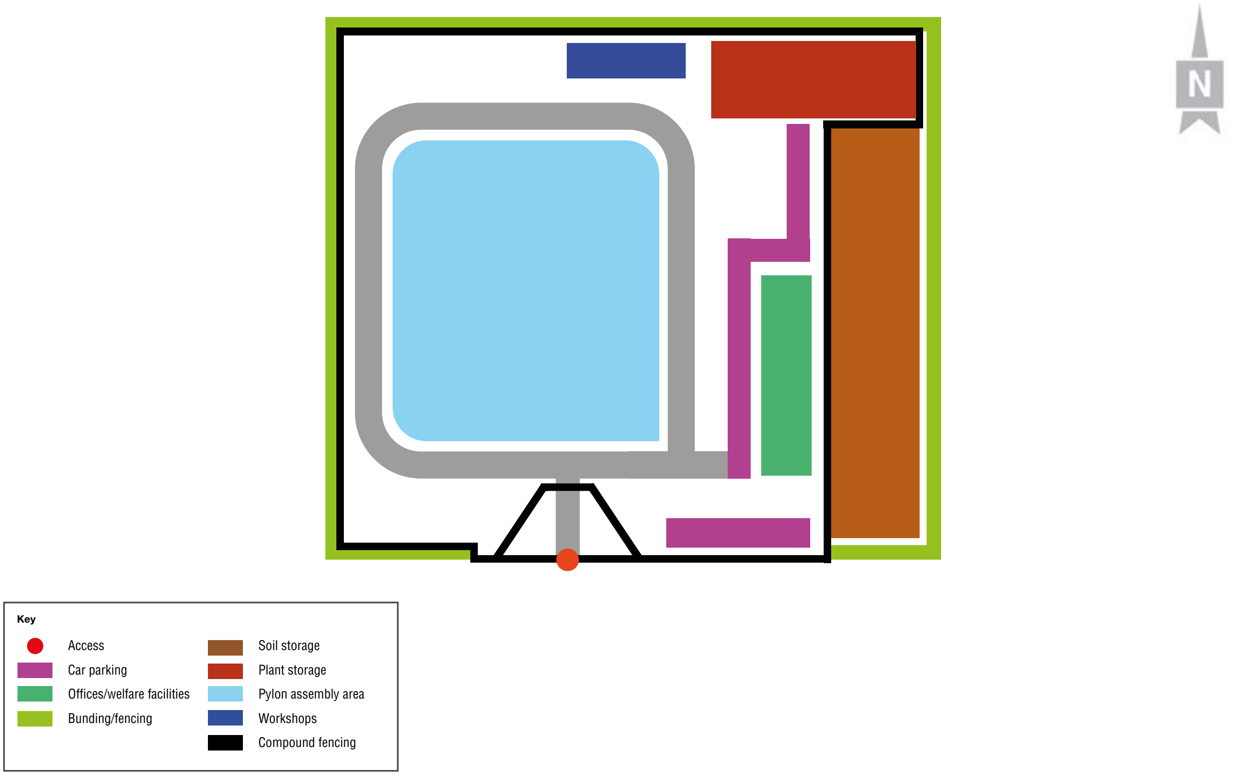


Figure 2-19 Utility Logistics Hub alternative indicative layout



2.8 Construction traffic and haul routes

Challenges and considerations

We would need a large number of vehicles and associated traffic management measures for construction, so we engaged early with relevant stakeholders (including local authorities, emergency services, local landowners and businesses) in the design development phase of the new road. We also took on board the feedback received during public consultations in 2018 and 2020, and much of this has fed into our current proposals and design.

As a result of this engagement, we made several changes in our approach to design and construction that would significantly reduce the new road's predicted impact. Some examples of these include:

- Redesigned overbridges to reduce temporary traffic management on local roads, particularly during construction and the number of closures required.
- Redesigned Lower Thames Crossing junctions (such as at the A13 and the A2) to reduce and, in some cases, remove the need for traffic management measures.
- Redesigned embankments, cuttings and landscaping to increase the potential for reusing material on site (for instance, at Chalk Park) and to cut the amount of material being brought in and out, to help to reduce construction traffic.
- Refined proposed construction methods and timings to ensure impacts to key services, such as the emergency services, are reduced. For example, Baker Street and Rectory Road would not be closed at the same time to ensure access for the public and services throughout.
- Refined the location and shape of construction compounds to reduce any effects on local communities and wider area where possible.
- Refined approach to considering local businesses and points of interest to reduce our impact on them.
- Refined land use, in some instances reducing and/or changing our proposals to meet the needs of the landowner.

Construction logistics

We would use established practices and developing technology to plan and manage the construction of the new road in ways that seek to minimise impacts on the environment and road users. Examples of these practices and technologies include:

- Consolidation – we would try to group materials on to fewer deliveries to the worksites and construction compounds where possible.
- Construction areas and compounds – would be located to support distinct works, such as the Northern Tunnel Entrance Compound or the A2 Compound. The size of the compounds would be based on forecast labour demand (both office-based and on-site), catering and welfare provision, as well as plant and material storage requirements and other factors.
- Delivery booking – a delivery booking system would plan and monitor vehicle movements. This would identify peaks in demand and address any issues in advance and would be an integral part of managing the flow of materials to the site. It would ensure we keep stocks of construction material at appropriate levels and avoid any excess, meaning space within compounds and work sites is efficiently managed.
- Multimodal transport – using a combination of road, water and rail to optimise the transport and delivery of material. The location of the construction sections and compounds provides access to ports, rail (in some locations), and the strategic road network (SRN). We would seek to reduce the number of miles travelled by vehicles using a combination of modes to transport materials efficiently to site from the main delivery terminal or depot. The Materials Handling Plan provides further information on how we would approach the transport and delivery of construction material.
- Planning – our contractors would produce Construction Logistics Plans to show how they would plan and deliver the works, materials and the personnel involved. This is a requirement set out in the CoCP.

- Vulnerable road users – we would introduce appropriate measures, in line with the following national standards, to identify and manage the risks relevant to each area of works. We would also identify what incremental improvements we can make to working practices, both on and offsite:
  - Construction Logistics Community Safety (CLOCS) – a national standard of planning the supply routing and management of sites to reduce risk to vulnerable road users. All contractors will have and maintain CLOCS champions throughout the programme.
  - Fleet Operator Recognition Scheme (FORS) – a national standard of managing vehicle fleets and driver training to reduce risk to vulnerable road users. Our contractors would be required to set out their strategy for implementing FORS silver standard or above.
  - Considerate Constructors Scheme (CCS) – our contractors would be required to sign up and adhere to the CCS, which is a national scheme promoting good practice on construction sites through its codes of considerate practice. Signing up commits registered sites to be considerate and good neighbours, respectful, environmentally conscious, responsible and accountable.
  - Driving for Better Business (DfBB) – a national standard of reducing risk to professional drivers.

Access routes and haul roads

Routes to and from the proposed Lower Thames Crossing have been considered for their suitability for HGV use and these are shown in the construction compound maps earlier in this chapter. The use of haul roads, including in the area and route where the new road would be built, would reduce the number of HGVs on public roads.

We have selected access routes for construction compounds by following the key principle of reducing the use of the local road network for construction traffic. To do this, we would maximise our use of haul roads on land within our Order Limits, provide direct links between compounds, use the SRN wherever possible (as an alternative to using local roads), and engage with local landowners and businesses to establish access via private roads. All compounds would have at least one access point, with larger compounds having more. These access points may connect directly to the public road network or via a dedicated haul road.

Establishing access routes to the works has been a continuous process, involving stakeholders and changes to our design. The key principle during development has been to reduce construction traffic on the local road network and getting this traffic to the works areas as quickly as possible.

This has been achieved by:

- early construction of temporary offline haul roads directly off the SRN where possible
- maximum use of internal haul roads to gain access to worksites
- engagement with local businesses and landowners to establish access via private roads

In addition, connecting some compounds directly to the SRN, such as the M25 or A2, would mean that fewer HGVs would use local roads, reducing the impact of construction traffic on nearby communities.

Haul roads have been proposed within the Order Limits to connect the SRN directly to the work sites where possible. While these would be built early in the construction process, construction traffic would need to use the local road network.

We would create some site access and temporary haul roads by replacing topsoil with a capping material to make them suitable for vehicles. Other haul roads would be dirt tracks.

We would also build haul roads to take very heavy deliveries, especially those associated with the tunnels. These would need foundations and surfaces capable of supporting substantial weight.

The project would require abnormal load journeys, with the TBMs being the largest. It is anticipated that the TBMs would be delivered to the heavy-lifting berth at the Port of Tilbury 2 and be transported to the Northern Tunnel Entrance Compound via a haul road built from the east of the Port of Tilbury 2.

Once the haul roads are no longer needed, we would take them out of service and any material would be either re-used onsite or removed. The land would then be reinstated using the topsoil and seeded as required. Where the landowner has requested and obtained the appropriate approvals, some haul routes could remain permanently in place.

For more information on how we would approach construction logistics, materials movement and workforce travel, please refer to the Materials Handling Plan, Outline Traffic Management Plan for Construction and the Framework Construction Travel Plan. These and other control documents are described in chapter 1 of this document.

2.9 Waste management

There are many types of waste that could be generated during construction. Where possible, waste would be reused onsite, for example, excavated material used as earthworks fill material, and concrete from demolition used as secondary aggregate. Re-using waste material would allow us to minimise the amount that would otherwise have to be recycled offsite. We would dispose of any contaminated waste at an appropriate facility.

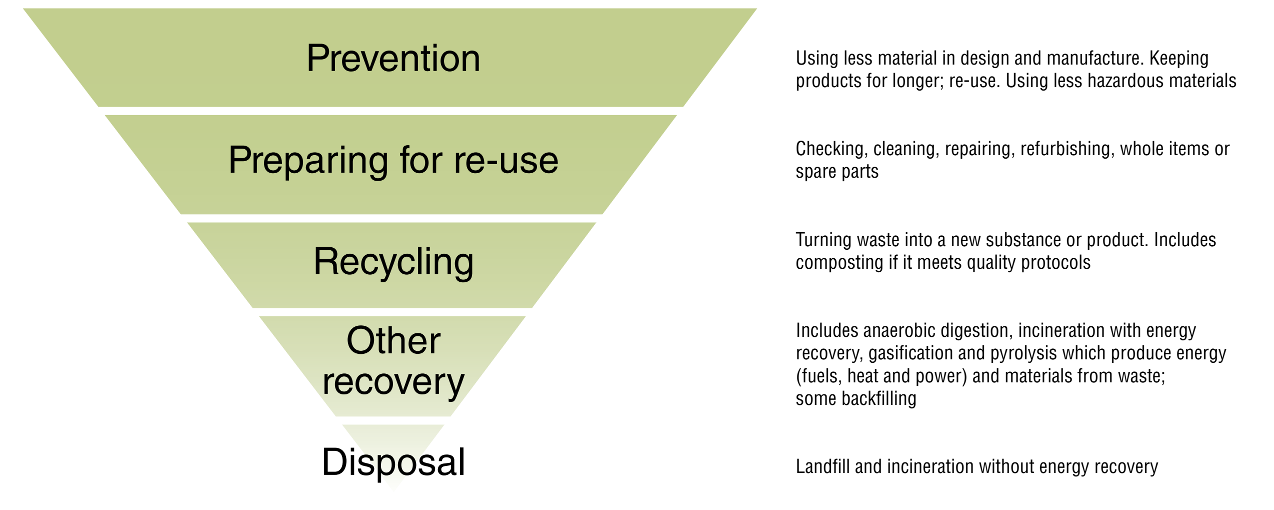
An important consideration in our planning for the construction of the Lower Thames Crossing is how to deal with the earth and rock generated from preparing the ground and excavating. Road construction projects often need to build embankments from compacted soil, so that a new road can then be built at an appropriate height. Such earthworks would be necessary for every part of the Lower Thames Crossing. We have developed a detailed understanding of how much excavated material will be generated, what we can reuse and how much we will need to remove.

Please see the Outline Site Waste Management Plan (OSWMP) for more information, including our waste forecast of the types and quantities that will be generated during construction, and whether it would be recovered, reused or diverted from landfill either within the Order Limits or offsite.

Lower Thames Crossing and the waste hierarchy

We are committed to designing out material use, reuse and sourcing of materials on site, and applying the waste hierarchy: prevention-reuse-recycle-disposal.

Figure 1-1 Waste hierarchy diagram



Waste minimisation and prevention is at the top of the waste hierarchy and focuses on avoiding the production of waste in the first place. While we cannot completely avoid producing waste, adopting certain waste practices would ensure that the overall quantity of materials not used beneficially within the Order Limits is kept to a minimum.

Throughout our design development process – from early route options assessment through to refinement of the design – we have considered the environmental impacts of our work. A continuing process has enabled design updates and improvements, informed by environmental assessment and input from the engineering teams, stakeholders and public consultation.

We would prevent waste in a variety of ways, for example:

- minimise demolition requirements
- re-using demolition materials as recycled aggregate
- retaining vegetation from site clearance for ecological mitigation works

- reducing our footprint for temporary and permanent works
- reducing the width of the carriageway while maintaining safe driving conditions
- retaining and reusing all topsoil within the Order Limits
- maximising the use of cut and fill to reduce the volume of excavated materials being moved offsite

As a result of applying the above steps, around 11 million cubic metres of potential waste has been eliminated through the design process since statutory consultation until now. This is summarised in the table below.

Table 2-5 Construction waste eliminated through project design changes

Design change	Estimated reduction (m^3)
Changes to lanes at junction 29 on the M25	11,500
Reducing the number of lanes from three lanes to two (southbound only) between the M25 and A13	15,000
Moving the south tunnel entrance 350 metres south	620,000
Retaining and reusing within the Order Limits excavated materials and treated tunnel boring machine slurry to fill and landscape (including topsoil)	10,400,000

We have selected materials for their long design life. The new road's permanent works have a 60-year life span. However, through regular maintenance the road would be expected to be in use for longer. The tunnels and bridges have been designed for an operational life of at least 120 years. This would minimise maintenance, reduce resource consumption, produce less waste and avoid the replacement of redundant equipment.

Our contractors would be set a target of 31% for importing aggregate from recycled or secondary sources, as long as engineering specifications allow this. This target takes into account the likely supply of such materials in the region.

Current calculations suggest around 23 million tonnes would be reused on site. In addition, approximately 8,000 tonnes of demolition rubble would be generated and reused. The contractors are expected to re-use 70% of this waste, as some demolition material may contain asbestos, which cannot be re-used.

Please see the Materials Handling Plan for more information on how material would be transported within the construction site and offsite.

Clearing the route and construction compounds of vegetation would produce about 26,000 tonnes of green material and we propose to use this for ecological and landscaping purposes, such as the use of dead wood to promote invertebrate interest or chipped vegetable matter as a mulch.

Northern tunnel entrance and excavated material

The earthwork operation at the northern tunnel entrance would involve handling more than 2.1 million cubic metres of excavated material including material generated from our two TBMs.

The site is located on and adjacent to Goshems Farm, a historical landfill site between the north tunnel entrance and the Thames. It is currently managed by Ingrebourne Valley Limited (IVL) as part of a restoration project to raise the land and restore it back to high quality, arable farmland. IVL has been receiving excavated material from several major infrastructure projects in London for around five years and operates the existing permits associated with these sites.

The DCO would authorise IVL to receive our material and it will use the land parcel, known as Shed Marsh, to temporarily store and manage excavated material generated from the northern tunnel entrance. IVL will work with the appointed contractor to handle and place material to form a landscaped feature named Tilbury Fields as part of our proposed design.

The Tilbury Fields landscape feature will be situated on Goshems Farm and we anticipate the works would happen at the same time as tunnelling and north tunnel entrance construction works, as material becomes available.

We would transport all the excavated material (excluding any contaminated material) from the northern tunnel entrance on heavy duty construction vehicles using haul roads that we will build for that purpose.

2.10 Working hours

Throughout the construction programme, with the exception of the tunnel activities, normal working hours are proposed to be 7am to 7pm on weekdays and 7am to 4pm Saturdays, plus up to one hour before and after for start-up and close down procedures. Working hours for certain activities (including earthworks) would be up to 10pm on Monday to Saturday.

For the tunnelling construction activities, including the build of the ground treatment tunnel, we would carry this out underground on a continuous 24/7 basis. Additionally, main supporting activities, such as handling excavated material, slurry treatment, pumps, ventilation fans, cranes, compressors and site security would operate and be maintained on a continuous 24/7 basis.

Some works, such as utility works, earthworks and ecological works are dependent on agreed outages, weather conditions and seasonal variation. In these circumstances, it may be necessary for our contractor to seek an extension to the normal working hours. Extensions to working hours would need to be agreed before works begin.

Proposed working hours are detailed in the CoCP.

2.11 Monitoring

Our project would include various types of monitoring during construction and for an appropriate time following the opening of the new road. The REAC identifies the required monitoring as well as appropriate time spans. Examples that would be carried out are:

- noise and vibration monitoring at agreed sites to make sure the proposed mitigation measures work effectively
- regular onsite and offsite inspections to monitor dust
- monitoring of protected species and important habitats during construction to identify and/or adjust any mitigation measures, subject to Natural England licence
- monitoring of translocated wildlife habitats, with further surveys to monitor botanical diversity and habitat condition once the road opens

Our Framework Community Travel Plan (FCTP) sets out how the implementation and operation of the plan would be monitored, reviewed and evaluated to achieve its aims and objectives.

2.12 Worker accommodation

The Lower Thames Crossing would create jobs for construction workers, many of whom will commute from home. However, the project would also provide temporary sleeping accommodation at the Northern Tunnel Entrance Compound (see chapter 4 for more information). It is acknowledged that the project would stimulate demand for construction workers who may require sleeping accommodation in the local area. Highways England has made an assessment of the impacts of the project on the local accommodation market, and concludes that there is sufficient capacity through a combination of private rented properties, visitor accommodation such as hotels, and owner-occupied homes.

Nevertheless, Highways England would employ measures to reduce the impact on the local accommodation market and associated social services. Highways England and its contractors would implement travel plans to encourage sustainable travel from home. We would also help workers to find accommodation and is considering an accommodation helpdesk to align need with supply, therefore benefiting local accommodation providers and the local economy.

3

Section A – Roads in Kent

3.1 Overview

This chapter sets out the approaches likely to be used by our appointed contractors to build Section A, which is to the south of the project, and includes, the northern Thong Lane green bridge, which would pass over the Lower Thames Crossing. There would be a second green bridge further south on Thong Lane.

Our Ward impact summaries provide more specific details on the construction process, its impacts and mitigations for Section A. The Outline Traffic Management Plan for Construction (OTMPfC) provides further information on our temporary traffic management proposals. Chapter 7 of the Construction update focuses on project-wide information on the impacts across a number of environmental topics, such as air quality and cultural heritage.

To see how our plans for the Lower Thames Crossing have developed following consultation and feedback, please refer to our You said, we did document.

We have divided the construction of Section A into the following sub-sections. Some, such as initial works, utility works, and testing and commissioning would happen across all of Section A. The remaining sub-sections describe works that would take place in a specified zone, as shown in figure 3.1 below.

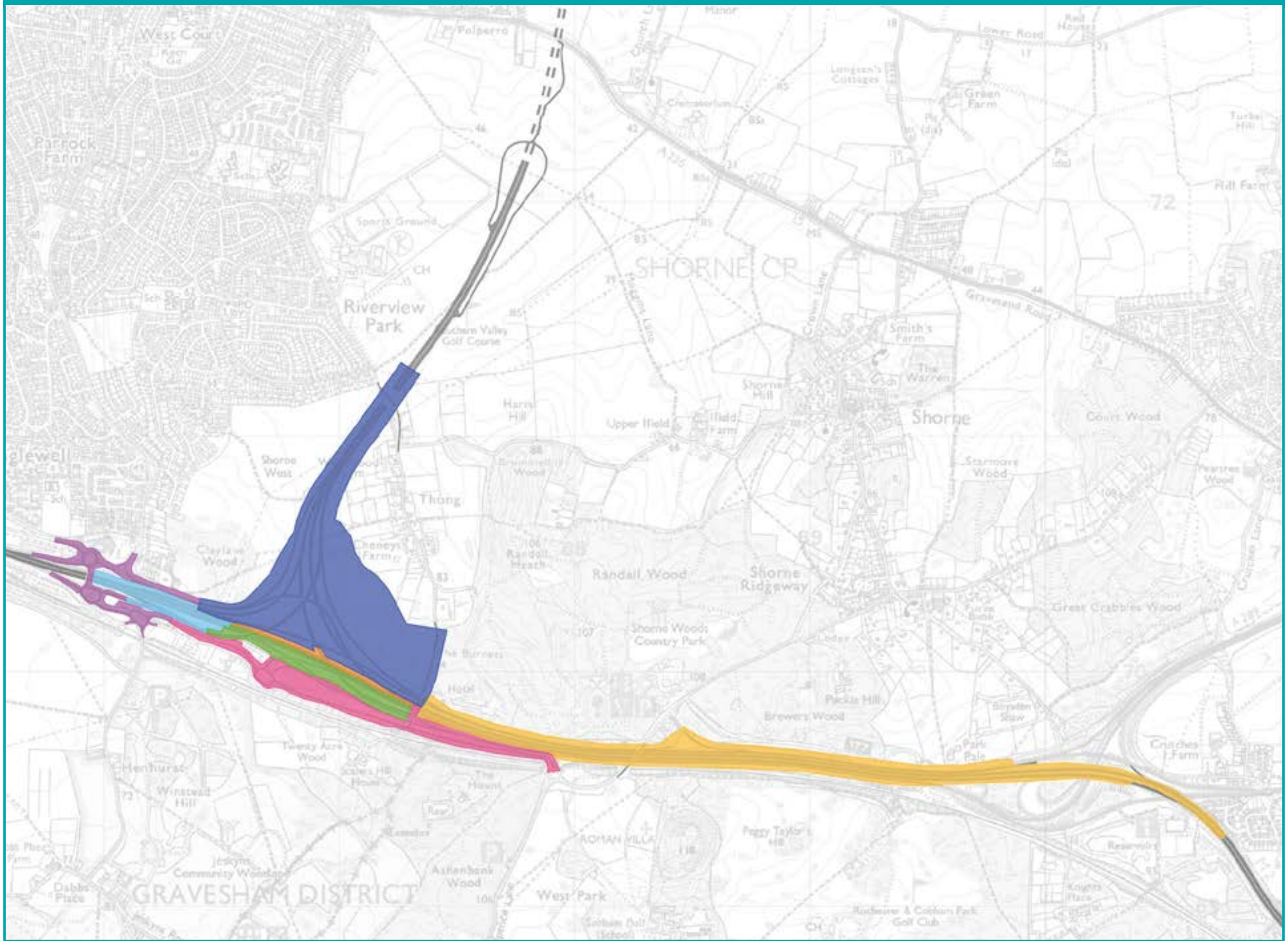
- initial works, including environmental mitigation
- utility works
- offline works north of A2/M2 – zone 1
- Gravesend East junction – zone 2
- connector roads around the A2/M2 – zone 3
- A2/M2 corridor works – zones 4, 5, 6 and 7
- testing and commissioning

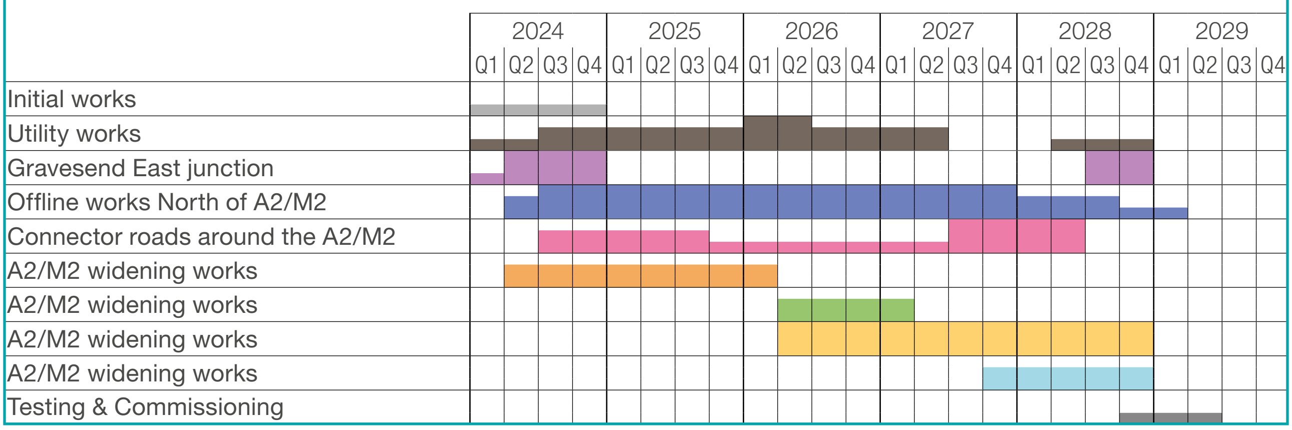
Each sub-section of work is described in more detail later in this chapter.

Offline works

These are works that would take place away from the existing road network and do not directly affect it.

Figure 3-1 Section A construction zones and timeline





3.2 Timeline

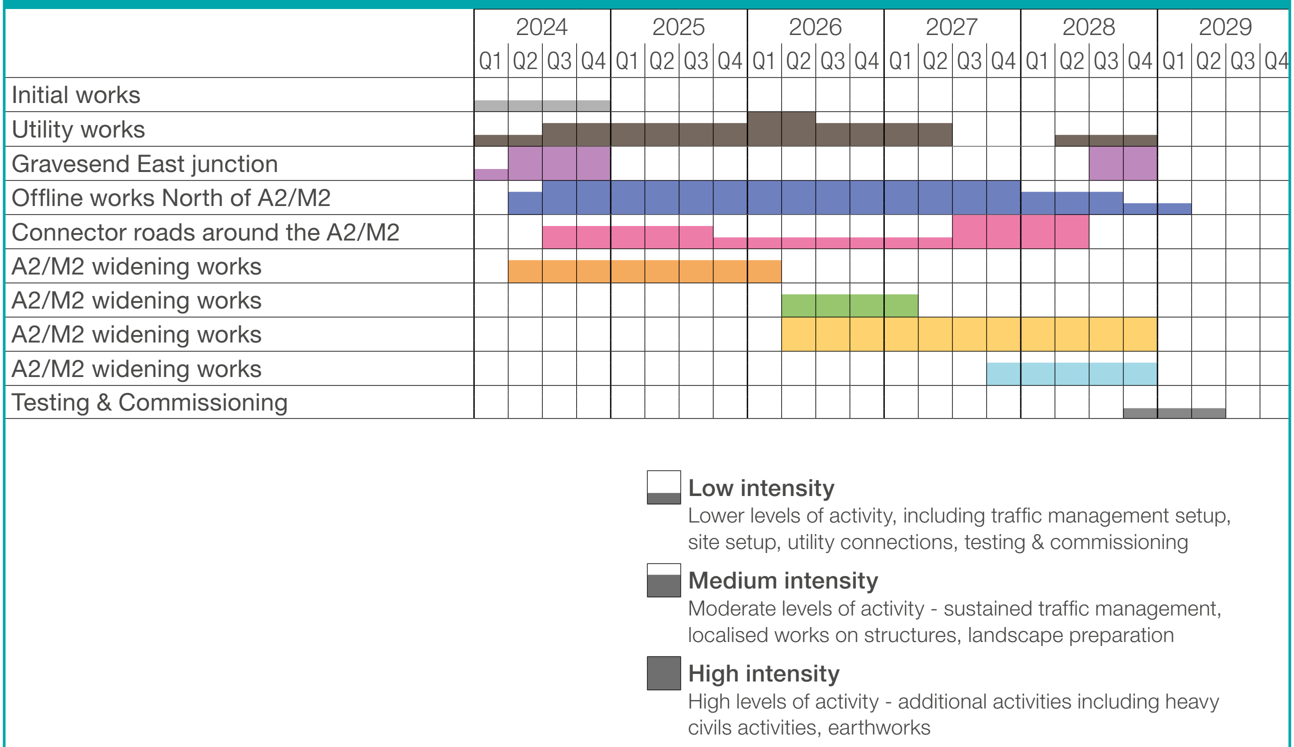
Figure 3-2 below provides an indicative timeline for each of the sub-sections listed above, including details of periods of low, medium and high intensity activity.

Lower levels of activity would include traffic management setup, site setup, utility connections, testing and commissioning.

Medium levels of activity would include sustained traffic management, localised works on structures, and landscape preparation.

High levels of activity would include heavy civil engineering activities and earthworks. These timelines are indicative and would be confirmed later, once contractors are appointed to carry out the works and our detailed design of the new road is further developed.

Figure 3-2 Section A construction zone timeline



3.3 Initial works

Introduction

Our initial works are those that prepare the site and the compounds for the main construction activity. They would include:

- The early stages of ecological mitigation, such as preparing habitats and moving species (this would continue through later phases of construction)
- Securing the site, including diverting or closing temporary public rights of way
- Constructing the main works compounds, including utility connections

Timing

Most activities related to our initial works would last around one year, with construction due to begin early in 2024.

Description of works

Ecological mitigation

During our initial works, the main ecological mitigation would be preparing habitats and moving existing species into these new habitats and suitable retained habitats. For more information about creating new habitats, refer to chapter 2, which has been published as part of this consultation.

In Section A, we would create open grassland and scrub habitats, together with new ponds, east of the northern Thong Lane green bridge. This would help to support reptiles and amphibians including great crested newts. Where the woodland along the A2 is affected by the new road, animals would be moved into woodland north of this, and around the Inn on the Lake.

As a result of the project, an air-raid bunker in Shorne Woods Country Park which is home to a bat hibernation roost would be lost. To offset this, a replacement structure would be put in place between Shorne Woods and Great Crabbles Wood. These habitats are similar to those in which the original structure is located. The works for establishing habitats and moving species are unlikely to affect nearby communities such as Thong or leisure users in Shorne Woods Country Park.

Securing the site, including public rights of way

During the initial works, our appointed contractors would put up fencing around areas within the Order Limits that could present a risk to the public during construction. In some cases, these areas may include compounds or sections of compounds. Environmentally sensitive areas that need to be separated from the public or construction works would also be fenced off.

Site-specific security risk assessments would be carried out to determine the type of perimeter fencing or hoarding to be installed.

We would ensure that hoarding and other materials used are appropriate to the location and to the activities within the compound/worksite that may affect noise levels at the boundary.

Fencing would be used in areas of low security risk to reduce the visual impact on the environment and aid security patrol management of the area. Heras fencing (mesh fencing) may be used as a temporary measure to secure a site or adapted site boundary before installing permanent hoarding, or when demobilising from an area.

We would erect hoarding to the boundary of higher-risk activity sites or where visual screening is required. Hoarding would typically be 2.4 metres high but could be higher in the highest security risk areas.

Find out more

The Code of Construction Practice (CoCP) provides more information on the control measures for site fencing and hoarding.

Any public rights of way, such as footpaths or bridleways, affected by works would also be made safe. This would involve creating diversions or using temporary closures. Some public rights of way would be closed permanently and replaced by new ones during the construction period or once the new road is complete.

For more information about how public rights of way in Section A would be affected during construction, please refer to our Ward impact summaries. These summaries cover impacts associated with construction and operation of the new road, information on how routes for walkers, cyclists and horse riders would be affected in each local area, and how we are proposing to mitigate them. More information is also provided in the Operations update.

Before any work takes place, we would share with local communities how their public rights of way could be affected. More information on this process is provided in the CoCP, which is included in this consultation.

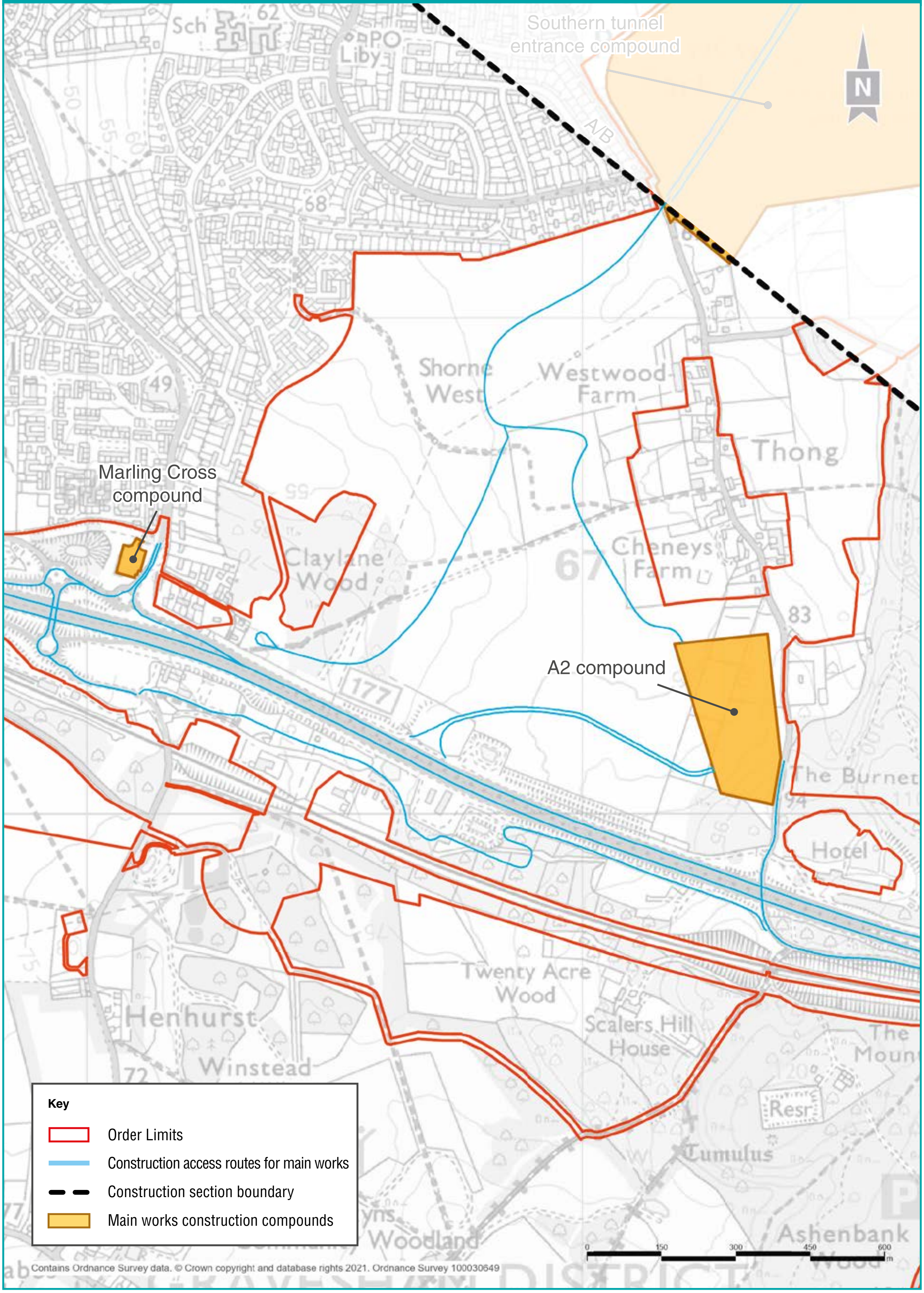
Haul roads

As part of the initial works, we would create a network of haul roads connecting compounds with work areas. Haul roads are temporary roads constructed within the Order Limits that are used for the movement of construction vehicles, including HGVs, around the construction site. These temporary roads would provide access for construction vehicles along the Lower Thames Crossing route and link roads to reduce the need for construction traffic to use local public roads. Please refer to the large-scale construction maps that accompany this consultation for details of the layout of haul roads.

Construction compound set-up

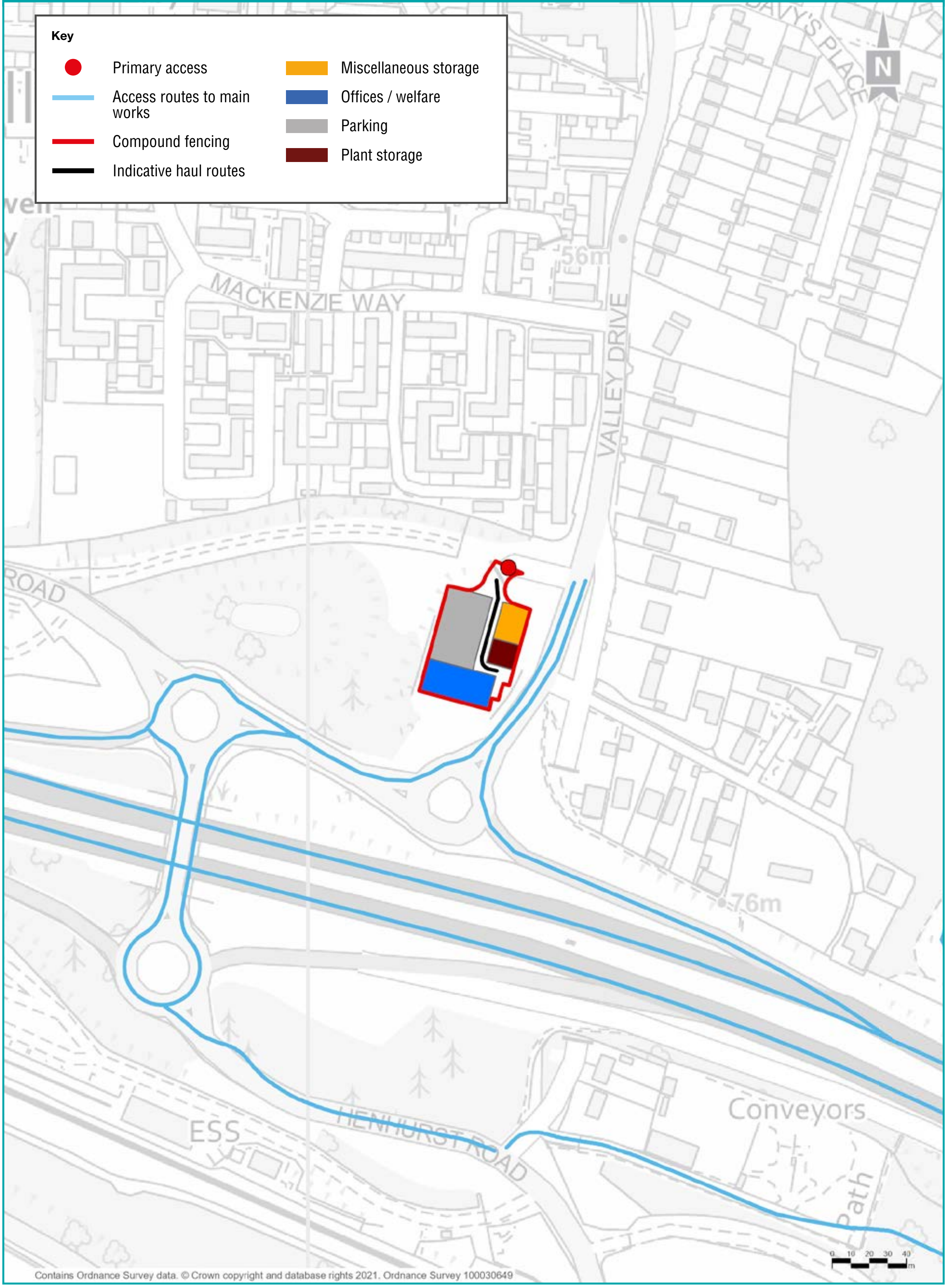
There are two proposed construction compounds in Section A: one to support the Gravesend East junction works, and a second near Thong Lane, to serve the other construction sub-sections in Section A. These are shown in Figure 3-3 below.

Figure 3-3 Section A construction compounds and access routes



Marling Cross Compound

Figure 3-4 Marling Cross Compound indicative layout



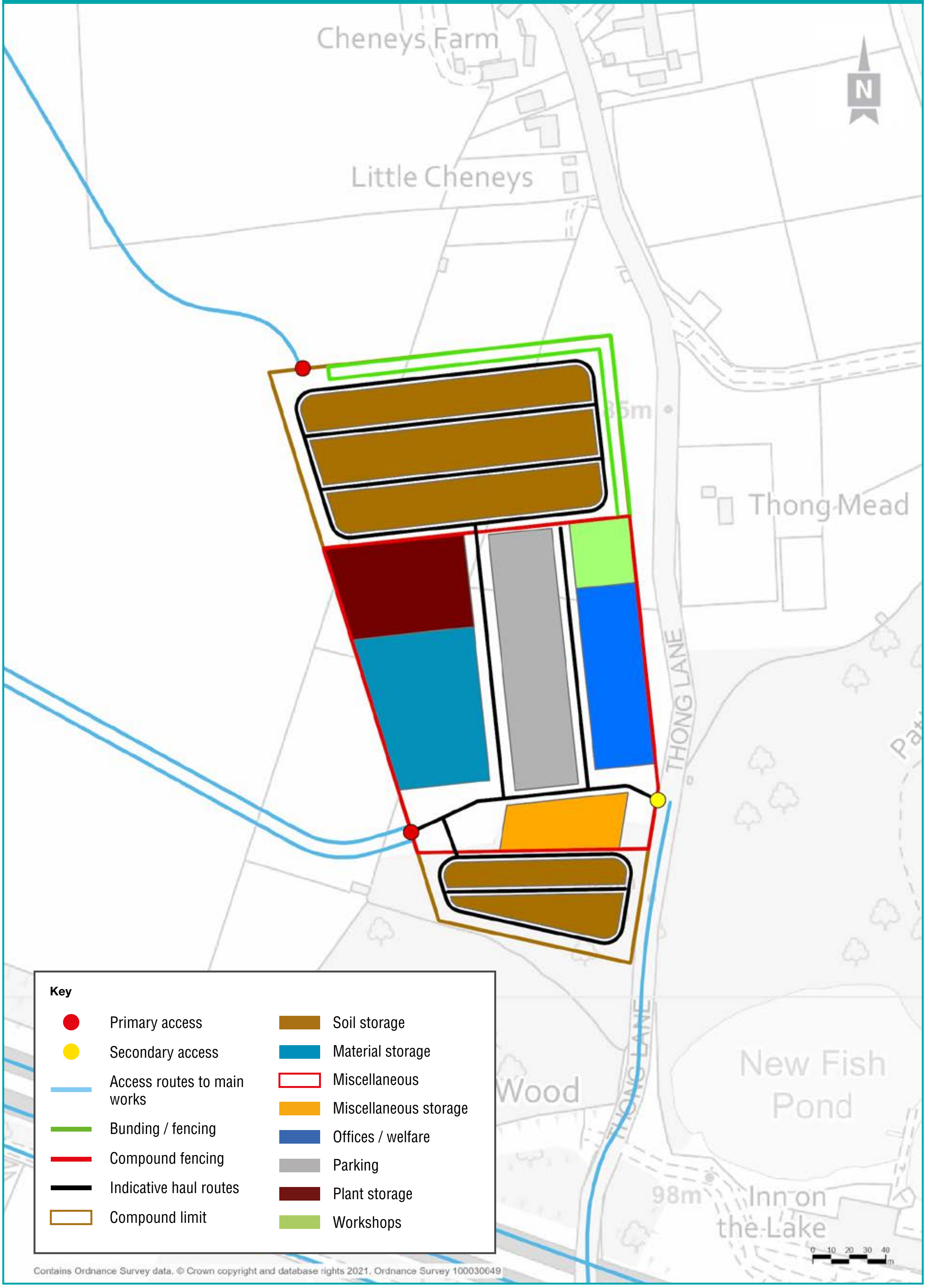
Our compound at Marling Cross, near the Gravesend East junction, is around 0.3ha in size and situated on land owned by Highways England. The compound already exists and has been used as a base for personnel carrying out pre-construction investigative works for the new road, such as archaeological and environmental surveys. The compound's facilities would be repurposed during our initial works to accommodate more staff and provide additional space. The existing utility connections from Valley Drive, which include a small substation on the edge of the compound, would be adequate.

We would use the compound to support the works needed to build the Gravesend East junction. The site has a two-metre high boundary fence with security cameras around its perimeter, and the existing access via Hever Court Road would remain during construction

This compound would have hardstanding with a tarmac surface throughout. Space would be provided for car parking, offices and welfare facilities, as well as storage for equipment and materials. It would be visually shielded from nearby properties by existing vegetation, and no noisy activities (such as piling) would be expected to take place here. As a result, additional noise mitigation features would not be necessary.

A2 Compound

Figure 3-5 A2 Compound indicative layout



This compound would be used for the main construction work for Section A, apart from the Gravesend East junction works (see Marling Cross Compound above). It would act as a hub for deliveries and logistics, as well as checking and storing materials and equipment. The compound would be in place for the construction of Section A, which is planned to last around five years.

The compound would need electricity, communications, water and sewerage and be connected to existing utilities near the Inn on the Lake. It would include a temporary electricity substation to provide power. We would need to connect the utilities under Thong Lane, which could cause temporary traffic disruption for up to a month. See the Ward impact summaries and the OTMPfC for more information about how our traffic management measures south of the Thames would minimise disruption.

Around half of the compound would be used for car parking, materials and equipment storage, offices and welfare facilities, and workshops. The remainder would be used for soil storage up to five metres high. Any construction compound facilities greater than five metres in height would be located as far as possible from nearby residential properties on Thong Lane and from the Kent Downs Area of Outstanding Beauty. Our contractor would carry out a risk assessment to establish whether the area set aside for soil storage should be fenced or not.

To reduce the visual and noise impacts on nearby Thong village, we would construct a three-metre high bund, or barrier made of compact earth, along the north-east boundary of the compound. This would remain while the compound is operational.

The main access to the site for works vehicles, including HGVs, would be via the eastbound A2. From here, vehicles would use an eight-metre wide, two-way haul road. Existing access on the north side of the A2, which used to be part of the former Esso petrol station, would be adapted.

There would be a secondary access on Thong Lane. HGVs would use the A2 as their primary access rather than driving through Thong village. Thong Lane would, however, be available to worker traffic which would mostly consist of cars and vans. For more information about the impacts of works on local roads, including Thong Lane, see the Ward impact summaries and the OTMPfC.

To create access for staff to the compound, works would be needed along Thong Lane and a rolling contraflow would be put in place. This means that instead of having the entire length of road under contraflow conditions, shorter 200-metre sections would be used and relocated as our works progress. We expect the contraflow system to be in place for one month, which would also assist with our utility connections to the compound.

The Marling Cross Compound would be accessed via Gravesend East junction and Valley Drive. The A2 Compound would be accessed directly from the A2 eastbound.

There would also be a haul road crossing Thong Lane, close to the south-eastern limit of Riverview Park, where temporary traffic lights would be needed.

3.4 Utilities works

Introduction

Construction of the Lower Thames Crossing would require changes to existing utilities. These include overhead power lines and underground utilities such as gas and water pipelines, and telecommunications cables.

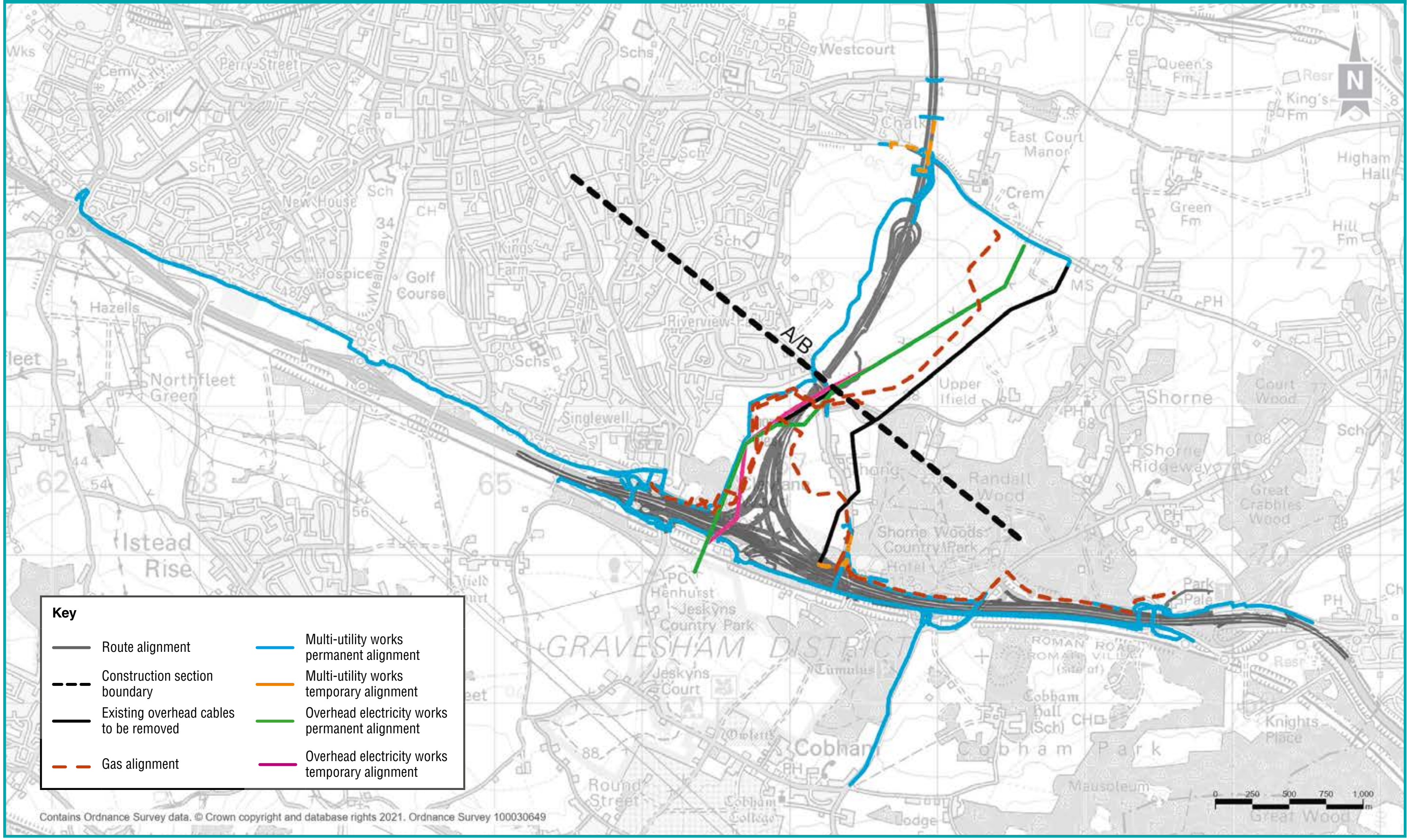
Our proposals for utilities works in Section A have evolved during the project's design and development. We have been working closely with the utility companies to significantly reduce the environmental impacts and shorten the duration of the works.

To make sure the main works compounds operate efficiently, temporary connections to the utility networks are required. Where possible, these works will take place at the same time as other highway works or permanent utility diversions to minimise the impact on the local communities. These connections would be removed at a later date as part of the compound demobilisation.

Timing

We would expect work to begin on the utility networks at the start of construction for Section A, and continue for up to five years. We do not expect local communities to experience any change in their supply of utilities, including water, power and access to broadband services as a result of these works. Towards the end of the construction programme, we would remove any temporary connections and, where appropriate, reinstate the land to its previous condition.

Figure 3-6 Map of utility works in Section A and Section B (south of the river)



Description of works

In addition to the main works compounds outlined earlier, there would be four temporary Utility Logistics Hubs (ULHs) south of the River Thames, as set out in table 3-1 below and the map provided in chapter 2. Each would be set up by the relevant utility company to allow specific works to be carried out in the area.

Table 3-1 Utility Logistics Hubs south of the river

Utility Logistics Hub	Utility company	Works	Approximate area (m^2)	Access	Indicative duration
Shorne Ifield Road Utility Logistics Hub	National Grid Gas	Gas pipeline diversions: Claylane Wood to Thong Lane; Thong Lane to the A226	60,800	A226 Gravesend Road	24 months
A2 West Utility Logistics Hub	National Grid Gas	Gas pipeline diversions: Claylane Wood to Thong Lane	52,700	A2	24 months
A2 East Utility Logistics Hub	National Grid Electricity Transmission	Overhead electricity network modifications; south of HS1 to the A226	15,600	A2	15 months
Gas pipeline diversions: Marlin Cross to Park Pale	Park Pale Lane Utility Logistics Hub	Gas pipeline diversions: Marlin Cross to Park Pale	9,400	Park Pale	15 months

The ULHs and, where appropriate, the main works compounds would serve the major utility diversions south of the Thames. Each of these is summarised below.

Any traffic management that would be required to the compounds and the utilities works outlined below is described in the Ward impact summaries and the OTMPfC.

National Grid gas diversions near the A2/M2

National Grid has two gas transmission pipelines which would need to be diverted. One of the pipelines would be diverted in two separate locations. These would consist of around 0.12km in length at the Claylane Wood area and 2.7km from the west of Thong Lane to the A226. Each part of this diversion is identified as being a Nationally Significant Infrastructure Project (NSIP) in its own right, as a result of the specific nature of the work.

The other pipeline diversion would be around 1.6km in length and run from the east of Claylane Wood to Shorne Ifield Road, passing beneath Thong Lane and the nearby Lower Thames Crossing.

We would lay the majority of the pipeline diversions using normal open cut trenching techniques. However, due to the small footprint of land to the west of Thong Lane, the only option to install the pipelines safely and efficiently is to excavate two deep tunnels beneath the new Lower Thames Crossing. Both tunnels would be around 200 metres in length and around 20 metres deep. To construct the tunnels, 24-hour working would be necessary.

Diversion of National Grid power line at Thong Lane and the A2/M2

These works would need temporary and permanent modifications to existing overhead power lines 1.76km in length, of which 0.5km would be permanent. This would include construction of a 75-metre pylon north of the A2 at Claylane Woods where the new road crosses the A2, and three new pylons to cross the route and Thong Lane, and removal of four existing pylons. Two temporary diversions of the power line on four temporary pylons would be needed to maintain electricity supply while the new pylons are installed. To complete the re-stringing of the overhead power line, the working area would need to include the existing pylons from the south of HS1 through to the A226, a distance of around 3km. The methods used for installing and re-stringing new pylons are described in chapter 2.

UK Power Networks (UKPN) proposals

Since our last consultation in July 2020, we have worked with UKPN to develop plans for removing the proposed switching station at Thong Lane. We would now be able to locate the equipment within the proposed substation area near the A226.

This substation would be connected to the Northfleet grid substation at the B262 Hall Road via an 11km cable, to be installed as part of the project along the A2 Roman Road, Hever Court Road and then north heading along the walker, cyclist and horse-rider routes on the western side of the new road to the A226. The A226 substation would provide permanent power for building and operating the new tunnels and southern entrance, and provide temporary power to the A226 Gravesend Road Compound and Milton Compound to complete the associated works.

Working with UKPN, we would propose a reconfiguration of the local network to supply the required electricity north of the A226 from the new substation. This would involve removing 2.9km of existing overhead power lines and poles between Gravelhill Wood and the A226.

To make sure the network is operational and safely maintained during the new road's construction and operation, and ensure that customers' supplies are not adversely affected, we would propose several diversions of the 33kV, 11kV and pilot-cable networks and the construction of six substations throughout Section A. For further information, please see Map Book 1: General Arrangements.

Diversion of Southern Gas Networks pipeline

To allow for the widening of the A2/M2, a gas pipeline that follows the A2/M2 near Shorne Woods Country Park, would need to be diverted. The total diversion length from Marlin Cross to Park Pale is 5.3km. Between Brewers Road to the Inn on the Lake (0.9km in length), we have worked with the relevant utility companies to propose a route and construction area that would minimise our impact on the existing vegetation, and lessen the impact on existing open space at Shorne Woods Country Park. To reduce the impacts on ancient woodland, the 1.5km section of the pipeline from Brewers Road to Park Pale has been moved from adjacent to the A2 northern verge to a proposed route under Brewers Road and Park Pale carriageway. More information is available in our You said, we did document, which forms part of our consultation materials.

Works on Park Pale would need a contraflow with traffic signals for between four and six months in sections of up to 300 metres long.

The diverted utilities corridor to the north of the A2/M2 limits opportunities for tree planting. However, the areas are south-facing and we would create a chalk grassland habitat once the works are finished.

Diversion of Southern Water sewers and water mains

Our proposals have been updated to allow the utilities to cross the A2 using the new road's proposed structures, including the Marling Cross bridge, Thong Lane green bridge and Brewers Road bridge. This would help to significantly reduce the working room required. Throughout the project, we have been committed to using structures to carry sewers and mains water wherever possible. By updating our proposals, we have avoided the need for major excavations.

Diversion of communications

We would carry out these works using the standard methods and mitigations for cable diversions which are outlined in chapter 2. These are necessary to make sure all networks for customer supplies – including commercial properties and the emergency services – are operational and maintainable during the construction and operation of the new road. Temporary connections to the construction compounds would also be required.

3.5 Offline works north of the A2/M2 (zone 1)

Introduction

This sub-section relates to the construction of the Lower Thames Crossing between the A2/M2 junction and the northern Thong Lane green bridge.

Following consultation feedback, we have redesigned the A2/M2 junction and reduced its construction impacts. With fewer structures and a smaller overall footprint our revised design was included in the proposals put forward in our 2020 supplementary consultation, and remains our proposed design.

Timing

The construction of these works would be expected to take five years, beginning in early 2024 and lasting until early 2029.

Description of works

Earthworks

A significant amount of this sub-section involves earthworks. This is because the new road requires a deep cutting between the proposed A2/M2 junction and the southern tunnel entrance. There would also be a false cutting along the A2/M2 junction slip roads near Thong village. All these earthworks would be carried out according to the construction methods set out in chapter 2.

Construction of Section A extends to the northern Thong Lane green bridge, where the cutting would be excavated to a depth of eight metres and around 60 metres wide. We continue to investigate ways to reduce the amount of material transported in or out of our worksite and to limit the number of HGV journeys. These efforts build on work already carried out since the statutory consultation to reduce HGV journeys. More robust ground investigation data, based on surveys carried out over the last year or so, is contributing to our assessments.

The ground we would propose to excavate south of the Thames is mostly chalk, covered by a layer of soil around two metres deep. The soil layer would be removed, stored and reused within the project, for example, to provide a top layer on nearby embankments for seeding with vegetation. Most of the excavated chalk would be reused around the south tunnel entrance for the new landscaped area, Chalk Park, which will be open to the public once the new road is complete.

Find out more

More information on our approach to the excavation, storage and movement of waste material can be found in our Outline Site Waste Management Plan and Materials Handling Plan. These are included in our consultation material, and described in chapter 1.

A2/M2 junction

The A2/M2 junction would require the construction of two viaducts: Gravesend East to the M2 eastbound viaduct and the Lower Thames Crossing southbound to the A2 westbound. Our general approach to construction of viaducts is set out in chapter 2.

Ecological work, including the moving of species, would take place at the start of construction while some landscaping and environmental mitigation would happen towards the end of the programme. The existing A2/M2 is within a sensitive wooded landscape and our planting proposals for this part of the project are designed to be mostly woodland. We would propose to plant around 105 ha of new woodland, linking existing areas including Great Crabbles Wood, Shorne Woods, and Claylane Wood. There would also be woodland planting south of the A2, near the young woodland planted by HS1 and Jeskyns Community Woodland. The woodland would be set back away from St Margaret's Church to preserve its setting.

Map Book 1: General Arrangements provides more information on these proposals.

Our environmental mitigation measures would include maintaining and improving hedgerows in areas close to our proposed green bridges, including the bridge to the north of Thong Lane, as these are important wildlife corridors. Green bridges are built over infrastructure such as roads or railways to help wildlife continue using an area once the new infrastructure is built. They usually include features to encourage use by native species, and can also be used by pedestrians, cyclists and horse-riders. The Lower Thames Crossing would benefit from seven new green bridges.

We would also need to carry out additional works for building the parts of the proposed A2/M2 junction that intersect with the existing A2/M2. The A2/M2 would remain open for most of the works, although overnight closures are likely towards the end of the programme when the new roads and structures are tied into the existing road network. We would adapt traffic management along the A2/M2 as construction progresses, with narrow lanes and 50mph speed limits likely.

The northern Thong Lane green bridge

Our proposals include a green bridge to allow Thong Lane to pass over the new road, connecting woodland planting and providing a footpath for pedestrians. Its construction would require Thong Lane to be moved northwards so the road could remain open while the bridge is being built, with the exception of a few overnight and/or weekend closures. The bridge is designed to be about 80 metres wide. Its construction would use similar techniques to a standard bridge, for example, piling, building the supports and piers, and installing the deck. For more information on the construction of structures, see chapter 2.

3.6 Gravesend East junction (zone 2)

Introduction

Our plans for the Lower Thames Crossing would include modifications to the Gravesend East junction, including an upgrade to the existing roundabout, widening an existing bridge, and changes to existing utilities in the area.

Timing

These works would be scheduled to begin early in the construction of Section A with an initial period of around one year of construction. It would be necessary to complete these works towards the end of the overall construction period, in 2028.

Description of works

Our main works to upgrade the roundabouts would involve building retaining walls, carrying out earthworks, widening roads and upgrading lighting. For more information about how we would carry out these works, see chapter 2.

The junction would remain open throughout the work needed to upgrade the existing roundabouts, although there would be periods of reduced capacity and lane closures. These are described in the Ward impact summaries and the OTMPfC.

3.7 Connector roads around the A2/M2 (zone 3)

Introduction

Our plans would include the construction of new connector roads and bridges, as well as modifications to existing roads.

Timing

These works would take place throughout the construction of Section A. They would begin in 2024 and end in 2028.

Description of works

The southern Thong Lane green bridge

We would build a new green bridge over the A2/M2 at Thong Lane, to the south of the other green bridge described in this chapter, taking Thong Lane over the Lower Thames Crossing. It would be built using the techniques described in chapter 2. As the new bridge has been designed on a different alignment to the existing one, the existing bridge would not need to be demolished until the new structure is in place. It is likely that the new bridge supports would be built on-site and the completed deck brought in by road. Assembling the green bridge would need some overnight closures of the A2/M2.

Brewers Road green bridge

The new Brewers Road green bridge would be built on the same alignment as the existing bridge as it would need to connect directly to the existing High Speed 1 (HS1) green bridge immediately to the south. This is the best way to maintain the wildlife corridor across the HS1 bridge, which would be further improved by the new green bridge linking habitats to the north of the A2/M2 with those south of HS1.

A long-term closure of Brewers Road (approximately 16-19 months) would be necessary to demolish the existing structure and build the replacement bridge. Although we would need to close the old bridge while the new green bridge is built, the A2/M2 would be kept open most of the time, with only occasional overnight or weekend closures. A2 slip roads and the HS1 bridge would also remain open. Information on the closure of Brewers Road is included in the Ward impact summaries and the OTMPfC.

Our first step towards building the new bridge would be to close the A2/M2 for a period of 36 hours over a weekend, while we demolish the old one. During this time, the entire bridge deck would be removed. The existing piers (bridge supports) would then be removed while the A2/M2 is running.

Building the replacement bridge would take 16 to 19 months. This is longer than some similarly sized projects because Brewers Road bridge would have to be built alongside the A2/M2 widening works, as described later in this section. Construction of the new, wider bridge would also involve replacing the northern supports, repositioning the piers, and partially rebuilding the southern supports. During this work, the A2/M2 would be subject to traffic management measures, including narrow lanes, a 50mph speed limit and some overnight or weekend closures. More information on road closures and diversions is provided in the Ward impact summaries and the OTMPfC.

Once the green bridges at Thong Lane and Brewers Road are built, features such as new planting would be added to make them more likely to be used by wildlife, as would features appropriate for public rights of way. Our landscape proposals include a drought-tolerant, species-diverse mixture of grassland and shrubs. Hedgerows close to the proposed green bridges would be improved and maintained to strengthen the wildlife corridors.

Other works, including Halfpence Lane

Other works in this sub-section include the link roads between the new road and the A2 westbound, local roads between Henhurst Road roundabout and Thong Lane and Brewers Road roundabout, and sections of the Thong Lane green bridge over the A2, and the Brewers Road bridge. We would build these links using the methods presented in chapter 2. None of these roads, apart from Brewers Road bridge, would be expected to close during construction, with the exception of nights and weekends.

Works would be necessary on Halfpence Lane to divert a foul water main, however, it would remain open to traffic apart from occasional short-term closures at night or weekends. There would be a rolling contraflow where, rather than having the entire length of road under contraflow conditions, shorter 200-metre sections would be used and then relocated as the works progress. The contraflow is expected to be in place for four to six months. More information on this is provided in the Ward impact summaries and the OTMPfC.

Cobham service station

The service station would be closed early in the construction programme. Some decontamination activities might be needed, but this would not be confirmed until the tanks under the concrete have been checked for leaks or seepage. Once assessed, we would carefully remove the tanks. We would then start the significant works to build a new roundabout involving the demolition of the existing petrol station, vegetation clearance, earthworks, new retaining walls and a bridge (see chapter 2 for information about these construction methods). New utilities would also be diverted into this area.

Highways England recognises that Cobham service station is well-used and there would not be a direct replacement for it as part of our proposals. However, if development consent for the new road is granted, we would work with roadside facility operators, the haulage industry and road user groups to consider the need for roadside facilities and the most appropriate locations on the strategic road network. Any new roadside facility would require planning consent from the appropriate local authority.

3.8 A2/M2 corridor works (zones 4, 5, 6 and 7)

Introduction

Our plans would involve widening a section of the A2/M2 close to the proposed new junction between those roads and the Lower Thames Crossing. This would include adding a fourth lane of the M2 through junction 1, and additional lanes in both directions running parallel to the A2 to provide connections to the A289 and the old A2.

Timing

This would affect zones 4-7 of Section A, as described at the beginning of this chapter, with work beginning in 2024 and lasting until 2028.

Description of works

Following feedback from our statutory consultation, we reduced a 5km section of the A2/M2 due to be widened by removing the eastbound collector road's hard shoulder. We also propose to remove an area of vegetation in the central reservation of the A2, allowing the width of the route to be further reduced. This would lessen the impacts on woodland and the Kent Downs Area of Outstanding Natural Beauty (AONB), although it is acknowledged that the central reservation provides screening to the AONB at present.

Our widening works would use standard construction methods, namely building the new sections of highway alongside the existing road and then joining them together at the end. Chapter 2 includes a more detailed description of how widening works are carried out. The A2/M2 widening works would take place in phases to align with the construction of Brewers Road bridge (see above).

Our proposals would keep the A2/M2 open for the seven-year construction period, apart from occasional overnight or weekend closures. More information on these closures is provided in the Ward impact summaries and the OTMPfC.

The traffic management for these widening works would involve introducing narrow lanes and a 50mph maximum speed limit on the main A2/M2 carriageway in both directions between Gravesend East junction and junction 1 of the M2, along with the removal of the hard shoulder. Introducing narrow lanes on the main carriageway would also lead to changes at the merge and diverge locations. More information on this is included in the Ward impact summaries and the OTMPfC.

Conserving woodland has been an important factor in our design and construction of the A2/M2 widening works. Where woodland needs to be removed, we propose woodland edge planting. This would include flowering and fruiting plants that would be visually appealing and would provide food for insects, birds and small mammals.

3.9 Testing and commissioning

Introduction

As well as implementing the environmental mitigation measures described in the various sub-sections, the final part of our construction phase involves making sure the road (including all electrical and mechanical systems), structures, earthworks, drainage, public rights of way and other elements are complete and function to the required standards.

Timing

These activities would be scheduled to take place in 2028 and last around nine months.

Description

The individual parts of the new road, including its structures, gantries, drainage and other supporting infrastructure would be tested as they reach completion. Testing would include adherence to the design specifications for each section of the road. Our safety checks would vary according to the different functions and specifications of the element being tested. As more of the route is built, then it would be tested in its entirety. Commissioning refers to the completion of the testing phase, at which point we would bring the new road into public use.

4

Section B – Tunnels

4.1 Overview

This chapter explains the methods we would use to build the Lower Thames Crossing tunnel and approaches, and the steps we have taken to mitigate the impacts of these activities. It also includes references to chapter 2, which describes the construction methods that apply across the project, for example, details of how compounds function or structures are built.

Our Ward impact summaries provide more specific details on the construction process, its impacts and mitigations for Section B. The Outline Traffic Management Plan for Construction (OTMPfC) provides further information on our temporary traffic management proposals. Chapter 7 of the Construction update focuses on project-wide information on the impacts across a number of environmental topics, such as air quality and cultural heritage.

Section B, shown on the map below, covers the area between the proposed northern Thong Lane green bridge and the proposed Tilbury Viaduct. This includes the work needed to construct the tunnels and their approach roads, south and north of the Thames. A ground protection tunnel, described later in this chapter, would also be in this area. This small tunnel would run from south of Lower Higham Road to north of the Medway Canal and North Kent Railway line.

Each of our two bored tunnels would be approximately 4.25km long with an entrance in the south, near Chalk, and another in the north, near Tilbury. Both tunnels would be around 16 metres in diameter to accommodate a three-lane road. The western tunnel would carry northbound traffic and the eastern tunnel, southbound traffic. Along their length, at 150-metre intervals, there would be approximately 26 cross-passages connecting the two tunnels for emergency use.

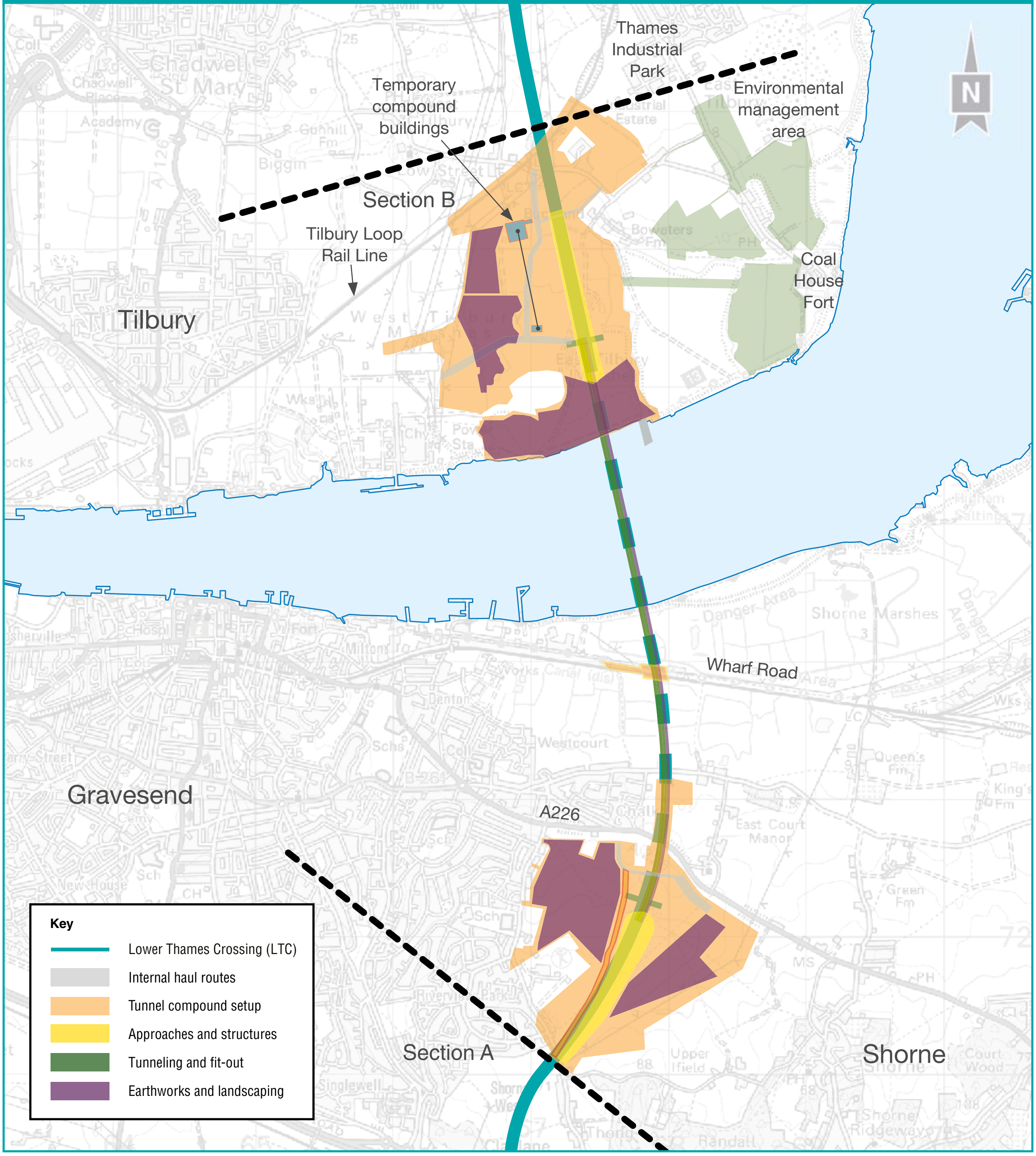
4.2 Section B tunnels construction works

The work needed to build the tunnel section of the route has been broken up into the following sub-sections. More information on each is provided in this chapter.

- **Initial works, including environmental mitigation**
  - Relocating wildlife species, utility connections to site compounds and constructing compound access roads.
- **Tunnel compound set-up**
  - Preparation for the launch of the TBMs including site set-up, mobilisation and excavation, and construction of the northern portal box from which the TBMs would be launched. The portal is the entrance to the bored tunnel and the portal box is a large excavation created to launch the boring machines. This includes starting the construction of the tunnel ramp which is a section of new highway that starts at the tunnel entrance and connects the road to the ground-level sections. For drivers travelling south, they would cross over the Tilbury Loop railway line on a viaduct and then follow the road down a gradual incline until it is at the depth of the tunnel entrance. For drivers travelling north, they would exit the tunnel at the bottom of this incline and then travel north, gaining height until they are above ground level on the viaduct over the Tilbury Loop railway line.
- **Launch structure and approach ramp**
  - Construction of the other elements, including structures such as the tunnel entrance, and the section of road that leads into the bored tunnel through the cut and cover sections. There are short lengths of cut and cover section in the north and south. These connect from the bored tunnel to the open highway element of the Lower Thames Crossing.

- **Ground protection tunnelling and strengthening works**
  - Ground treatment to minimise risks to the operation of the TBMs.
  - Construction of a ground protection tunnel and reception shaft.
- **Tunnelling and tunnel fit-out**
  - Launching the TBMs and starting the tunnel driving.
  - Internal fit-out of the tunnels with road deck, constructing cross-passages and adding mechanical and electrical systems, instrumentation, controls and automation equipment.
- **Earthworks and landscaping**
  - Completion work inside and outside the tunnels, such as earthworks, landscaping and bunding.
- **Testing and commissioning**
  - All electrical and mechanical equipment within the tunnels, as well as all safety features would be tested to ensure they are safe to use.

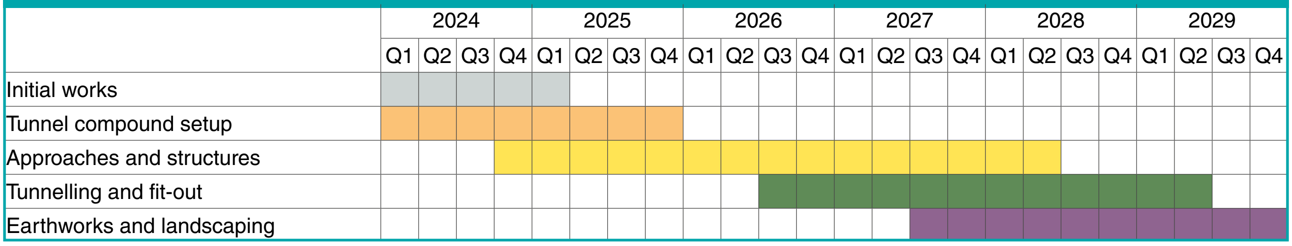
Figure 4-1 Section B construction map



4.3 Timeline for Section B

The section below provides an indicative high-level summary of when different sub-sections of work needed to build the tunnel would take place. Exact timings would be determined later, following the grant of consent and once our contractors have been appointed.

Figure 4-2 Section B construction timeline



4.4 Initial works

Introduction

The initial works would involve preparing the site for the heavy construction activities that would follow. This would include ground improvement works to provide stable foundations for haul roads and other temporary structures. It would also include general site clearance and relocation of any species that need to be moved.

Timing

These works would take place over approximately 12 months, beginning in mid-2024.

Description

Before heavy construction activities can begin, the ground would need to be strengthened to support the heavy loads that would be placed upon it. We would do this using a number of different techniques, including stabilising the ground by mixing with grout and cement. Where there are particularly heavy loads, for example underneath fixed crane positions, we would have to carry out more ground improvement and the construction of deeper foundations.

4.5 Tunnel compound set-up

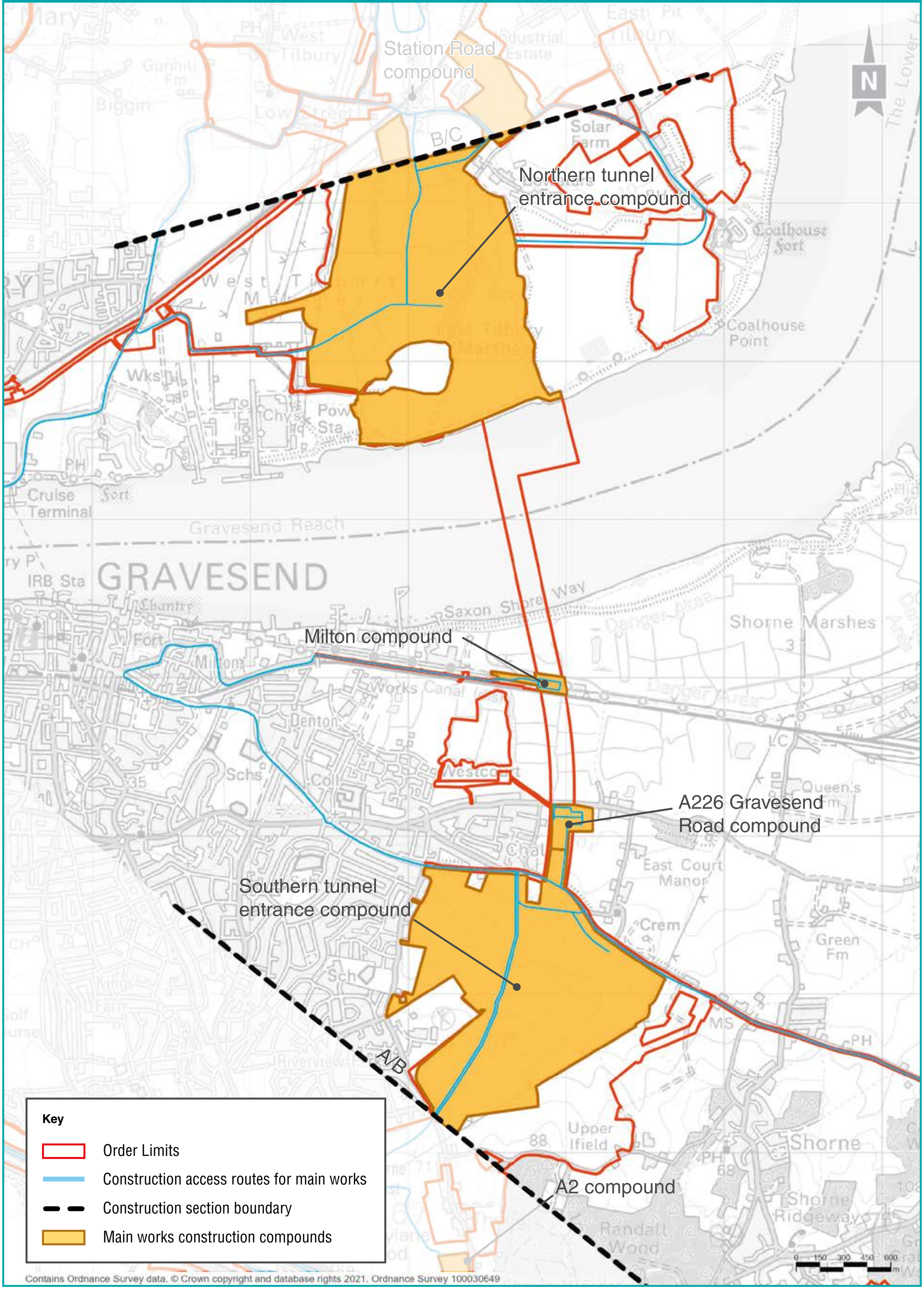
Introduction

There are four proposed construction compounds in Section B, one north of the Thames and three to the south.

Table 4-1 Section B construction compounds

Compound name	Compound type	Location
Northern Tunnel Entrance Compound	Main	Northern tunnel entrance – Tilbury Marshes, west of East Tilbury and Coalhouse Fort
Southern Tunnel Entrance Compound	Main	Southern tunnel entrance – south of Chalk village and the A226 and Thong Lane in the south and west
A226 Gravesend Road Compound	Satellite	South of Lower Higham Road
Milton Compound	Satellite	North of the Thames and Medway Canal and North Kent Railway line railway

Figure 4-3 Section B construction compounds and access routes



Timing

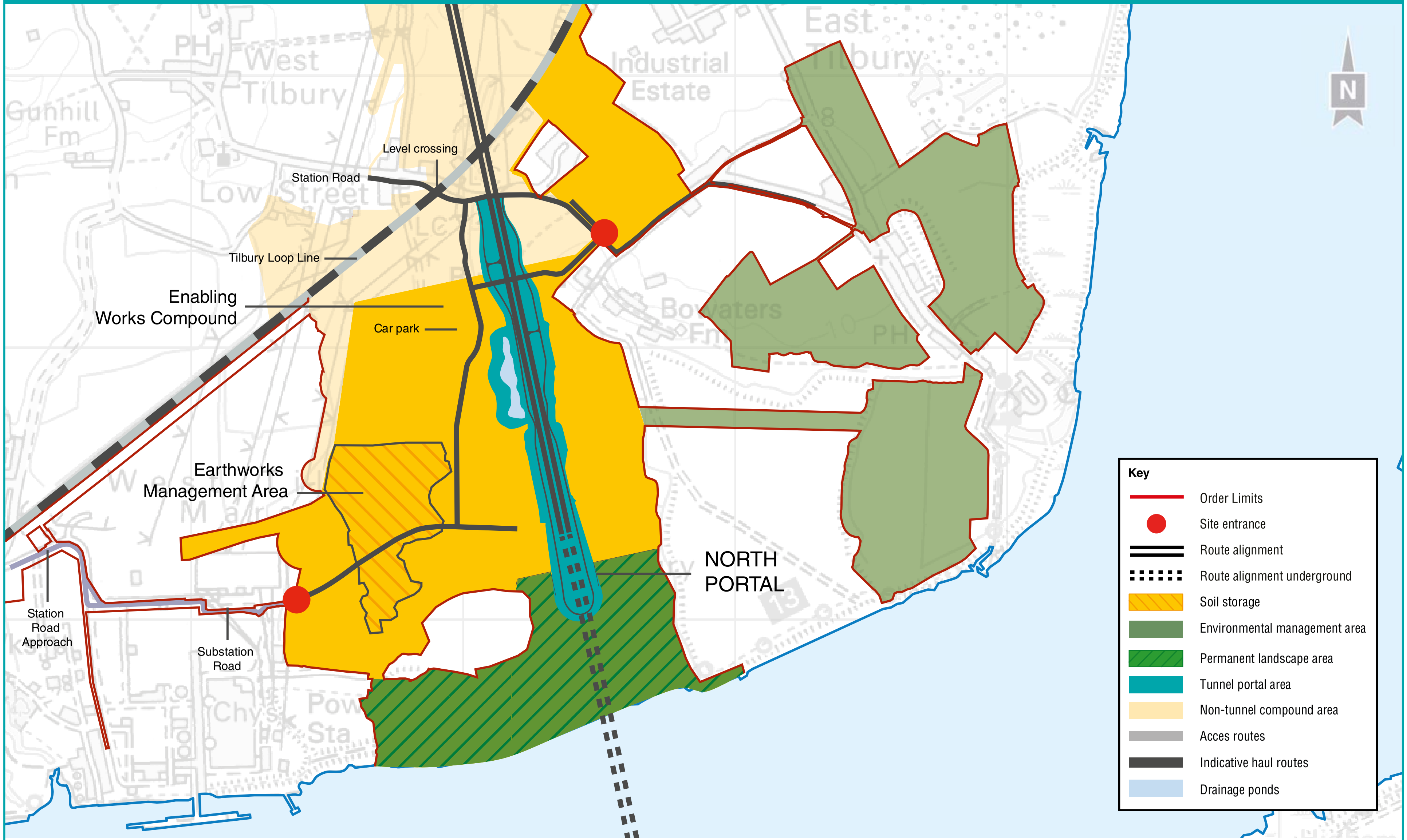
The setting up of compounds would take place over roughly two years. This period includes all the access roads and ground improvement works, in addition to the time needed to set up offices and welfare facilities. This would start within the first three months of the construction process for Section B. The compounds would be in use throughout construction.

Description

Northern Tunnel Entrance Compound

We would set up a 270ha construction compound during preparation works near the Thames to support our tunnel boring activity. The compound would be next to the northern tunnel entrance, west of East Tilbury and Coalhouse Fort, with access from the local road network. The main access would be from the west through the Port of Tilbury, with a separate access for cars and vans from Station Road. These access points would be connected through the site by an internal haul road.

Figure 4-4 Northern Tunnel Entrance Compound map



This large compound would be the main tunnelling worksite and we have located it away from residential areas on the north bank of the Thames.

Tunnelling and supporting operations on the surface would require the installation of temporary infrastructure, including a haul road through the site for the delivery of materials. Work would be carried out on a 24/7 basis. A concrete batching plant would also be built within the compound.

Before tunnel construction begins, essential site facilities would be set up next to the northern tunnel entrance. In addition to the usual compound arrangements of offices, welfare, parking and areas for material to be delivered and stored, this site would include temporary facilities such as:

- a precast facility for tunnel lining production and storage
- a separation plant for processing excavated material
- a water treatment plant
- hyperbaric facilities, allowing specialist workers to remain in high pressure compressed air environments, which would be necessary for certain tunnelling activities
- sleeping accommodation for construction workers
- other equipment to support tunnel construction such as cranes and special vehicles to carry segments into the tunnel

Prior to tunnelling, we would need to dig and construct the tunnel entrance. This would also serve as the assembly and launch pit for the tunnelling machines.

Access to site

To reduce the overall number of road journeys, equipment and material would arrive via the Port of Tilbury and its new terminal, Tilbury 2 (PoT2). Some of this would also be delivered using the strategic road network, through PoT2 and along a new, dedicated access road. Smaller deliveries, shuttlebuses for staff from local train stations and the Gravesend Ferry, together with cycles and cars, would use a smaller, dedicated road built from Station Road to the north-east of the site. Deliveries of larger items, for example, those needed for the construction of the viaduct north of the Thames, would also pass through the Port of Tilbury and Substation Road.

The main access to this compound for most traffic, including HGVs, would be from the eastern end of the Port of Tilbury's Substation Road. Three further access points would be located off Station Road, East Tilbury. These would mainly be used by Lower Thames Crossing contractors and small delivery vehicles. They would also allow access between the main compound and a proposed fabrication yard and segment factory, on a north-east parcel of the site. These would link to internal east-west and north-south roads in the compound. We are currently in discussions with the operator of the Port of Tilbury about using their new Tilbury2 infrastructure corridor as a primary access for the tunnelling compounds.

When construction starts, and subject to local road network restrictions, it may be necessary to allow some HGVs to access the compound via Station Road. This would only be for the first few months of the construction period, until the haul road in from Substation Road has been constructed.

The movement of construction vehicles would be planned to make sure the compound operates efficiently and unnecessary journeys and congestion are avoided. Speed limits in the compound, likely to be 10mph, would improve safety and suppress dust emissions, and pedestrians would be separated from vehicles. Security and traffic management would be in place at access points off the public road. More information on these measures is provided in the Ward impact summaries and the OTMPfC.

Materials handling

Before tunnelling starts, we would cast the tunnel segments and then stockpile them ready for construction. This would begin while the launch shaft is being excavated and ground treatment work is carried out. Most of the spoil from this activity would remain on site for future landscaping works.

As the launch structure is completed, the two tunnelling machines would be delivered to the site in large, heavy pieces and assembled using cranes inside the launch shaft. We are still deciding on the most viable option for transporting these elements to the site, including decisions over which port they could be delivered to. As the largest component parts could exceed 400 tonnes, they may arrive by multi-axle trailer, and cranes would be needed to assemble the TBMs on site.

During this time, buildings would be constructed to process slurry from the tunnels, including the removal of excess water. The area known as Shed Marsh would be prepared to manage the spoil and would include lagoons and pumps to clean and manage rainwater falling on the spoil stockpiles.

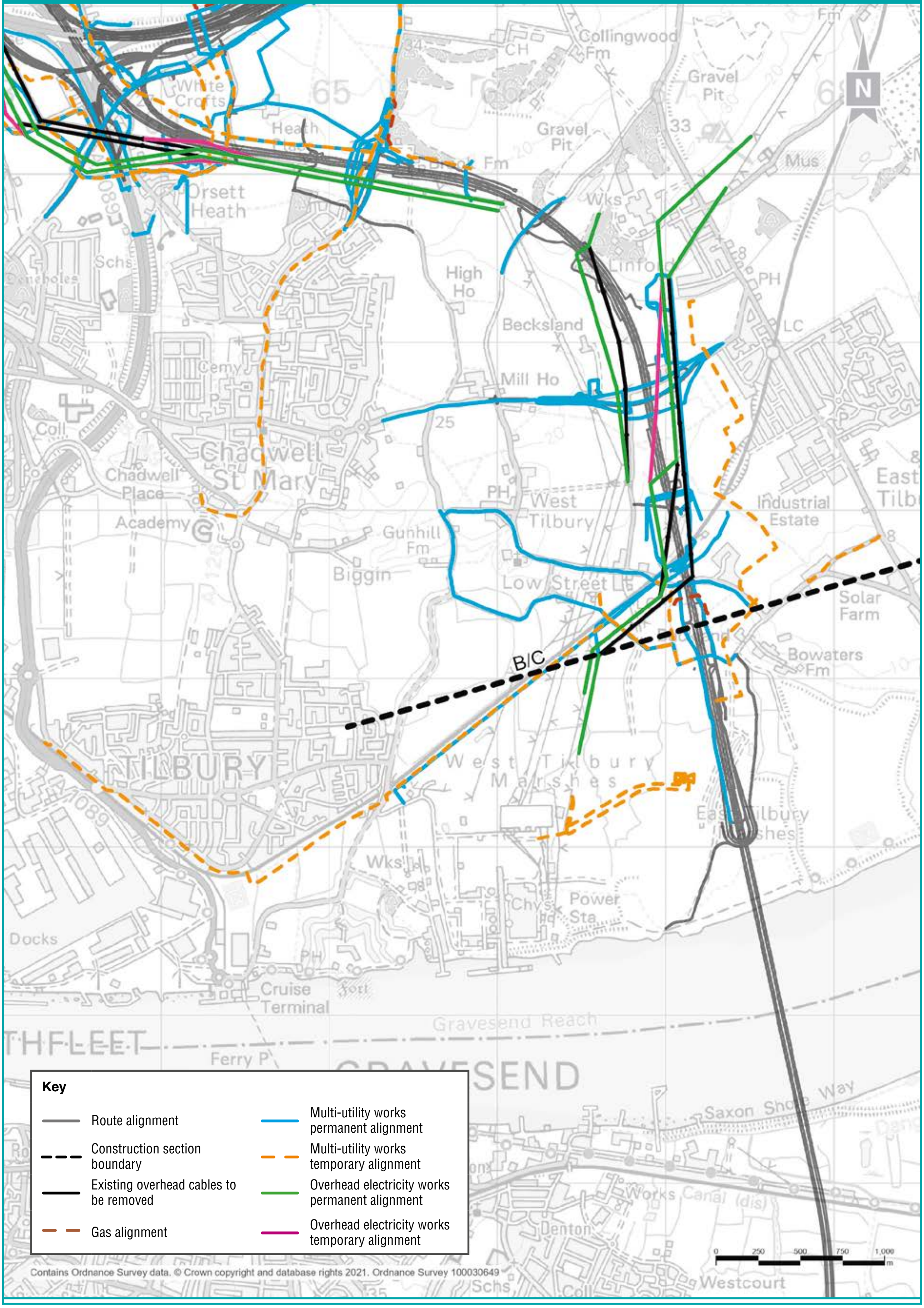
On-site haul routes for the Northern Tunnel Entrance Compound

Within this compound, there would be internal haul roads for the distribution of excavated material to where it is placed in permanent earthworks. These haul roads are not for public use and are for construction vehicles and equipment that would not use public roads.

Utility connections

We would build a temporary substation in the Northern Tunnel Entrance Compound to provide power for the TBMs. It would be connected to the existing overhead power line network east of Tilbury, on the western edge of the Order Limits. The permanent northern tunnel entrance electricity supply would be provided via a 3.6km cable network installed from the existing substation east of Fort Road. This supply would provide power to other temporary worksites within the compound during construction. Figure 4-5 below shows the proposed utility works for the Northern Tunnel Entrance Compound. For further information, please see Map Book 1: General Arrangements.

Figure 4-5 Map of utility works in Section B (north of the river)



Temporary and permanent telecommunication links would be via connections to the networks located in Station Road.

The permanent water supply for the northern tunnel entrance building would be provided by a 2.8km connection to the junction of Gun Hill and Cooper Shaw Road via Cooper Shaw Road. This supply would be used temporarily to feed the compound offices and welfare. It would then be repurposed to become the permanent supply to the tunnel operations building.

Due to the water requirements of the TBMs, and to avoid any impact on local water supplies, we have proposed pipeline connections at the Linford borehole (3.2km in length), and at the western end of Dock Road (4.5km in length). Both of these are temporary and the pipeline would be removed as part of the compound demobilisation.

The Linford borehole pipeline would connect to the borehole along Lower Crescent, Linford and travel in a southerly direction under the railway to the TBM distribution point.

The Dock Road connection would be sited west of the Russell Road roundabout, continuing eastbound on Dock Road towards Hume Avenue. At Hume Avenue, it would pass south under the Tilbury Loop railway line and head east along the PoT2 infrastructure corridor to Fort Road, and then east on the southern side of the railway until entering the compound. Dock Road would require traffic management for up to three months, including traffic lights and contraflow measures.

All temporary assets would be removed as part of the process of demobilising the compound once construction is complete.

Next to the project is the Thurrock Power Ltd proposed Thurrock Flexible Generation Plant development, which is currently going through its DCO examination. Both projects are working closely together and we have identified a number of potential interfaces during construction, including the proposed high-pressure gas pipeline. The proposed gas pipeline runs through our construction compounds and work areas, and crosses beneath the Lower Thames Crossing.

We are working jointly on an alternative route beneath the Tilbury Viaduct and adjacent to Low Street Pit so that, if both projects are consented, they can be developed together and the proposed re-alignment of this gas pipeline would be contained within the DCO application.

Site-specific worker accommodation

The scale and nature of tunnel construction is such that sleeping accommodation for workers would be necessary at the Northern Tunnel Entrance Compound. This would include around 400 beds for construction workers to allow for shift-working and an additional approximate 80 beds for certain workers to remain in high-pressure compressed air environments following tunnelling work. Prefabricated temporary office and worker welfare buildings would be built in the Northern Tunnel Entrance Compound, located south of Station Road. More information on accommodation for construction workers is provided in chapter 2.

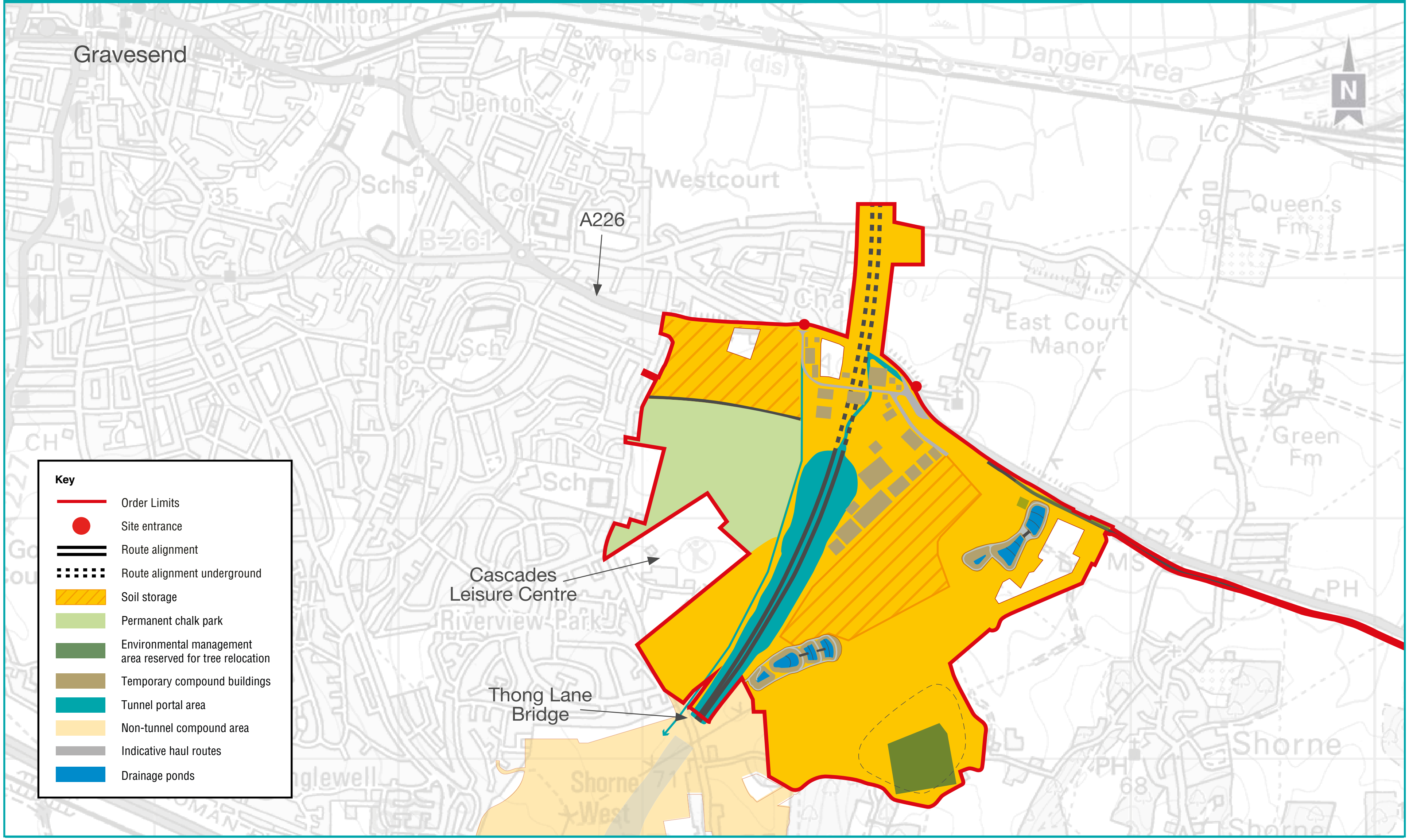
Site drainage, construction and drainage outfalls

Due to the size of the site, rainwater runoff cannot be managed by temporary drainage methods. For this reason, a series of temporary treatment ponds/lagoons and weirs would be constructed within the Order Limits. The water from the treatment process in the Northern Tunnel Entrance Compound would be pumped into a new outfall pipe and then pumped into the Thames. The outfall structure is likely to be a pipeline installed to the edge of the river's mud flats.

Southern Tunnel Entrance Compound

This compound would provide welfare and construction support for the works at the southern tunnel entrance. This would be a large site of around 163ha in size, although the scope of works here would be narrower than at the northern launch site. It would be located south of the Ramsar area, with no direct connection to the Thames.

Figure 4-6 Southern Tunnel Entrance Compound map



A temporary, one-way internal access road would be built off the A226 to provide access for construction materials, equipment, personnel and for emergency services. The access road would be built to limit disruption to other road users and in line with standards required for HGVs. Generally, the road surface in the compound would be at ground level, but cuttings or raised embankments would be used to even-out the route.

As with the Northern Tunnel Entrance Compound, we would plan construction vehicle movements to make sure the compound operates efficiently and that unnecessary journeys and congestion are avoided. Speed limits in the compound would apply to improve safety and suppress dust emissions, and pedestrians would be separated from vehicles. Security and traffic management would be in place at access points off the public road. More information on temporary traffic management measures is set out in the Ward impact summaries and the OTMPfC.

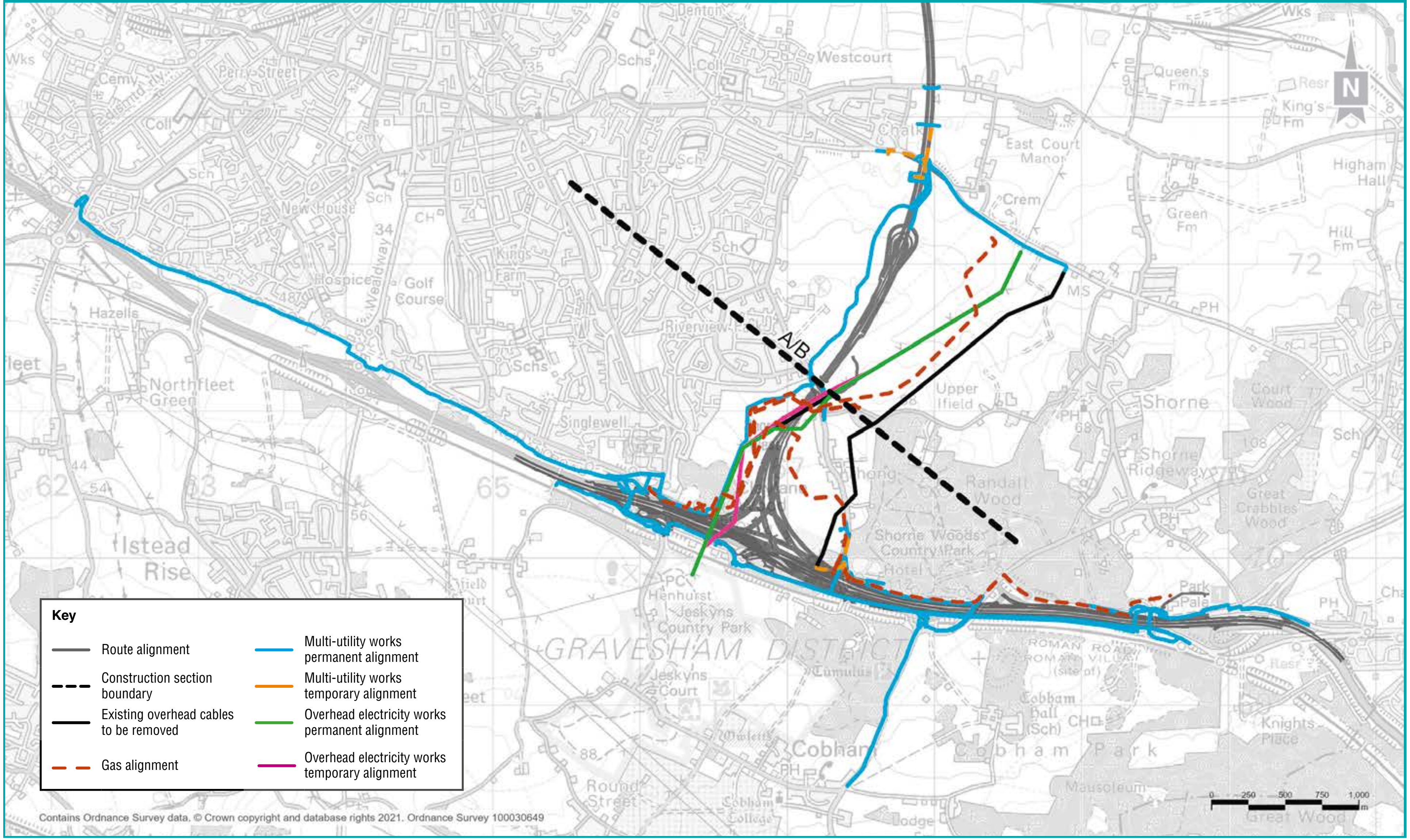
On-site haul routes

Within the Southern Tunnel Entrance Compound there would be internal haul roads for the distribution of excavated material to where it would be placed in permanent earthworks. These haul roads are not for public use and are for non-road-going construction equipment.

Utility connections

For the Southern Tunnel Entrance Compound, temporary and permanent power would be supplied by the new A226 primary substation, as described in section 3-4 of the Construction update. For water, sewerage and telecommunication services all connections would be made to the local networks located within the A226 highway boundary. For further information, please see Map Book 1: General Arrangements.

Figure 4-7 Map of utility works in Section A and Section B (south of the river)



We would remove all temporary assets as part of the process of demobilising the compound once construction is complete.

Site-specific worker accommodation

Prefabricated temporary office and worker welfare buildings would be built within the compound, located to the south of the A226 Rochester Road. Temporary water, electricity and telecoms utilities would be installed. There would be no sleeping accommodation at this compound.

Site drainage

Due to the size of this compound, rainwater runoff cannot be managed by temporary drainage methods such as local connections to the sewer network. To effectively treat the water and meet discharge consent standards, a full collection and management system would be in place until the compound is reinstated to its former use. A series of ponds/lagoons and weirs would be constructed within the Order Limits to serve three purposes:

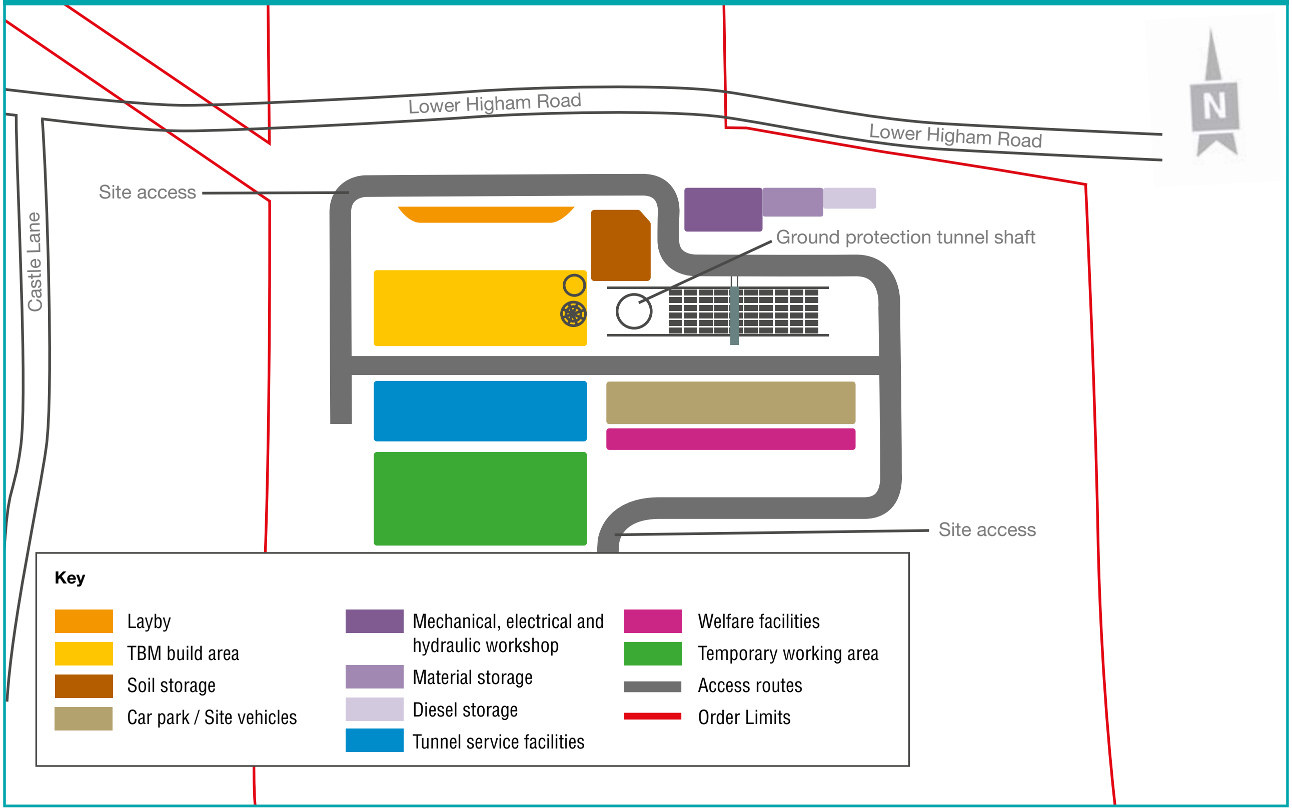
- provide a volume of storage to manage rainfall overflows
- encourage gravitational settlement of any particles within the water
- enable excess water to soak naturally into the chalk ground

The treated water from the final lagoon in the Southern Tunnel Entrance Compound would be pumped into the ditch network that forms part of the Thames Estuary and Marshes Ramsar site. The discharge of water into the environment would be controlled to ensure that the flows into the ditch network are similar to natural flows caused by rainfall.

A water treatment system would be built to manage and clean runoff from the stockpiles of excavated chalk before it is discharged to the ditch network. A series of temporary, interconnected settlement ponds would be excavated between the A226 and Lower Higham Road. From here, the clean water would be pumped under Lower Higham Road and into the ditch network, supplementing the Ramsar area water. Any surplus water would drain into ditch networks and finally into the Thames. An access track would be incorporated into the system for pond cleaning and for the A226 Gravesend Road Compound.

A226 Gravesend Road Compound

Figure 4-8 A226 Gravesend Road Compound indicative layout



Local ground conditions mean we expect a number of ground treatment measures would be needed as part of the Lower Thames Crossing tunnel works. To treat the ground beneath the Thames Estuary and Marshes Ramsar site and Special Protection Area, we are proposing to build a ground protection tunnel. This would be subject to the contractor's proposals.

If these works are required, two compounds will be necessary to support construction: the A226 Gravesend Road Compound and the Milton Compound. Further information on the proposed works is provided in section 4.6.

There would be three main phases of work at the compound, including the excavation of a ground protection tunnel:

- mobilisation, site set-up and the excavation of a vertical shaft from which to launch the TBM
- TBM assembly, launch and tunnelling
- ground treatment and site take-down

This satellite compound would be approximately six ha in size.

Access to site

While the site is being established, access would be provided from Gravesend along Lower Higham Road. A dedicated access road would also be built across the field from the A226 to the south for the delivery of the ground protection TBM components and larger HGV loads.

On-site haul routes

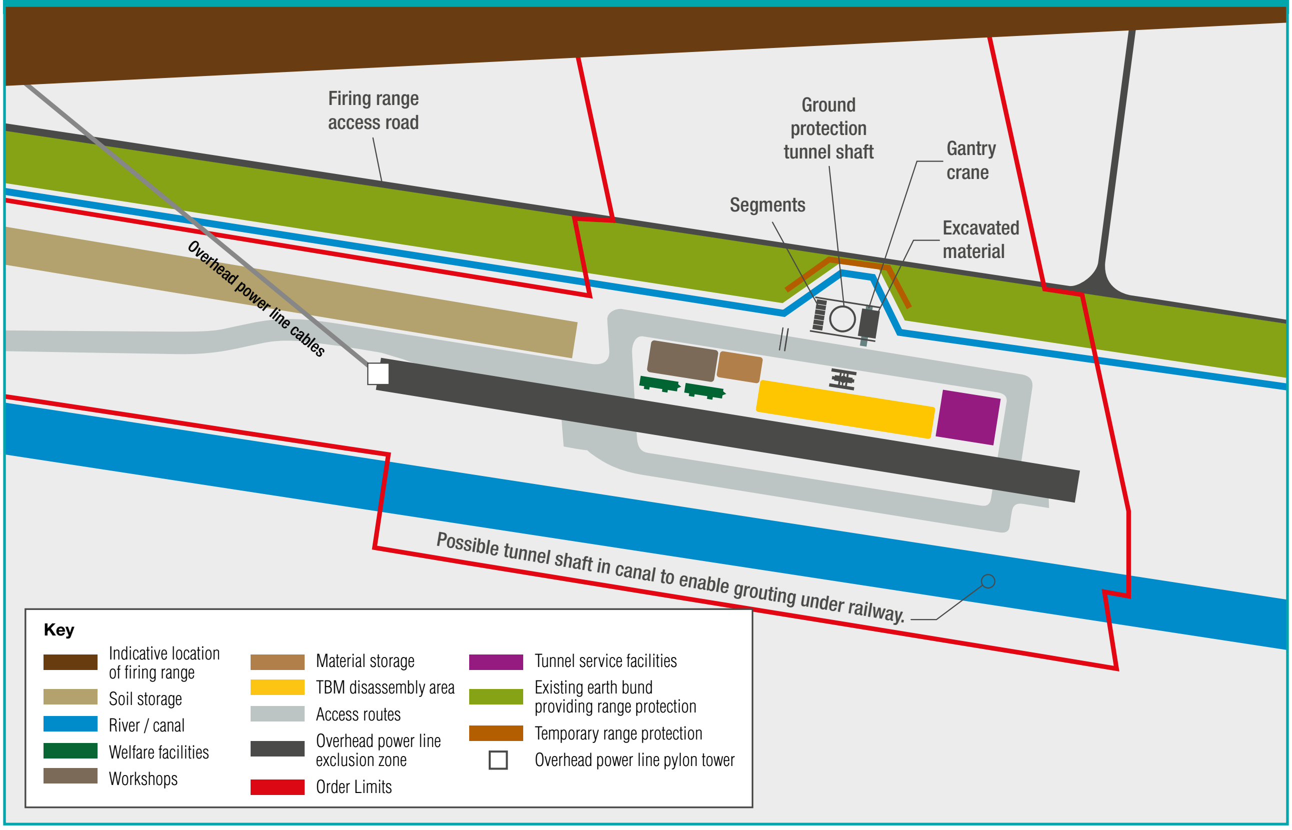
All vehicle movements will be on the roads set out in Figure 4-2.

Utilities connections

Temporary provision of utility supplies for the Gravesend Road Compound would be provided from the A226 substation and via connections to the local utility networks. These connections would be removed as part of the compound demobilisation.

Milton Compound

Figure 4-9 Milton Compound indicative layout



This satellite compound would be approximately three ha in size and mainly used for the reception and removal of the ground protection TBM, and to manage the settlement of the ground above the tunnel. The site set-up would include cabin installation, delivery of a super-silenced generator and the preparation of the ground for use by heavy machinery. A gantry crane would be used to support tunnelling operations.

Access to site

Access to the Milton compound would be provided along the A226 Rochester Road.

Materials handling

As the site is next to the Mayor's Office for Policing and Crime firing range, it would have bullet-proof barriers and secure hoardings installed around the perimeter. Topsoil would be stripped and stored on-site so that the land could later be restored to its former condition once our works are complete.

Precast concrete segments would be delivered by HGVs and used to support the tunnel's shaft walls and the previously stockpiled spoil would be used for backfilling the shaft as the site is reinstated and equipment is removed.

After the TBM is dismantled, removed from the shaft and taken from the site, the compound would remain secured and accessible for the grouting and settlement mitigation works in the tunnel below until the main road tunnels have been successfully driven underneath this area.

Utilities connections

Temporary water and power supply for use in Milton Compound would be via connections to the local utility networks along the Thames and Medway Canal, and would be removed as part of the compound demobilisation.

Watercourses

Due to the proximity of the overhead pylons, the reception shaft would have to be sunk to the north of the compound, which would conflict with an existing watercourse. This watercourse would be diverted around the shaft location. The diversion would be less than 50 metres in length and would likely be permanent. The reception shaft would be backfilled with material and the land above reinstated.

4.6 Ground protection tunnelling and strengthening works

Introduction

Our bored tunnels would need to pass beneath the Thames Estuary and Marshes Ramsar site and Special Protection Area, through material that includes sand and gravel, as well as chalk. Because sand and gravel are less stable than chalk, we may need to bind it together using a cement-like grout. This will allow for pre-treatment of the ground to strengthen the soil, involving the use of cement to bind the existing sand and gravel together for two purposes:

- To allow the main TBMs to pass through this area without causing any excessive settlement, including under the North Kent Railway line.
- To allow for safe construction of cross-passages between the two tunnels.

To carry out this work, we would first need to build a ground protection tunnel.

Timing

This phase of work would take place over a period of around two years, beginning towards the start of the construction period for Section B.

Description

Works to allow ground treatment beneath the Thames Estuary and Marshes Ramsar site would involve constructing an outside diameter ground protection tunnel, approximately 5.8 metres wide.

It would start from a shaft located south of Lower Higham Road, and travel to a shaft north of the North Kent Railway line. (See Figure 4-10).

This tunnel would then be used to access the areas above which our main road tunnels will pass and where ground treatment is needed. Figure 4-11 illustrates how the ground protection tunnel would be used.

Once the works are completed, we would backfill both the shafts and ground preparation tunnel, and the ground would be reinstated to its original condition.

Our plans assume that the ground protection tunnelling will be needed, though we would allow our appointed contractors to carry out further detailed ground investigations and these may conclude that the work can be avoided.

Figure 4-10 Map of ground protection tunnel

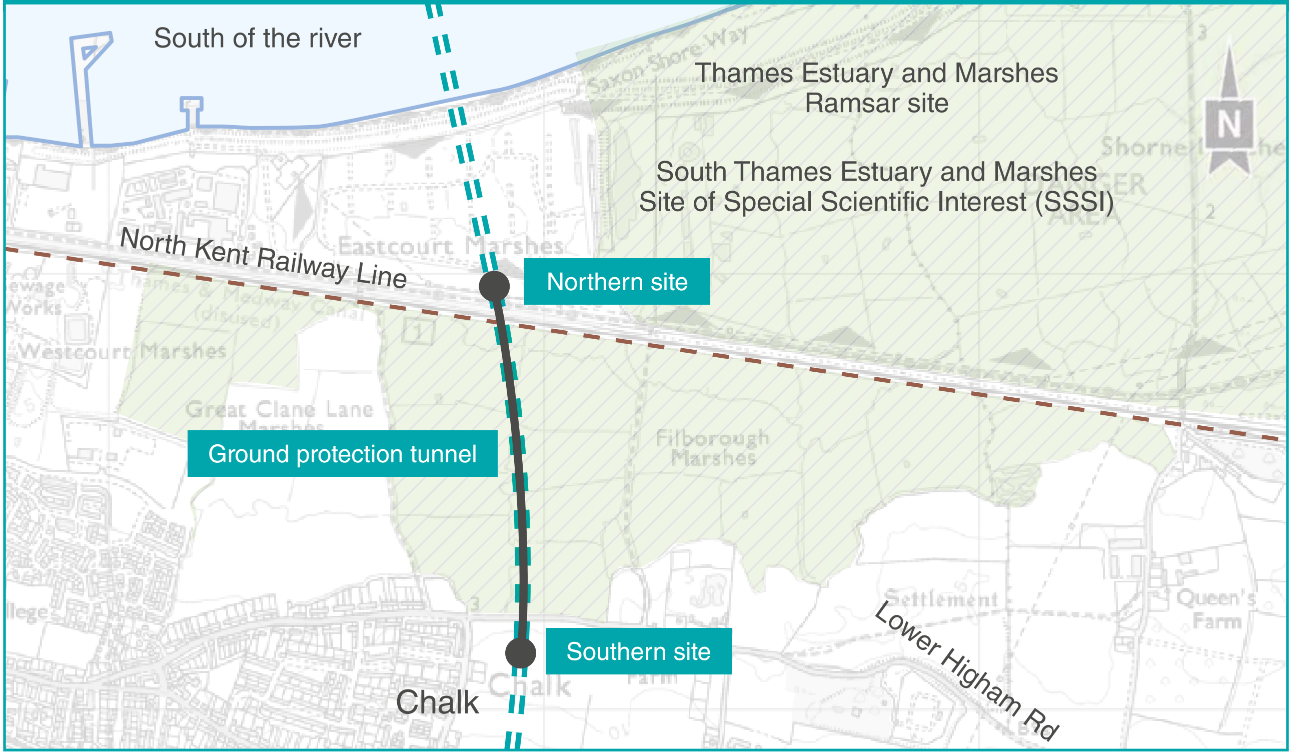


Figure 4-11 Cross-section of ground protection tunnel

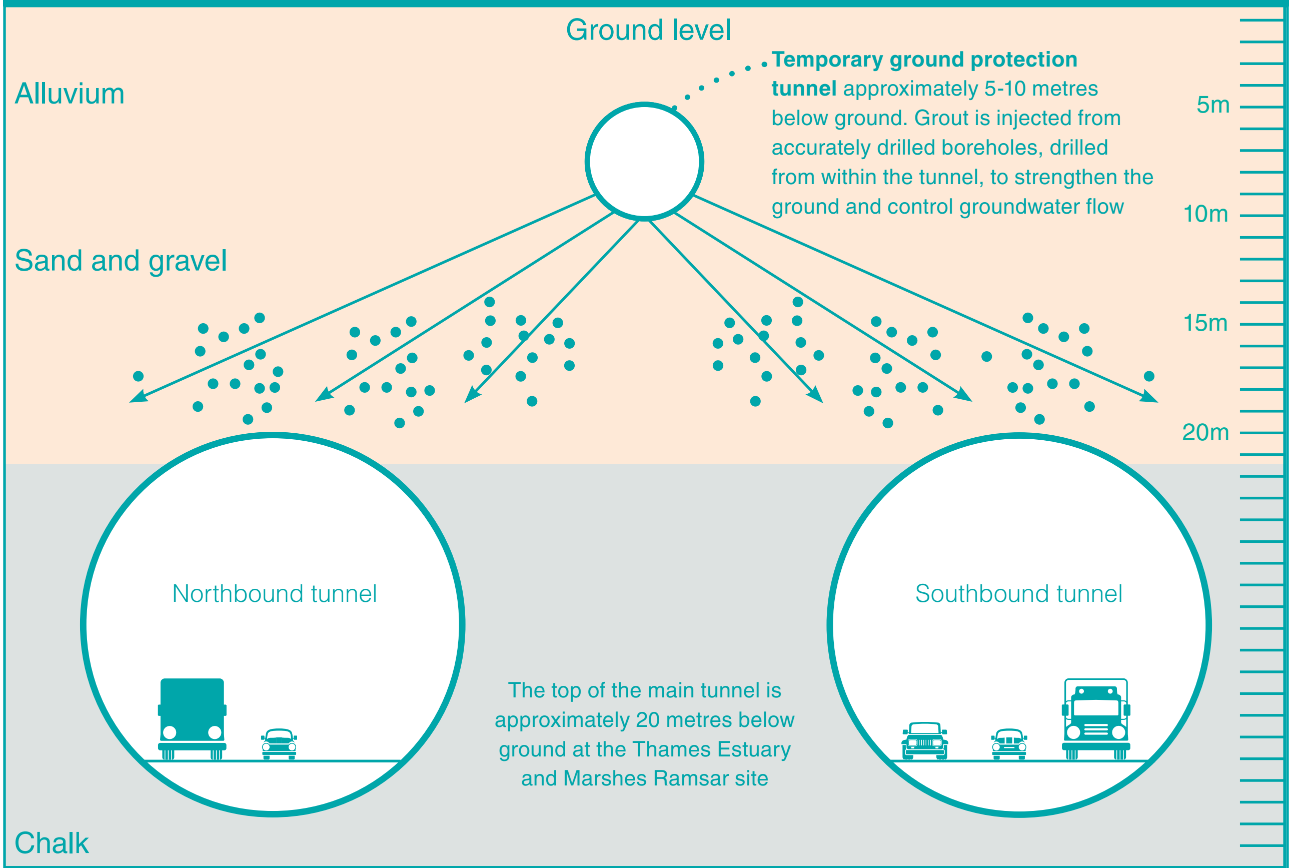


Diagram not to scale

4.7 Launch structure and approach ramp

Introduction

To move from the deep bored tunnel to surface-level highway, we would build a connecting section called the approach ramp. At the northern tunnel entrance, the deeper part of the approach ramp would be excavated first so that we can lower our TBMs into the excavation and start tunnelling. Once this is done, a structure is built to form a section of tunnel which is then covered over to bury it. This is called the ‘cut and cover’ section. As this section rises to meet ground level it gets shallower to a point where it longer needs to be a tunnel. At this point, the excavation is left open and formed into a cutting. The road continues to rise following the ramp, becoming shallower until it eventually meets ground level.

Timing

This phase of work would run from approximately mid-2024 to mid-2028.

Description

A launch structure is a large excavation, with a concrete base and walls, supported by steel props. This provides a solid base on which to assemble the TBM, and a firm support against which pressure can be applied to push the TBM forwards.

Structures would be built at the northern tunnel entrance site for launching and servicing the TBMs for their tunnel drives. Each tunnel would be excavated by a single TBM and lined with precast concrete segments. These would be assembled once the TBM has passed through that area.

The box structure would be open during tunnelling activities and then incorporated into the cut and cover tunnel.

4.8 Tunnelling and fit out

Introduction

Once the tunnels under the Thames have been made by our TBMs, we would then strengthen and prepare the tunnels for use as public roads.

Timing

This sub-section would take place throughout the second half of the construction of Section B, beginning in 2026 and continuing until early 2029.

Description

On average, the TBM would advance at a rate of 50 metres per week. Site activities on the surface would need to support the TBMs and this would be a 24/7 operation. The works at the Northern Tunnel Entrance Compound would be lit at all times and measures would be taken to limit any disturbance caused. For example, we would make sure that lighting was not directed toward residential areas.

Once the TBM has finished a section of the tunnel, the internal road deck would be installed as large precast units within the tunnel. Due to their size and weight, these units are likely to be produced onsite.

The twin road tunnels are connected at regular intervals by cross-passages. These are short, smaller diameter tunnels that provide emergency escape routes for pedestrians to move from one tunnel to the other.

The cross-passages would require several stages of construction including:

- ground treatment and dewatering, which is the treatment of solid material to remove liquid from it
- temporary propping of excavated areas
- mining and support
- waterproofing
- secondary lining, involving the addition of a permanent layer of concrete to support the tunnel structure
- fit out (for example, installation of doors and lighting)

Material would be supplied from the Northern Tunnel Entrance Compound. Our contractors would work on rotating shifts to crew the TBMs, install the deck, and cross-passages, and carry out surface activities.

Some non-technical works, such as the installation of support brackets and cable-trays, may take place as the tunnel progresses. However, the bulk of the more sensitive mechanical, electrical and communication equipment installation would happen once the TBM work is complete and they are removed from the tunnels. This would be on a 24-hour basis from both north and south tunnel entrances. The more sensitive mechanical, electrical and communication installation would need to take place in a clean environment, after the main civil engineering works have been completed.

4.9 Earthworks and landscaping

Introduction

There would be a substantial amount of earthworks associated with the tunnel construction. This would include starting with preparatory works for the tunnelling, continuing with the management of the excavated material during the tunnelling, and concluding with the landscaping of the site following completion of the tunnel and removal of the tunnelling infrastructure.

Timing

This work would take place throughout the second half of the construction of Section B, beginning in 2027 and concluding towards the end of 2029.

Description

Earthworks activities for Section B would involve:

- excavation of north launch box and ramp section
- excavation of the south tunnel entrance and the deep section of cutting that leads southwards towards the A2/M2 junction
- operation of both TBMs and dealing with the excavated material that they produce. This excavated material emerges at the north tunnel entrance where it is processed and then spread as fill to create the finished landscape

- construction of cross-passages between the two main tunnels
- landscaping of the site following completion of the works and preparation of the onsite ecological mitigation

North tunnel entrance, tunnels and cross-passages

To start tunnelling, we would excavate a large, deep box into which we lower the TBMs. This produces a significant amount of excavated material in addition to large amounts from the tunnels. In total around 2 million cubic metres of material would be excavated.

South tunnel entrance

In the south, the tunnel emerges into a deep cutting and we would begin this cutting work early on in the construction process, involving the excavation of around 2.4 million cubic metres of mostly chalk material. A deep excavation would be needed to build the section of road between the new A2/M2/ Lower Thames Crossing junction and the tunnel. Around 75% of the excavated earth would be used to create a new public park to the west of the south tunnel entrance.

How we will move the excavated material

We would use a combination of excavators and cranes with grab attachments to move the material from the north tunnel entrance area and ramp section. Temporarily, the spoil would be transported to a site west of the project, but still within the Northern Tunnel Entrance Compound. This material would then be moved to create a permanent, landscaped area to the south of the tunnel entrance, abutting the Thames, in an area known as Goshems Farm.

In the cutting that leads to the southern tunnel entrance, multiple excavators, wheeled loaders and trucks would move material from the cutting to one of two temporary stockpiles, either side of the new road to be stored on site. Eventually left-over material would be moved off site for disposal. Surplus chalk material for disposal is used for positive purposes, typically capping old landfill sites or filling in old quarries so that they can be used for development.

4.10 Testing and commissioning

Introduction

In addition to putting in place the environmental mitigation measures described in this chapter, the final part of our construction involves making sure the tunnels and road (including all electrical and mechanical systems), structures, earthworks, drainage, public rights of way, and other elements of the project are complete and functioning to the required standards.

Timing

Testing and commissioning would happen from mid-2026 to late-2029, as more construction elements are completed and ready to be tested.

Description

The individual elements of the new road, including its structures as well as roadside gantries, drainage and other supporting infrastructure, would be tested as they reach completion. Our testing would include adherence to the design specifications for each section of the road, as well as safety checks according to the different function and specifications of the element being tested. As more of the route is built, then it would be tested in its entirety. Commissioning refers to the completion of the testing phase, at which point the new road would be brought into use for the public.

5

Section C – North of the River Thames 1

5.1 Overview

This chapter sets out the approaches likely to be used by our appointed contractors to build Section C, which is the part of the Lower Thames Crossing north of the River Thames between the proposed Tilbury Viaduct and Green Lane, north of the A13 junction.

Our Ward impact summaries provide more specific details about the construction process, its impacts and mitigations for Section C. The Outline Traffic Management Plan for Construction (OTMPfC) provides further information on our temporary traffic management proposals. Chapter 7 of the Construction update focuses on project-wide information on the impacts across a number of environmental topics, such as air quality and cultural heritage.

To see how our plans for the Lower Thames Crossing have developed following consultation and feedback, please refer to our You said, we did document.

We have divided the construction of Section C into the following sub-sections. Some, such as initial works, utility works, and testing and commissioning, would happen across all of Section C. The remaining sub-sections describe works that would take place in a specified place, as shown on the map below.

- Initial works, including environmental mitigation
- Utility works
- Tilbury Viaduct (zone 1)
- Chadwell St Mary link (zone 2)
- A13 junction (zone 3)
- Testing and commissioning

Each sub-section of work is described in greater detail later in this chapter.

Figure 5-1 Section C construction zones and timeline

5.2 Timeline

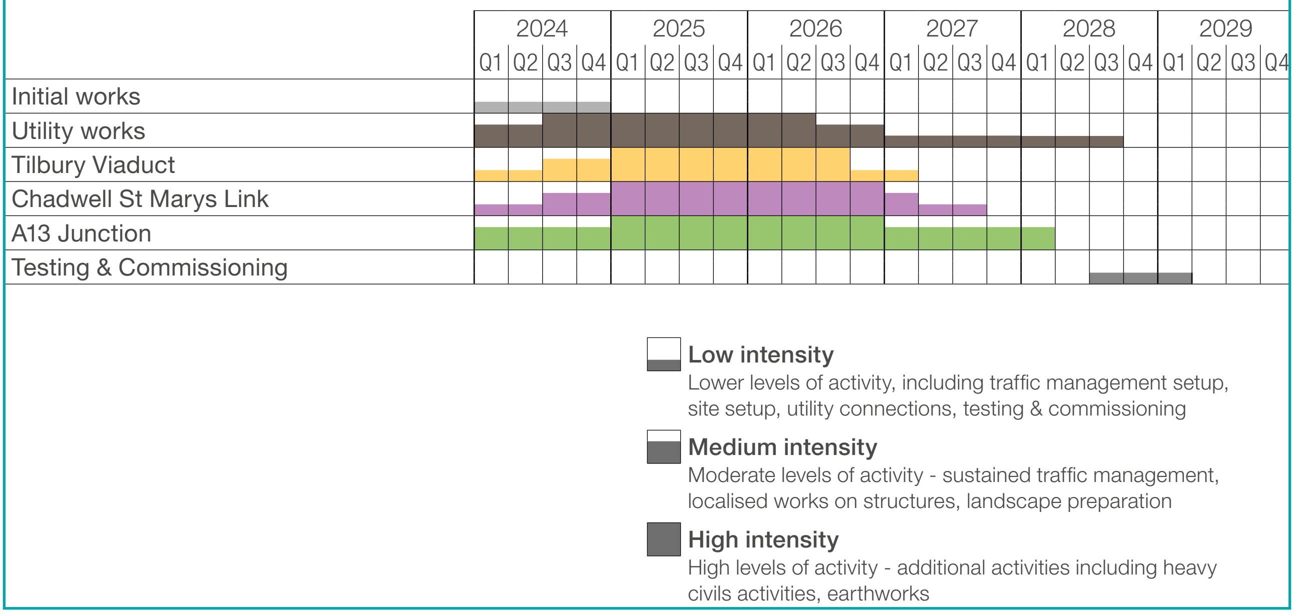
Figure 5-2 below provides an indicative timeline for each of the sub-sections listed above, including details of periods of low, medium and high intensity activity.

Lower levels of activity would include traffic management setup, site setup, utility connections, testing and commissioning.

Medium levels of activity would include sustained traffic management, localised works on structures and landscape preparation.

High levels of activity would include additional activities including heavy civil engineering and earthworks.

Figure 5-2 Section C construction timeline



These timelines are indicative and would be confirmed later, once contractors are appointed to carry out the works and our detailed design of the new road is further developed.

5.3 Initial works

Introduction

The initial works would prepare the site and the construction compounds for the main works. Activities would include:

- ecological mitigation, such as habitat preparation and relocation of species
- archaeological investigations (as required)
- securing the site, including temporary diversions or closures to public rights of way
- demolishing properties affected by the project and relocating a traveller site
- building the main compounds and providing utility connections

Timing

These works would be planned to take place in the second half of 2024, lasting until the end of 2026.

Description

Ecological mitigation

Several areas of land within the Order Limits have been identified as potential sites to relocate reptiles and amphibians, including protected species such as great crested newts. We would create new habitats in these areas to provide shelter, foraging and breeding opportunities for the species relocated there. These would link into the project landscape, with planting providing them with green corridors and shelter for hibernation.

Archaeological investigations

We have already carried out a series of desktop studies based on historical information, as well as walking surveys of the area and trial investigations.

Archaeological trial trenches tend to be about two metres wide and between 20 and 50 metres long. A typical depth for a trench is one metre.

These trial trenches are first dug by mechanical excavator and once the trench is open, archaeologists would hand-excavate and collect archaeological finds. Everything is described, photographed and drawn so that a full report can be made. The trench is then filled in.

Nearly 2,750 archaeological trial trenches have been excavated along the route of the proposed Lower Thames Crossing, and some 1,200 would still need to be dug. The findings would continue to inform our approach to archaeology so we can make sure appropriate mitigations are in place.

Securing the site

Our contractors would install fencing around any areas within the Order Limits that would present a risk to the public during construction, or would be environmentally sensitive and need to be isolated.

Site-specific security risk assessments would be carried out to determine the type of perimeter fencing or hoarding to be installed.

We would make sure that hoarding and other materials used are appropriate to the location and to the activities within the compound/worksite that may affect noise levels at the boundary.

Fencing would be used in areas of low security risk to reduce the visual impact on the environment and aid security patrol management of the area. Heras fencing (mesh fencing) could be used as a temporary measure to secure a site or adapted site boundary before installing permanent hoarding, or likewise when demobilising from an area.

Hoarding would be erected to the boundary of higher-risk activity sites or where visual screening is necessary. Hoarding would typically be 2.4 metres high but could be higher in the highest security risk areas.

We would create a diversion or implement a temporary closure and make safe any public rights of way affected by our first phase of construction. Some would be closed permanently and replaced by new ones, forming part of the project once it is complete. We would inform local communities about how public rights of way would be affected in their area. Further information about specific changes to rights of way can be found in the Ward impact summaries document.

Relocation of the traveller site and property impacts

As described in previous consultations, the creation of a new slip road connecting the A1089 to the project route northbound would require the land occupied by the Gammonfields Way traveller site.

We would therefore provide an alternative site next to its current location, with access off Gammonfields Way. The site would remain approximately 1.5 ha in size, with an additional 1.5 ha set aside for appropriate landscaping and access. Noise mitigation and visual screening would be put in place.

Eighteen residential properties would also need to be demolished in this area. Highways England has been communicating with the relevant owners and occupiers over an extended period of time. Compensation has been or would be paid to qualifying parties in line with statutory blight arrangements and Highways England's own compensation packages.

Haul roads

As part of our initial works, we would create a network of haul roads connecting compounds with work areas. Haul roads are temporary roads constructed within the Order Limits that are used for the movement of construction vehicles, including HGVs, around the construction site. These temporary roads would provide access for construction vehicles along the Lower Thames Crossing route and link roads to reduce their need to use local public roads. Please refer to the large-scale Construction Maps (Compounds and Access) for details of the layout of haul roads.

A haul road would be established next to the Lower Thames Crossing from the south of the A13 to the Tilbury Viaduct (zone 1). It would have multiple crossing points for construction vehicles and would provide a route south of the A1013 to the Tilbury Viaduct for construction vehicles only, minimising their use of local roads.

South of the Orsett Cock roundabout, for approximately 1km, Brentwood Road (zone 2) would provide access to the Brentwood Road Compound throughout the construction period.

Muckingford Road and Hoford Road (zone 2) would also provide initial access for the construction of haul roads across the route. When the haul roads are complete, contractors would only use Muckingford Road and Hoford Road while crossing over them.

We would put traffic signals in place until the new bridges at Muckingford Road, Brentwood Road and Hoford Road are built, as described in further detail in the Ward impact summaries and the OTMPfC. Construction traffic would then cross underneath.

Green Lane and Stifford Clays Road (zone 3) would be used to enable the construction of a haul road in Section C.

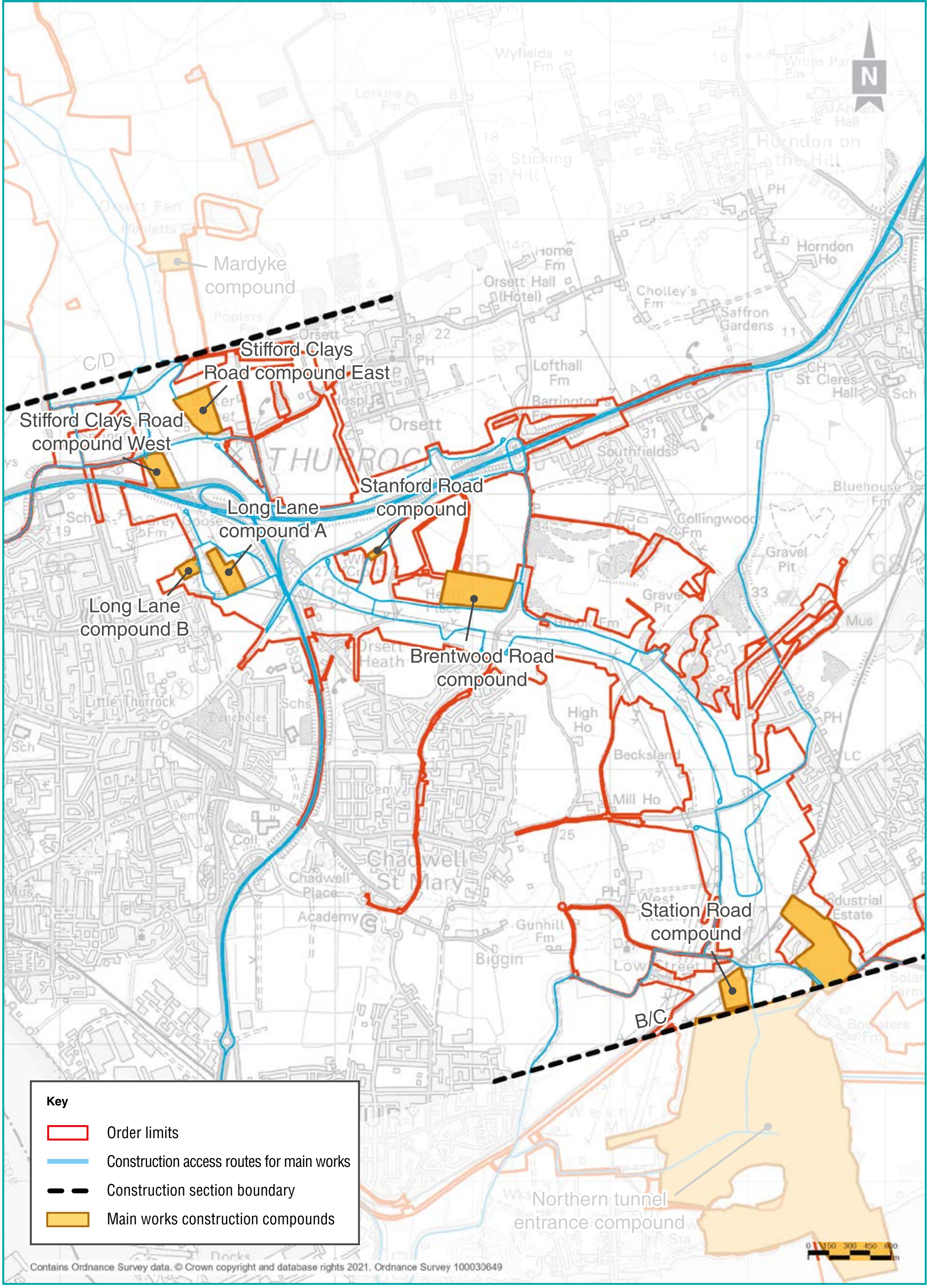
Once the haul road is completed, Stifford Clays Road would only be used by construction vehicles, excluding private vehicles used by construction personnel, for infrequent and specific works, such as utilities and tie-in works. It would, however, still need to be crossed by construction traffic and this would be managed by temporary traffic signals. These temporary signals would be in place until the new Stifford Clays Road bridges (described later in this chapter) are in place.

A section of Green Lane would be required for use by construction vehicles throughout the construction phase but would remain open for public use, with short-term closures associated with tie-in works.

Construction compound set-up

There are seven proposed construction compounds in Section C. These are shown on Figure 5-3.

Figure 5-3 Section C construction compounds and access routes



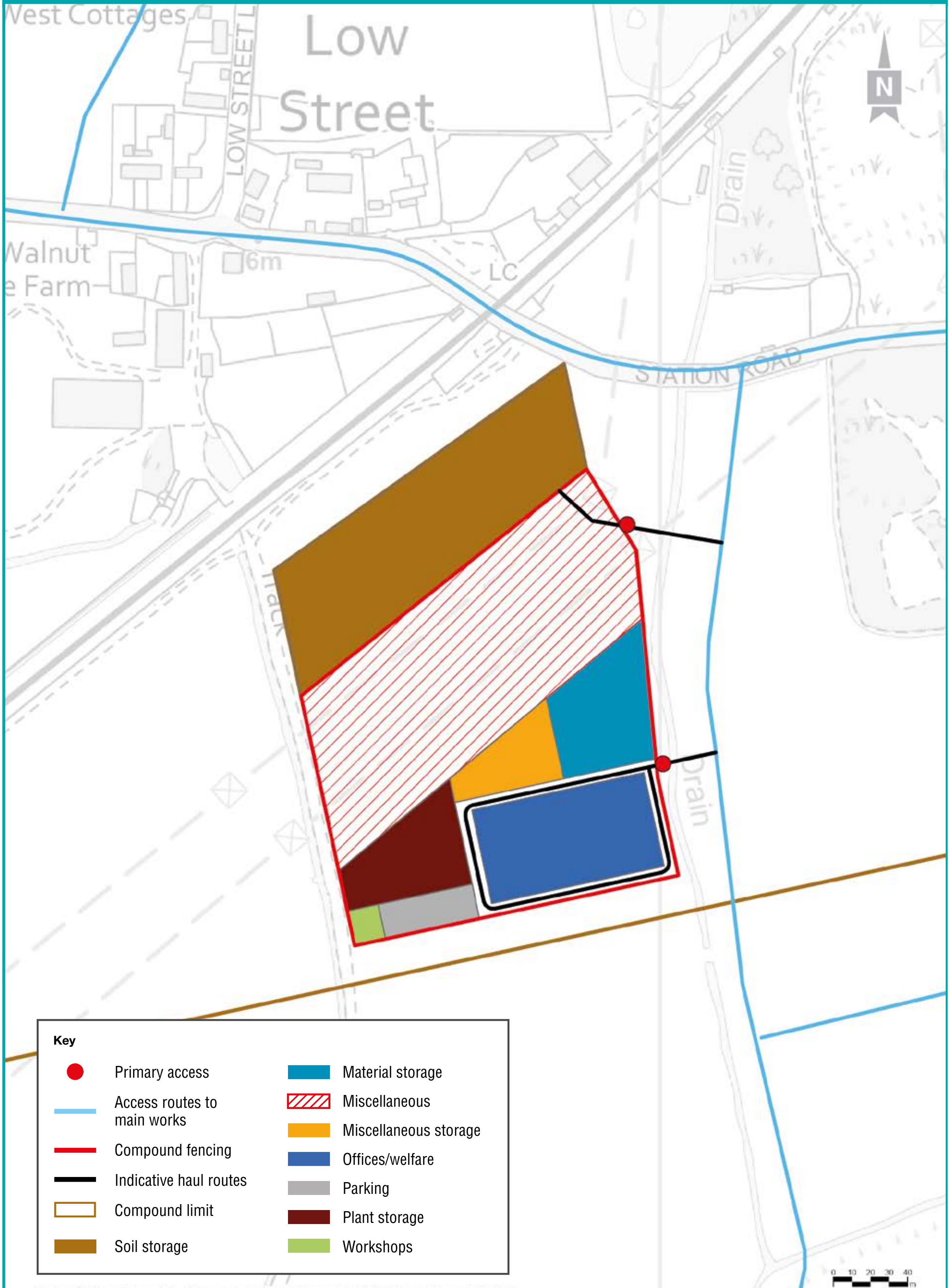
Where possible, temporary utility works needed for each compound would be carried out at the same time as permanent works to reduce the length of our programme and its impact.

Electricity would be supplied to all compounds via a new 10km network. It would be connected to UKPN's services at Marshfoot Road.

Around 2.4km of network would be installed over a 9 to 12-month period in 300-metre sections north through Chadwell Hill Road and Brentwood Hill Road. Traffic signals would be used to manage disruption associated with those works.

Station Road Compound

Figure 5-4 Station Road Compound indicative layout

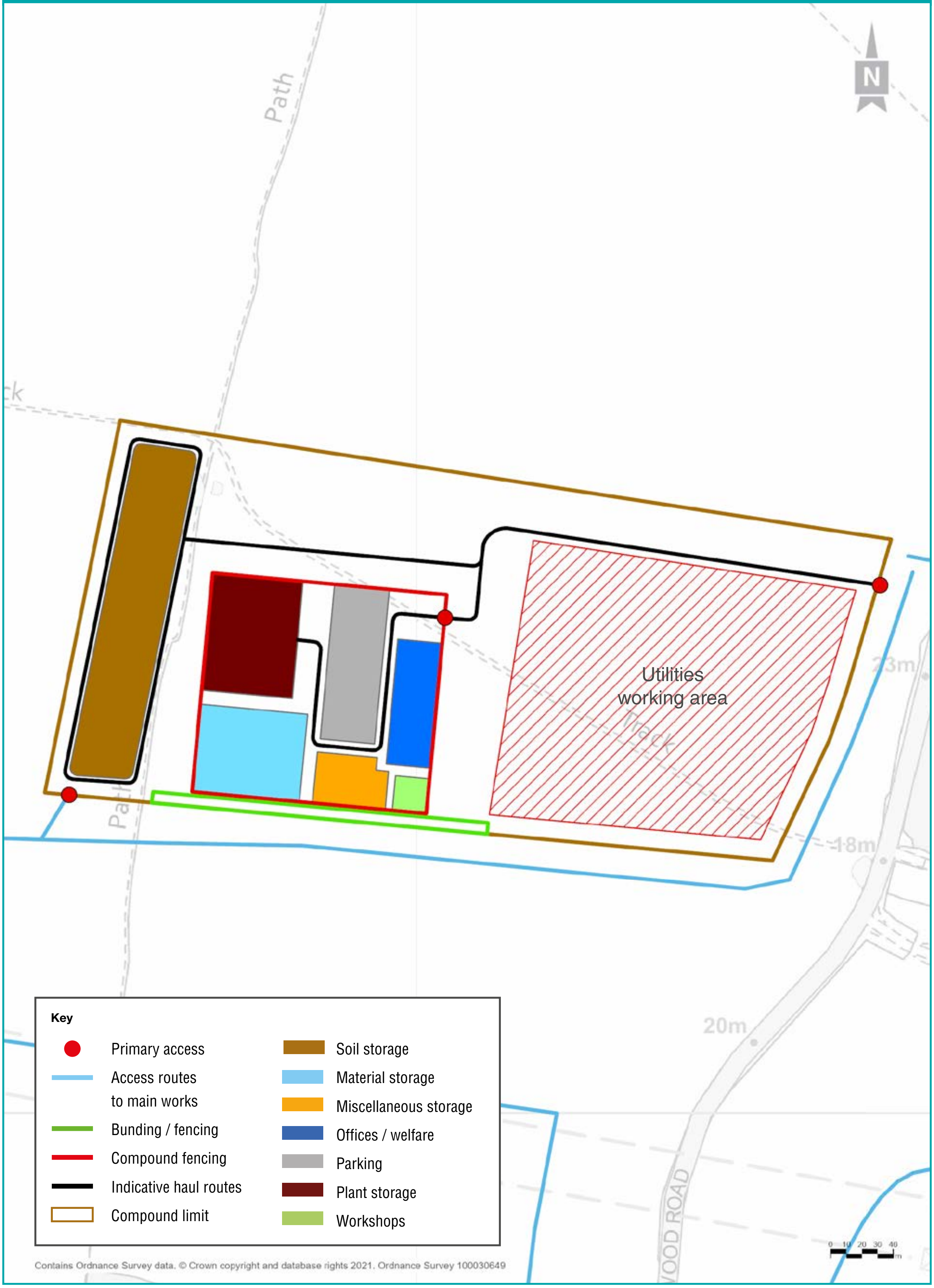


This compound would be located near Station Road, next to the Northern Tunnel Entrance Compound, and would be approximately 4.5 ha in size. Space would be allocated within the compound for stockpiling materials, workshops, offices, welfare facilities and parking.

This compound would support works at the Tilbury Viaduct and on connecting roads. It would be in place for approximately three years from 2024.

Brentwood Road Compound

Figure 5-5 Brentwood Road Compound indicative layout



This compound would be located on Brentwood Road near Heath Place, and would be approximately 11 ha in size. It would include space for car parking, offices and welfare facilities, as well as areas for storage of equipment and spoil.

The Brentwood Road Compound would support works south of the A13 towards the Tilbury Loop railway line and would be in place from early 2024 to mid 2028.

Where feasible, soil excavated and retained on-site temporarily would be stockpiled in bunds to use as screening for residential properties in Chadwell St Mary. Construction materials higher than five metres would, where possible, be located at the southern end of the compound, away from these properties.

Construction traffic would use Brentwood Road, between the Orsett Cock junction and the Lower Thames Crossing route, to access the Brentwood Road Compound. These vehicles would not go further south than the proposed new Brentwood bridge and would not pass through the residential areas of Chadwell St Mary.

Utility connections

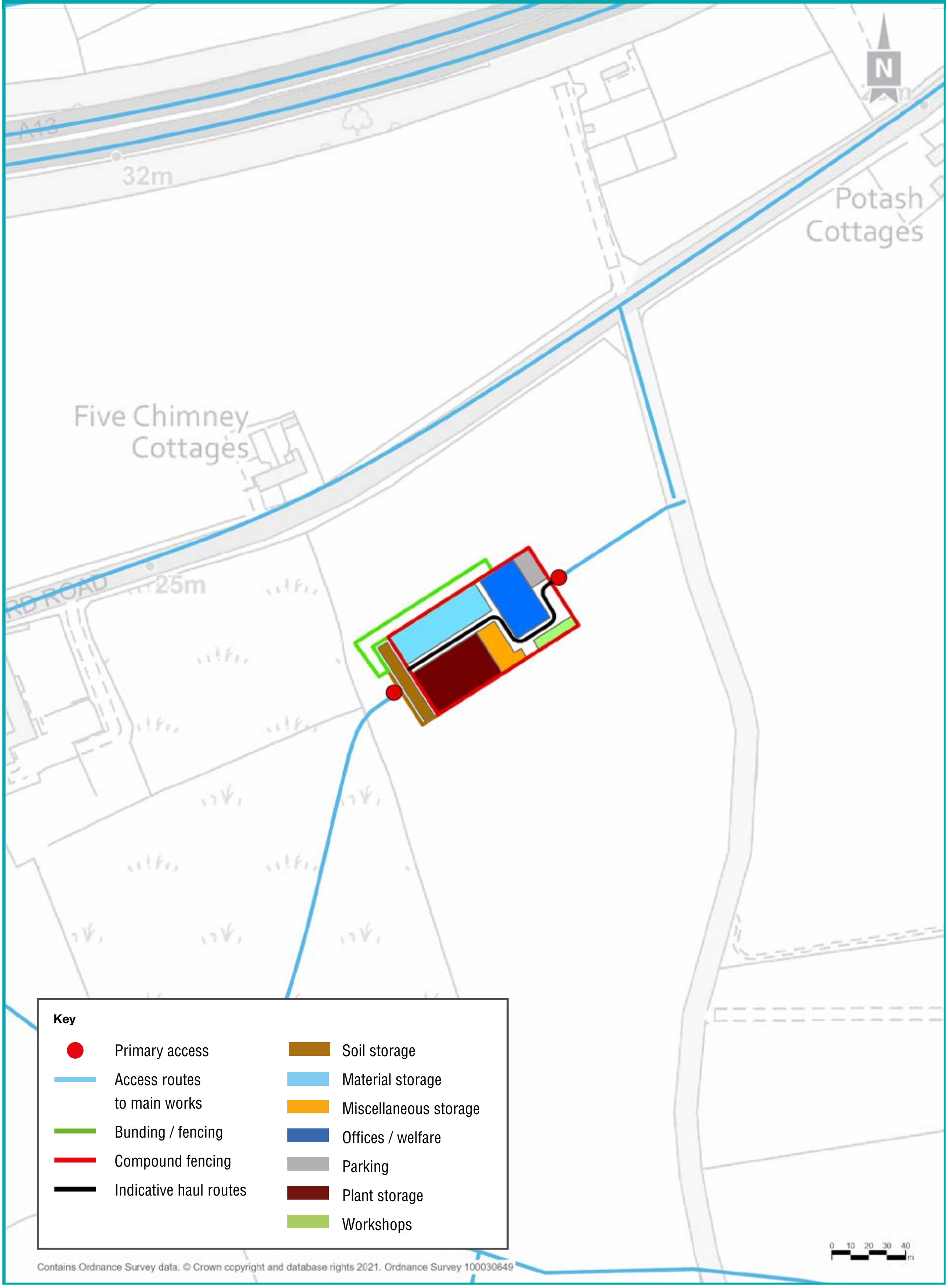
Waste water services would be provided via a connection to the existing sewerage network in a field, south of Orsett Golf Club and east of Brook Farm. A temporary 900-metre waste water pipeline would be installed in the ground over a two-month period during construction.

Works to install temporary telecoms infrastructure would happen early in the construction programme and would take approximately four to six months. They would be carried out from the Orsett Cock junction for around 800 metres to connect to the compound. At the same time, permanent and temporary utility works would be completed in 300-metre sections in the area to reduce any long-term impact. We would install traffic management, including traffic lights and contraflow measures, on Brentwood Road. Contraflow sections would be no more than 300 metres long. Please see the Ward impact summaries and the OTMPfC for more details.

When the compound is taken down, we would remove all temporary utility works and infrastructure, and the land would be reinstated.

Stanford Road Compound

Figure 5-6 Stanford Road Compound indicative layout



The Stanford Road Compound on Hornsby Lane near Stanford Road would be approximately 0.5 ha in size, and would support construction works affecting slip roads between the A13 and A1013.

Most of the compound would be used for storage, equipment and stockpiling. There would also be space for car parking, offices, welfare facilities and workshops.

Hornsby Lane would be permanently severed either side of the new road. Before the road is closed, we would put turning arrangements in place.

Utility connections

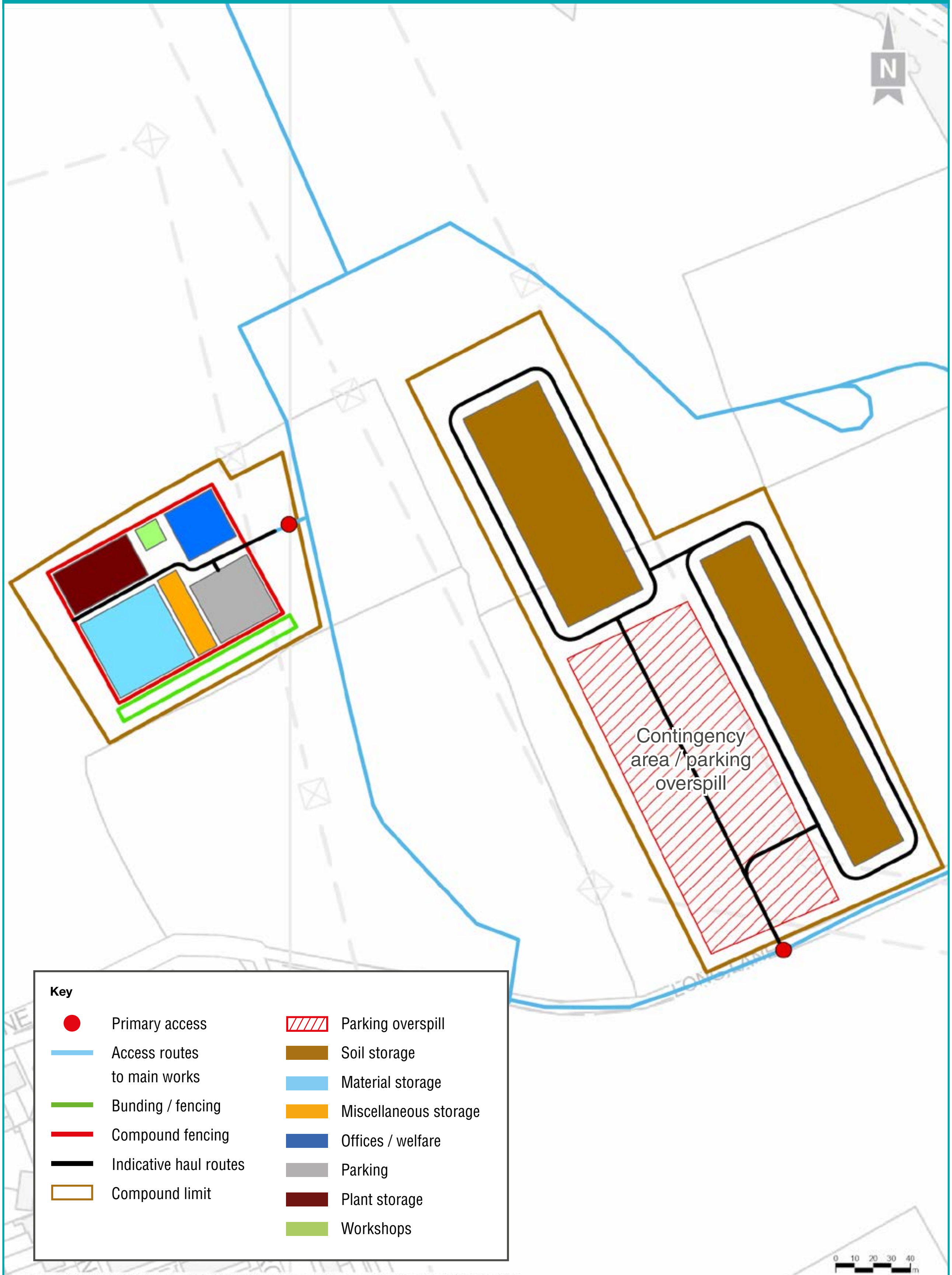
Works to temporarily connect the compound to the telecommunications network at the A1013 Stanford Road would take place at the same time as permanent utility works.

The compound would have its own temporary 1km wastewater connection to the local network at Heath Road. Works would be completed early in the programme over a period of approximately two months. We would install traffic management, including traffic lights and contraflow measures on the A1013 Stanford Road. Contraflow sections would be no more than 300 metres long. Please see the Ward impact summaries and the OTMPfC for more details.

When the compound is taken down, we would remove all temporary utility works and infrastructure, and the land would be reinstated.

Long Lane Compound

Figure 5-7 Long Lane Compound indicative layout



This compound would be located on the northern side of Long Lane and would be approximately 4.5 ha in size. It would be used to support construction of the slip roads south of the A13 and west of the A1089, as well as the western underpass bridge below the A13. We would set up the compound early in the construction period for Section C, and it would be in use until around August 2028.

Around half of Long Lane Compound would be for storage and equipment, and the other half for parking, offices and welfare facilities, workshops and earthworks stockpiling.

Access to this worksite would be via Long Lane.

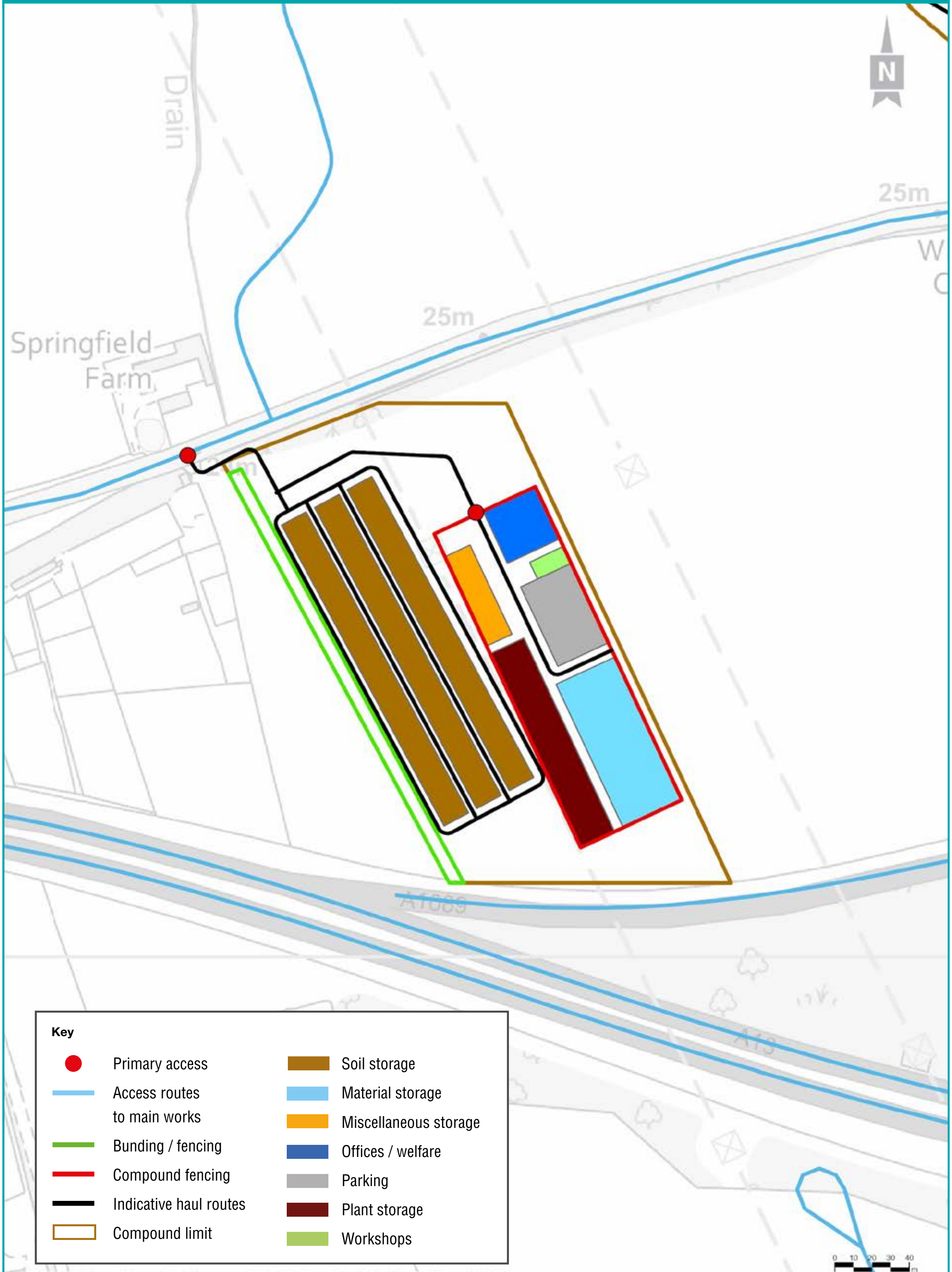
Utility connections

Telecommunications and water would be supplied via the local networks on Long Lane. The compound would connect to the wastewater pipeline that runs next to it.

When the compound is taken down, we would remove all temporary utility works and infrastructure, and the land would be reinstated.

Stifford Clays Road Compound West

Figure 5-8 Stifford Clays Road Compound West indicative layout



Stifford Clays Road Compound West would be on the southern side of Stifford Clays Road to the west of the Lower Thames Crossing. It would be around 4 ha in size and would be used for construction of the north-west section of the A13/Lower Thames Crossing junction. Space would be allocated within the compound for stockpiling materials, workshops, offices, welfare facilities and parking. Some fencing two to three metres high would also be in place.

We would build a temporary access haul road from Medebridge Road. The haul road would be constructed within the first six months of construction starting. Before then, Stifford Clays Road would be used by construction traffic to access this compound and the Stifford Clays Road Compound East. Once the temporary access road is open, Stifford Clays Road would only be used for specific works, including those to connect the new road to the existing road network.

However, we would use Stifford Clays Road as a crossing point, controlled by traffic signals. This would allow construction vehicles to access worksites between the A13 and Stifford Clays Road. Temporary traffic signals would be in place until the new Stifford Clays Road bridges are built and construction traffic can pass underneath.

Utility connections

A temporary wastewater pipeline, approximately 800 metres long, would be needed to connect with the existing network at Blackshots Lane to remove the wastewater from Stifford Clays Road Compound West. This would be placed in the ground in two locations: alongside Stifford Clays Road for 450 metres and south of the A13 to Blackshots. Works would be carried out during standard working hours over a six-month period at the start of the construction process. Contraflow traffic measures would be likely for four months to manage disruption at the connection on Stifford Clays Road. More information is provided in the Ward impact summaries and the OTMPfC.

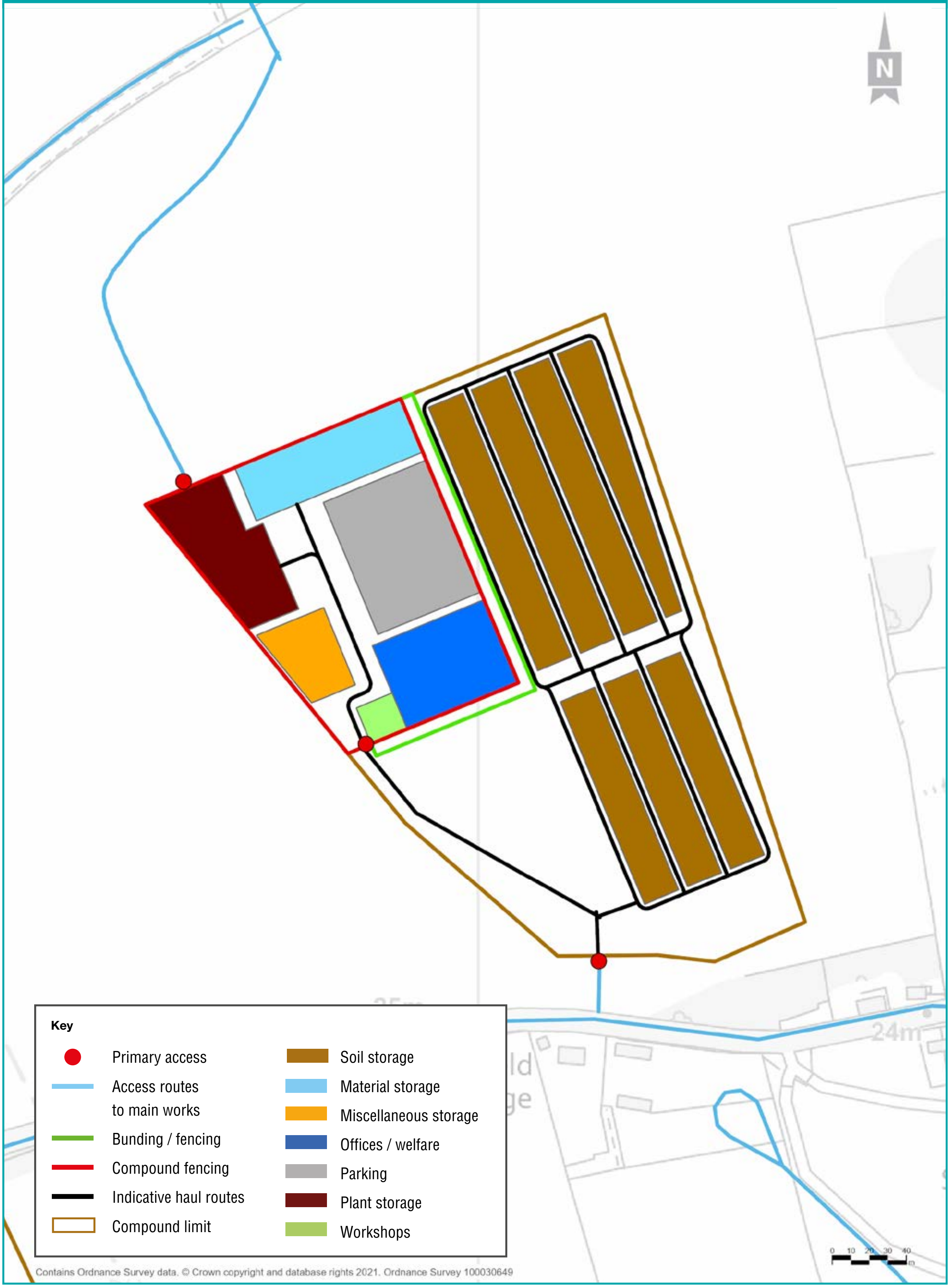
We would need to install a 3km water pipeline connecting to the local network at the Grangewaters Outdoor Education Centre. This means five or six bays of the centre's car park would be out of use for up to two weeks. Works would be completed during standard hours over a period of nine months. Trenchless techniques that do not require a continuous channel could be used to mitigate the impact on existing vegetation.

Temporary works would be needed to connect the compound to the local telecommunications network. This would involve installing a 1.6km network of ducts and cables to Orsett. Around 700 metres of this would be carried out at the same time as other works on this road, where possible, to reduce the overall time for these works. The remaining 900 metres from Baker Street east would be completed in up to 300-metre sections by installing the network in the ground. This would take between four and six months. Traffic signals would be needed from the junction of Baker Street and Stifford Clays Road, heading east towards Orsett.

When the compound is taken down, we would remove all temporary assets and the land would be reinstated.

Stifford Clays Road Compound East

Figure 5-9 Stifford Clays Road Compound East indicative layout



Stifford Clays Road Compound East would be located north of Stifford Clays Road, east of the Lower Thames Crossing. It would be approximately 7 ha in size, with space for car parking, offices, welfare facilities and storage. Around half of the site would be set aside for earthworks stockpiling.

The compound would support the construction works for the A13 junction slip roads and highways works north of the A13 towards the Mardyke, as well as the construction of the eastern underpass bridge below the A13. It would be in place throughout construction. We would locate facilities higher than five metres, including offices and storage buildings, as far as possible from residential properties on Stifford Clays Road and Fen Lane.

Access would be via Stifford Clays Road, until a temporary haul road for construction traffic is in place. We would expect to complete the works to construct the temporary haul road within the first six months of the construction programme.

Utility connections

Telecommunications would be supplied via the connection from Stifford Clays Road Compound East to the existing network. Waste and water supply would require the temporary installation of a 100-metre pipeline to connect to the existing network on Stifford Clays Road. We would coordinate works with Stifford Clays Road Compound East to minimise any impact on Stifford Clays Road.

When the compound is taken down, we would remove all temporary assets and the land would be reinstated.

5.4 Utilities

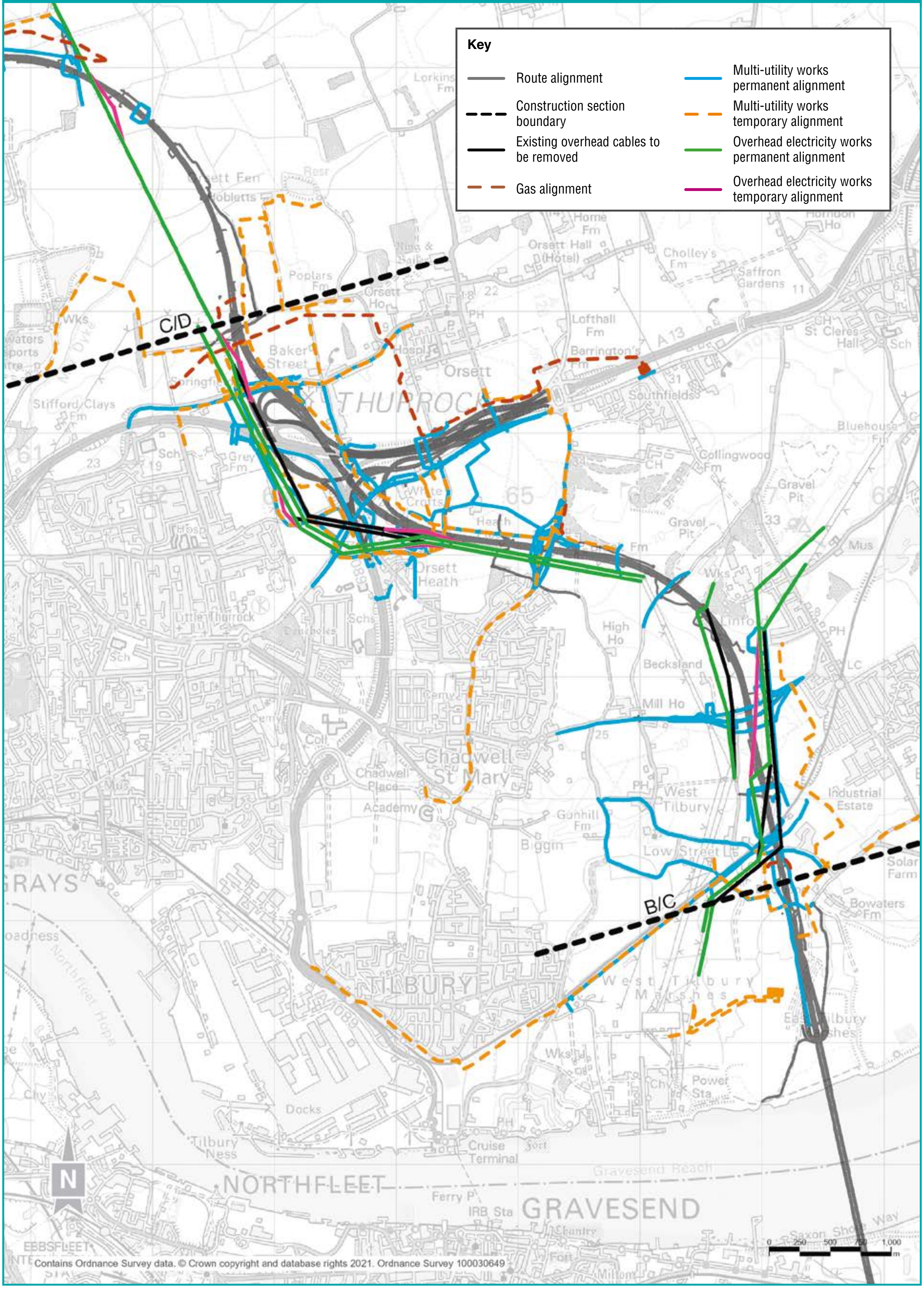
Introduction

Construction of the Lower Thames Crossing would require changes to existing utilities, including overhead power lines, gas and water pipelines and telecommunications cables.

The proposals for utilities works in Section C have changed during the project's development. We have been working closely with the utility companies to improve the design and have significantly reduced the environmental impacts and shortened the duration of the works.

To make sure the main works compounds operate efficiently, temporary connections to the utility networks would be required but would be removed when we take the compounds down. Where possible, these works would be delivered at the same time as other highway works or permanent utility diversion works to minimise their impact on the local communities.

Figure 5-10 Map of utility works in Section C



Timing

Works would begin on the utility networks when construction starts on Section C. The work would be carried out over approximately five years. We would plan and carry out the works so that local people would not experience a disruption to their supply of utilities, including water, power and broadband services.

Description

In addition to the main works compounds, there would be eight temporary Utility Logistics Hubs (ULHs) in Section C: Low Street Lane, Muckingford Road, Brentwood Road, Hornsby Lane, Long Lane, Stifford Clays Road, Stanford Road and Green Lane. Each would be set up by the relevant utility company to allow specific works to be carried out in that area, as set out in table 5-1. A map showing the locations of the ULHs is provided in chapter 2.

The ULHs and the main works compounds, where appropriate, would serve the major utility diversions necessary north of the river. These are summarised below.

Table 5-1 Section C Utility Logistics Hubs

Utility Logistics Hub	Utility company	Works	Approximate area (m^2)	Indicative duration
Low Street Lane	National Grid Electricity Transmission	Overhead electricity network modifications: East of Tilbury to north of Linford	14,300	13
Muckingford Road	National Grid Electricity Transmission	Overhead electricity network modifications: East of Tilbury to north of Linford	14,300	13
Brentwood Road	Cadent	Gas pipeline diversion: Brentwood Road	13,200	12
Hornsby Lane	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke to Hornsby Lane	14,300	33
Long Lane	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke to Hornsby Lane	18,000	33
Stifford Clays Road	National Grid Electricity Transmission	Overhead electricity network modifications: Mardyke to Hornsby Lane	13,300	33
Stanford Road	Cadent	Gas pipeline diversion: A13 junction	14,800	26
Green Lane	Cadent	Gas pipeline diversions: A13 junction and Green Lane	13,200	26

Diversion of National Grid power line at Tilbury to Linford

The works would require temporary and permanent modifications to 2km of existing overhead power line, of which 0.89km is permanent. This would include construction of five new pylons to cross the route and Tilbury Loop railway line. Two short-term diversions of the power lines on two temporary pylons would be needed to maintain electricity supply while new pylons are installed. To complete the re-stringing of the overhead power lines, the working area will need to include the existing pylons from the south of the Tilbury Loop railway line through to the north of Walton's Hall Road (about 3.58km). For more information on overhead power line works, see chapter 2.

Diversion of National Grid power lines from Chadwell St Mary to Stifford Clays Road

Temporary and permanent modifications would be required to two existing overhead power lines. The first would be 1.7km long, of which 1.2km would be permanent. It is located west of Hornsby Lane heading west of the A1089 and then north to the A13. These works would include building four new pylons and removing four existing ones. Two short-term diversions of the power line on two temporary pylons would be needed to maintain electricity supply while new pylons are installed. To complete the re-stringing of the overhead power lines, the working area would need to include the existing pylons from the south of Hoford Road through to the north of Green Lane (about 4.75km).

The second line would be 3.17km long, of which 2.5km would be permanent and is located west of Hornsby Lane heading west of the A1089, then north over the A13 to Stifford Clays Road. These works would include building eight new pylons and removing eight existing ones. Two short-term diversions on two temporary pylons would be needed to maintain electricity supply while the new pylons are installed. This work qualifies as a Nationally Significant Infrastructure Project (NSIP) in its own right, and is referred to in chapter 2. To complete the re-stringing of the overhead power line, the working area would need to include the existing pylons from the south of Hoford Road through to the north of Green Lane (about 4.95km).

UKPN proposals

Construction works in Section C would affect two networks east of Tilbury. One, running from south of the Tilbury Loop railway line to north-west Linford, would require the removal of nine pylons and 2.6km of cables, with new cables routed underground. The other network would be on the western side of the route, starting south of Muckingford Road. It would be diverted as it heads north before crossing the route for 1.44km. The works would include building five new pylons and removing four existing ones.

To make sure customer supplies are not affected, and that the network can be maintained safely, there would be multiple diversions of the 33kV, 11kV and pilot-cable networks. We propose to also install nine substations throughout Section C. For further information, please see Map Book 1: General Arrangements.

Diversion of Cadent high-pressure gas network

Works would be required in three separate locations for Cadent's gas network and associated infrastructure. This would involve diverting the following high-pressure pipelines:

- a 0.34km diversion to cross the route north of Green Lane
- a 0.27km diversion east of Brentwood Road at the western edge of Orsett Golf Club
- a 5.2km diversion of a high-pressure pipeline from Green Lane to Stanford Road that is currently located south of the A13 from Green Lane to the Orsett Cock junction. This would pass under the route heading east from Green Lane to Orsett where it would turn south. At the A13 it would turn east following the earthworks under Rectory Road. After passing north of the existing woodland block, it would pass under the A128 and continue east before heading south under the A13 and joining the existing network at the A1013 Stanford Road. At the connection at Stanford Road a new gas valve compound, that would be around 30m by 30m and 2.4m high, and permanent access from Stanford Road would be required for the ongoing operation and maintenance of the gas network. This diversion work would qualify as a NSIP in its own right

Diversion of sewers and water mains

To make sure customer supplies are not adversely affected and can be operated and maintained safely while the new road is built and when it is open, we would need to complete multiple diversions of the network of sewers and water mains in Section C.

Diversion of telecommunications networks

In Section C, we would also need to divert a series of telecommunication networks. These currently provide services to local communities, international businesses and the emergency services. It is likely they would be moved temporarily then relocated into the new road and its structures as they are being built.

5.5 Tilbury Viaduct (zone 1)

Introduction

A viaduct is proposed to carry the new road over the Tilbury Loop railway line. It has been designed at the lowest possible height to reduce its visual impact on the surrounding area.

Timing

We would expect work to construct the Tilbury Viaduct to begin at the start of the construction period early in 2024 and to be completed in early 2027.

Description

These works would be carried out offline and in agreement with Network Rail and would feature pre-cast concrete. For further information on our proposed methods, see chapter 2.

As the viaduct would need to be built over Station Road, a series of short-term closures would be necessary and a diversion would be put in place.

5.6 Chadwell St Mary link (zone 2)

Introduction

The proposed junction between A13, A1089 and Lower Thames Crossing would need to be modified and new slip roads constructed to link these roads. This particular chapter is about works south of the A13.

Timing

Work would begin early in 2024, at the start of the construction period for Section C, and is expected to continue until mid-2027.

Description

Main route, Tilbury Viaduct to south of the A13

These works would involve construction away from the existing road network, and would include major earthworks, preparation of the new road's surface, drainage and finishing works from the A13 to the Tilbury Viaduct. Please see chapter 2 for more information. Construction would be phased over three to four years, starting in the earlier stages of the programme.

The route has been designed to be as low as possible, keeping within the natural valley of the landscape. Earthworks and false cuttings would provide visual screening for nearby properties and residents.

Bridge construction

A series of bridges would be constructed at Brentwood Road, Muckingford Road and Hoford Road. These would be built using standard bridge construction as described in chapter 2.

Muckingford Road bridge

We would build this as a green bridge to maintain a habitat link for wildlife. It would take approximately 14 to 18 months to build, primarily offline. Some short-term temporary traffic management measures would be required to maintain through traffic while the road is widened where the new bridge ties into the existing network. This is described in the Ward impact summaries and the OTMPfC.

Muckingford Road would remain open, with some overnight or weekend closures to tie-in the new bridge.

Our proposed bridge design is inspired by the local area and incorporates hedgerow planting, paved areas and open grassland. A segregated track would improve connections for walkers, cyclists and horse riders.

Brentwood Road bridge

A bridge would be installed at Brentwood Road, and the road would be realigned and raised to cross over the new route. The bridge construction would take place offline with some short-term overnight or weekend closures for tie-in works. These are expected to take around 12 to 14 months.

Our design of Brentwood Road would draw upon the existing landscape by expanding the woodland associated with Orsett Golf Club.

Hoford Road bridge

Hoford Road would be realigned and raised to cross above the new road. The construction of the bridge would take place offline over 12 to 14 months.

We are proposing a green bridge that uses hedgerow planting to maintain the character of this historic and protected lane. The planting would be provided at the modified sections of Hoford Road.

5.7 A13 junction (zone 3)

Introduction

The proposed junction between the Lower Thames Crossing, the A13 and A1089 would require changes to the existing junction as well as modifications to approach roads. We would design the project route to pass beneath the A13 with one underpass to the west of the A1089 and another to the east.

Timing

We would begin the work to build the A13 junction and modify the approach roads at the start of the construction period, and this would take until early 2028.

Description

Structures under the A13

As part of the initial works for the underpasses, a programme of earthworks would be required to allow construction to take place.

Construction of the A13 underpass east of the A1089 would likely take place early in our construction programme and would take 20 to 24 months. The underpass to the west would take between 18 and 22 months to build, towards the end of construction. This is because we would first need to divert existing overhead power lines. Access to the worksite would be via Gammonfields Way.

We would not need to close the A13 during these works. but temporary traffic management measures would be required throughout. More information on these measures is provided in the Ward impact summaries and the OTMPfC.

We would design woodland planting around the proposed A13 junction and incorporate this into the surrounding land. To reduce the impacts on the local community, we would use earthworks, such as false cuttings and noise barriers.

Rectory Road

The bridge carrying Rectory Road over the A13 would be replaced and we would need to close it for approximately 12 months. More information on the closure and the traffic management measures that would be in place is provided in the Ward impact summaries and the OTMPfC.

The processes for building the new structure, including piling, abutments and piers are described in more detail in chapter 2.

We would not close Rectory Road and Baker Street at the same time to make sure local access either side of the A13 is maintained. Construction traffic would only be permitted to use Rectory Road for specific works, for example utility works. The Ward impact summaries and the OTMPfC set out more information on this process.

A haul road would need to cross Rectory Road to access works to the east, and so traffic control measures would be installed for public traffic at that crossing point. Our Ward impact summaries provide more information on these measures.

A1013 (Stanford Road) realignment and tie-in structures

The A1013 would be realigned as part of these works, which would include building three new bridges. This would involve construction activity including piling and earthworks. For more information about our construction methods, see chapter 2.

The realignment of Stanford Road would take approximately 12 to 18 months. Some elements would take place towards the beginning of the construction programme. Most of this work, however, would need to be carried out after a gas main diversion in the area.

Works would be phased to make sure the A1013 remains open throughout construction. Traffic management, as described in the Ward impact summaries and the OTMPfC, would be necessary in some areas along the road. This would change throughout the programme to allow construction vehicles and staff to access the works area. Signage would keep road users informed.

While the A1013 would remain open, overnight and weekend closures would be required for works to tie-in the Lower Thames Crossing to the existing road network.

Orsett Heath Viaduct

We would build this over Baker Street and the A1089, using the construction methods explained in chapter 2. These works would be likely to take 18 to 22 months, and would happen after the diversion of a gas main in the area and during the closure of Baker Street (described below).

Baker Street

The stretch of Baker Street between the A13 and A1013 would be closed for around 30 months to allow the following works:

- existing bridge demolition
- bridge construction over Baker Street (Lower Thames Crossing primary route)
- realignment of Baker Street

We would realign the road south of the A13 to its connection with the A1013. This would happen while it is closed, and the methods we would use are outlined in chapter 2.

Construction vehicles would use Baker Street for up to six months from works for the site preparation. Baker Street south of A13 would be closed to traffic for the duration of the works. Baker Street south of the A13 would be closed to the general public and only used as a through-connection for construction works during the closure.

Crossing points would be needed on Baker Street to access works north of the A13 and to the east, as well as south of the A13 east of the A1089. When Baker Street is open, crossing points north and south of the A13 would be introduced. Traffic signals would be installed to allow construction traffic to cross. Additional overnight or weekend closures may be required to complete construction. While Baker Street is closed, Rectory Road would be open to maintain local access north and south of the A13. The Ward impact summaries and the OTMPfC provide more information on traffic management measures.

Heath Road

This road would be realigned from the A1013 to 250 metres south of the A1013. This would require some earthworks and standard road construction. See chapter 2 for further details.

Heath Road and its connection to the A1013 would be open for the duration of construction but some tie-in works would need overnight or weekend closures.

Works west of A1089

As described previously, the existing traveller site would be relocated to allow a new slip road to connect the A1089 northbound to the Lower Thames Crossing northbound. This would involve earthworks and road construction as outlined in chapter 2.

Access to the works site would be via Gammonfields Way and a new haul road.

Realignment of Stifford Clays Road and bridge construction

Stifford Clays Road would need to be realigned and two bridges would be built to allow construction of the Lower Thames Crossing underpass. These works would take approximately 12 to 14 months and Stifford Clays Road would remain open. Overnight or weekend closures would be required for tie-in works. See chapter 2 for more information on the construction methods.

Realignment of Green Lane and bridge construction

Green Lane would be realigned, and a green bridge built with features that allow wildlife to pass over it. These works would take place mostly away from the existing road network and carried out over a 12 to 14 month period. Some overnight or weekend closures would be needed for tie-in works. See chapter 2 for bridge construction methods. The Ward impact summaries and the OTMPfC provide further detail on the traffic management measures associated with these works.

Construction of the link roads north of the A13 junction

We would need to build a series of roads and bridges to link the Lower Thames Crossing to the A13 and the Orsett Cock junction. The majority of these works would take place away from the existing road network, towards the start of our construction programme. The works needed to connect the new road with existing roads would be phased to minimise construction impacts.

5.8 Testing and commissioning

Introduction

As well as implementing the environmental mitigation measures described in the various sub-sections, the final part of our construction phase involves making sure the road (including all electrical and mechanical systems), structures, earthworks, drainage, public rights of way and other elements are complete and function to the required standards.

Timing

These works are expected to take place over nine months, ending late in 2029.

Description

The individual parts of the new road, including its structures, roadside gantries, drainage and other supporting infrastructure, would be tested as they reach completion. Testing would include adherence to the design specifications for each section of the road. Our safety checks would vary according to the different function and specifications of the element being tested. As more of the route is built, then it would be tested in its entirety. Commissioning refers to the completion of the testing phase, at which point we would bring the new road into public use.

6

Section D – North of the River Thames

6.1 Overview

Section D is the part of the Lower Thames Crossing between the A13 junction and the M25, including the Ockendon link and the M25 junction. This chapter provides a summary of how Section D would be built by our appointed contractors.

Our Ward impact summaries provide more specific details about the construction process, its impacts and mitigations for Section D. The Outline Traffic Management Plan for Construction (OTMPfC) provides further information on our temporary traffic management proposals. Chapter 7 of the Construction update focuses on project-wide information on the impacts across a number of environmental topics, such as air quality and cultural heritage.

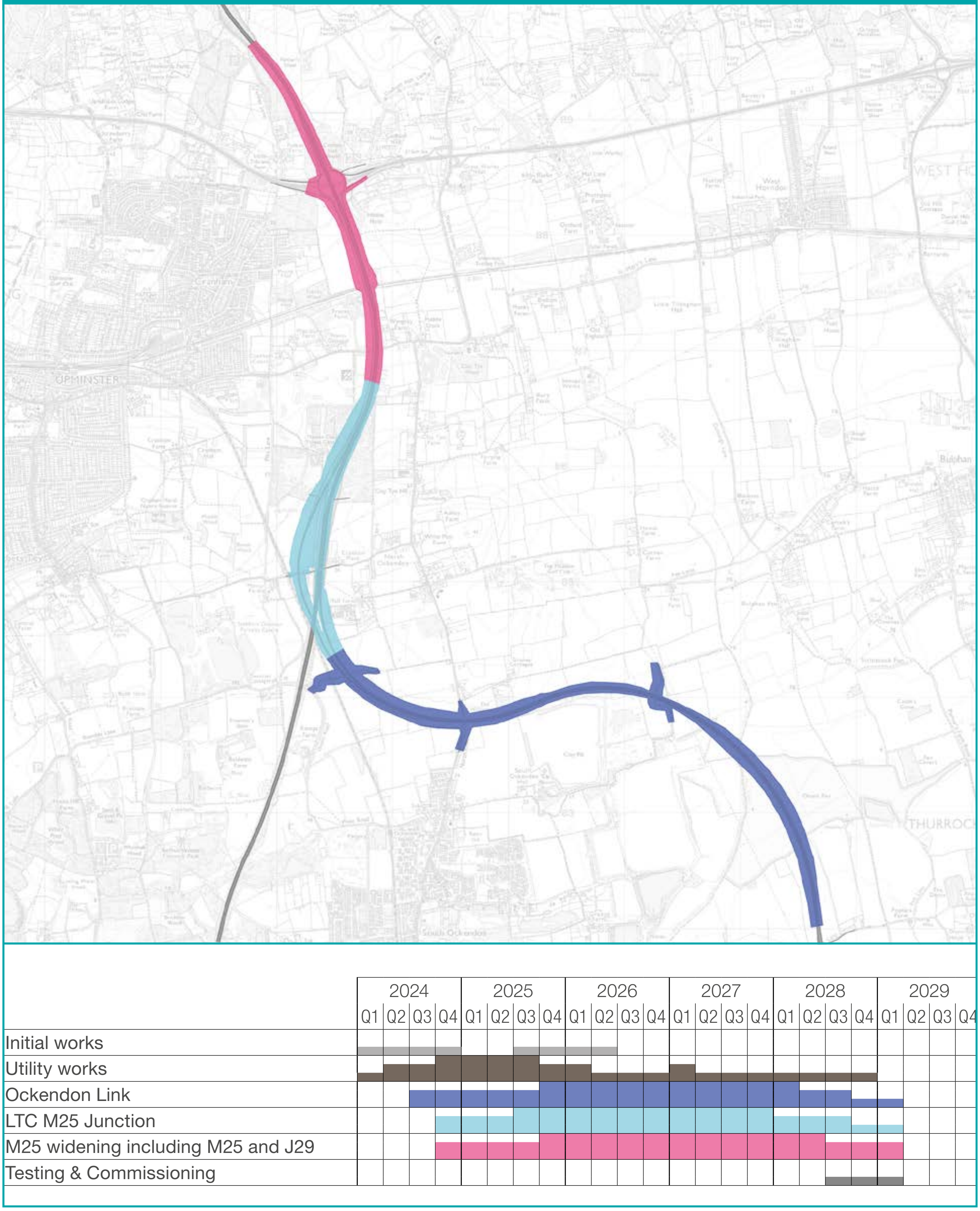
Our You Said, we did document looks at all aspects of our plans for the Lower Thames Crossing, including those affecting the route north of the Thames. It explains how we have developed our plans further following feedback from earlier consultations.

We have divided the construction of Section D into the following sub-sections. Some, namely the initial works, utility works, and testing and commissioning, would take place across all of Section D. The remaining sub-sections describe works that would happen in a specified place, as shown on the map below.

- Initial works, including environmental mitigation
- Utility works
- Ockendon link (zone 1)
- Lower Thames Crossing/M25 junction (zone 2)
- M25 widening, including M25 junction 29 (zone 3)
- Testing and commissioning

Each section of work is described in greater detail later in this chapter.

Figure 6-1 Section D construction zones and timeline



6.2 Timeline

Figure 6-2 below provides an indicative timeline for each of the sub-sections listed above, including details of periods of low, medium and high intensity activity.

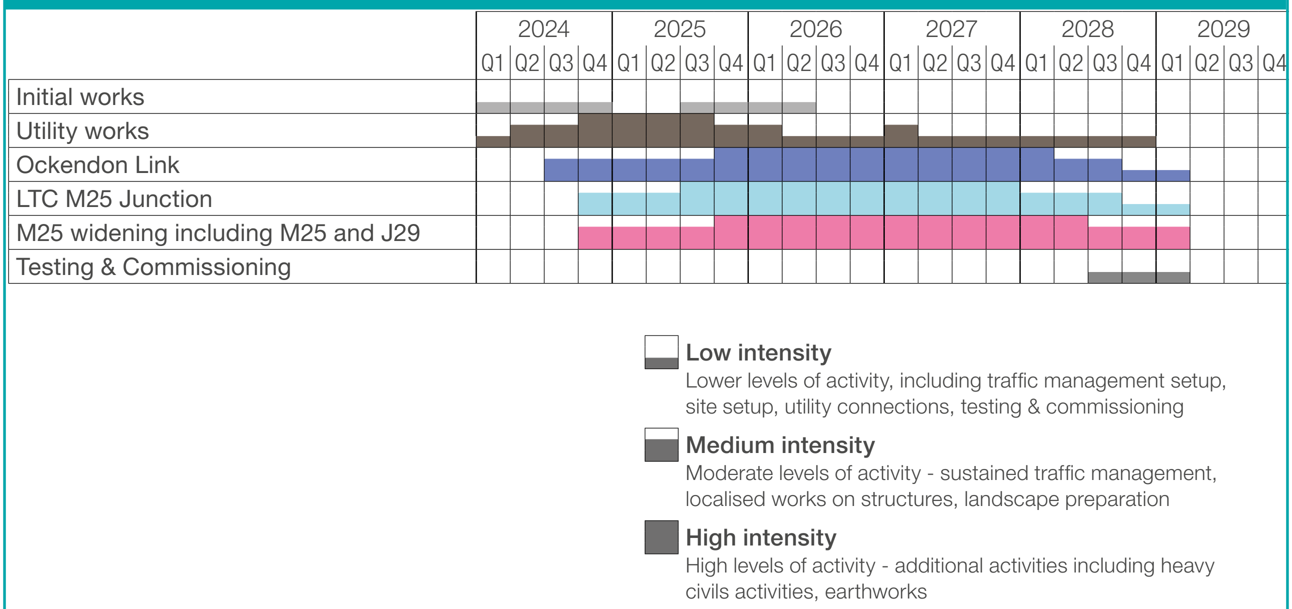
Lower levels of activity would include traffic management setup, site setup, utility connections, testing and commissioning.

Medium levels of activity would include sustained traffic management, localised works on structures and landscape preparation.

High levels of activity would include heavy civil engineering activities and earthworks.

These timelines are indicative and would be confirmed later, once contractors are appointed to carry out the works and our detailed design of the new road is further developed.

Figure 6-2 Section D construction timeline



6.3 Initial works

Introduction

Our initial works would help prepare the site and the compounds for the main construction work. These would occur progressively through the first few years of construction in advance of the main works in each geographic location. Activities include:

- Preparing the site for our ecological mitigation activities, such as preparing the habitat and moving species to new areas. This would continue through later phases of construction.
- Securing the site, including temporary public rights of way diversions or closures.
- Building the main works compounds, including installing utilities connections.

Timing

Most activities relating to the initial works would take place over two periods of work: one from early 2024 until the end of that year, and the next beginning in the second half of 2025 and lasting for one year.

Description

Haul roads

As part of the initial works, we would create a network of haul roads connecting compounds with work areas. Haul roads are temporary roads constructed within the Order Limits that are used for the movement of construction vehicles, including HGVs, around the construction site. These temporary roads would provide access for construction vehicles along the Lower Thames Crossing route and link roads to reduce their use on local public roads. Please refer to the large-scale construction maps that accompany this consultation for details of the layout of haul roads.

Ecological mitigation

Our main ecological mitigation would involve preparing the habitat and moving existing species into new and suitable retained habitats before construction starts. More information about these activities can be found in chapter 2, which also has information about our draft Outline Landscape and Ecological Management Plan (oLEMP) document provided for comment as part of this consultation.

Archaeological investigations

We have already carried out a series of desktop studies based on historical information, as well as walking surveys of the area and trial investigations.

Archaeological trial trenches tend to be about two metres wide and between 20 metres and 50 metres long. A typical depth for a trench is one metre.

These trial trenches are first dug by mechanical excavator and once the trench is open, archaeologists hand-excavate and collect archaeological finds. Everything is described, photographed, and drawn so that a full report can be made. The trench is then filled in.

We have excavated nearly 2,750 archaeological trial trenches across the Lower Thames Crossing, and there would be some 1,200 still to dig. These findings would continue to inform our approach to archaeology so we can make sure appropriate mitigations are in place.

Securing the site, including public rights of way

During the initial works, our appointed contractors would erect fencing around areas within the Order Limits that could pose a risk to the public during construction. We would also screen off any sections that are environmentally sensitive from the public or construction works.

Site-specific security risk assessments would be carried out to determine the type of perimeter fencing or hoarding to be installed.

We would ensure that hoarding and other materials used are appropriate to the location and to the activities within the compound/worksite that may affect noise levels at the boundary.

Fencing would be used in areas of low security risk to reduce the visual impact on the environment and aid security patrol management of the area. Heras fencing could be used as a temporary measure to secure a site or adapted site boundary before installing permanent hoarding, or likewise when demobilising from an area.

Hoarding would be erected to the boundary of higher-risk activity sites or where visual screening is necessary. It would typically be 2.4 metres high but could be higher in the highest security risk areas.

The CoCP provides more information on the control measures for site fencing and hoarding.

Any public rights of way (footpaths or bridleways) affected by these first phases of construction would be made safe by either diverting or temporarily closing them. Some public rights of way would be closed permanently and replaced by new ones. More information about how public rights of way would be affected are in the relevant Ward impact summaries and the Operations update. Our Ward impact summaries also cover the impacts of the new road and its construction on walkers, cyclists and horse riders in each local area, and how we are proposing to mitigate them.

We would share information about how public rights of way would be affected with local communities.

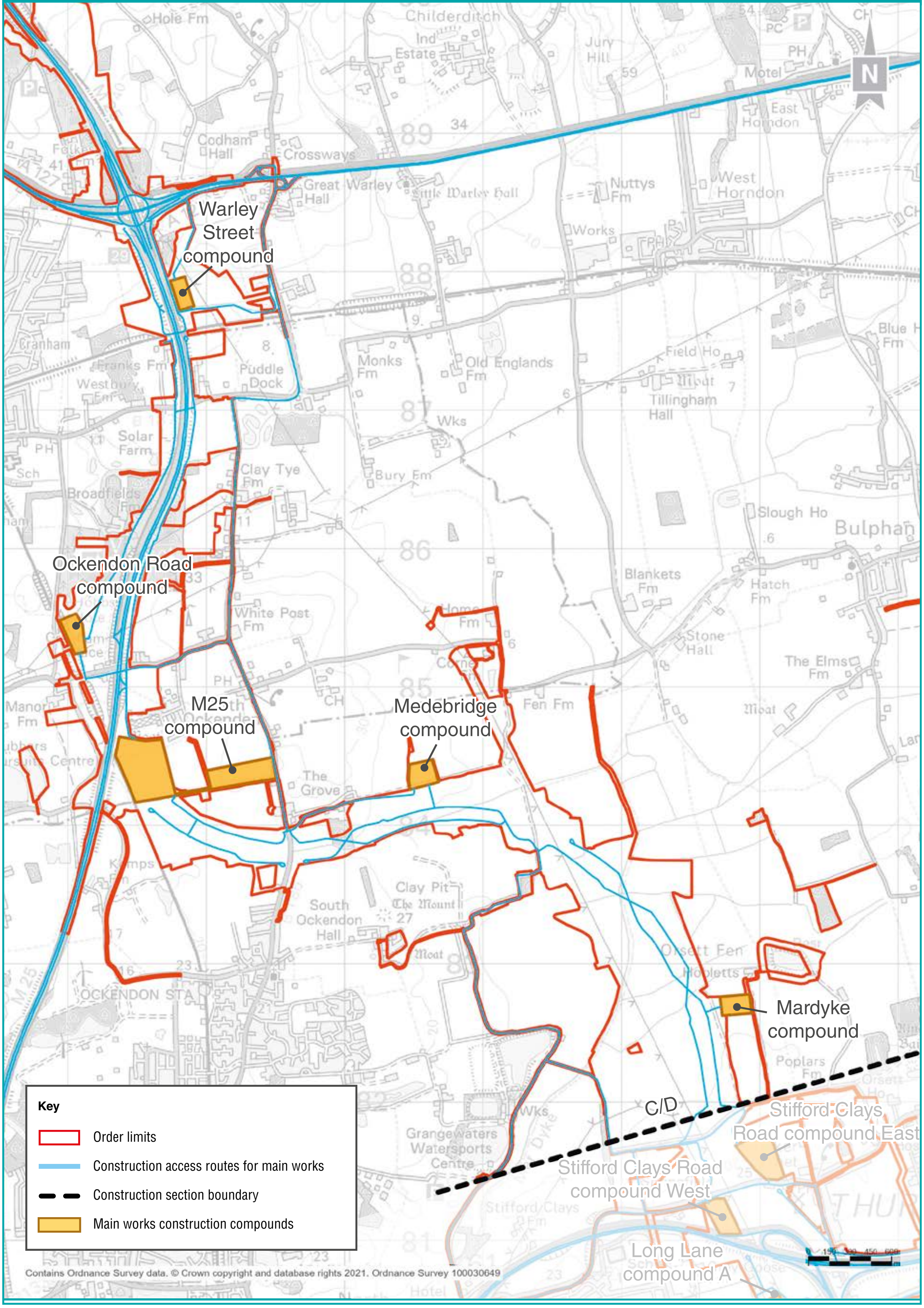
Construction compound set-up

There are five proposed construction compounds in Section D. These are shown on Figure 6-3.

Each compound would need utility connections. We would install these mostly using open trench methods, which are described in chapter 2. However, we would use trenchless techniques, where appropriate, to limit any impact.

Please refer to the large-scale construction plans, provided as part of this consultation, for details of the roads likely to be used by construction traffic to access the main works compounds.

Figure 6-3 Section D construction compounds and access routes



Mardyke Compound

Figure 6-4 Mardyke Compound indicative layout

This compound would be on the eastern side of Green Lane, and would be around 3 ha in size. Space in the compound would be used for parking, welfare and office space, workshops, equipment and material storage.

We would keep excavated soil on-site, temporarily, in bunds to provide screening for residential properties to the south.

This compound would support the construction works in the area surrounding Mardyke Viaduct, but would not be in place for the duration of construction.

Initially, access would be via Green Lane until we set up temporary haul roads for construction traffic only. During the works, access would be required from Stifford Clays roundabout to these routes alongside the Lower Thames Crossing.

Utility connections

We would need to extend the existing telecommunications, water and wastewater networks on Fen Lane, and this would all be done at the same time to minimise any disruption. The work would take place on Fen Lane so landowners and vegetation would not be disturbed. We would use trench excavation methods during standard working hours over a period of six to nine months.

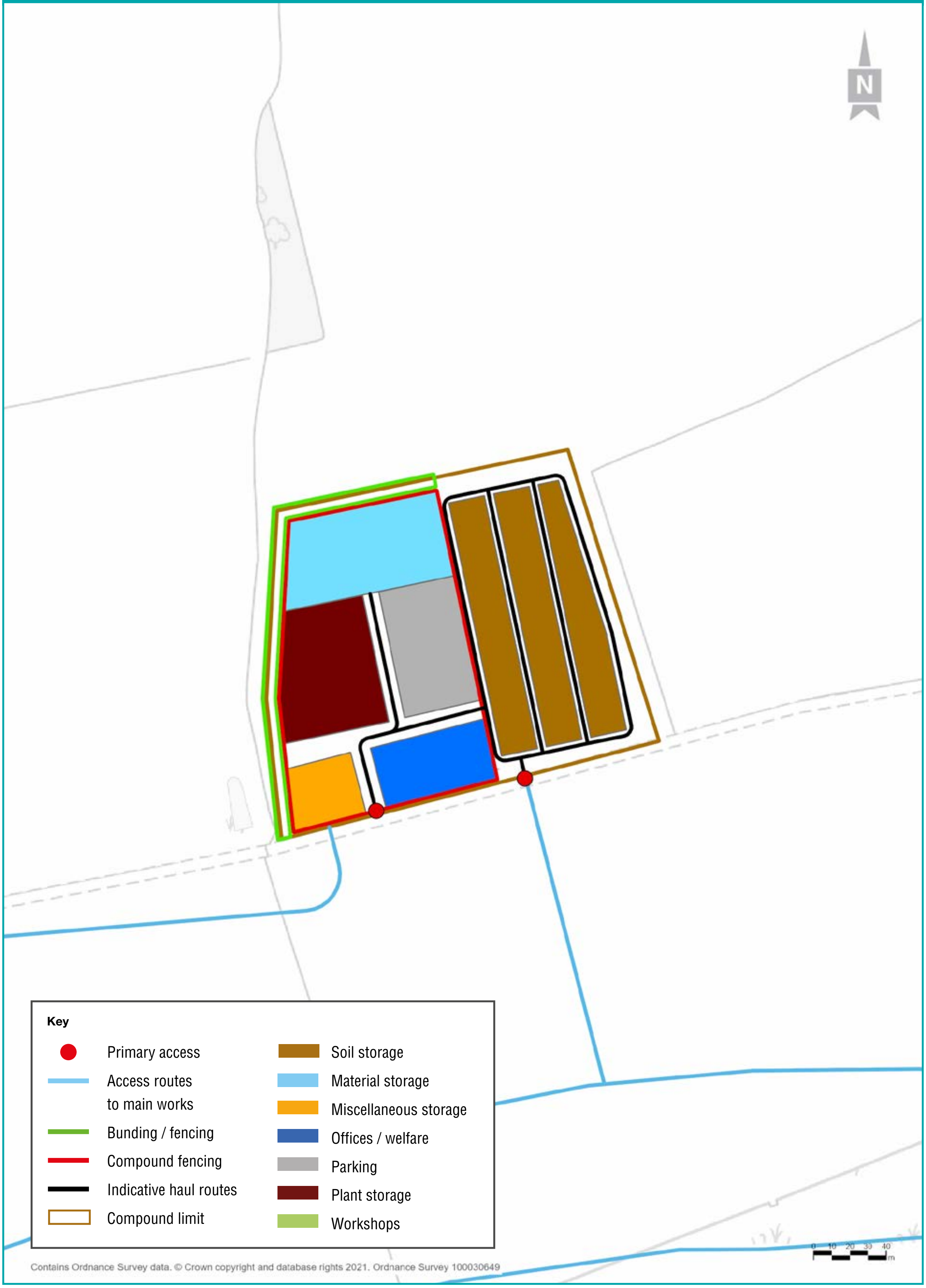
Telecommunications would need around 1.5km of cabling installed from the junction of Stifford Clays Road and Fen Lane to the junction of Green Lane.

Water and wastewater would require new 1.2km pipelines to connect to the existing network at Fen Lane, running from Fen Lane to the junction of Green Lane. Traffic management measures, including lane closures, would be necessary to carry out these works. More information is provided in the Ward impact summaries and the OTMPfC.

After the work, we would dismantle the compound and reinstate the land.

Medebridge Compound

Figure 6-5 Medebridge Compound indicative layout



This compound would be located close to Fen Lane and North Road, east of North Ockendon. It would be around 3.5 ha in size and would be used for the construction of the new road between the M25 and the new Mardyke Viaduct. It would include a concrete mixing plant to supply the surrounding works.

Most of the space in the compound would be used for equipment and storage, with the remainder for parking, or offices and welfare facilities. We would need to stockpile earthworks and would limit these to a height of five metres.

Construction vehicles would need to use Fen Lane at the start of the programme, for a period of around nine months, to allow utilities works to be carried out. We would need to use traffic management measures, with closures in approximately 300-metre sections of the road. More information on the use of Fen Lane is provided in the Ward impact summaries and the OTMPfC.

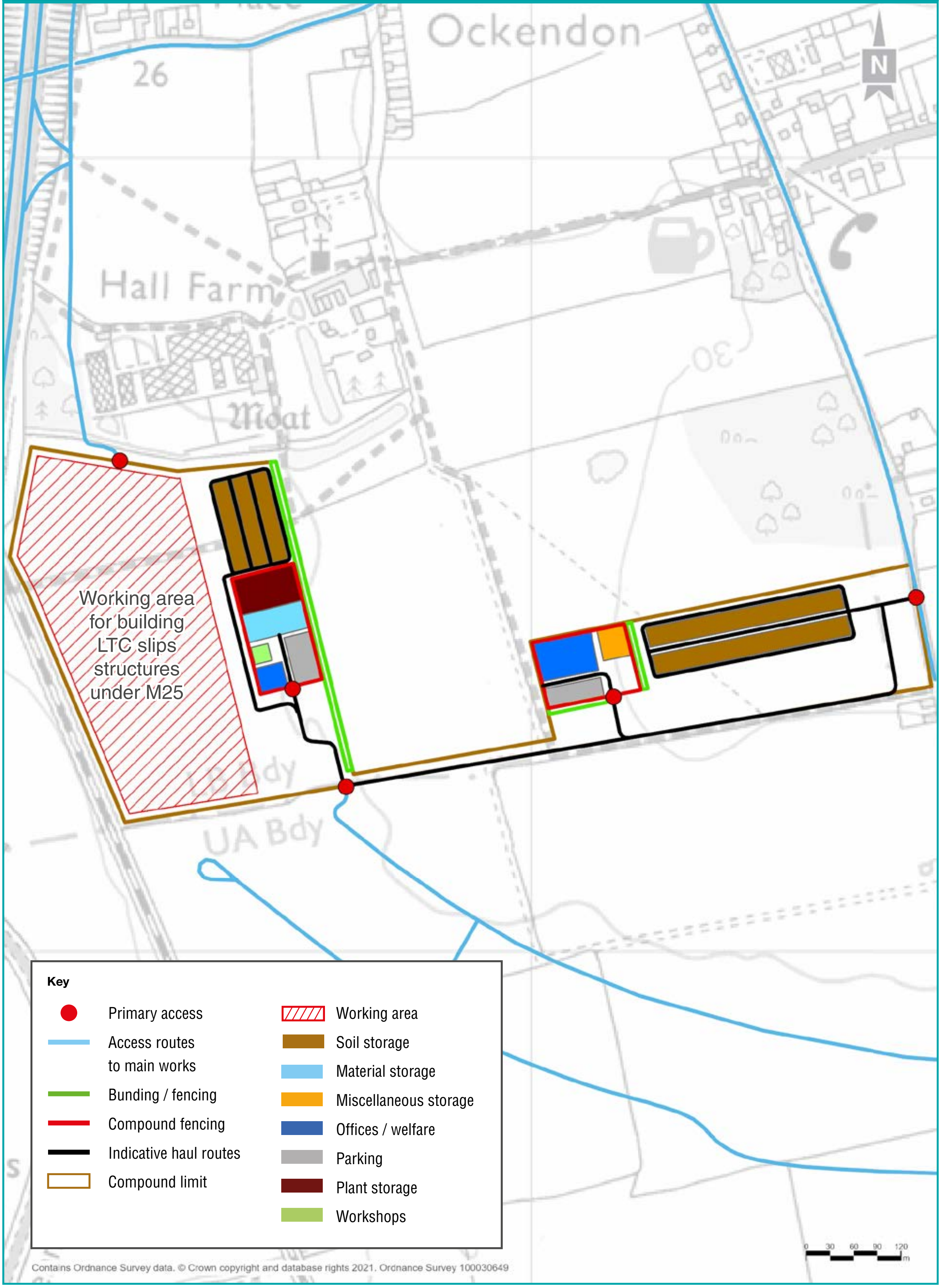
The access route for HGVs and most staff vehicles to Medebridge Compound would be via the A127, Warley Street, St Mary's Lane, Clay Tye Road and North Road for the first 9-12 months of the construction programme. For the remainder of the programme, access to the compound would be provided by the haul roads constructed from the A13 rather than these public roads.

Utility connections

The telecommunications, wastewater and water networks would need a temporary 1km extension from the east of North Road to the compound, and we would install pipelines using open cut techniques (see chapter 2 for more details). We would also need to manage traffic at the connection points on North Road, with single lane closures and traffic lights. More information can be found in the Ward impact summaries and the OTMPfC.

M25 Compound

Figure 6-6 M25 Compound indicative layout



This compound would be located near North Ockendon to the east of North Road and would be around 22 ha in size. It would act as the main workforce compound for Section D and support construction of the Lower Thames Crossing between the A13 and M25 including earthworks and road construction, construction of an underpass beneath the M25, North Road overbridge and widening of the M25 southbound carriageway.

Most of the space in the compound would be used for equipment and storage, with the remainder for parking or offices and welfare facilities. We would need to stockpile earth up to five metres high and create earthwork bunds of two to three metres. This compound would also be likely to contain a concrete mixing plant and a temporary pre-cast facility.

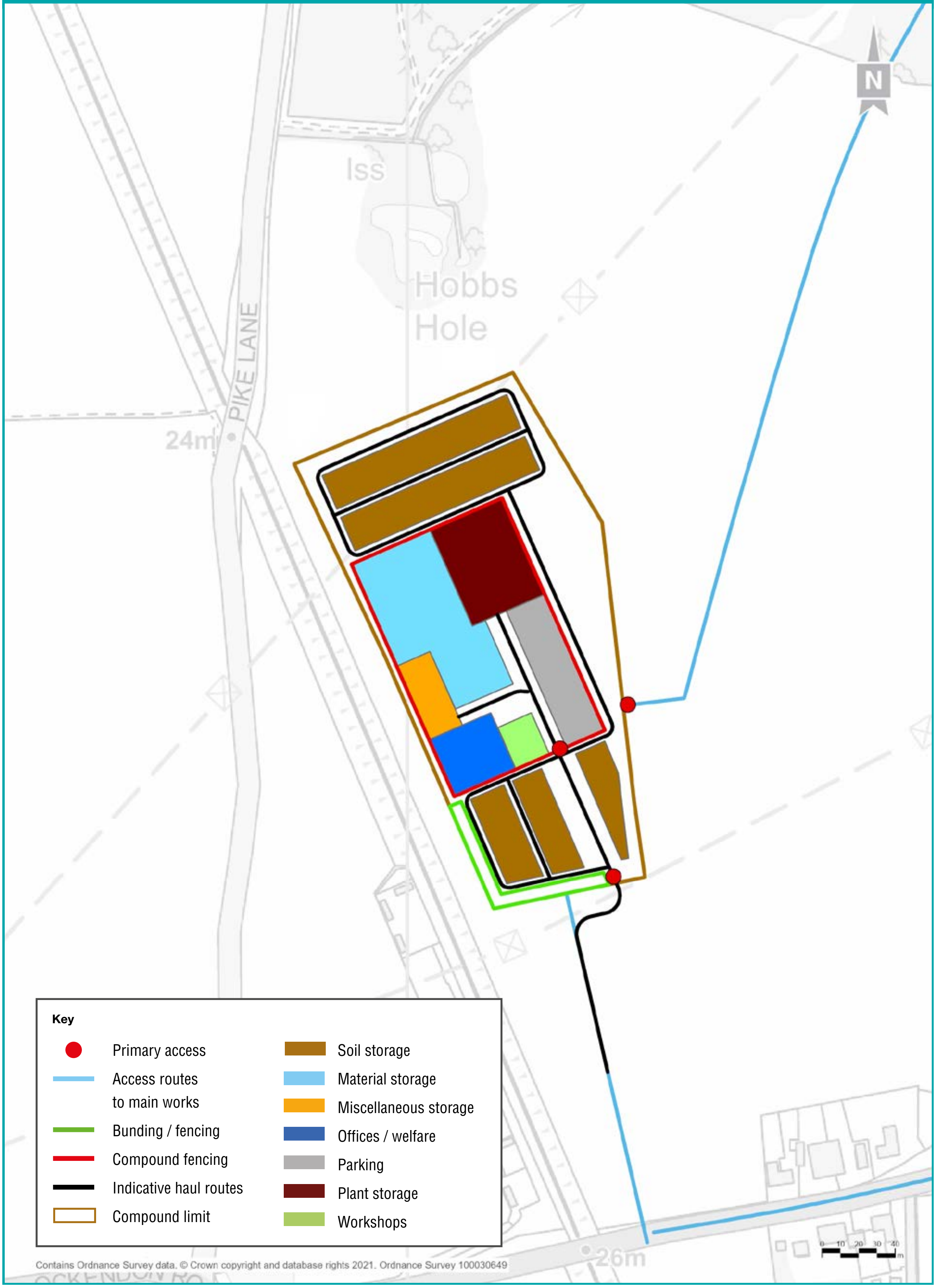
Construction vehicles and our workforce would need to use Clay Tye Road at the start of the works to access this site and the Ockendon Road Compound. We would create temporary works access off the M25 to allow construction vehicles to enter the Lower Thames Crossing and worksites, at which point Clay Tye Road would only be used for workforce access.

Utility connections

The compound's electricity and telecommunications would be supplied via installing connections to the local networks along North Road. The wastewater and water supply would need a temporary 2km pipeline to connect into the existing network on North Road, which would be removed at the end of the construction programme. More information can be found in the Ward impact summaries and the OTMPfC.

Ockendon Road Compound

Figure 6-7 Ockendon Road Compound indicative layout



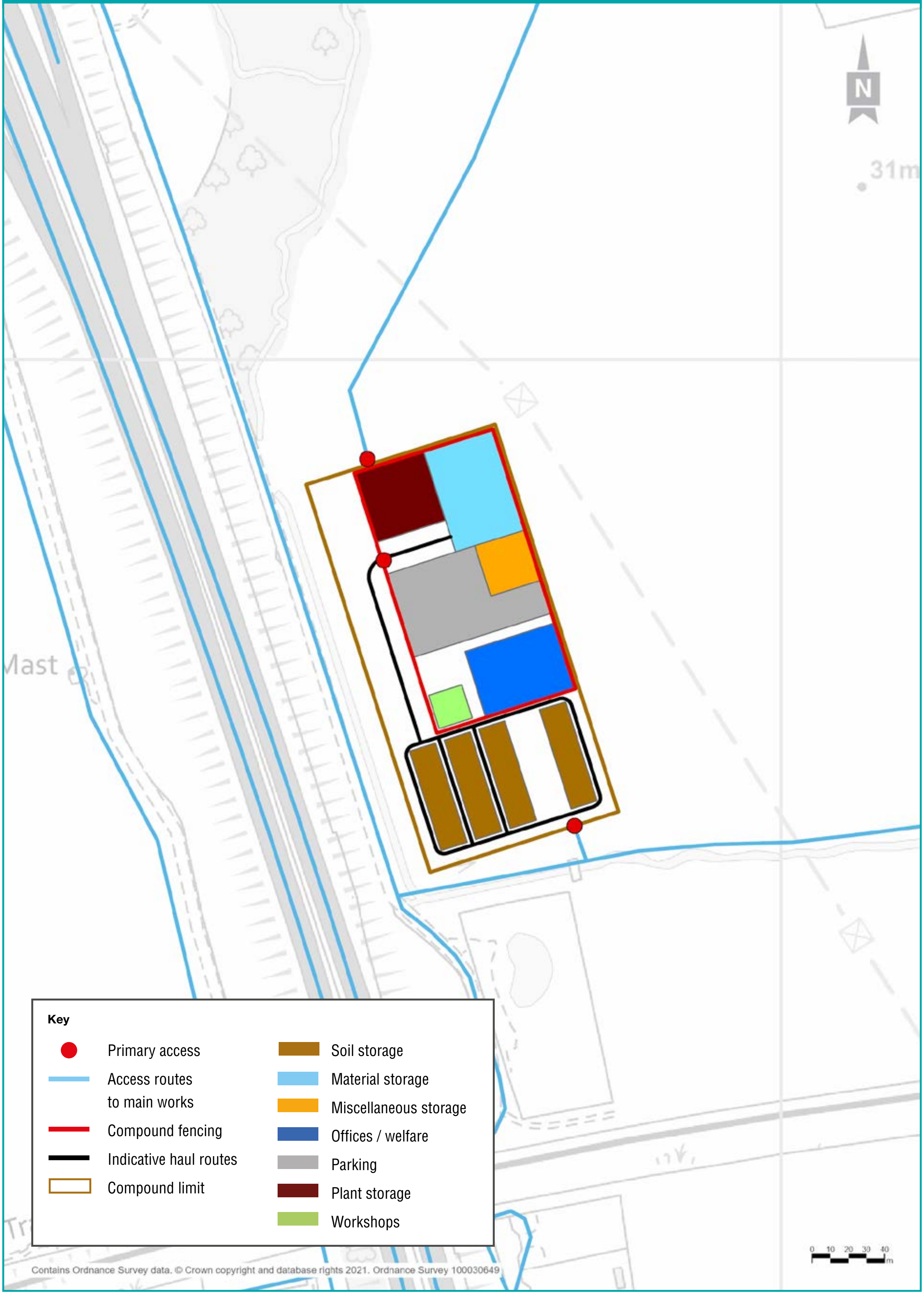
This compound would be located to the east of the junction of Ockendon Road and Pike lane, and would be around 4.5 ha in size. It would offer space for parking, offices and welfare, as well as storage and equipment. The compound would support the earthworks to the west of the M25, the construction of a new bridge to carry Ockendon Road over the new road's northbound carriageway, and the widening of the M25 northbound carriageway.

Utilities connections

The compound would need utilities to be connected via local networks. We would install a 200-metre pipeline using open trench methods (see chapter 2) through land next to the access road, to link the compound to connection points on Ockendon Road. We would need to manage traffic for around two weeks at the connection points, with single-lane closures and traffic lights, which we would remove once completed. More information is provided in the Ward impact summaries and the OTMPfC.

Warley Street Compound

Figure 6-8 Warley Street Compound indicative layout



The Warley Street Compound would be located south-east of M25 junction 29, west of the B186 Warley Street. It would be around 2.5ha in size, with space for parking, offices and welfare, as well as storage and equipment.

We would use it as a supporting compound for the widening of the M25, mostly around junction 29. Access would be via a temporary haul road from Warley Street.

Construction vehicles would need to use Warley Street between the A127 junction and the entrance of the compound (about 200-300 metres north of the bridge over the Shoeburyness railway line) throughout construction.

We would manage vehicles turning in and out of Warley Street from the compound using temporary traffic signals.

Utility connections

The compound would need utilities to be supplied via the existing network on Warley Street. We would install around 800 metres of pipes and ducts using open-cut techniques, next to the permanent maintenance road. To minimise any disruption, the utilities works would take place at the same time as those at the Warley Street junction.

6.4 Utilities

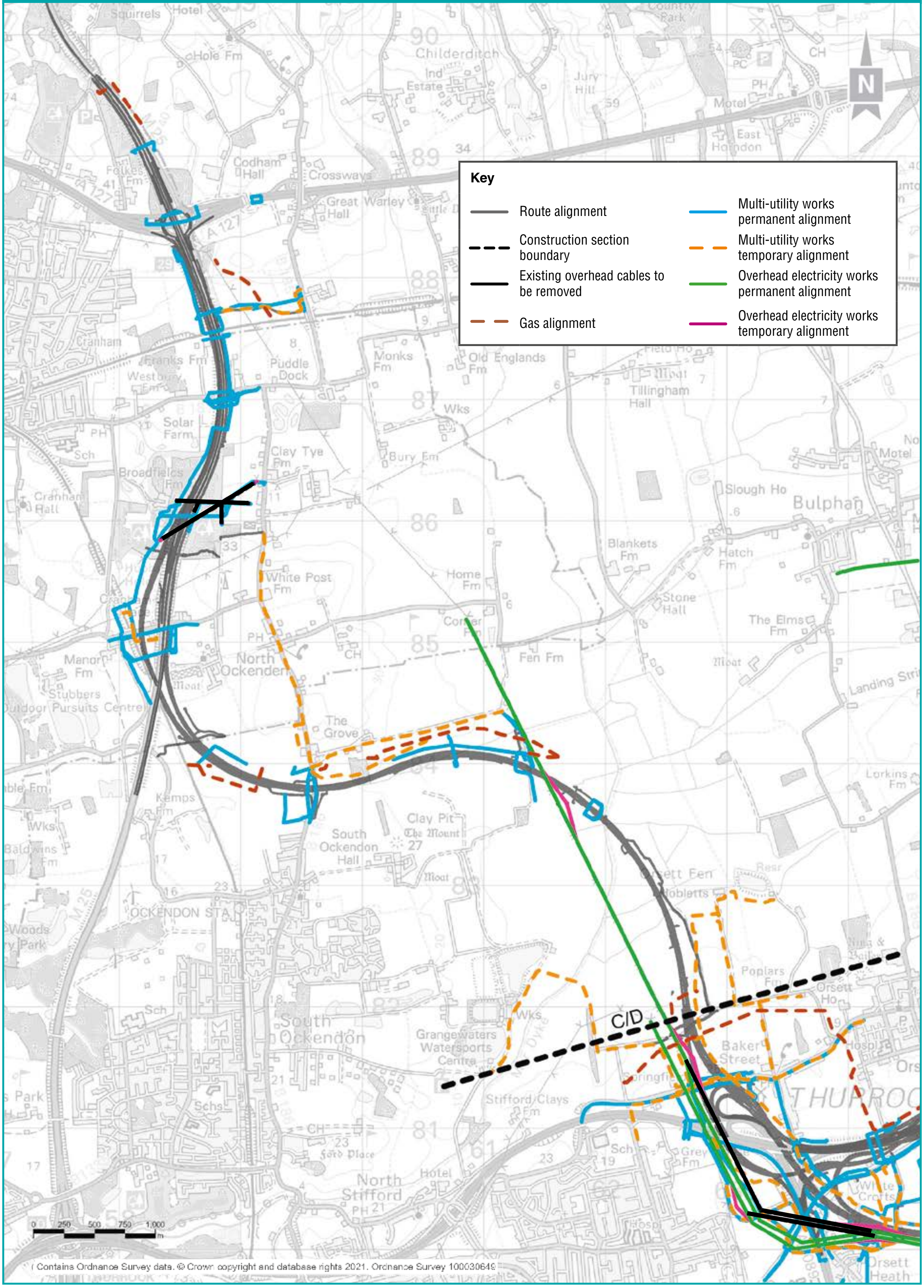
Introduction

Construction of the Lower Thames Crossing would require changes to existing utilities, including overhead power lines as well as underground utilities, such as gas and water pipelines, and telecommunications cables.

Our proposals for utilities works in Section D have been refined during the development of the project and we have been working closely with the utility companies to improve the design. As a result, we have reduced the environmental impacts and shortened the duration of the works.

To ensure the main works compounds operate efficiently, we would connect temporarily to the utility networks. This link would be removed after the compound is dismantled. Where possible, these works would take place at the same time as other highway works or permanent utility diversion works to minimise any impact on the local communities.

Figure 6-9 Map of utility works in Section D



Timing

Work affecting utilities is expected to take place throughout most of the construction period for Section D, from early 2024 until the end of 2028. The highest levels of activity are expected from the end of 2024 for a period of one year. We would not expect local people to experience any change in their supply of utilities, including water, power and access to broadband services.

Description

In addition to the main works compounds, there would be four temporary Utility Logistics Hubs (ULHs) in Section D. Each would be set up by the relevant utility company to allow specific utility works to be carried out in the area. The table below lists each ULH.

A map showing the locations of the ULHs is provided in chapter 2.

Table 6-1 Section D Utility Logistics Hubs

Utility Logistics Hub	Utility company	Works	Approximate area (m^2)	Indicative duration (months)
Medebridge	National Grid Electricity Transmission	Overhead electricity network modifications: vicinity of Mardyke	14,300	33
Folkes Lane	Cadent	Gas pipeline diversion: M25 Folkes Lane	2,100	12
Warley Street	Cadent	Gas pipeline diversion: south-east of M25 junction 29	13,200	11
Beredens Lane	Cadent	Gas pipeline diversion: M25 Folkes Lane	13,200	12

The ULHs and, where appropriate, the main works compounds would serve the major utility diversions needed north of the Thames. Each of these is summarised below:

Diversion of National Grid power lines at the Mardyke

The works would require temporary and permanent modifications to the overhead electricity transmission power line of 0.69km length. They include building a new pylon, around 16 metres taller than the existing structure, to cross the route on the current alignment. A temporary diversion of the power line on a temporary pylon would be needed to maintain electricity supply while the new pylon is being installed. To complete the re-stringing of the overhead power line, the working area will need to include the existing pylons from the north of Green Lane through to Fen Lane (about 3.41km). The methods for installing and restringing new pylons are described in chapter 2.

UK Power Networks (UKPN) proposals

We have developed proposals with UKPN to install around 1km of 132kV electric network cabling, roughly 1km of 11kV and 1km of other electric cables within the Thames Chase area. The new utilities would be installed underground, allowing for the removal of two pylons and up to 10 wooden poles within the area.

To ensure the network is maintained and operates safely during and after construction, and that customers' supplies are not affected, we are proposing multiple diversions of the 33kV, 11kV and other electrical cable networks and the construction of two substations throughout Section D. For further information, please see Map Book 1: General Arrangements.

Diversion of Cadent gas networks

Diversions to Cadent's gas network would be required in several areas of the Section D. The first is a 0.63km diversion of a high-pressure pipeline to cross the M25 north-east of Folkes Lane.

The second is a 0.67km diversion of a high-pressure pipeline in the field south-east of M25 J29 to accommodate the M25 widening works. The third part of the works would be to divert four pipelines of intermediate and medium pressure of around 1.6km each. These are located east and west of North Road and are intersected by the route.

Diversion of foul sewers and water mains

To make sure we keep supplies to customers during the construction and afterwards, we would carry out a number of diversions of foul sewers and water mains. This includes a 3km diversion of a trunk water main from south of Ockendon Road to St Mary's Lane through Thames Chase and under the M25.

Diversion of telecommunications networks

To keep telecommunication networks available for local communities, businesses and the emergency services during construction, we would divert them temporarily, and then relocate them into the highway and structures as they are being built.

Barking Power Station high-pressure gas pipeline

We are developing proposals with the owner of a high-pressure gas pipeline running under North Road to either cap and remove it within the Order Limits or carry out 1.6km and 0.7km diversions of the pipeline east and west of North Road where it would otherwise be affected by the route. The pipeline formerly supplied Barking Power Station.

6.5 Ockendon link (zone 1)

Introduction

Ockendon link describes the 5km section of the Lower Thames Crossing that extends between the A13 and M25. It includes construction of two viaducts, three embankments, earthworks cuttings, two footbridges and an overbridge to carry North Road (B186) over the Lower Thames Crossing.

Timing

We would expect these works to begin in the second half of 2024 and continue throughout the construction period for Section D, ending in early 2029.

Description

Construction of the Mardyke Viaducts and embankments

Our works would involve the construction of two viaducts in the Mardyke area between Green Lane and North Road to allow the Lower Thames Crossing to pass over the Mardyke and associated flood zones. We would use the techniques outlined in chapter 2.

We would expect the construction of the Mardyke Viaduct and embankments to take around three years and take place away from the existing road network. This work would include taking excavated material from the west of the M25 to the east of the motorway to create embankments that support the viaduct.

Construction of North Road bridge

We would realign North Road temporarily to the west of the existing route to provide working space for construction, and we would use standard bridge construction methods (see chapter 2). These works would take around 18 to 22 months.

North Road would remain open, although temporary traffic management measures would be needed to divert traffic on to the temporary route and then subsequently on to the new bridge. More information is provided in the Ward impact summaries and the OTMPfC.

North Road has been designed as a green bridge to encourage habitat connection between The Wilderness and the woodland to the south of the Lower Thames Crossing.

Before North Road bridge is built, we would need to install a temporary junction, with signals, to allow construction traffic using our haul roads to cross North Road. Once the bridge is complete, haul roads in this area can be diverted under the new bridge. The temporary crossings at this location would then be removed as construction traffic would no longer need to cross this road.

6.6 Lower Thames Crossing/M25 junction (zone 2)

Introduction

This section of the Lower Thames Crossing includes the construction of new roads to form a junction between the new road and the M25. Works would include a cutting to take the new road northbound below the existing ground level before passing under the existing M25 via a new underpass and joining the M25 northbound approximately 1km north of Ockendon Road. The new road southbound off-slip would pass under the existing Ockendon Road bridge and would then run between North Ockendon and the Upminster railway line before joining with the new road northbound carriageway. Map Book 3: Engineering Plans includes maps of the new junction.

Timing

This work would begin in late 2024 and would be expected to end early in 2029.

Description

To reduce the number of construction vehicles using local roads, we would build temporary slip roads for direct access between our worksite and the M25. These temporary slip roads would be in the area around Ockendon Road and built within the first two years of construction.

We would need some overnight or weekend temporary traffic management measures to tie-in the access roads to the M25. More information can be found in the Ward impact summaries and the OTMPfC.

M25 underpass

We would propose to build the northbound Lower Thames Crossing in an underpass beneath the M25.

It is intended that works would be carried out using the box jacking construction method described in chapter 2. This method would avoid the need to close the M25, however, some temporary traffic management measures may be necessary towards the end of the programme to connect the Lower Thames Crossing to the existing network. We would need some traffic management measures, including lane narrowing and reduced speed limits, throughout construction, which would change as work progresses. More information on this can be found in the Ward impact summaries and the OTMPfC.

The Lower Thames Crossing would enter a cutting (below existing ground level) and then pass through a newly constructed underpass beneath the M25, which would help to reduce its visual impact on the area. Its link roads would be kept as close as possible to the M25 to minimise our footprint.

Proposed Ockendon Road bridge structure

A new overbridge is needed to carry Ockendon Road over the northbound carriageway of the new road.

A section of Ockendon Road extending between the Upminster to Grays railway line and the M25 would need to be closed for approximately 19 months to allow for the construction of the new overbridge structure.

We would propose to extend the closure to the east side of the M25 so that construction traffic could use the existing bridge that carries Ockendon Road over the M25 during the period of works to construct the new bridge. The purpose of this proposal would be to reduce the need for construction traffic to use the public road network during the period of closure.

A diversion via Dennis Road would be in place throughout the period of disruption. More information on these measures can be found in the Ward impact summaries and the OTMPfC.

6.7 M25 widening, including M25 junction 29 (zone 3)

Introduction

These works would take place south of junction 29 to where the Lower Thames Crossing connects to the M25, and would involve widening the M25 St Mary's bridge and Shoeburyness railway line bridge.

Timing

These works would be expected to begin early in 2025 and continue until early 2029.

Description

M25 widening

Northbound works would mostly take place away from the existing road network, to limit disruption to traffic, but the southbound widening works would need to happen on or very close to the existing road. These works have been designed to manage traffic flow on the M25, and we would need to temporarily manage the traffic with lane reductions and reduced speed limits.

We would need to install some temporary crossing points to provide access for construction vehicles to carry out the widening of the M25 between the Shoeburyness railway line and St Mary's Lane. These crossing points would link the proposed haul roads that run either side of the M25, and they would be required for about two years.

We would add traffic signals to manage both public and construction traffic on a 120-metre stretch of St Mary's Lane. More information on these measures can be found in the Ward impact summaries and the OTMPfC.

Widening at St Mary's Lane and Shoeburyness railway line bridge

Widening St Mary's Lane and the Shoeburyness railway line bridge north of St Mary's Lane would involve standard bridge construction techniques (see chapter 2).

Works on the Shoeburyness railway line bridge would likely take place towards the end of the construction programme and take around 12 to 14 months. The works would be carried out with Network Rail's agreement. The railway would be closed, and our contractor would undertake the engineering works in this location. Typically, they would be scheduled for a weekend or bank holiday to minimise disruption.

The works on St Mary's Lane would take about the same time, and begin after utility works in the area are completed. Most works would take place without the need to close St Mary's Lane. Access to the worksite would be provided by the haul roads running alongside the M25. However, specific works would need overnight or weekend closures. More information on these can be found in the Ward impact summaries and the OTMPfC.

M25 junction 29

At junction 29, the M25 main carriageway would be increased to four lanes. This would involve widening the Cobham Viaduct.

Works to widen this viaduct would make use of the standard bridge construction methods described in chapter 2. Where possible, the works would be carried out offline, meaning no direct impacts on the road, though some online works would be necessary to widen the viaduct structure. Modifications to connections north of junction 29 would be primarily offline and involve standard road construction and drainage works. See chapter 2 for further information.

Some online works would be required to tie-in with the existing network. We would need some temporary traffic management on junction 29, the M25 and A127, with narrow lanes or short-term lane closures for around two years. We would also introduce a reduced speed limit.

6.8 Testing and commissioning

As well as implementing the environmental mitigation measures described in the various sub-sections, the final part of our construction phase involves making sure the road (including all electrical and mechanical systems), structures, earthworks, drainage, public rights of way and other elements are complete and function to the required standards.

Timing

These activities would be scheduled to take place over a period of around nine months, beginning in mid-2028.

Description

The individual parts of the new road, including its structures, roadside gantries, drainage and other supporting infrastructure, would be tested as they reach completion. Testing would include adherence to the design specifications for each section of the road. Our safety checks would vary according to the different function and specifications of the element being tested. As more of the route is built, then it would be tested in its entirety. Commissioning refers to the completion of the testing phase, at which point we would bring the new road into public use.

7

Project-wide impacts

7.1 Overview

This chapter provides a project-wide summary of the construction impacts and how they would be effectively managed, including traffic management measures and environmental mitigation. It sets out the likely construction impacts of building the Lower Thames Crossing on transport networks at a project-wide level, and how we would seek to reduce or minimise them. This chapter also provides information on how we have approached the environmental assessments that will help us to understand the likely construction impacts of building the Lower Thames Crossing at a project-wide level, what those likely impacts would be, and how we would mitigate them.

Building the Lower Thames Crossing and the impacts on the local road network

The construction of the project would have an impact on the performance of the highway network and the journey times for many people travelling in the area.

There would be an increase in the number of heavy goods vehicles (HGVs) on public roads, as these would be used to deliver materials to the various construction compounds and Utility Logistics Hubs (ULHs). Chapters 2 to 6 describe the location of these compounds and ULHs, and the access routes HGVs would take. These routes are designed to make the maximum use of the Strategic Road Network, and in some locations there would be a ban on the project's HGVs using certain local roads. Once haul roads are built early in the construction programme, it would be possible to reduce further the use of the local road network by vehicles accessing the compounds.

A major consideration in the design of the project has been to minimise the volume of earth that has to be moved away from or into construction locations. Much of the earth to be moved along the project's route would be transported by HGVs along the haul roads, to reduce the number of vehicles using the public highway.

There would be some use of private cars by staff to reach the compounds and ULHs. The Outline Framework Construction Travel Plan sets out the way in which we have planned to reduce the number of staff cars on the network. This includes the promotion of car sharing and public transport, and providing staff buses from key local railways stations to the compounds. The effectiveness of the travel plans would be monitored and adjustments made to these routes and the use made of car sharing throughout the construction period. Some of the compounds would be close to established bus services and these may also be used by staff.

The impacts of the presence of staff cars on the highway network would be greatest in the morning peak period, when most staff would be travelling to their base compound between 7am and 8am in the morning. In the evening, most staff would be expected to leave between 6pm and 7pm. When other shift patterns are in operation the cars would be on the network outside peak hours.

The most noticeable impact of the construction of the project on other road users would arise from the traffic management measures that would be in place. The location and duration of these works in any particular place would vary throughout the construction period. The Ward impact summaries contain descriptions of the traffic management measures planned in each area. In several places on single-lane carriageway roads, it would be necessary to close short lengths of the road to traffic. There would be shuttle working through these sites, with traffic signals controlling access in turn for vehicles to the part of the carriageway that remains open. Drivers who arrive at a red light at one of these locations would experience a delay to their journey. The closed sections would be no longer than 300 metres, thereby reducing the time when the lights in both directions are red to allow vehicles to clear the single lane section.

Vehicles could also be delayed at the entrance and exit of compounds, particularly if traffic were to be stopped to allow a vehicle to exit the site, or slowed down while travelling behind a vehicle turning into a compound.

On some parts of the network, particularly the A2 in east Gravesham and the A13 near the junction with the A1089, there would be periods when there are narrow lanes in force and the speed limit reduced. Where possible, the design of the traffic management in the sections of narrow lane running would be set to meet the requirements allowing traffic to flow at 60mph. At certain times of day and where the flow of traffic is heaviest, there could be an impact on the speed of vehicles on narrow lane sections.

In some locations, road closures would be needed. These locations are described in the Ward impact summaries and in the Outline Traffic Management Plan for Construction. The longer closures would be where a new bridge is to be provided in the same location as an existing one. Vehicles that would otherwise use these roads would be directed on to a diversionary route and would have longer journey times. There may also be some delays to the other traffic on these routes, such as at the junctions.

Some of the traffic management measures would occur along bus routes and may result in increased journey times for bus users. Details of the timings of the planned closures would be shared in good time with the bus operators. This would allow plans to be set up for the diversionary routes for bus services, and these changes communicated in advance to bus users.

Find out more

The Outline Traffic Management Plan for Construction outlines our approach to carrying out temporary traffic management for the safe construction of the new road, access routes, and haul roads.

The Ward impact summaries provide descriptions of the impacts of construction on local roads, including HGV and project workforce movements.

Our environmental assessment of construction

This section will look at how we have approached the environmental assessments that will help us to understand the likely construction impacts of building the Lower Thames Crossing at a project-wide level, and how we would mitigate them. Our assessments focus on the identified impacts and proposed mitigation in a wider geographic area and include:

- air quality
- noise and vibration
- terrestrial and marine biodiversity
- geology and soils
- minerals and waste
- road drainage and water environment
- climate and carbon
- landscape
- cumulative effects

Information on local environmental assessments can be found in the Ward impact summaries.

Our approach to environmental assessment

Due to the size of Lower Thames Crossing an Environmental Impact Assessment (EIA) would be required to support our application for development consent. EIA is the process of assessing the potential impacts, both positive and negative, that a development might have on the environment. The EIA process is often described as iterative. This means developing the project design with an understanding of the environmental impacts in stages. First, the design is developed to avoid environmental impacts. Where this is not possible, mitigation measures are developed to reduce the level of the impact.

The outcome of the EIA process is documented in an ES. This would be submitted with our DCO application.

The EIA follows industry standards set out in Highways England design standards along with other topic-specific methods and guidance. Each chapter of the ES would be completed by specialists.

Our EIA follows a series of key steps:

- Identification of the study area and the receptors to be assessed. Receptors range from people, properties, ecological species to the surrounding environment and its resources.
- Information on the existing environment is collected through surveys, desk-based studies, and consultation with environmental groups and the public.

- Production of a Scoping Report to request a Scoping Opinion from the Planning Inspectorate. The scoping process identifies the main environmental issues of the project, and decides which environmental topics and elements of these topics should be assessed. This step was completed in 2017.
- Environmental assessment of the project to identify any potentially significant effects.
- Establish the necessary mitigation measures that set out to avoid, reduce or offset potential adverse impacts.
- Identification of the likely significant environmental effects, considering whether effects would be beneficial (positive) or adverse (negative), permanent or temporary and take proposed mitigation measures into account.

A Habitat Regulations Assessment is also being prepared and would be submitted with our application for development consent. This is required due to the proximity of the Lower Thames Crossing to European designated sites including Thames Estuary and Marshes Special Protection Area and Ramsar site.

A Register of Environmental Actions and Commitments (REAC) is being prepared as part of the ES and is available as part of this consultation. It identifies all good practice and essential mitigation that would be carried out during construction and operation of the project. The assessments of any significant effects presented in the ES rely on these mitigations so that they can be secured under the DCO.

Find out more

There are other control documents associated with the application for development consent. A description of the control documents is provided in chapter 1 of this document.

CoCP is also being prepared to accompany the ES and is available as part of this consultation. This will provide a framework to manage construction activities. Its key aims are to ensure that our environmental mitigation commitments are met and that any necessary consents and licences are obtained.

7.2 Other documents

In response to stakeholder comments, we have produced a number of documents to supplement our DCO application. These documents provide further detail on the commitments and processes which would be undertaken in the delivery of project, both in construction and operation. Those new documents relevant to the management of the construction of the project are briefly described below.

An outline Site Waste Management Plan (oSWMP) and outline Material Handling Plan (oMPH) is being produced to accompany our DCO application. The oSWMP provides the overarching principles and procedures for the management of waste during the construction of the project. Before construction, our contractors would prepare a Construction Site Waste Management Plan using the principles presented in the oSWMP and update it as a live document throughout the construction phase.

The outline Materials Handling Plan (oMHP) includes a description of the contracts that would cover different areas of the project. The oMHP provides information on how we have considered the use of rail and river transport options to minimise road miles where reasonably possible, the use of internal haul roads, the supply network requirements to allow deliveries of construction material such as concrete, aggregates and cement, and how we would handle and transport excavated material.

The Outline Traffic Management Plan for Construction outlines our approach to carrying out temporary traffic management for the safe construction of the new road, access routes, and haul roads.

7.3 Consultation and environmental assessment

To support statutory consultation in 2018, and as a legal requirement, a Preliminary Environmental Information Report (PEIR) was prepared, which provided early information on the likely environmental effects and mitigation required.

The aim of our PEIR was to inform the public, stakeholders, landowners and statutory environmental bodies of the ongoing EIA work and to enable them to understand the potential significant effects that could arise from the Lower Thames Crossing. The PEIR generated useful feedback in the consultation and has been used to inform the assessments reported in the ES.

At supplementary consultation in 2020, we produced a comprehensive Environmental Impacts Update (EIU). This contained the likely significant effects on the environment for our proposed changes, during construction and operation of the new road, as compared with that reported in the PEIR. It also outlined the mitigation measures proposed to reduce adverse effects associated with the changes.

Further design refinements were proposed and, at the design refinement consultation, we produced another EIU, explaining any associated new or changed environmental effects.

The majority of the expected environmental effects remain the same as presented in the PEIR, however, there are some minor changes as the project design has evolved. The likely environmental effects reported in this consultation provide an update to that presented in our PEIR and EIUs against the current project design.

Consulted organisations

Throughout the development of Lower Thames Crossing, we have continued to engage with various stakeholders who have, and continue to, provide insight and advice on the project's design and environmental mitigation.

Statutory environmental bodies are advisory regulatory bodies and key stakeholders. These include the Environment Agency, Historic England (including the Greater London Archaeology Advisory Service), Marine Management Organisation, Natural England, Kent Downs Area of Outstanding Natural Beauty (AONB) Unit and the Port of London Authority.

Other non-statutory organisations which we continue to consult include Buglife, Essex and Kent Wildlife Trusts, the Forestry Commission (including Forestry Enterprise), RSPB, The Woodland Trust and the Canal & River Trust.

We are also liaising with local authorities on all environmental topics that would be covered in the ES. These local authorities include those where the footprint of the Lower Thames Crossing would be located (known as host local authorities) and those adjacent who may be indirectly affected. Technical officers and specialists, including Environmental Health and planning officers as well as councillors and environmental consultants have been engaged. The host local authorities are:

- Brentwood Borough Council
- Dartford Borough Council
- Essex County Council
- London Borough of Havering
- Gravesham Borough Council
- Kent County Council
- Medway Council
- Thurrock Council

7.4 Our approach to environmental mitigation

The design of the Lower Thames Crossing has been developed, where possible, to avoid or minimise significant effects on the environment. During the design process, we introduced further measures to lessen any adverse impacts that cannot be avoided. Some of these include landscaping, noise mitigation, and green infrastructure, for example, a number of green bridges along the new road.

We would propose to avoid or reduce potentially significant effects on the environment by using:

- Embedded mitigation: measures that are part of the engineering design and Design principles, such as the use of green bridges.
- Good practice: standard approaches and actions used by construction companies to avoid or reduce effects on local communities and the environment, such as the prevention of pollution incidents.
- Essential mitigation: specific measures in particular areas of the project to avoid or reduce significant environmental effects, such as monitoring protected ecological species during construction.

The Design principles outline the high-level objectives and vision for Lower Thames Crossing including how it would fit into the surrounding area. It also contains project-wide principles and area specific commitments which the project would adhere to. They capture the key principles that have shaped the design of the route. The Design principles would be submitted as part of our DCO application and updated through the examination period taking into account additional commitment made during this time. A final version would be issued to our contractors who would be required to adhere to the commitment set out within it.

The final REAC would summarise mitigation measures that we have committed to within the ES. Even once the DCO application has been submitted, the REAC would continue to be updated throughout the examination period taking into account additional commitments made during this time. A final version would be issued to the contractors who would need to adhere to the commitments set out within it.

Essential and best practice mitigation is set out in the REAC. These measures take into account when the Lower Thames Crossing is being built and cover:

- air quality
- climate
- cultural heritage
- geology and soils
- landscape
- terrestrial biodiversity
- marine biodiversity
- material assets and waste
- noise and vibration
- population and human health
- road drainage and the water environment

Some commitments are deemed as essential and relate to specific areas in the project design. These include:

- restrictions on construction compound facility heights and locations
- visual screening of compounds using bunds
- tree and woodland planting

The good practice commitments are more general measures and typical of large infrastructure projects such as the Lower Thames Crossing. These include measures such as:

- on-road heavy vehicles complying with the standards set within the London Low Emission Zone
- controls to reduce dust
- use of renewable electricity suppliers for power to cover compound consumption
- waste targets (by weight) of construction waste diverted from landfill
- measures to reduce noise nuisance such as installing hoarding around construction areas and turning off machinery when it is not in use

7.5 Recent updates to our environmental assessments

Since our DCO application was withdrawn in November 2020, we have been working to update the EIA to make sure changes to Lower Thames Crossing have been assessed. These include changes to the Order Limits, a change in our construction programme (which would start in 2024 and last until 2029), changes to the traffic model including the introduction of traffic management measures. Further information around the changes to the project since our design refinement consultation last year are described in chapter 3 of the Operations update.

These changes have meant updating some of our assessment work (for example, the change in Order Limits means we need to review our impact on any new areas of land such as vegetation removal/retainment). In some cases, we have been updating our assessments based on comments received from stakeholders on previous drafts.

The air quality and noise sections of this document present a qualitative summary of the likely effects during the construction of the project on air quality and noise. Quantitative noise and air quality assessments, incorporating the latest construction details such as refinements to traffic management measures, construction compound layouts and changes in construction equipment types, will be presented as part of our DCO application. The air quality and noise construction information presented in this document is still representative of the impacts we expect to result from the construction of the project.

A summary of likely significant environmental effects and mitigation during construction for each environmental topic is presented below.

Air quality

The construction of the Lower Thames Crossing has the potential to affect air quality through the release of dust and exhaust emissions from construction activities and traffic during the construction phase.

Those areas most at risk of an increase in dust and emissions are those located within 200 metres of haul roads, compound areas and soil storage areas.

Analysis of traffic changes on the road network during the construction phase shows that there would be areas where traffic increases, and others where it decreases as a result of construction and the implementation of the associated traffic management measures. Traffic flows are expected to decrease on the M25 and A2/M2, which could lead to temporary air quality improvements at properties located close to the affected roads. Traffic flows are expected to increase on the A13, A1089, M20 and A226 which could lead to temporary increases in air pollutant concentrations at properties close to the affected roads. Changes in traffic on roads in the localities affected are described in the Ward impact summaries.

These changes in traffic flows during construction would be evaluated following best practice guidance (Highways England design standards) to establish whether the construction of Lower Thames Crossing would lead to an overall significant effect on local air quality. This process would take into account the degree of worsening or improvement at these receptors and the number of locations affected. Given the temporary nature of construction it is unlikely that the project would have a significant effect on air quality during its construction due to changes in the key traffic-related pollutants NO_2 and PM_{10}.

The REAC sets out essential and best practice measures to reduce the air quality effects associated with construction dust and construction vehicles, as well as non-road mobile machinery. Some examples are provided below:

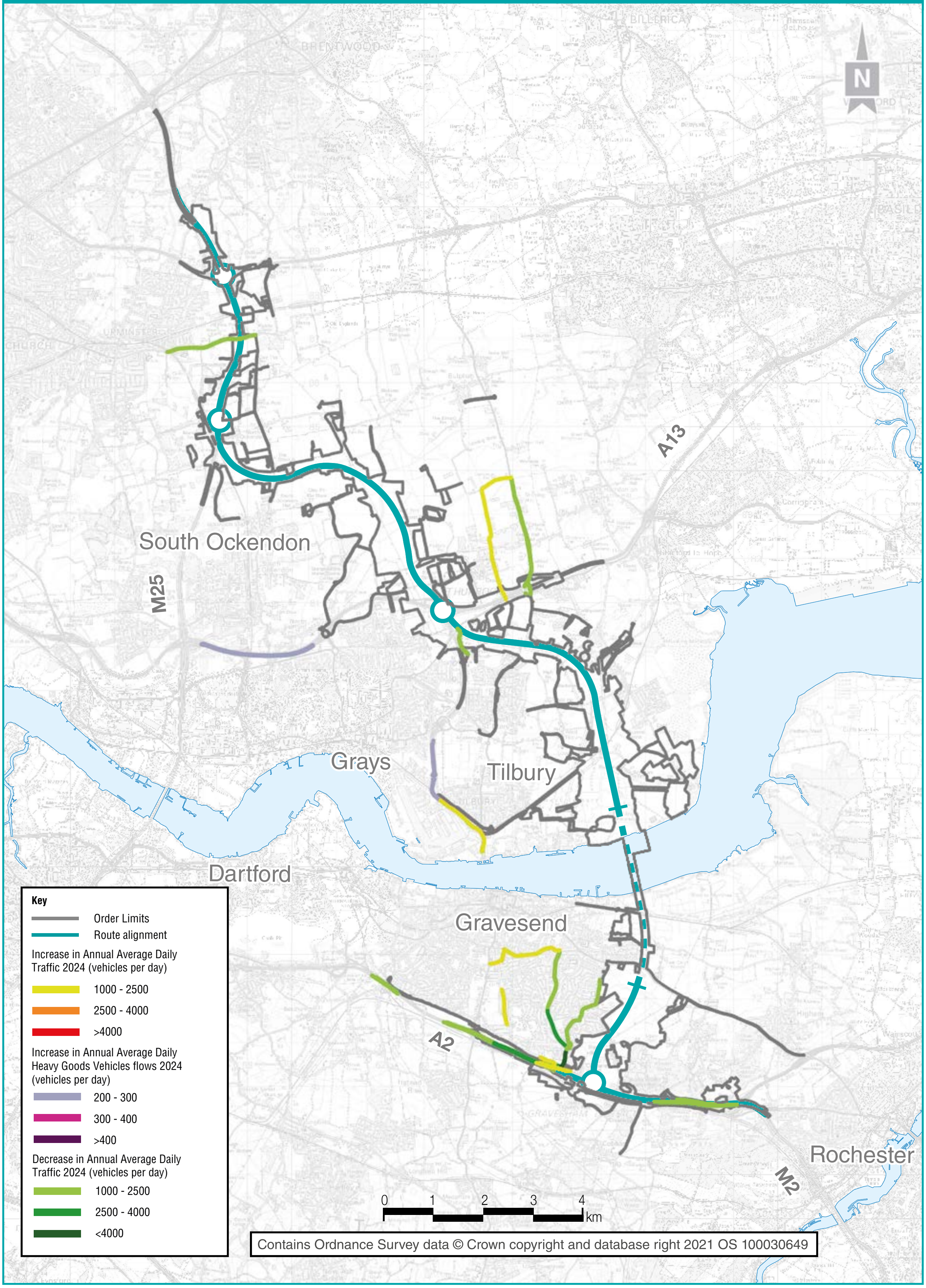
Find out more

Further information on potential air quality impacts at a local level along the proposed new road can be found in the Ward impact summaries.

- using water as a dust suppressant
- regular inspections
- locating dust causing activities within compounds away from receptors (for example homes)
- setting up barriers or screens around dusty activities
- re-vegetating or covering stockpiles
- ensure material deliveries are in enclosed tankers

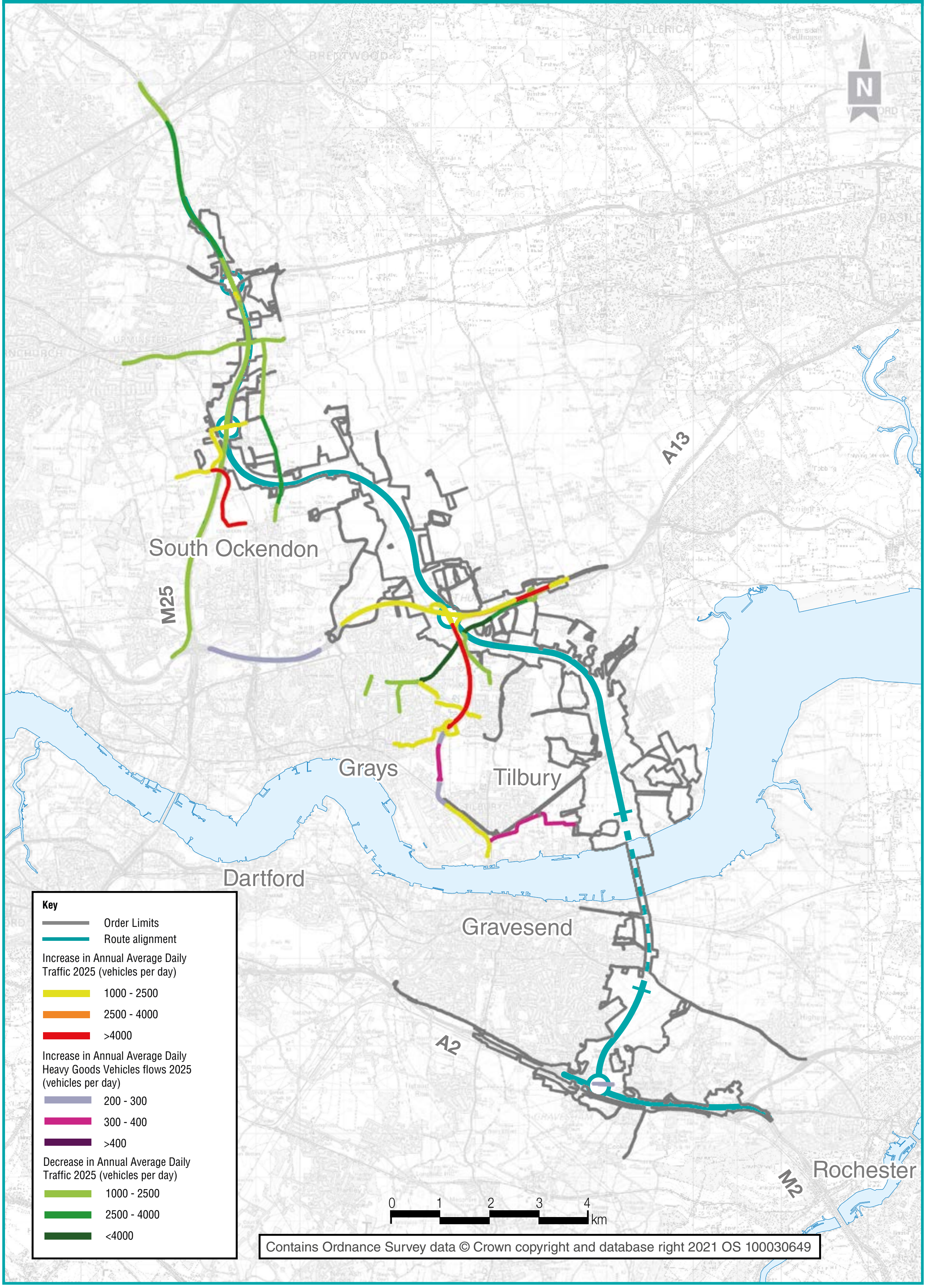
Applying the proposed mitigation measures means there would be no significant effects on air quality from dust generated or re-suspended by construction activities and vehicles.

Figure 7-1 Changes in air quality during construction, 2024



Analysis of construction traffic flows predicts there would be a reduction in traffic flows and therefore a likely temporary improvement in air quality in the area around the A2 corridor (south of Gravesend), Valley Drive and A128 Brentwood Road during 2024. There are anticipated increases in traffic flows on Singlewell Road and Old Road East in Gravesend and on Conways Road north of Orsett. It is likely there would be increases in construction lorries (heavy goods vehicles) moving to and from the site compounds via the A1089 and A13 north of Thurrock during 2024, which could lead to temporary deterioration in air quality at properties adjacent to these roads.

Figure 7-2 Changes in air quality during construction, 2025



Analysis of construction traffic predicts there would be a reduction in traffic flows and therefore a likely temporary improvement in air quality at properties adjacent to the M25 between junctions 28 and 30 during 2025. We would anticipate increases in traffic flow associated with construction lorries moving to and from the site compounds via the A1089 and A13 during 2025 and on Fort Road east of Tilbury, which could lead to temporary deterioration in air quality at properties adjacent to these roads. The implementation of traffic management measures is expected to lead to a redistribution of existing traffic and cause increases in traffic flow on the A13, the A126 Broadway in Thurrock, the B149 near the A1089 in Thurrock and on Dennises Lane/Pea Lane north of South Ockendon.

Figure 7-3 Changes in air quality during construction north of the river, 2026

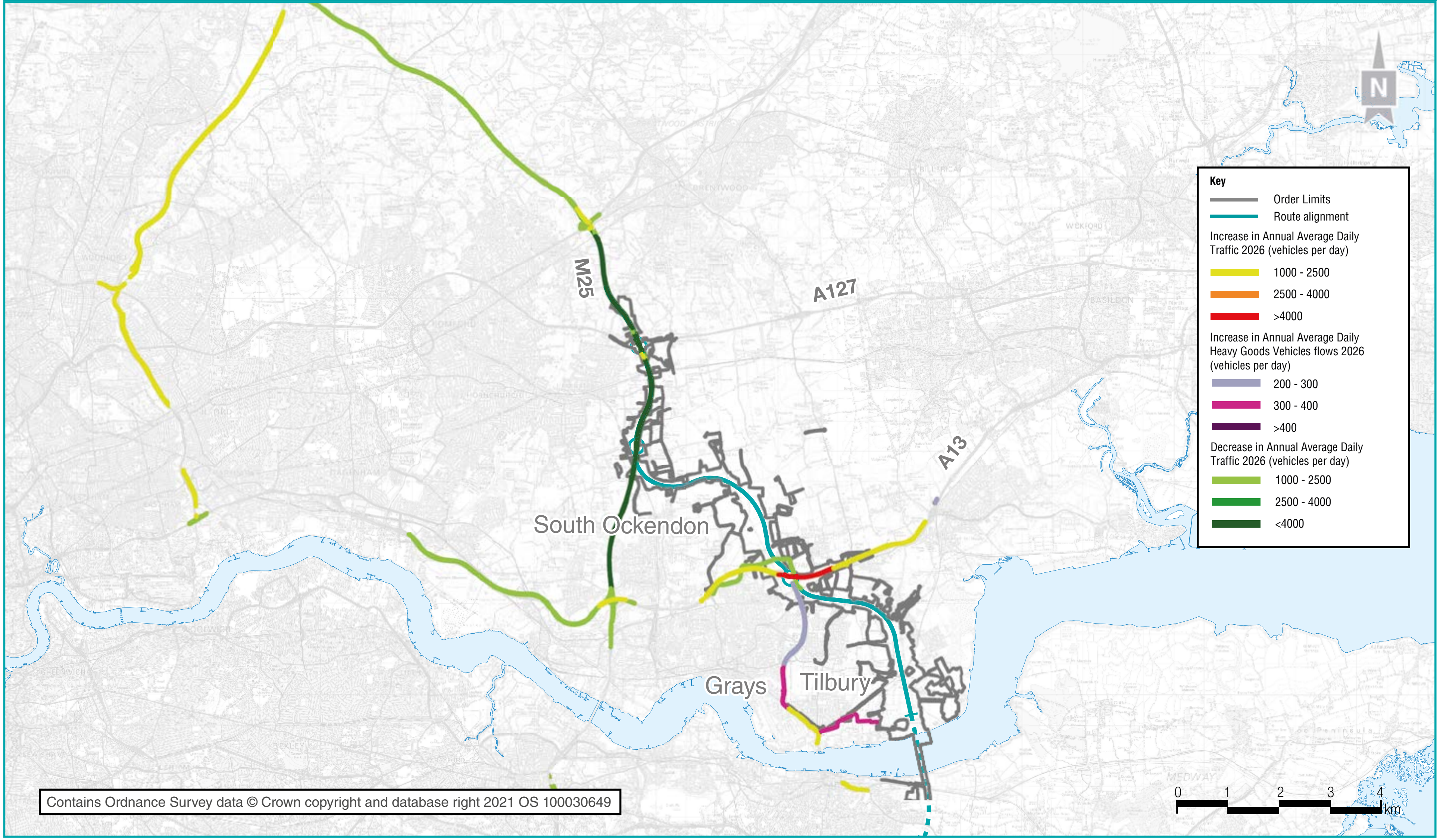
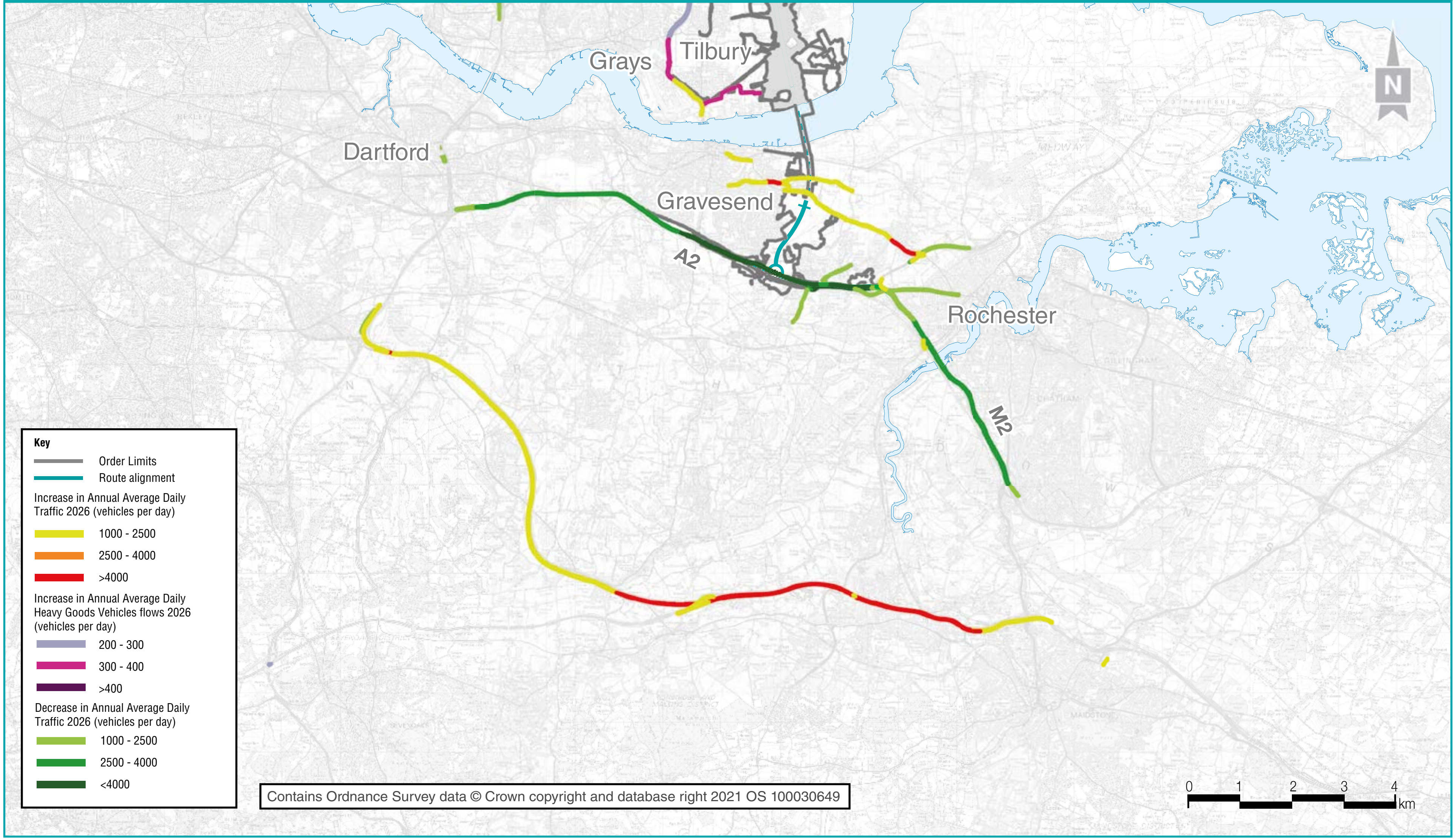


Figure 7-4 Changes in air quality during construction south of the river, 2026



Our analysis of construction traffic predicts there would be a reduction in traffic flows and therefore a likely temporary improvement in air quality during 2026 on the A2 corridor between the A282 and the A229, and on the M25 between junctions 26 and 30. There are anticipated increases in traffic flow (as a result of traffic management measures) on the M20, the M11/A406, the A13 between the M25 and Stanford-le-Hope, and the A226 between Gravesend and Higham. There would also be increases on the B261 Old Road East and Lower Higham Road in Gravesend. In addition, anticipated increases are predicted in traffic flow associated with construction lorries moving to and from the site compounds via the A1089 during 2026 and on Fort Road east of Tilbury, which could lead to temporary deterioration in air quality at properties adjacent to these roads.

Figure 7-5 Changes in air quality during construction north of the river, 2027

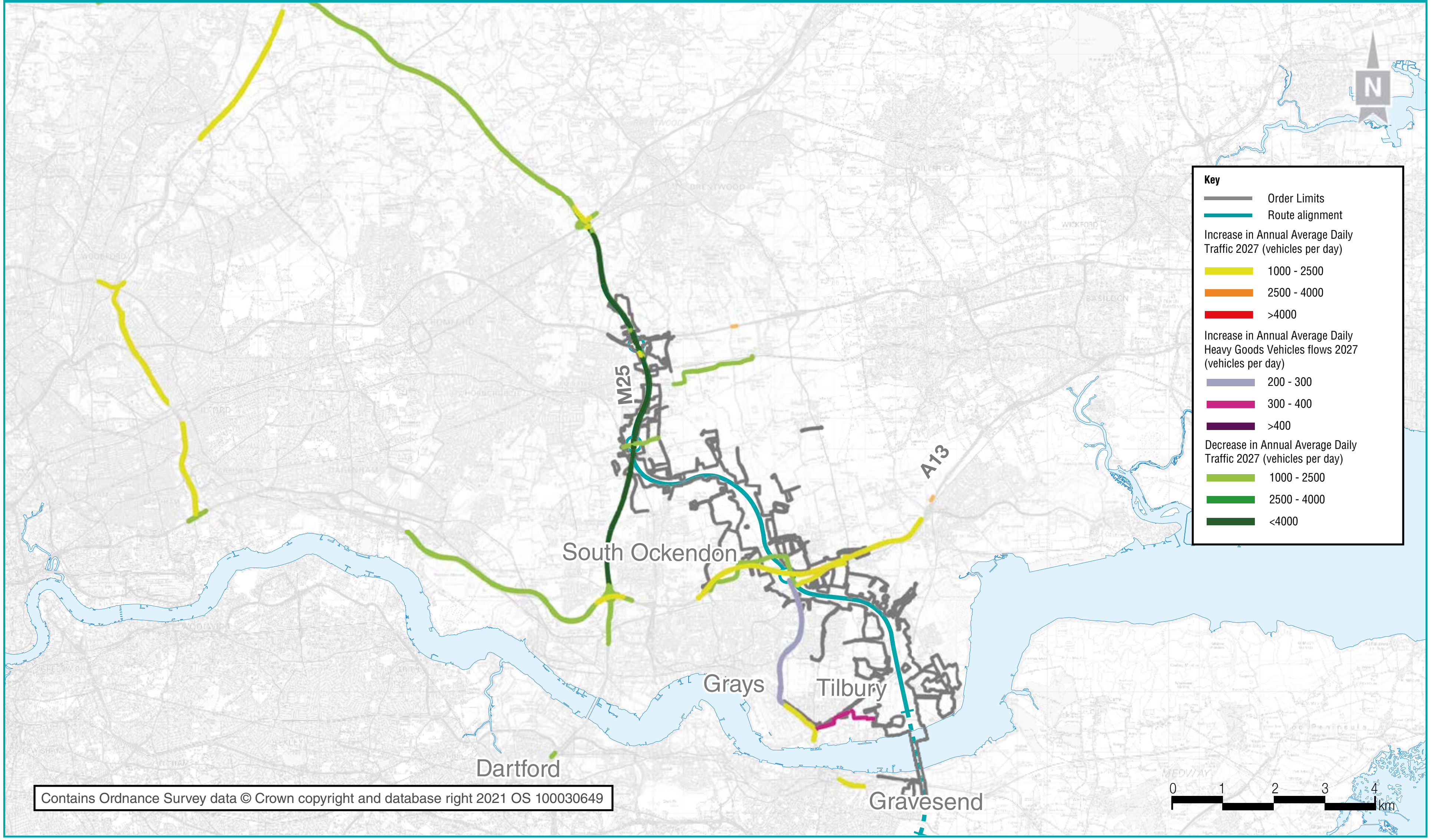
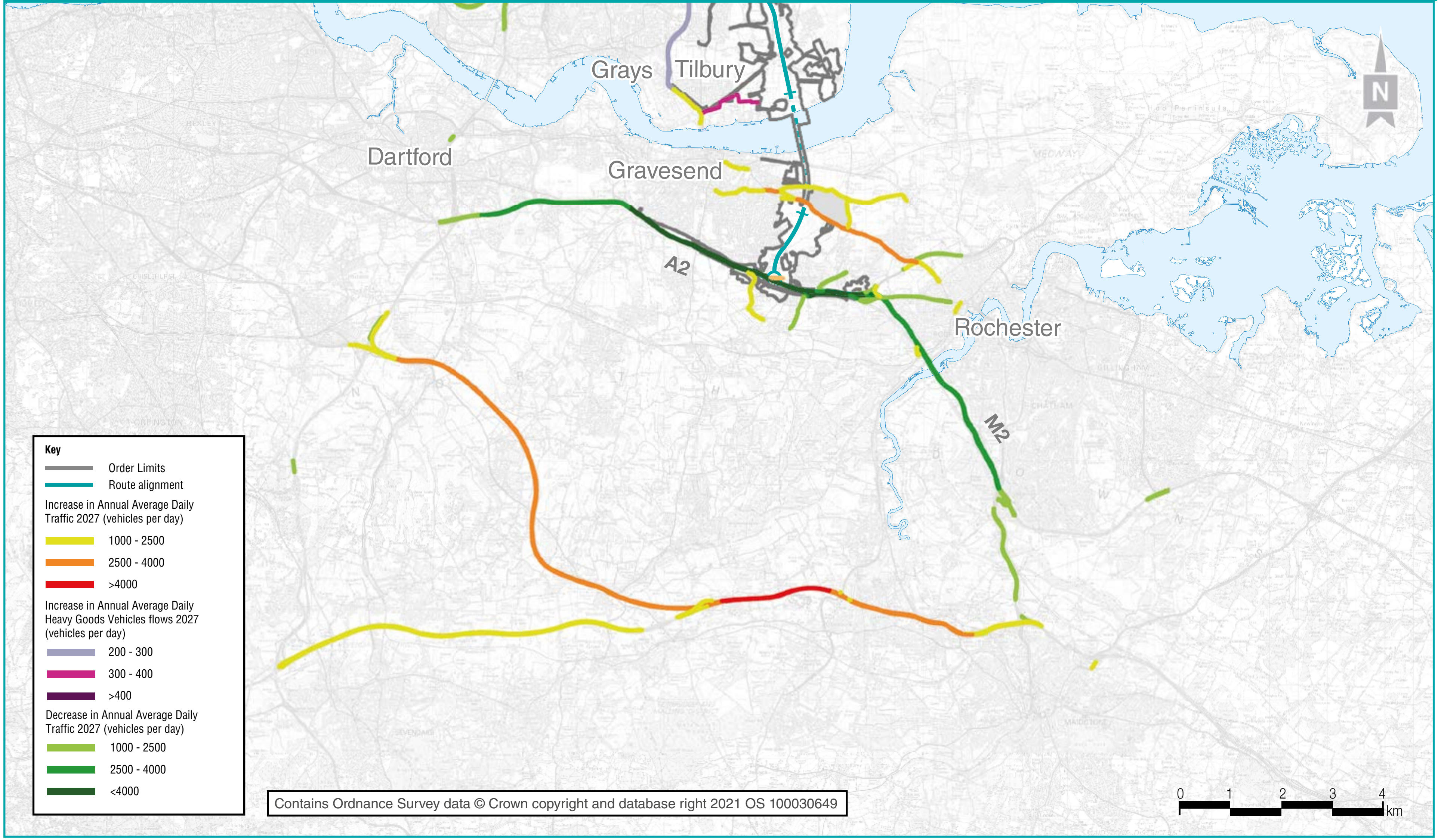


Figure 7-6 Changes in air quality during construction south of the river, 2027



Analysis of construction traffic predicts there would be a reduction in traffic flows and therefore a likely temporary improvement in air quality during 2027 on the A2 corridor between the A282 and the A229 (as well as on the A229 itself), and on the M25 between junctions 26 and 30. There are anticipated increases in traffic flow (as a result of traffic management measures) on the M20, the M26, the M11/A406, the A13 between the M25 and Stanford-le-Hope, and the A226 between Gravesend and Higham. There would also be increases on the B261 Old Road East, Lower Higham Road, and Green Farm Lane in Gravesend. Again, there are anticipated increases in traffic flow associated with construction lorries moving to and from the site compounds via the A1089 during 2027 and on Fort Road east of Tilbury, which could lead to temporary deterioration in air quality at properties adjacent to these roads. There is also a redistribution of freight traffic along the M20 and M26 as vehicles re-route to avoid the M25 and associated traffic management measures north of the Thames.

Figure 7-7 Changes in air quality during construction north of the river, 2028

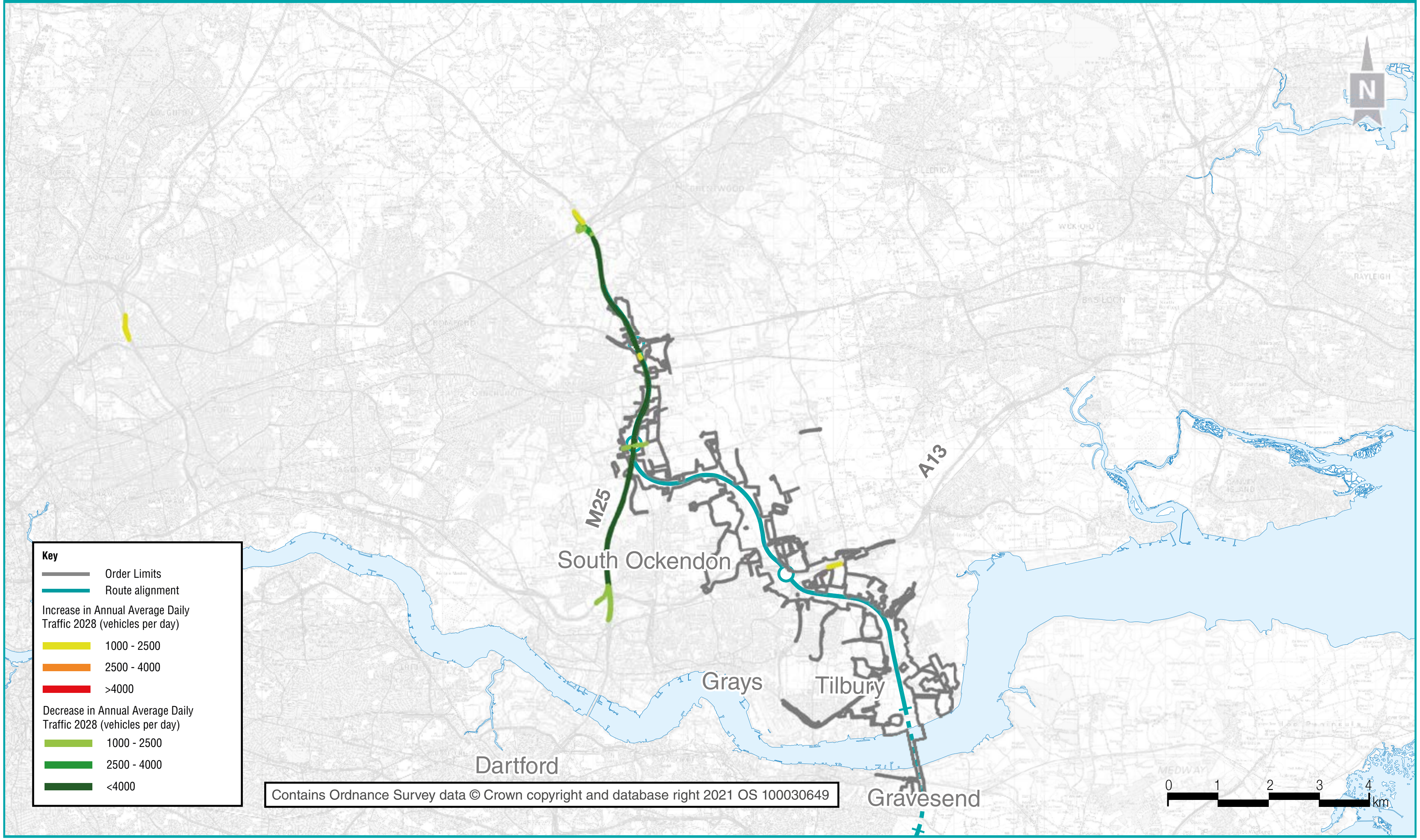
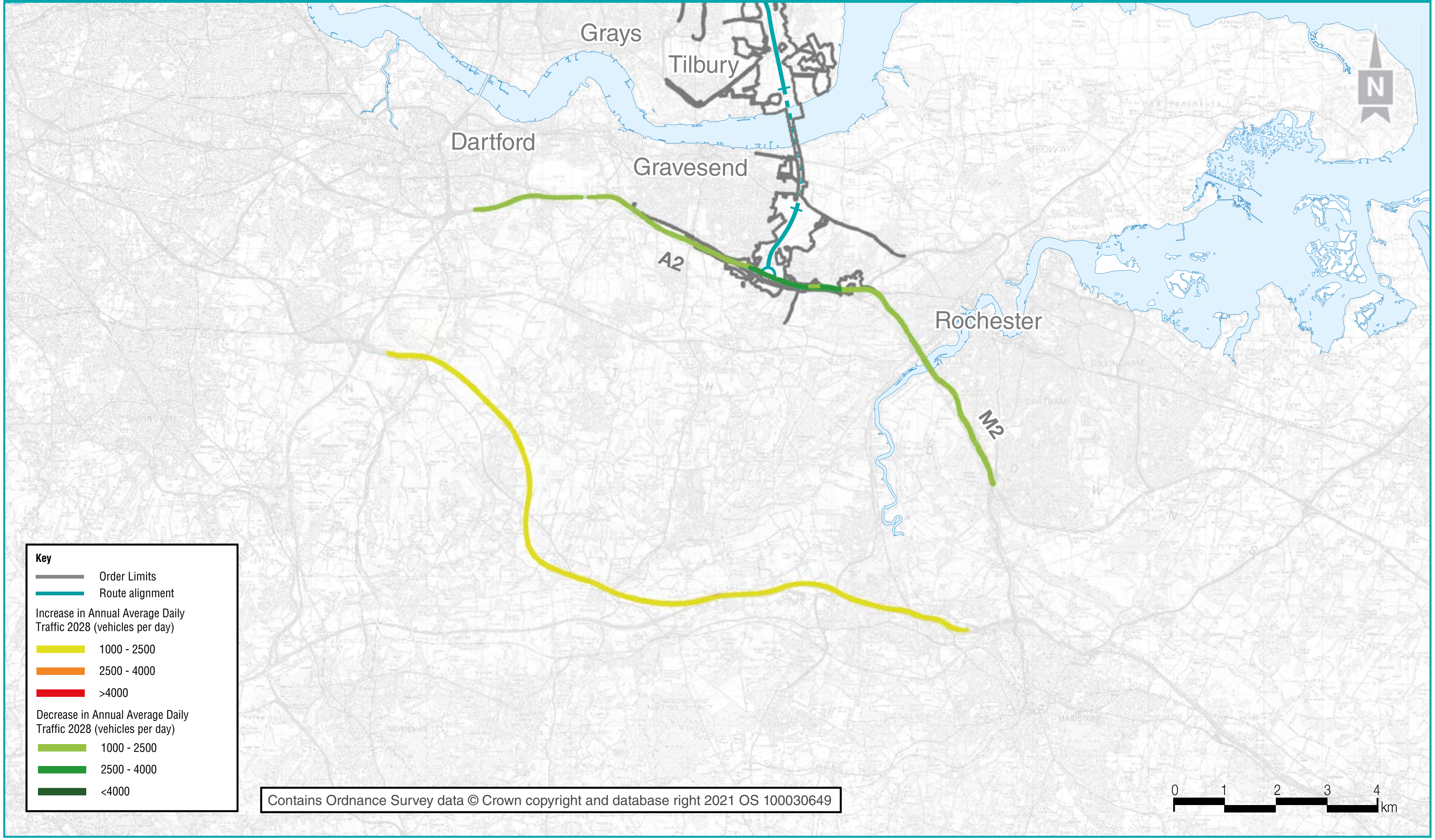


Figure 7-8 Changes in air quality during construction south of the river, 2028



Our analysis of construction traffic predicts there would be a reduction in traffic flows and therefore a likely temporary improvement in air quality during 2028 on the A2 corridor between the A282 and the A229, and on the M25 between junctions 28 and 30. There are anticipated increases in traffic flow (as a result of traffic management measures) on the M20 between junctions 1-6. During 2028, there are no roads where there is expected to be an annual average daily increase in excess of 200 heavy goods vehicles.

We predict no significant changes in annual average traffic flow during 2029 as part of the construction phase of Lower Thames Crossing.

Noise and vibration

Construction impacts

The construction of the Lower Thames Crossing would have an impact on the noise environment because of activities associated with building the new road and tunnel. The existing background noise is typical of rural/semi-rural/urban settings. Noise sensitive receptors, including residential properties, schools, hospitals, care homes and churches, are mainly located in the towns and villages close to the project or roads that may be affected by traffic changes. Throughout our study area, there are 52 designated Noise Important Areas where the population is already affected by high road traffic noise levels.

Noise sensitive receptors, both to the south and north of the Thames, located within 300 metres of the centre of the new road and 50 metres of any construction haulage routes, have the potential to experience temporary construction noise impacts during the daytime, evening and night-time, depending on the type of activity and what machinery is used.

Did you know?

A Noise Important Area is a location(s) identified by the Department for Environment, Food and Rural Affairs as a noise hotspot with sensitive receptors.

Changes in road traffic noise levels on the existing road network due to construction traffic would be confined to the daytime period. Road traffic noise impacts as a result of road closures and diversions (redirection of existing traffic) during the construction phase could extend from day to night-time and weekends, as overnight and weekend closures would be likely.

Did you know?

Vibration sensitive receptors can include houses, hospitals, healthcare and education facilities, community facilities and cultural heritage assets.

There could be temporary negative effects from the vibration of piling works (such as bridge construction and other structures) near vibration sensitive receptors. The vibration caused by the operation of our tunnel boring machine (TBM) is unlikely to cause any adverse effects as there is a large separating distance between the tunnels and any vibration sensitive receptors.

Mitigation

To control construction noise and vibration impacts, an environmental management plan for noise and vibration would be prepared containing both best practice and specific mitigation measures. We would consult local authorities and the plan would require approval from the Secretary of State for Transport before construction started.

Examples of the good practice measures that would be used during construction include:

- closed board fencing installed around the construction compounds to provide screening
- use of low noise equipment where practical
- locating noisy activities as far away as possible, within the confines of the project, from noise sensitive receptors

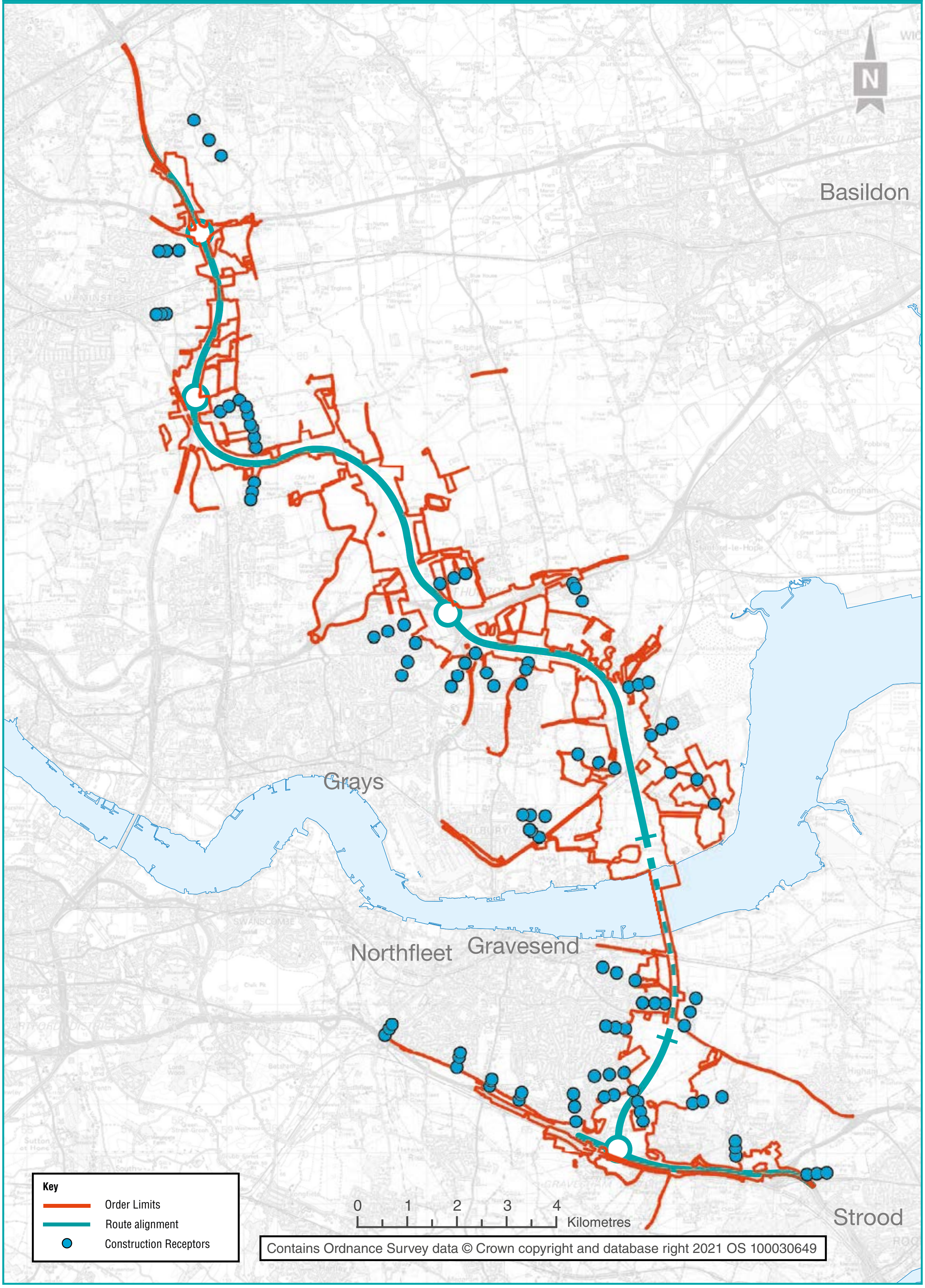
In addition, we would carry out noise surveys to establish pre-construction baseline noise levels, allowing for a noise specialist to calculate the appropriate noise limits and in consultation with local authorities. These limits would then be used to control construction noise and implement mitigation (examples above) by our appointed contractors, in conjunction with local authorities.

During the construction phase, noise and vibration levels would be monitored to ensure that construction limits are not exceeded and mitigation measures are working effectively. Should an exceedance occur, the activity would be stopped and investigated, with additional mitigation put in place to reduce the noise to below the noise limit.

Due to the scale and nature of the Lower Thames Crossing, even once mitigation is in place, it is likely that around four noise sensitive receptors within 300 metres of the project, and approximately 900 noise sensitive receptors within 50 metres of an existing road used by construction traffic, would experience significant effects on their noise environment during construction. It is likely they would exceed the noise limits during the monitoring explained above.

These significant effects on the noise environment would be temporary. Our good practice and essential mitigation measures, along with policing and controlling noisy activities through monitoring, are considered to be acceptable and in line with national policy.

Figure 7-9 Construction noise assessment locations



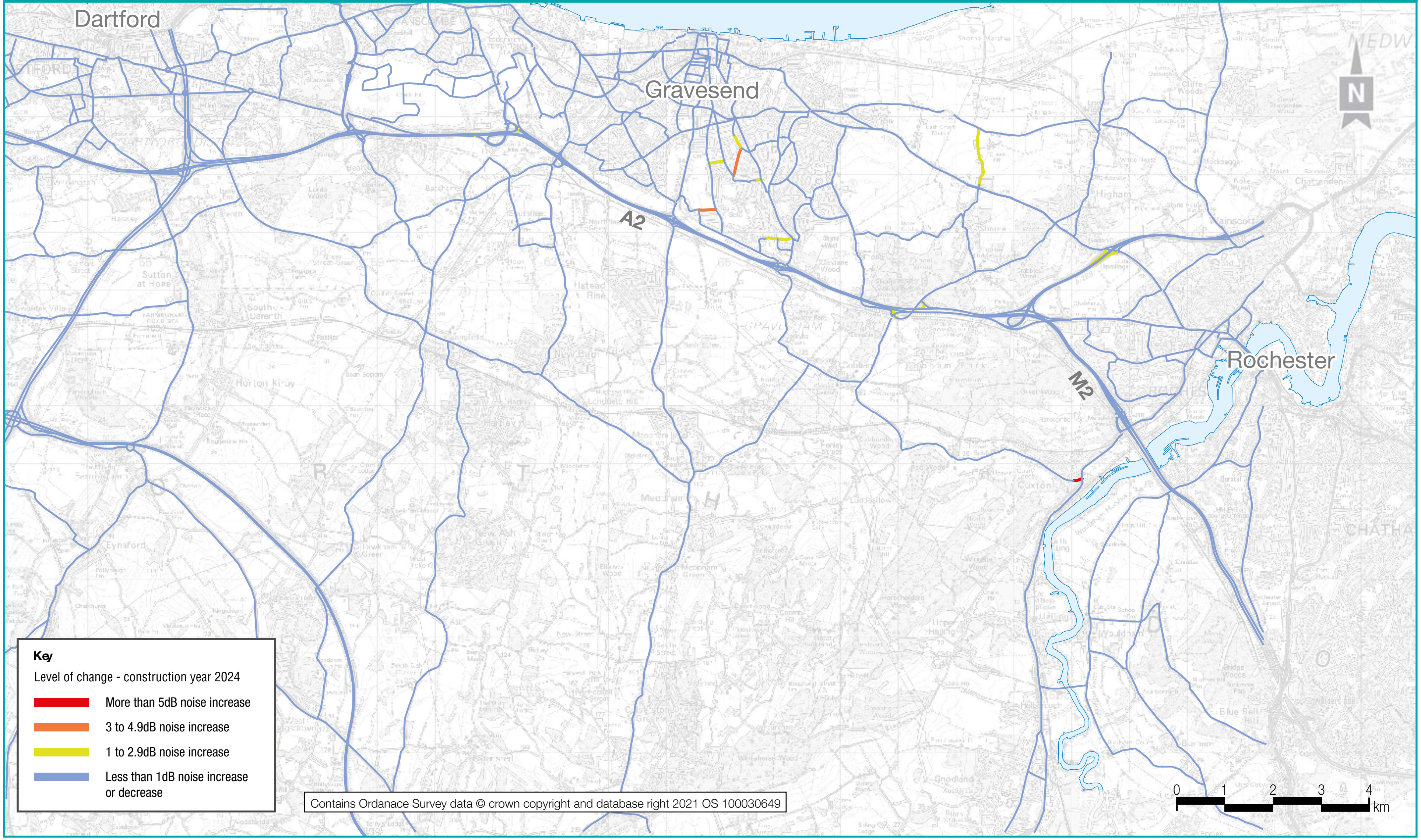
Construction daytime noise levels have been predicted at locations to the north and south of the Thames, and are described in the Ward impact summaries. These locations were chosen to provide a representative level of noise communities would be expected to hear during construction.

Construction traffic movements

The figures below detail the links where data for construction-related vehicle movements indicate a change in road traffic noise. Our plans would be presented on the basis of changes in road traffic noise as a result of the changes in vehicle flow, speed and composition for each year of the construction programme (2024 to 2029).

The plots are further presented separately into north and south of the Thames.

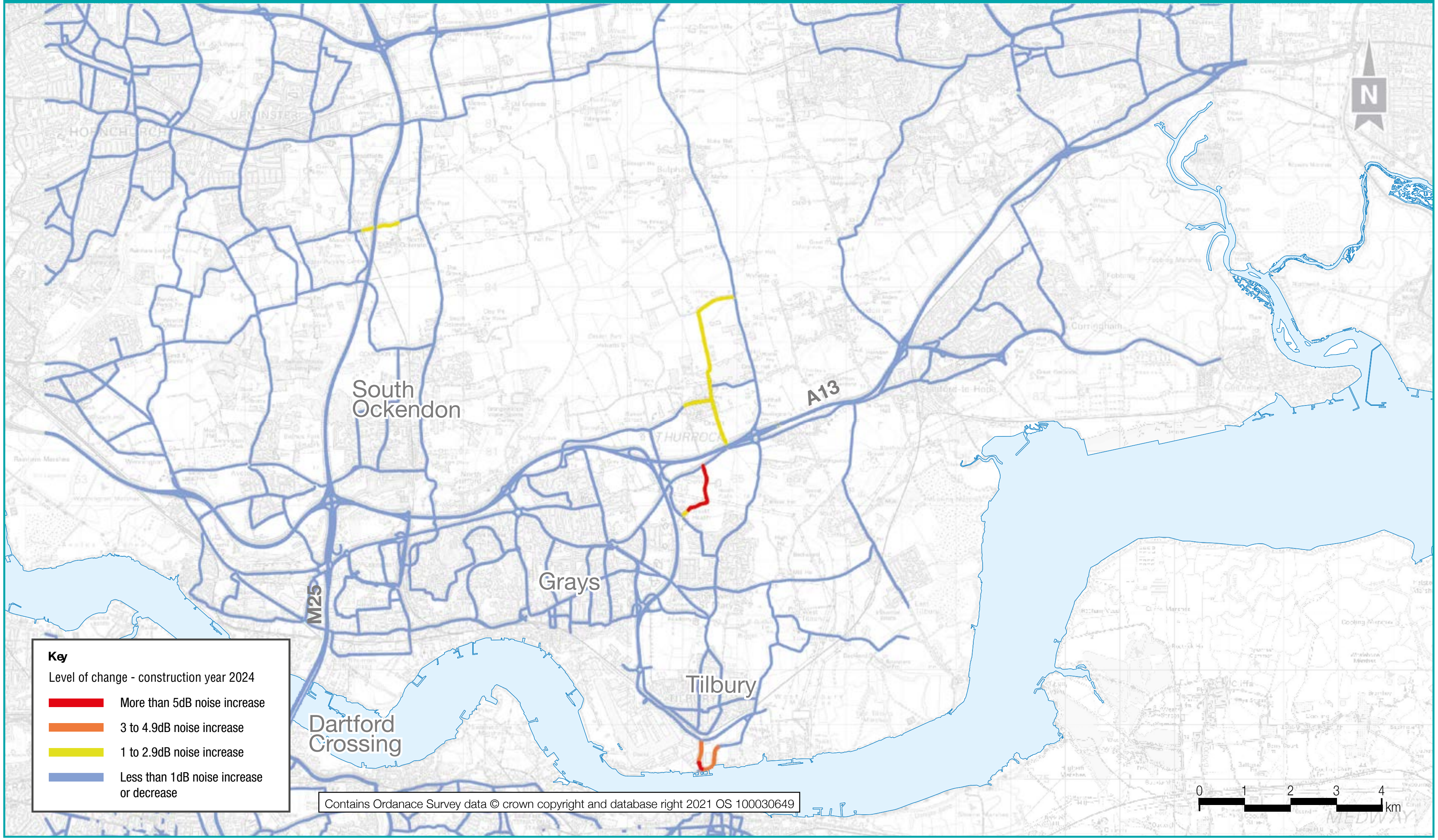
Figure 7-10 Changes in road traffic noise during construction south of the river, 2024



During the construction phase of the project, changes in road traffic noise on the existing road network in 2024 south of the River Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Bush Road
- moderate adverse impact (change of greater than 3dB(A) and less than 5dB(A)) along Kitchener Avenue and Harman Avenue
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Brewers Road, Green Farm Lane, Ifield Way, Ridgeway Avenue, Sun Lane, Miskin Way and Christianfields Avenue

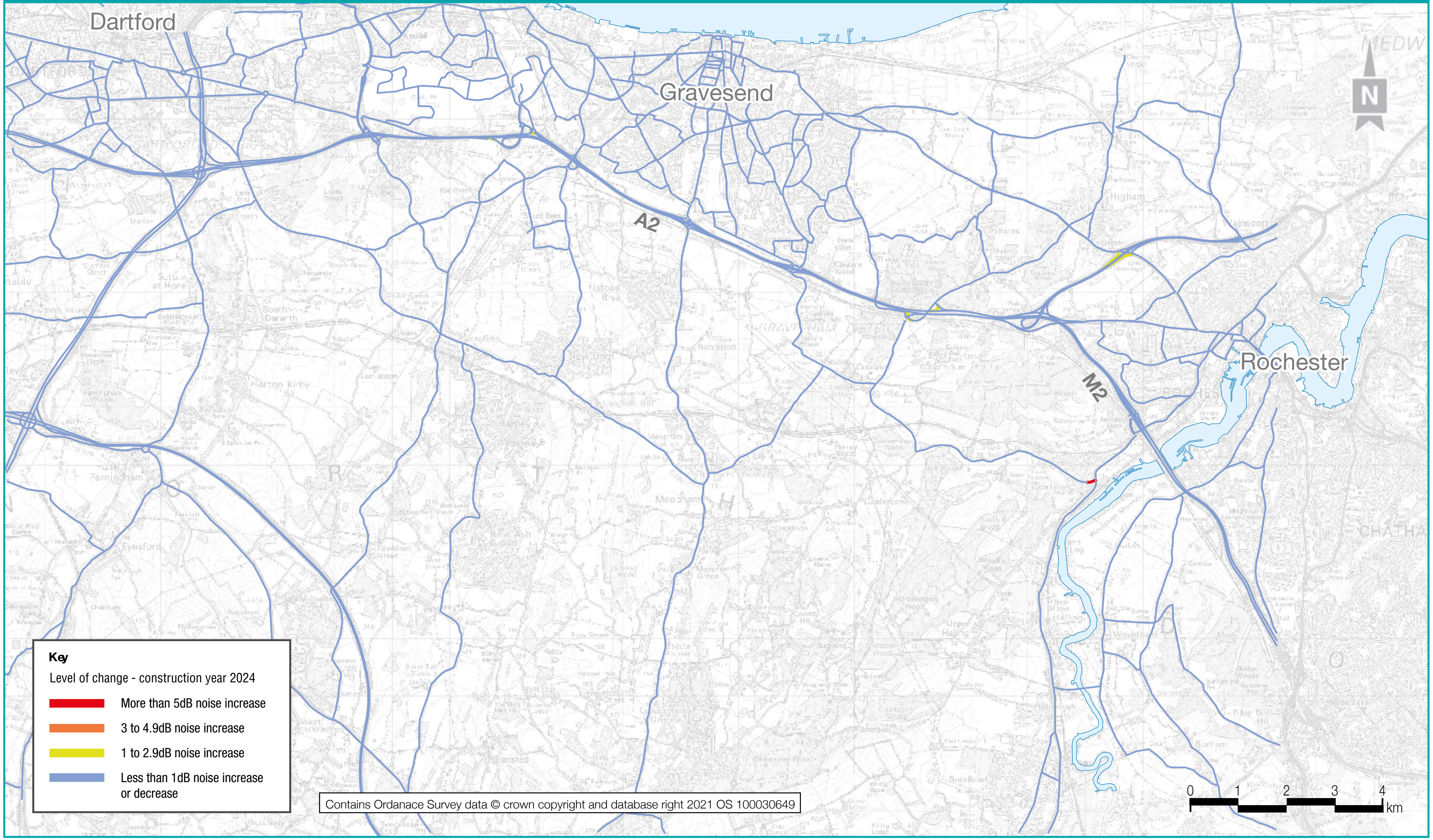
Figure 7-11 Changes in road traffic noise during construction north of the river, 2024



During the construction phase of the project, changes in road traffic noise on the existing road network in 2024 north of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Hornsby Lane and Ferry Road
- moderate adverse impact (change of greater than 3dB(A) and less than 5dB(A)) along Fort Road
- minor adverse Impact (change of greater than 1dB(A) and less than 3dB(A)) along Stanford-Le-Hope bypass, Rectory Road, Conway’s Road, High Road and Ockendon Road

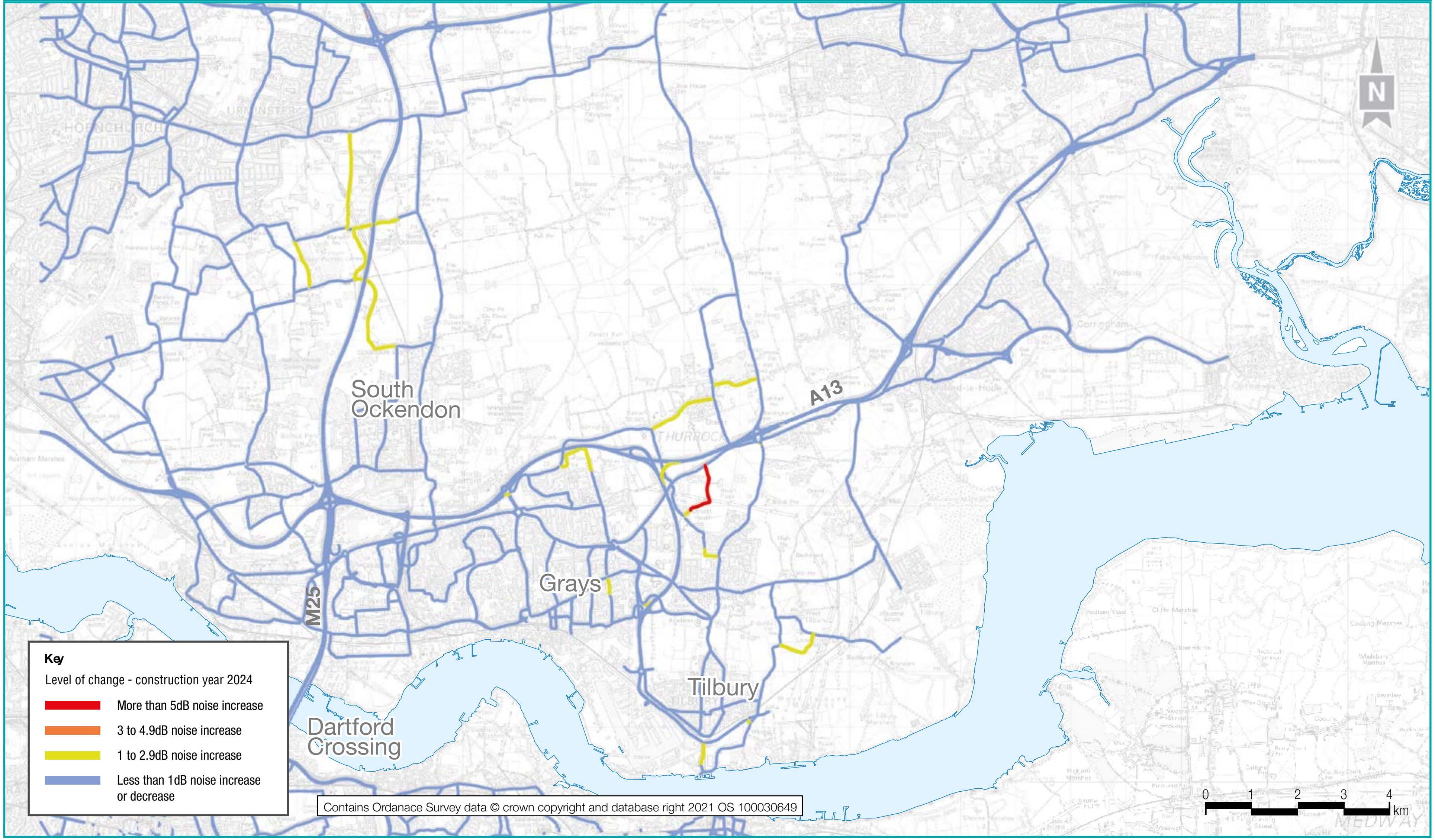
Figure 7-12 Changes in road traffic noise during construction south of the river, 2025



During the construction phase of the project, changes in road traffic noise on the existing road network in 2025 south of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Bush Road
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along the A2260 slips

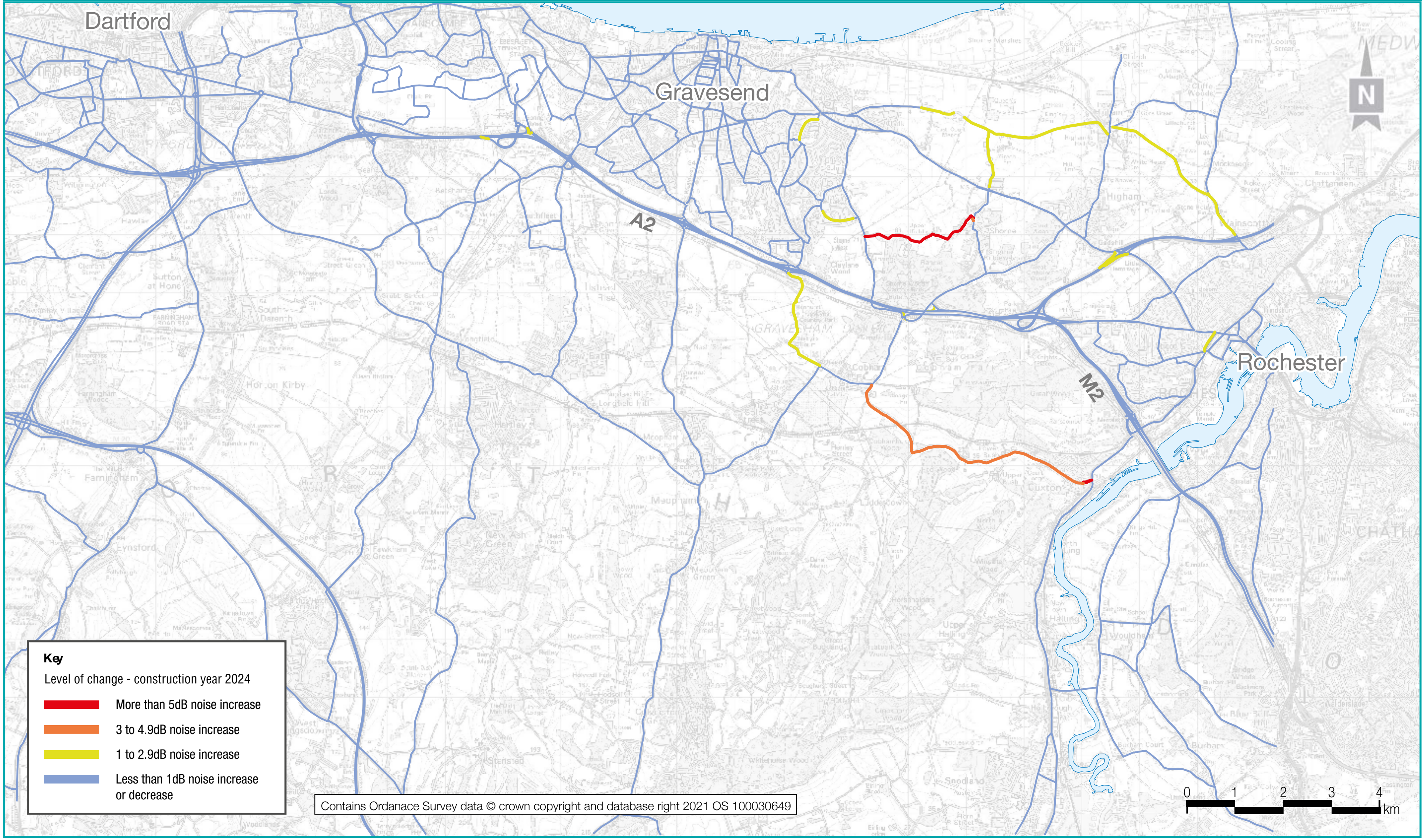
Figure 7-13 Changes in road traffic noise during construction north of the river, 2025



During the construction phase of the project, changes in road traffic noise on the existing road network in 2025 north of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Hornsby Lane
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Stanford-Le-Hope bypass, Brentwood Road, Stifford Clays Road, Prince Charles Avenue, Ferry Road, High Road, Heath Road, Rectory Road, Stubbers Lane, Dennis Road, Pea Lane, Pike Lane, Ockendon Road, Cooper Shaw Road and New Road

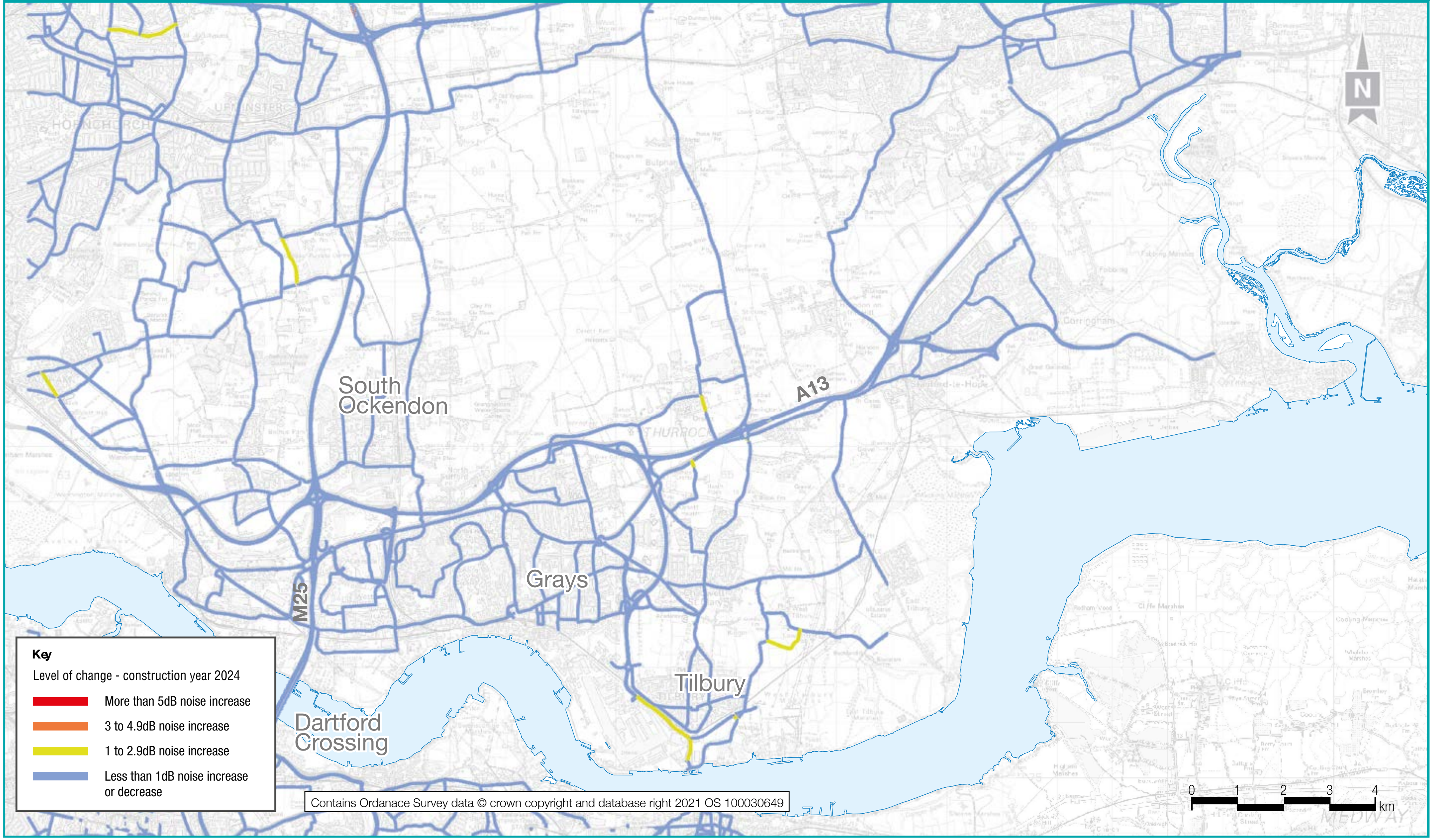
Figure 7-14 Changes in road traffic noise during construction south of the river, 2026



During the construction phase of the project, changes in road traffic noise on the existing road network in 2026 south of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Bush Road, Crown Lane and Shorne Ifield Road
- moderate adverse impact (change of greater than 3dB(A) and less than 5dB(A)) along Cobhambury Road and Warren Road
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Northcote Road, Lower Road, Lower Rochester Road, Lower Higham Road, Green Farm Lane, Vigilant Way, Hampton Crescent, Henhurst Road, Jeskyns Road and Brown Road

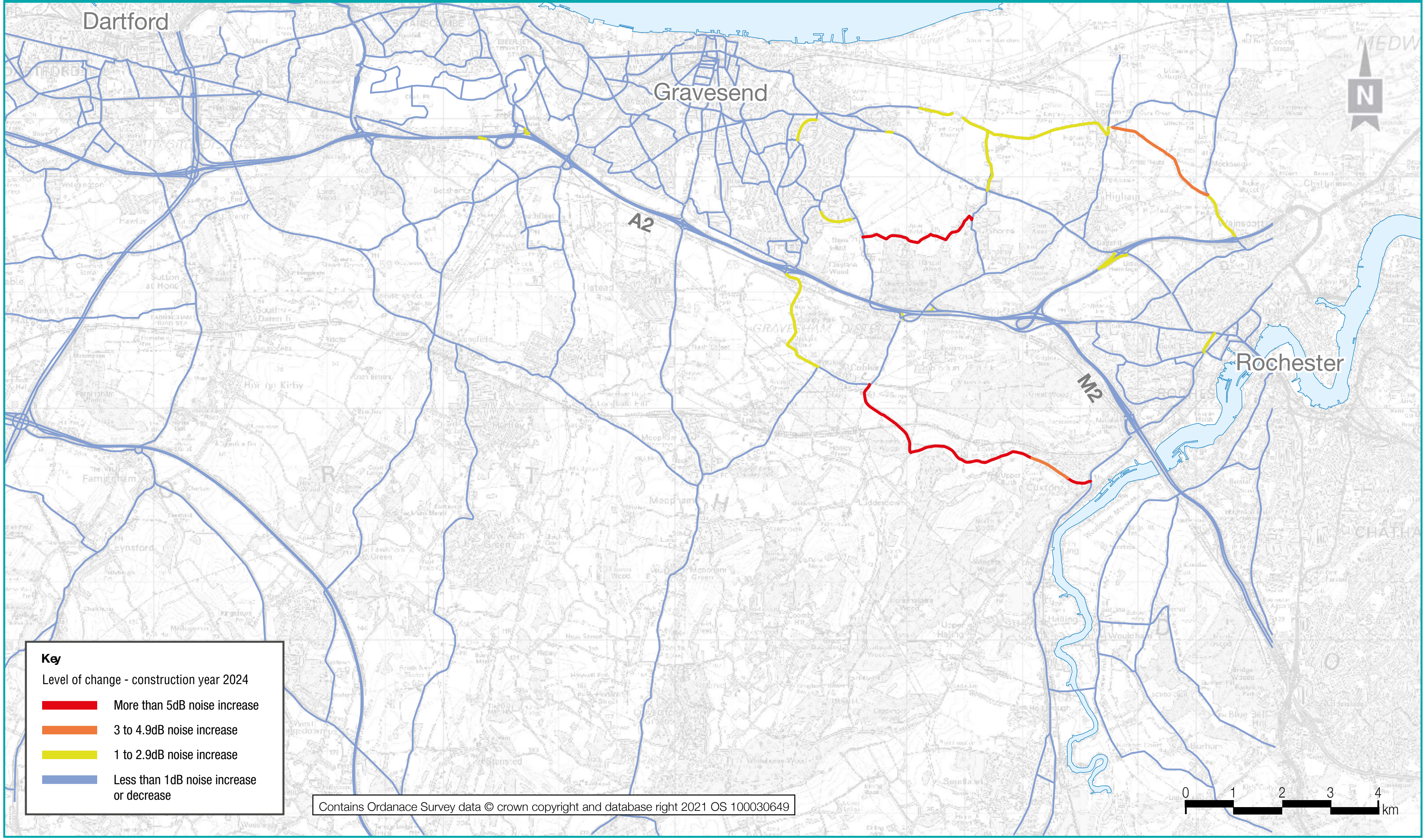
Figure 7-15 Changes in road traffic noise during construction north of the river, 2026



During the construction phase of the project, changes in road traffic noise on the existing road network in 2026 north of the Thames are predicted as follows:

- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Stanford-Le-Hope bypass, Brentwood Road, Ferry Road, Rectory Road, Hornsby Lane, Ingrebourne Road, Stubbers Lane, Woodlands Avenue, Sylvan Avenue, Cooper Shaw Road, New Road and A1089 St Andrews Road

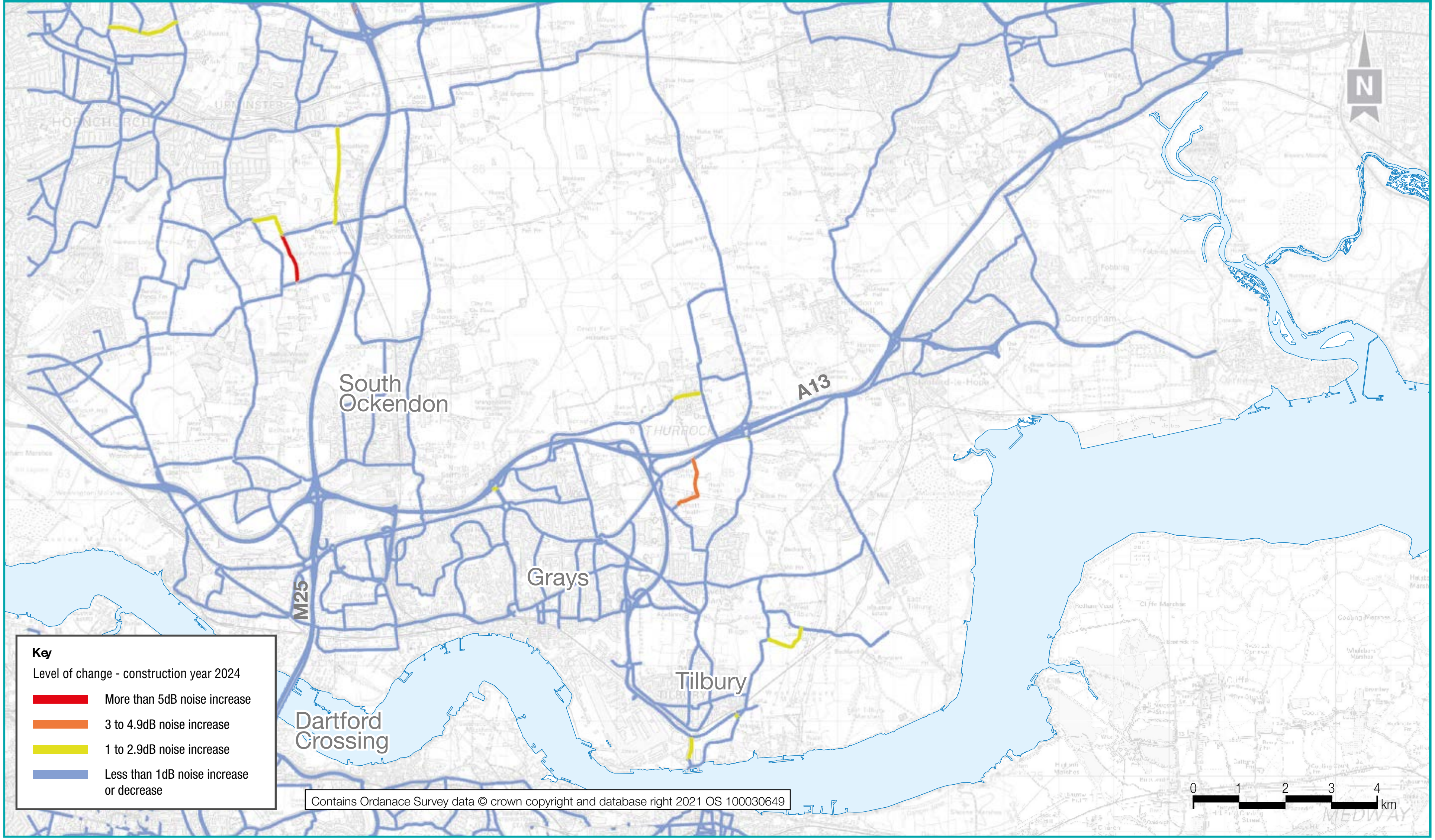
Figure 7-16 Changes in road traffic noise during construction south of the river, 2027



During the construction phase of the project, changes in road traffic noise on the existing road network in 2027 south of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Bush Road, Cobhambury Road, Warren Road, Crown Lane and Shorne Ifield Road
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Northcote Road, Lower Rochester Road, Lower Road, Lower Higham Road, Green Farm Lane, Vigilant Way, Hampton Crescent, Rochester Road, Henhurst Road, Jeskyns Road and Brown Road

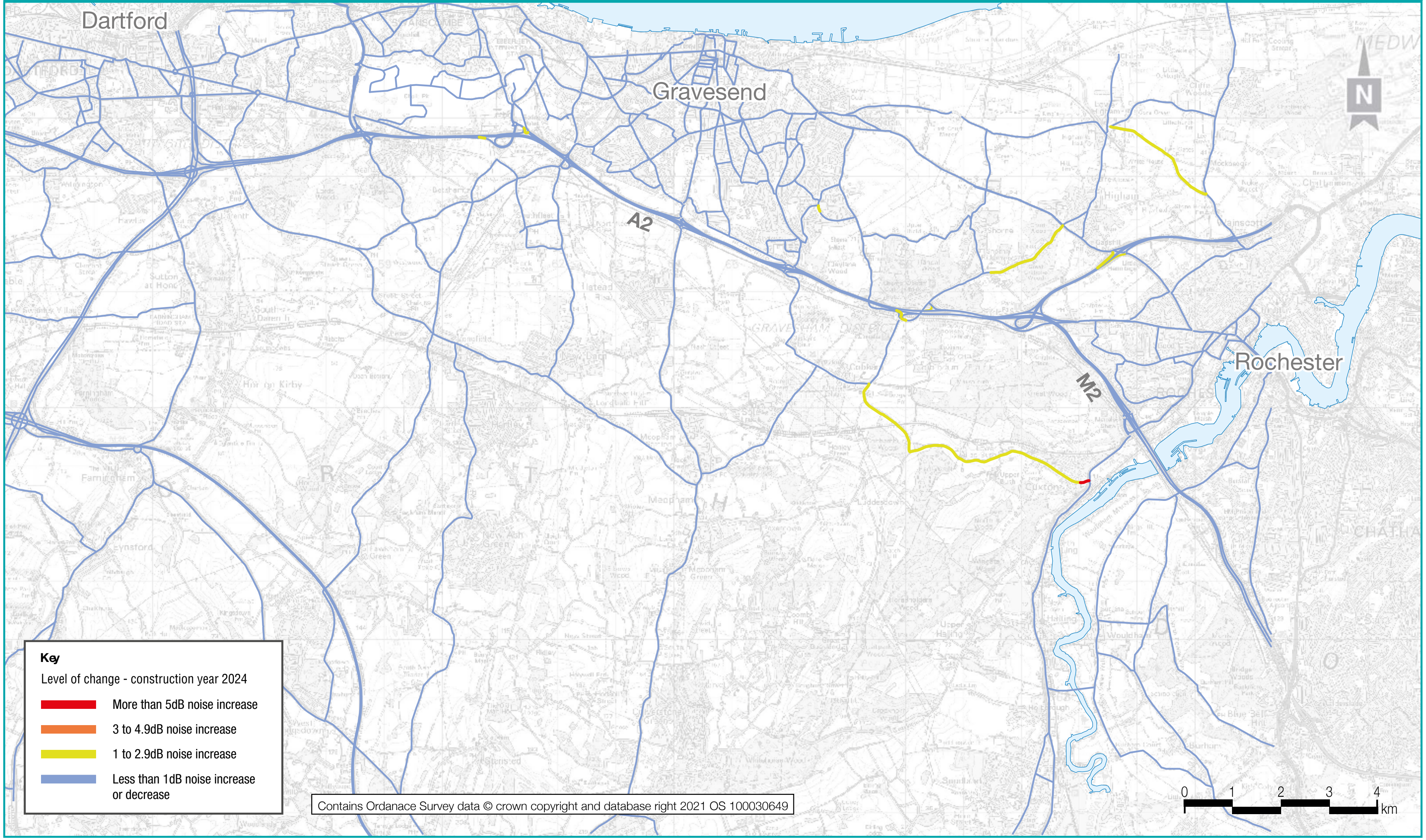
Figure 7-17 Changes in road traffic noise during construction north of the river, 2027



During the construction phase of the project, changes in road traffic noise on the existing road network in 2027 north of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Stubbers Lane
- moderate adverse impact (change of greater than 3dB(A) and less than 5dB(A)) along Hornsby Lane
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Brentwood Road, Ferry Road, High Road, Ockendon Road, Woodlands Avenue, Sylvan Avenue, Pike Lane, Cooper Shaw Road, New Road and Stifford Clays Road

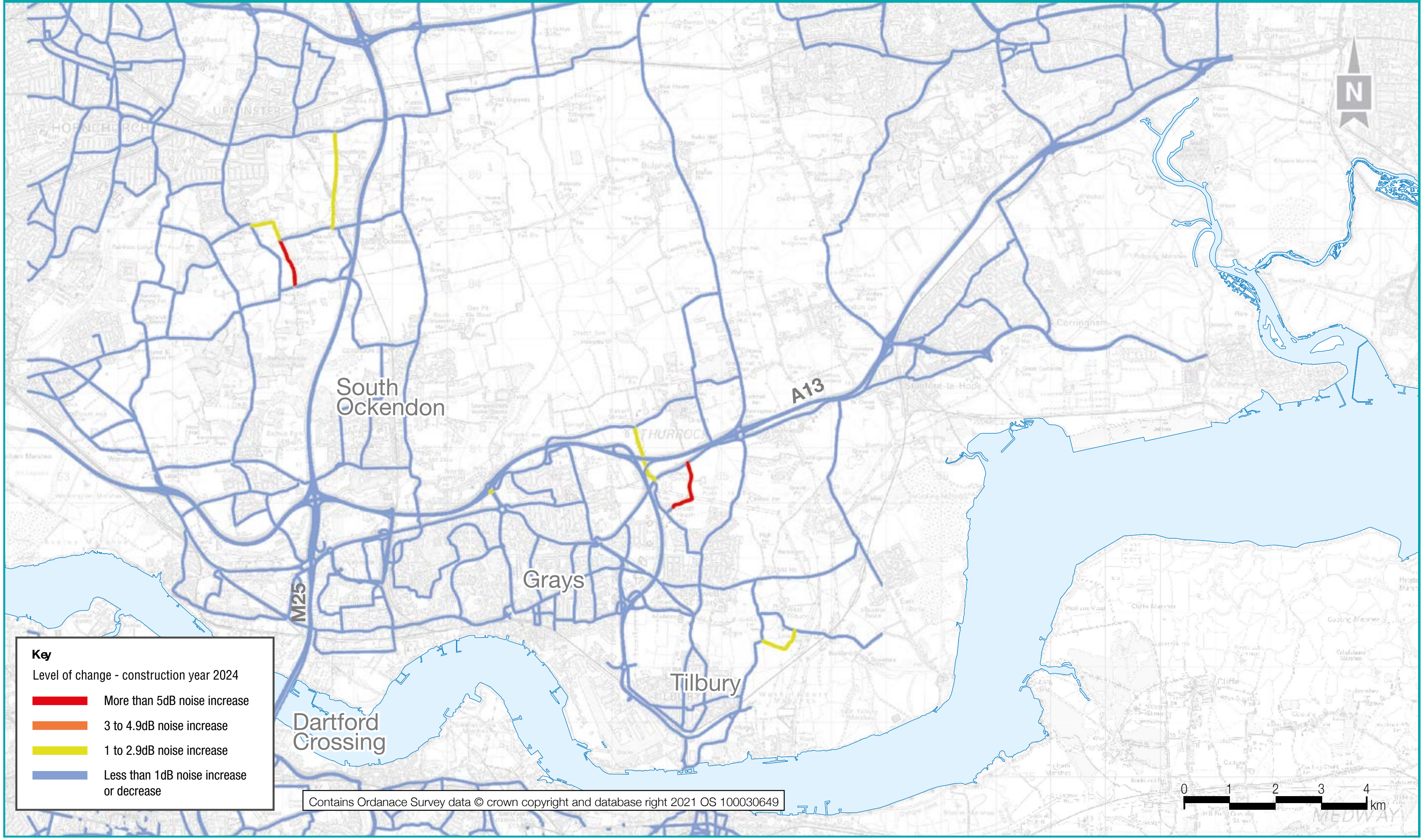
Figure 7-18 Changes in road traffic noise during construction south of the river, 2028



During the construction phase of the project, changes in road traffic noise on the existing road network in 2028 south of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Bush Road
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Brewers Road, Cobhambury Road, Warren Road, Lower Rochester Road, Peartree Lane and Vigilant Way

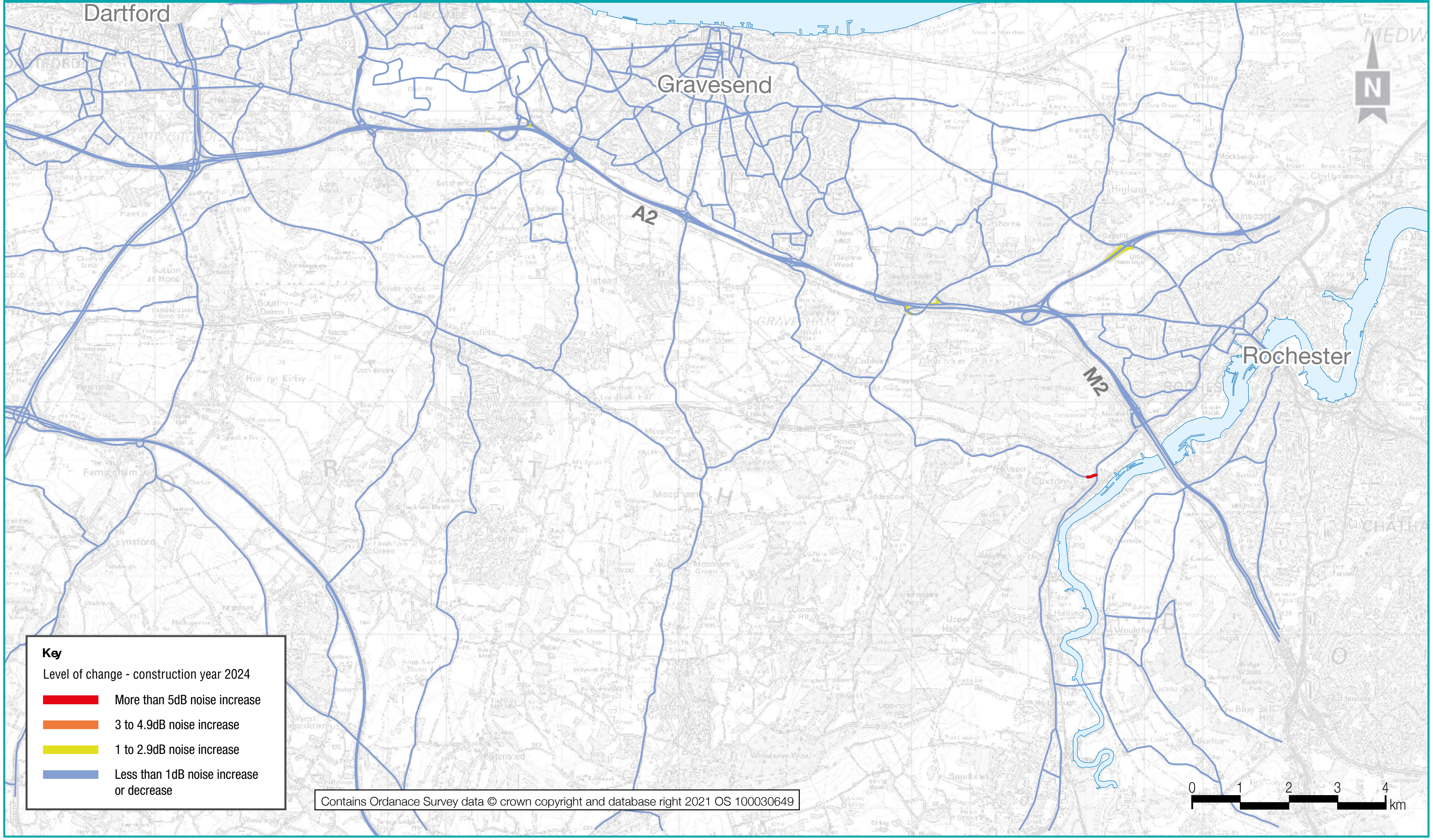
Figure 7-19 Changes in road traffic noise during construction north of the river, 2028



During the construction phase of the project, changes in road traffic noise on the existing road network in 2028 north of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Hornsby Lane and Stubbers Lane
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Baker Street, Ockendon Road, Pike Lane, Cooper Shaw Road and Stifford Clays Road

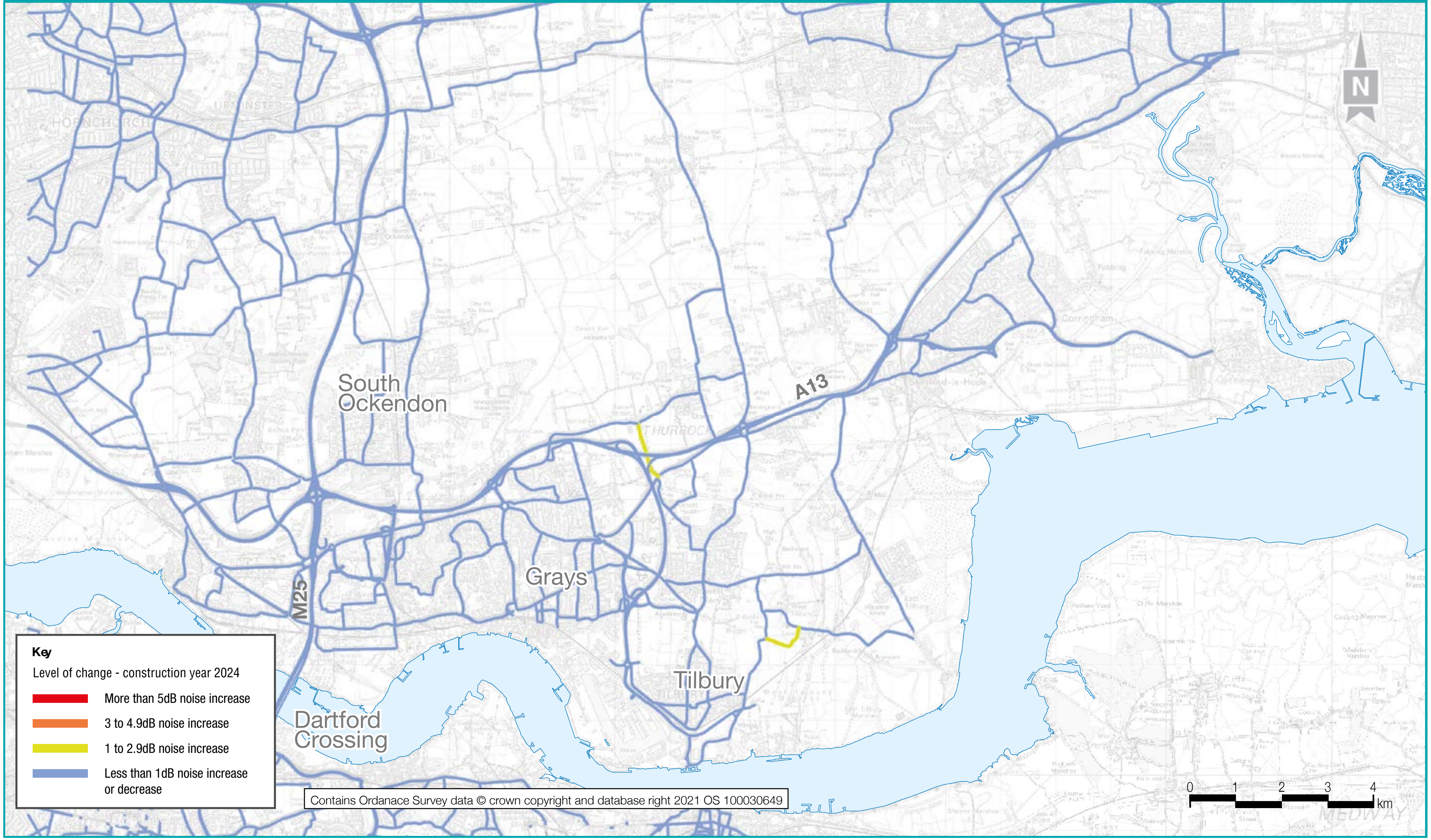
Figure 7-20 Changes in road traffic noise during construction south of the river, 2029



During the construction phase of the project, changes in road traffic noise on the existing road network in 2029 south of the Thames are predicted as follows:

- major adverse impact (change greater than 5dB(A)) along Bush Road
- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along A2260 slips

Figure 7-21 Changes in road traffic noise during construction north of the river, 2029



During the construction phase of the project, changes in road traffic noise on the existing road network in 2029 north of the Thames are predicted as follows:

- minor adverse impact (change of greater than 1dB(A) and less than 3dB(A)) along Baker Street and Cooper Shaw Road

Cultural heritage – archaeology

People have lived in and around the Thames Estuary for many thousands of years, adapting and moving in response to the Ice Ages, the forming of the English Channel and later sea level rise, and changes in the shape and width of the River Thames.

The first people lived here during the Upper Palaeolithic period, between 50,000 and 300,000 years ago. They came and went with the Ice Ages, migrating south to Europe where it was warmer. During the Mesolithic period (around 10,000 years ago) small groups of hunter gatherers made temporary camps in the area. Permanent settlement, and the first signs of agriculture, took shape in the Neolithic period, around 8,000 years ago. This was followed by the Bronze and Iron Ages and the arrival of the Romans, around 2,000 years ago. The power and influence of Rome decreased around 1,600 years ago and the Saxons and Vikings came, first to fight and then to settle. By the time of the Norman Conquest in 1066, the area was settled with the villages and parishes that would be familiar today.

We know about these people because of the physical evidence they left behind known as archaeological finds. These could be individual items, such as pottery fragments or animal bone left over from food preparation, which are very common, or rarer objects such as jewellery or coins. They tell us much about how people used to live, and become really important when they are found with other archaeological remains. Buried in the ground throughout the area is other evidence of these past people; rubbish pits, trackways, traces of hard earth floors and prehistoric huts, the foundations of Roman buildings, ditches that were used to enclose property or to keep animals from straying.

These are all examples of archaeological features. Where groups of archaeological features are found together, they are known as archaeological sites.

Find out more

Further information on built heritage, such as listed buildings and scheduled monuments, can be found in the Ward impact summaries.

Archaeological remains are protected, and they need to be considered before any development can take place. Often this means an archaeological excavation is necessary or sometimes project designs can change slightly to avoid an archaeological site.

To do this, we need to know more about all these buried archaeological remains. We have reviewed aerial photographs and carried out documentary research and geophysical surveys. However, the only way to know if archaeological remains are present, how well they are preserved or how important they are, is to see them.

Archaeologists do this by digging trial trenches. These sample the area of potential development, usually excavating around 4% of the total area. Not everywhere is trial trenched. Sometimes previous activity such as quarrying will have already removed any archaeological remains, or the impact of the development may not affect the buried remains.

Archaeological trial trenches tend to be about two metres wide, the width of a bucket on a mechanical excavator, and between 20 metres and 50 metres long. They are often about a metre deep, but sometimes archaeological remains are closer to the surface and sometimes deeper or thicker.

Did you know?

Nearly 2,750 archaeological trial trenches have been excavated across the project, and there are approximately 1,200 still to dig.

Archaeological trial trenches are first dug by mechanical excavator, the topsoil is carefully separated so they can be filled in the right order. Once the trench is open professional archaeologists will hand excavate archaeological features and collect archaeological finds, everything is described, photographed, and drawn so a full report can be made. The trench is then filled in. The report often available at a local museum or from the local council's archaeological advisers once the development has finished.

So far, our investigations have discovered:

- A Roman settlement is east of Orsett Heath and trial trenching has found several Roman kilns and evidence of animal butchery on an almost industrial scale.
- North of Chadwell St Mary there are Neolithic pits, which tell us this used to be a settlement. Archaeological finds included flint tools, pottery fragments and hazelnut shells (hazelnuts were a very popular delicacy in Roman times).
- North-east of Chadwell St Mary, pottery has been found

from the early middle and late Bronze Age and a series of enclosure ditches represent a small settlement and stock management. A cremation burial provides evidence of rituals and beliefs.

- West of Baker Street, there is more evidence of Romans farming the landscape. In the tidal salt marshes, people gathered salt from early Prehistoric times to the Late Medieval period.
- Off Rochester Road, there are more Iron Age and Bronze Age enclosures and possible burial mounds that have been ploughed flat over time. There is also evidence of Mesolithic occupation around Shorne and to the north of Thong.
- West of Thong Lane, there has been Roman occupation, including buildings and a small cremation cemetery. Evidence was also found of quarrying in the chalk that may also date to the Roman period.

The results of the trial trenching have allowed us to fully consider the impact on buried archaeological remains. To mitigate the impact of building the Lower Thames Crossing on archaeology, a draft Archaeological Mitigation Strategy and Outline Written Scheme of Investigation would be submitted with our DCO application. This would include specifically identified mitigation measures, such as protection or recording of heritage assets. It will continue to be updated with information from our trial trenching and through discussions with heritage stakeholders and the measures presented in this document would be secured through the REAC.

Geology and soils

Construction impacts

The geology underlying much of the Lower Thames Crossing is chalk, with clay in areas of high ground. The area north of the Thames is made ground as it has been subject to urban development and landfilling activity. There are locally important geological sites to the north of the Thames, but none have been identified to the south of the river or in the vicinity of the tunnel.

Soils and the value of agricultural land is influenced by the underlying geology. Agricultural land considered to be of the best quality and value (known as best and most versatile agricultural land) makes up almost 50% of the land needed for the Lower Thames Crossing south of the Thames and approximately 25% of the land needed north of the river.

Did you know?

Made ground is land and soil which has been replaced by man-made or artificial materials.

The construction of the Lower Thames Crossing would result in the permanent loss of agricultural land. We would also need some land temporarily during construction and we would then reinstate this for agricultural use. There would also be temporary and permanent impacts on soils supporting designated and non-designated notable habitats.

Mitigation

We would carry out further ground investigation to gather more information for the detailed design for construction (this stage would begin once our DCO application is submitted). This information would help to inform the specific mitigations required.

Excavated soils during the construction of the new road would be used and stored in the order it comes out of the ground. This would allow our contractor to re-use the soils elsewhere on the project and reinstate land needed on a temporary basis, back to its former condition.

Once mitigation is in place, there would remain a permanent loss of good quality agricultural land as a result of construction.

Did you know?

Ramsar sites are wetlands which are considered to be of international significance. They are designated as protected sites under the Ramsar Convention, a treaty for the conservation and sustainable use of wetlands.

Terrestrial biodiversity

Construction impacts

The Lower Thames Crossing is located in an area with a large number of ecological designated sites which are either within the Order Limits or within an influencing distance. These include European designated sites, including the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site which are located to the south and north of the shorelines of the Thames.

To the south of the Thames, there are six statutory designated sites including the South Thames Estuary and Marshes Site of Special Scientific Interest (SSSI), Shorne and Ashenbank Woods SSSI, Cobham Woods SSSI and Great Crabbles Wood SSSI. To the north of the river, there are eight statutory designated sites including Mucking Flats and Marshes SSSI, Hangman's Wood & Deneholes SSSI and Grays Thurrock Chalk Pit SSSI.

There are many other sites within our study area of importance to biodiversity, including country parks, Ancient Woodlands, ancient semi-natural woodland and Local Wildlife Sites. These sites

Did you know?

Special Protection Areas (SPAs) are strictly protected sites classified in accordance with the European Commission Birds Directive. They are classified for rare and vulnerable birds and for regularly occurring migratory species.

support habitats and species of importance, including ancient woodland, ancient and veteran trees, great crested newts, bats, dormice, barn owls, water voles and badgers.

Construction of the Lower Thames Crossing is expected to result in habitat loss, including habitat within designated sites. It would also result in the loss of Ancient Woodland and disturbance to protected species and wildlife.

There would be permanent habitat loss at Shorne and Ashenbank Woods SSSI, including Ancient Woodland to the south of the Thames, permanent habitat loss both north and south of the river at Claylane Wood Ancient Woodland, Franks Wood Ancient Woodland, and Local Wildlife Sites including Rainbow Shaw, Low Street Pit, Codham Hall Wood and Blackshots Nature Area.

There would also be loss of habitat used by terrestrial invertebrates, and increased mortality of terrestrial invertebrate groups north of the Thames.

There would be permanent habitat loss within Ancient Woodland around the A2/M2 junction 1 to the south of the Thames and west of M25 junction 29, north of the river.

There would be the permanent loss of 10 veteran trees, with five from both south and north of the Thames.

Mitigation

The Lower Thames Crossing would avoid, minimise or offset its impact on terrestrial biodiversity through a number of good practice and essential mitigation measures which are presented in the REAC. Examples include:

- translocation (movement) of protected species away from the construction area to a suitable existing or newly created habitat
- temporary fencing would be installed around important and protected habitats to prevent construction access or accidental damage
- hedgerow habitat would be compensated by creating new hedgerows elsewhere, using species native to the area
- vegetation clearance would be programmed sensitively to avoid bird nesting season (March to August) where possible. Where this is not possible, special care would be taken to avoid harming birds over their nest.

Did you know?

Sites of Special Scientific Interest (SSSI) are important as they support plants and animals that find it difficult to survive elsewhere in the countryside. They represent the country's best wildlife and geological sites.

- invasive species would be identified before construction and removed or treated (as appropriate) to prevent their spread
- all required Protected Species Licences would be in place before any construction started in areas where protected species are present
- a suitably qualified and experienced environmental clerks of works would be employed throughout the construction phase to supervise all of these mitigation measures

Find out more

Further information and other terrestrial biodiversity mitigation measures can be found in the REAC.

Further information on terrestrial biodiversity effects at a local level can be found in the Ward impact summaries.

Offsetting the loss of ancient woodland

As there would be permanent loss of ancient woodland, we would compensate for this through creating new habitat.

This would involve salvaging soils from the Ancient Woodlands and planting new woodland on existing agricultural land with woodland to the south of the Thames and a mix of grassland, scrub/hedgerow and trees to the north of the river.

To compensate for the habitat losses within designated sites and some habitat outside of these sites, we would create an area of mixed habitat to the north of the Thames, adjacent to Coalhouse Fort.

These new areas of habitats have also been designed to improve connectivity between existing habitats.

Highways England has committed to achieving no net loss in biodiversity by the end of 2025 and will work towards net biodiversity gain by 2040 across its estate. Although the construction of the project would have significant adverse effects on statutory designated sites and irreplaceable habitats, such as veteran trees and some sections of Ancient Woodland, our design has tried to provide biodiversity gains wherever possible.

- Enhancements made to non-designated habitats along the Lower Thames Crossing are likely to increase the biodiversity value by at least 15%
- 260ha of new woodland created – a 200% increase
- Over 400ha of arable land converted to semi-natural habitats
- 40 new wildlife ponds – a 40% increase
- 7.3km of new ditches – a 10% increase

Marine biodiversity

Construction impacts

The Lower Thames Crossing would be located within an influencing distance from three European sites of marine biodiversity importance: the Southern North Sea Special Area of Conservation (SAC), Thames Estuary and Marshes Ramsar site and the Thames Estuary and Marshes Special Protection Area (SPA). In addition, there are five nationally designated sites including SSSIs and the Swanscombe Marine Conservation Zone.

The Thames Estuary includes areas of mudflats, sandflats and saltmarsh, which provide key foraging, breeding and nursery habitat for aquatic invertebrates and fish which, in turn, support bird and mammal populations. It is considered an important habitat for a variety of fish species including species of conservation importance such as smelt. Marine mammals are found in the Thames Estuary and include seals, harbour porpoise and bottlenose dolphin.

The construction of the Lower Thames Crossing would require discharges to the Thames Estuary of rainfall collected within construction areas and groundwater collected from the tunnels during construction.

These discharges have the potential to change flows, water quality and sediment deposition.

A temporary pipeline and discharge outfall would be constructed from the Northern Tunnel Entrance Compound connecting to the Thames which would be removed once construction is complete. The pipeline would be one metre in diameter and installed in a two-metre-wide trench. This would result in a temporary, but direct loss of habitats and species where the works would take place.

Other effects on the marine environment include disturbance from construction activities, underwater noise and vibration, and risk of injury to marine mammals from collisions with boats associated with the import and export of material from the Lower Thames Crossing to and from the East Tilbury jetty.

Mitigation

The design of the tunnel and our proposed tunnel construction methods have been developed to avoid the need for works within the Thames, reducing the potential for effects on the marine environment. Water discharged to the river would be appropriately treated before discharge. Construction work like the temporary pipeline would follow methods to reduce effects on the marine environment. For example, planning the works around the tides and timing them to avoid disturbance to over-wintering birds.

With the implementation of proposed mitigation measures, no likely significant effects are predicted on marine biodiversity during construction.

Material assets and waste

Construction impacts

There are a number of waste facilities that would be suitable for offsite disposal or recovery of waste generated during the construction of the project. In 2019, there was over 22.8 million cubic metres of landfill capacity and 48.1 million tonnes annual capacity of waste treatment and recovery in the project study area.

There are minerals and aggregates within the area that are potentially suitable for re-use. Some minerals are safeguarded by local council designations.

Our assessment considers sources of materials including those that can be reused on site, and the use of recycled materials.

Materials needed for the construction of the project would include materials for earthworks such as fill and topsoil, as well as concrete and steel for new structures, and asphalt for road surfacing.

Where possible, materials needed for construction would be sourced and reused on site, including excavated material, concrete from demolition, and vegetation used as mulch and for habitat creation. Batching plants would also be used to minimise construction HGV traffic.

There are existing areas of safeguarded minerals and aggregates in areas of temporary land-take for the Lower Thames Crossing or close to existing roads such as the M25. These areas are designated by the relevant Mineral Planning Authority to make sure developments do not limit or prevent extraction of minerals and aggregates, for example, by building a development on top of them.

The construction of the Lower Thames Crossing is unlikely to limit or prevent the extraction of minerals and aggregates. The materials excavated during construction would be prioritised for re-use on site in concrete and fill during earthworks.

However, not all materials can be re-used on site, and the project has the potential to generate large volumes of waste during construction, which we would need to manage off site. Waste generated during the construction of the project could potentially use up landfill capacity in the area local to the project. However, there is the potential for hazardous wastes to arise from building demolitions and the excavation of historically contaminated land.

Mitigation

We have proposed mitigation measures to avoid or reduce effects on the availability of materials and waste facility capacity. These include:

- standardising design elements
- designing out material use
- reuse and sourcing of materials on site
- applying the waste hierarchy (prevention-reuse-recycle-disposal)

As a result of applying the above steps, around 11.1 million cubic metres of potential waste has been eliminated through our design process since statutory consultation until now. This has been achieved through the development of the design, for example, a reduction in the new road from three lanes to two between the M25 and A13 and moving the south tunnel entrance 350 metres south.

Where materials cannot be re-used on site, we have proposed mitigation measures to make sure that the waste taken off site would not go to landfill, where feasible, as described below.

Our construction contracts would include commitments and targets to reduce the impact, for example, there would be a contract commitment to ensure that 31% of imported aggregate is from recycled or secondary sources. The project would aim to divert a minimum of 70% of its waste from landfill and hopes to divert 90%.

The biggest source of waste from the new road would be excess excavated material. There would be a stringent target of 95% on this waste type to divert it from landfill. A full description of mitigation proposed in relation to the management of material assets and waste is included in the REAC.

Find out more

Further information and other material assets and waste mitigation measures can be found in the REAC.

By implementing the mitigation set out above, no likely significant effects are predicted for material assets during construction. However, likely significant effects are predicted for waste, due to the potential to temporarily use up the landfill capacity in the local area.

Road drainage and water environment

Construction impacts

Within the Order Limits of the Lower Thames Crossing, there is the River Thames, the Thames and Medway Canal, networks of ditches draining the Filborough, Shorne and Tilbury marshes, the Mardyke and its tributaries, the River Ingrebourne, several ponds and an agricultural water supply reservoir.

There are some habitats within the Order Limits, or the vicinity of the project, that are dependent on groundwater. These are called groundwater dependent terrestrial ecosystems and include the ditches and marsh at Goshems Farm Landfill, Low Street Pit Local Wildlife Site, and Jeskyns Community Woodland car park pond.

The River Thames floodplain is prevented from regular flooding by raised defences.

During construction, several temporary watercourse crossings, such as bridges, would be needed to allow the movement of construction equipment and materials as well as for the construction of utility diversions. Tunnelling, cuttings and other road construction activities have the potential to reduce groundwater levels and degrade groundwater quality. Surface water quality could also be affected where watercourses receive construction work site runoff, and there are also risks to surface water from accidental spillages or a pollution incident caused by extreme weather conditions, such as runoff from heavy rain.

Construction activities could increase the risk of river flooding as it would reduce the floodplain storage by constructing hard standing which would change rainfall runoff rates and volumes.

Mitigation

The impacts on the water environment would be mitigated through design measures and through control measures set out in the CoCP. An example of design measures would be the use of retaining walls to limit the amount of groundwater seeping into deep excavations. This reduces the effects on groundwater levels and flows.

The REAC contains good practice measures to manage pollution risk. For example, construction compounds and working areas would have pollution control systems designed in line with good practice guidance (Control of water pollution from construction sites C532 (CIRIA 2001). These systems would be inspected and maintained to make sure they continue to operate as expected. Any wastewater from welfare facilities at the construction compound would be discharged to the sewer with prior agreements with utility providers. There would also be measures to sure water use efficiency and leakage reduction across the construction, whether it be at the construction compounds or use of water to supress dusty construction activities, such as wheel washing construction vehicles.

Tunnel and cutting design and good practice construction techniques would reduce the risk of changes to groundwater quality, levels and flows which could affect groundwater dependent terrestrial ecosystems. Good tunnelling practice such as continuous working and installing tunnel linings immediately after excavation would also reduce risk of vibration impacting the integrity of other infrastructure close to the project. We would not expect construction to have any impact on the River Thames flood defences and would monitor the defences during construction. The deep cuttings required for the project would have retaining walls and seepage controls systems in place to limit the entering of groundwater.

As the project construction would remove some of the floodplain storage, we would provide compensatory flood storage elsewhere to offset this. The size of these have been carefully calculated to ensure there is adequate storage. Compensatory flood storage areas would be located in land adjacent to the Mardyke and the Mardyke West Tributary. Compensatory flood storage will also be provided in the upstream catchment of West Tilbury Main.

Find out more

Further information and other road drainage and water environment mitigation measures can be found in the REAC.

Once our proposed mitigation measures are in place, we do not expect there to be any significant effects on road drainage and the water environment during construction.

Climate

Construction impacts

The traffic on the existing road network in the area around the proposed Lower Thames Crossing (as defined by our transport model) generates greenhouse gas (GHG) emissions. The preliminary assessment estimates GHG emissions on the existing road network in 2016 (which is defined as the base year our transport model), 2029 (opening year) and 2044.

It was estimated that GHG emissions are just under 9 million tonnes of GHG emissions in 2016, and approximately 9 and 10 million tonnes of GHG emissions for the 2029 opening year and 2044 respectively, accounting for increases in traffic and associated congestion without the new road.

Our preliminary climate assessment, using emerging design information, shows that materials used during this phase are the biggest source of construction GHG emissions. Construction activities would also contribute to GHG emissions from fuel consumption by vehicles and machinery. The treatment, disposal and transport of waste material from the new road can also contribute to GHG emissions and would need to be carefully managed to reduce this. Site clearance, such as the removal of vegetation, would result in losses of carbon sinks (the natural environment's ability to absorb greenhouse gas emissions).

Climate observations for our study area show that there has been a gradual increase in air temperatures since 1970, with a decrease in average yearly rainfall. Climate predictions for the future suggest an increase in average summer and winter air temperatures, while rainfall rates are expected to become more seasonal, with more rain (or snow) expected in winter and less in summer.

In addition, the projections for changes to the frequency of severe weather events indicate that there is likely to be an increase in the average annual frequency of heatwaves, prolonged periods with no rainfall and days when precipitation is greater than 25mm per day.

Mitigation

The REAC contains mitigation measures to reduce our GHG emissions during the construction phase. Some examples of these include:

- the re-use of suitable excavated and demolition materials within the design proposals, avoiding the embodied carbon emissions associated with the import of new materials as well as emissions associated with the disposal of wastes
- the use of low carbon materials in the design, such as ground granulated blast furnace slag in concrete
- the use of some hybrid and electric plant and machinery for worksite activities to build the project. The contractor(s) would procure electricity from renewable electricity suppliers to cover consumption from the construction compounds (including the consumption by the tunnel boring machine and concrete batching plant)
- where design specification permits and material import is required, local sources would be used wherever possible to reduce transport emissions. The contractor(s) would also be required to identify, monitor and implement measures to further reduce GHG emissions
- trees, shrubs and hedgerows planted as part of the landscape design would offset some of the GHG emissions

The construction phase has been designed to be fully compliant to the government's worst-case predictions. For example, the drainage systems would be designed to cope with extreme weather events and the inclusion of construction materials to withstand fluctuating temperatures. With the implementation of proposed mitigation measures, no likely significant effects from climate are predicted during construction.

Find out more

Information on how we have calculated the likely greenhouse gas emissions during construction can be found in chapter 1 of this document.

Further information and other climate mitigation measures can be found in the REAC.

Landscape and visual

Construction impacts

While the Lower Thames Crossing is being built, there would be clearly noticeable activities resulting in temporary changes to views (termed 'visual effects') and noise levels, in some places reducing the tranquillity of the landscape. Construction activity would also affect some landscape features, for example, the removal of existing vegetation, to allow construction and temporary changes to characteristics of Orsett Fen and the Kent Downs Area of Outstanding Natural Beauty (AONB).

Find out more

Further information on visual effects at a local level can be found in the Ward impact summaries.

Mitigation

The CoCP and REAC present essential and best practice mitigation measures to reduce construction effects. These include:

- locating construction compounds outside the Kent Downs AONB
- positioning taller construction compound facilities as far away as possible from residential properties
- using temporary earth bunds to screen construction compounds
- re-vegetating stockpiles to soften their appearance
- temporary fencing around sensitive features such as protected habitats, retained woodland and trees
- a qualified and experienced environmental clerks of works would be employed throughout the construction phase to supervise all of the environmental mitigation and protection commitments
- land required on a temporary basis would be reinstated to its former use

There would be significant effects on Kent Downs AONB, and visual effects on users of footpaths and outdoor recreational facilities however, these would be temporary.

Cumulative effects

Cumulative effects are where two or more types of effects combine to cause impacts on the environment. These could be 'intra-project effects' where a receptor or location would experience more than one effect as a result of the new road (such as noise and air quality during construction), or 'inter-project effects' where there would be additional impacts due to other nearby projects which are either in construction or planned.

Intra-project effects

Our intra-project cumulative effects assessment considers locations that could experience more than one effect as a result of the new road.

The assessment would review all predicted effects for the various environmental topics on locations likely to be affected by the project. It is likely that multiple effects would combine throughout the project during its construction and operation phases with significant effects on some receptors. This would vary between geographical areas and all receptors would not experience the same impacts, magnitude or significance of effects.

The Ward impact summaries provide a description of predicted effects by ward, but we have not at this stage included a detailed assessment of the likely intra-project cumulative effects. The inter-project cumulative effects assessment for relevant receptors will be completed and reported within the DCO application.

Inter-project effects

Nearby projects are being identified and considered in our inter-project effects assessment along with the combined effects of the new road and other developments. Each of the projects identified would have a responsibility to include mitigation within their proposals to avoid or reduce adverse effects on the environment and comply with the relevant legislative requirements.

The list of nearby projects continues to be reviewed and updated for the inter-project effects assessment for our DCO submission. Other developments to be considered in the inter-project effects assessment include:

- Thurrock Flexible Generation Plant
- The London Resort
- M25 junction 28 improvement scheme
- various mixed use and residential developments
- various solar parks
- Thames Estuary 2100 long-term strategy for managing tidal flood risk in the Thames Estuary
- the Freeport

8

Visualisations of construction works

We have produced a series of computer generated visualisations of different features of our construction plans for the new road. These are based on the most up-to-date information we have but are subject to change and are intended only to give an impression of what features such as construction compounds would look like against the existing landscape, and to aid understanding of the descriptions provided earlier in this document.

Existing view

Figure 8-1 Existing view of the A2 corridor from east of Brewers Road, looking west

Indicative view during construction

Figure 8-2 Indicative view during construction of the A2 corridor from east of Brewers Road, looking west, showing the Park Pale Lane Utility Logistics Hub and combined utilities and highway construction areas

Existing view

Figure 8-3 Existing view of the A2 corridor from west of Claylane Woods, looking north-east

Indicative view during construction

Figure 8-4 Indicative view during construction of the A2 corridor from west of Claylane Woods, looking north-east, showing the Marling Cross Compound, A2 West Utility Logistics Hub and combined utilities and highway construction areas

Existing view

Figure 8-5 Existing view of Thong Lane from south of HS1, looking north to Thong

Indicative view during construction

Figure 8-6 Indicative view during construction of Thong Lane from south of HS1, looking north to Thong, showing the A2 Compound, A2 East Utility Logistics Hub, and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-7 Existing view of the South Tunnel Entrance Compound site from south of Chalk, looking north

Indicative view during construction

Figure 8-8 Indicative view during construction of the South Tunnel Entrance Compound site from south of Chalk, looking north, showing the South Tunnel Entrance Compound, A226 Gravesend Road compound, Shorne Ifield Road Utility Logistics Hub and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-9 Existing view of Thong Lane between Gravesend east and Thong from the south, looking north-east

Indicative view during construction

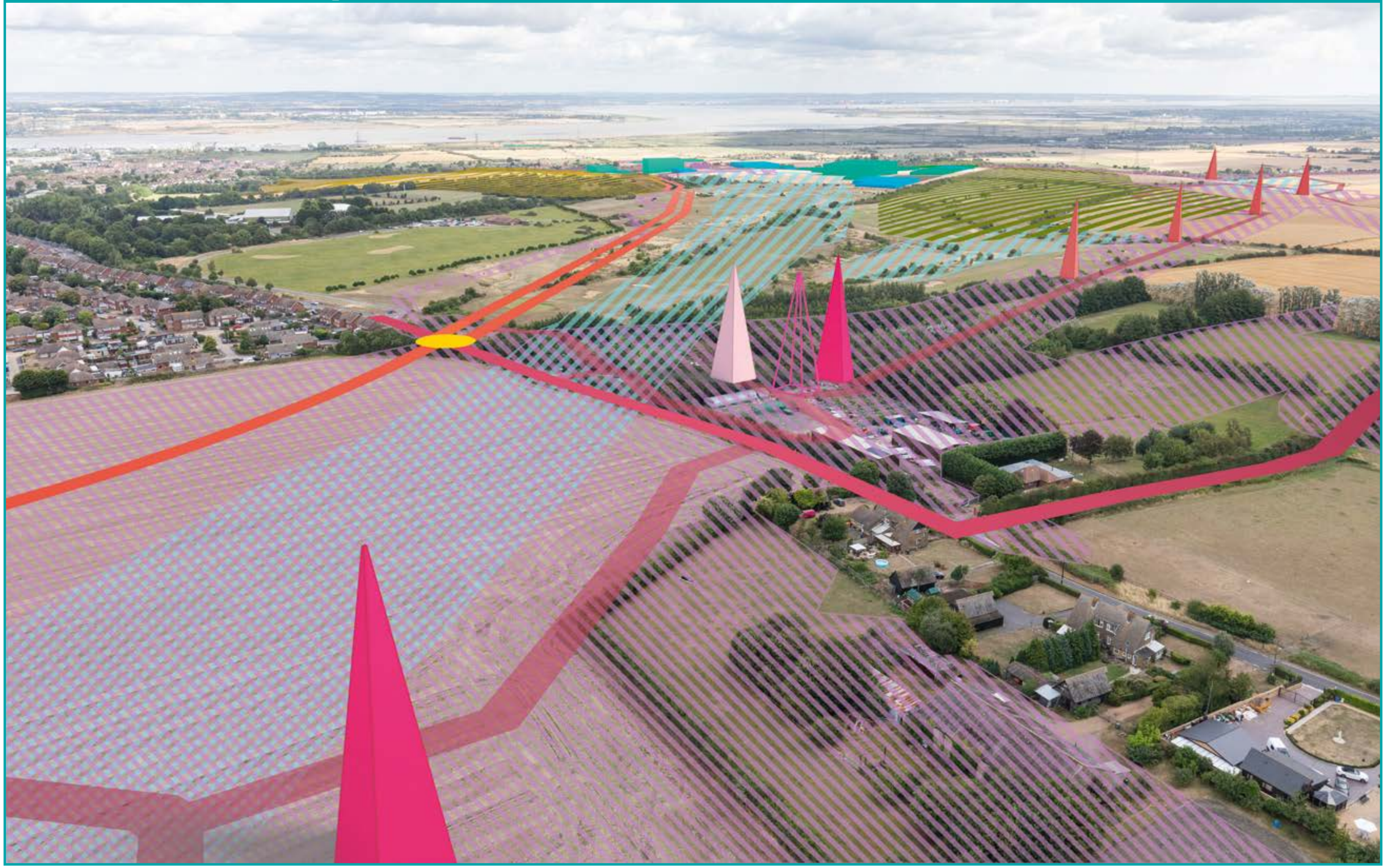


Figure 8-10 Indicative view during construction of Thong Lane between Gravesend east and Thong from the south, looking north-east, showing the South Tunnel Entrance Compound and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-11 Existing view of Shorne Marshes from the River Thames, looking south-west

Indicative view during construction

Figure 8-12 Indicative view during construction of Shorne Marshes from the River Thames, looking south-west, showing the A226 Gravesend Road Compound, Milton Compound and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-13 Existing view of East Tilbury and the Tilbury Loop railway line from Shed Marsh, looking north

Indicative view during construction

Figure 8-14 Indicative view during construction of East Tilbury and the Tilbury Loop railway line from Shed Marsh, looking north, showing Station Road Compound, Low Street Lane Utility Logistics Hub, Muckingford Road Utility Logistics Hub and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-15 Existing view of the Northern Tunnel Entrance Compound site from Goshems Farm, looking north-east

Indicative view during construction

Figure 8-16 Indicative view during construction of the Northern Tunnel Entrance Compound site from Goshems Farm, looking north-east, showing the Northern Tunnel Entrance Compound, Station Road Compound and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-17 Existing view of the Northern Tunnel Entrance Compound site from over Coalhouse Fort, looking west along the River Thames

Indicative view during construction

Figure 8-18 Indicative view during construction of the Northern Tunnel Entrance Compound site from over Coalhouse Fort, looking west along the River Thames, showing the Northern Tunnel Entrance Compound, Station Road Compound and combined utilities and highway/tunnel construction areas

Existing view

Figure 8-19 Existing view of Southfields and the A13 corridor from east of the Orsett Cock roundabout, looking south-west towards Chadwell St Mary and Orsett

Indicative view during construction

Figure 8-20 Indicative view during construction of Southfields and the A13 corridor from east of the Orsett Cock roundabout, looking south-west towards Chadwell St Mary and Orsett, showing Brentwood Road Compound, Brentwood Road Utility Logistics Hub, Hornsby Lane Utility Logistics Hub, Stanford Road Utility Logistics Hub and combined utilities and highway construction areas

Existing view

Figure 8-21 Existing view of the A13 junction and A1013 from the south-east, looking north-west towards Baker Street and Blackshots Nature Reserve

Indicative view during construction

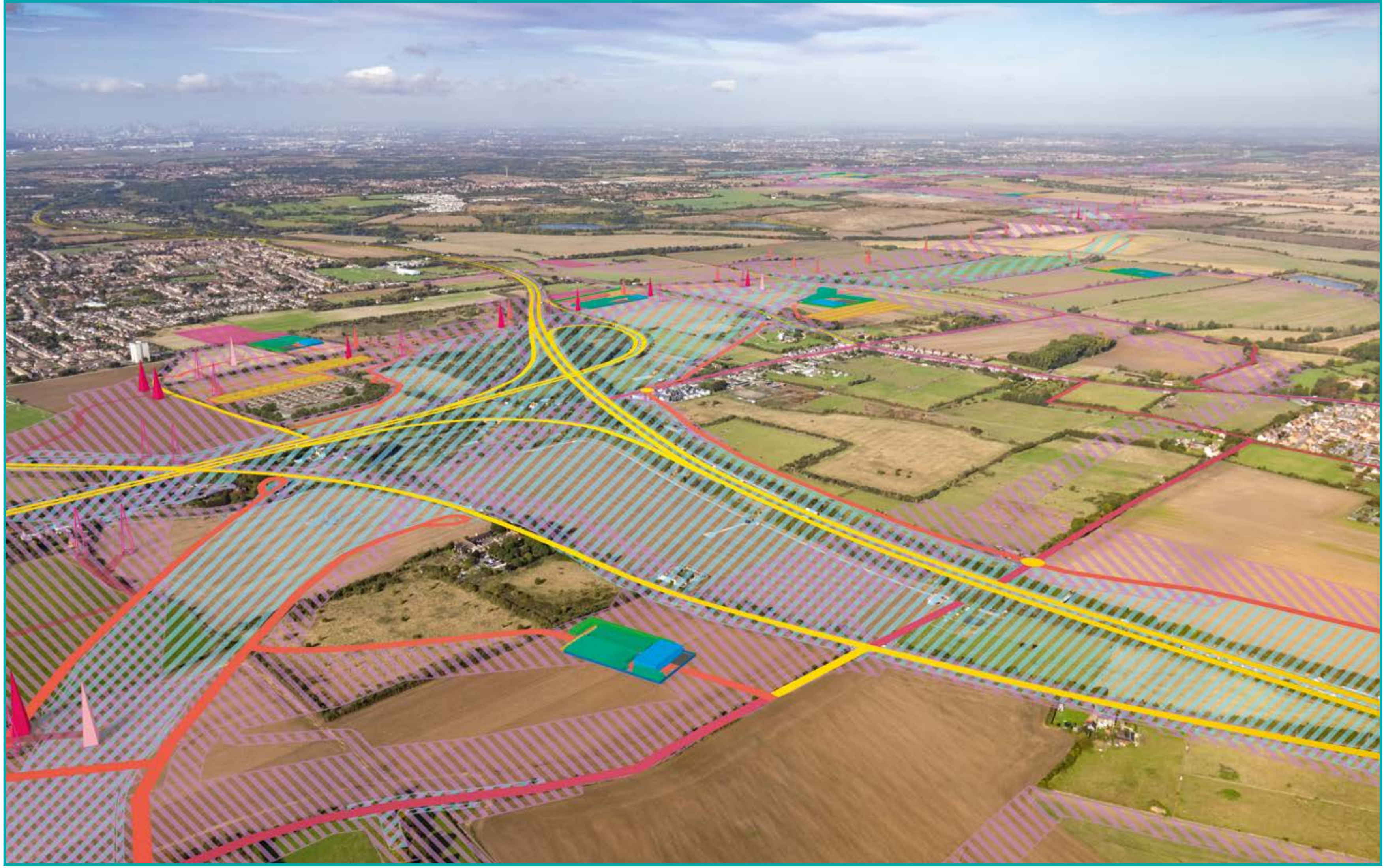


Figure 8-22 Indicative view during construction of the A13 junction and A1013 from the south-east, looking north-west towards Baker Street and Blackshots Nature Reserve, showing Stanford Road Compound and combined utilities and highway construction areas

Existing view

Figure 8-23 Existing view of the A13 junction and Blackshots Nature Reserve from the south-west, looking north towards Baker Street and Orsett

Indicative view during construction

Figure 8-24 Indicative view during construction of the A13 junction and Blackshots Nature Reserve from the south-west, looking north towards Baker Street and Orsett, showing Long Lane Compound A, Long Lane Compound B, Stifford Clays Road Compound West, Mardyke Compound, Long Lane Utility Logistics Hub, Stifford Clays Road Utility Logistics Hub, Green Lane Utility Logistics Hub and combined utilities and highway construction areas

Existing view

Figure 8-25 Existing view of the A13 Junction and Baker Street from the north, looking south-west towards Little Thurrock

Indicative view during construction

Figure 8-26 Indicative view during construction of the A13 Junction and Baker Street from the north, looking south-west towards Little Thurrock, showing Stifford Clays Compound East and combined utilities and highway construction areas

Existing view

Figure 8-27 Existing view of the Mardyke Valley and Veolia landfill site from the south-east, looking north-west towards the M25 and Fen Lane

Indicative view during construction

Figure 8-28 Indicative view during construction of the Mardyke Valley and Veolia landfill site from the south-east, looking north-west towards the M25 and Fen Lane, showing Medebridge Compound, Medebridge Utility Logistics Hub and combined utilities and highway construction areas

Existing view

Figure 8-29 Existing view of the M25 and The London Tilbury and Southend Railway from the south, looking north to North Ockendon

Indicative view during construction

Figure 8-30 Indicative view during construction of the M25 and The London Tilbury and Southend Railway from the south, looking north to North Ockendon, showing the M25 Compound and combined utilities and highway construction areas

Existing view

Figure 8-31 Existing view of the M25 corridor and Ockendon Road from the south, looking north towards Thames Chase Community Forest

Indicative view during construction

Figure 8-32 Indicative view during construction of the M25 corridor and Ockendon Road from the south, looking north towards Thames Chase Community Forest, showing the Ockendon Road Compound and combined utilities and highway construction areas

Existing view

Figure 8-33 Existing view of the M25 corridor and Saint Mary's Lane from the south, looking north-east towards Wyngray Farm and M25 junction 29

Indicative view during construction

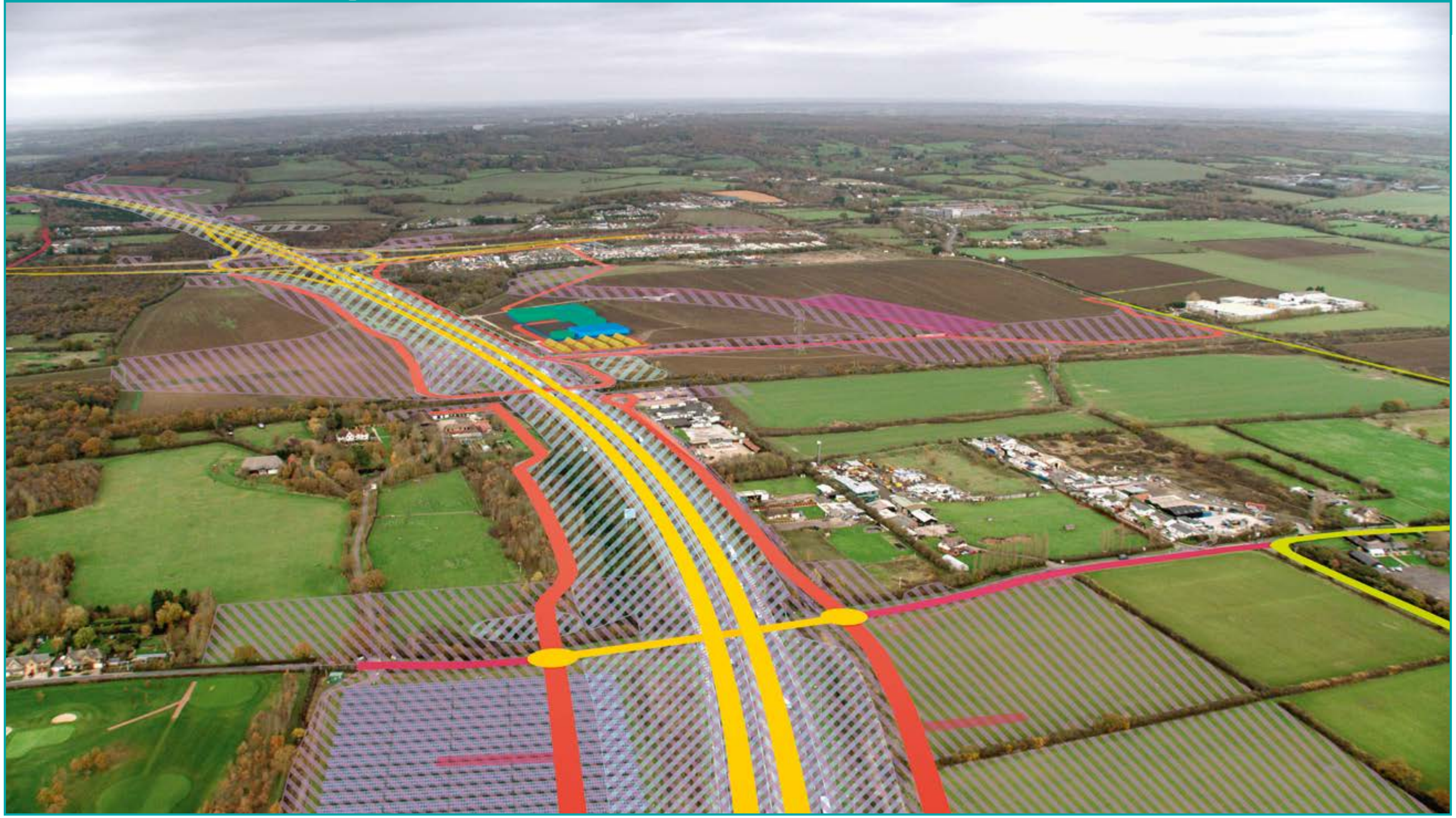


Figure 8-34 Indicative view during construction of the M25 corridor and Saint Mary's Lane from the south, looking north-east towards Wyngray Farm and M25 junction 29, showing the Warley Street Compound, Warley Street Utility Logistics Hub and combined utilities and highway construction areas

Existing view

Figure 8-35 Existing view of the M25 corridor and Folkes Lane Bridge from the south, looking north

Indicative view during construction

Figure 8-36 Indicative view during construction of the M25 corridor and Folkes Lane Bridge from the south, looking north, showing the Folkes Lane Utility Logistics Hub, Beredens Lane Utility Logistics Hub and combined utilities and highway construction areas

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9. How to have your say

Please let us know your views on our community impacts consultation. All the information, including the response form, is available at www.highwaysengland.co.uk/ltcconsultation

The easiest way to comment is by filling out our online consultation response form, but you can submit a response by using any of the methods listed below. Please note, we cannot guarantee that responses sent to any other address will be considered. Responses will be accepted until 23.59 on 8 September 2021.

If you would like to comment on aspects of our proposals from earlier consultations, please use the 'Other comments' section on the response form.

Online

Fill in the survey at www.highwaysengland.co.uk/ltcconsultation

Post

Send your response form, or comments, to
FREEPOST LTC CONSULTATION

The Freepost address is the only text needed on the envelope, and you don't need a stamp.

Email

Send your comments to
LTC.CONSULTATION@TRAVERSE.LTD

Telephone surgery

You can book a call back from a member of the project team to discuss any questions or provide comments on the proposal. From 14 July 2021, call us on **0300 123 5000** (weekdays between 9am and 5pm) to book an appointment.

Home delivery

If you do not have access to the internet, from 14 July 2021 you can order printed copies of this guide to consultation, a feedback form and Freepost return envelope, maps and other documents. Please call us on **0300 123 5000** to request a consultation pack. These will be delivered free of charge – there is a limit of one pack per household.

Data privacy notice

We are committed to protecting your personal information. Whenever you provide this information, we are legally obliged to use it in line with all applicable laws concerning the protection of personal data, including the General Data Protection Regulation (GDPR).

How will Highways England use the information we collect about you?

We will use your personal data collected via this consultation to:

- analyse your feedback to the consultation
- produce a summary report, based on our analysis of responses (individuals will not be identified in our Consultation Report)
- write to you with updates about the results of the consultation and other developments
- keep up-to-date records of our communications with individuals and organisations

Any personal information you include in this form will be available to, or used by:

- Highways England
- Traverse (an independent company we are using to analyse feedback to the consultation)
- the Planning Inspectorate (the Government agency that will consider our application for permission to build the Lower Thames Crossing)
- the Secretary of State for Transport (who will decide on our application)
- our legal advisers
- consultants working on the Lower Thames Crossing project

It is also possible that trusted third-party providers, for example construction companies, may later use your contact details to communicate with you about this project.

Under the terms of the GDPR, you have certain rights over how your personal data is retained and used by Highways England. For more information, see our full data privacy statement at www.highwaysengland.co.uk/our-work/lower-thames-crossing/privacy-notice/

Glossary

Term	Explanation
2029 Opening year	A modelled year in the LTC traffic model in which flows are estimated for each option
2044 Design year	A modelled year in the LTC traffic model. The design year is typically 15 years after opening - for LTC the design year is 2044.
AADT	Average Annual Daily Traffic
Affected Road Network	This comprises the area within which roads could be considered within the air quality model (selection of the roads within the model depends upon a number of criteria such as changes in Heavy Duty Vehicle flows).
Alignment	The alignment is the horizontal and vertical route of a road, defined as a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
AM	07:00 to 10:00
AOD	Above ordnance datum, vertical datum used by an ordnance survey as the basis for delivering altitudes on maps.
AONB	Area of Outstanding Natural Beauty: Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
APTR	All-purpose trunk road
AQMA	Air Quality Management Area: an area, declared by a local authority, where air quality monitoring does not meet Defra's national air quality objectives.
AQSO	Air Quality Strategy Objective: Objective set by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland to improve air quality in the UK in the medium term. Objectives are focused on the main air pollutants to protect health.
BAT	Best Available Techniques used for controlling construction noise levels
Best Practicable Means	Practicable relates to local conditions, circumstances, the current knowledge and understanding of technical aspects with consideration to financial implications. The means to be employed ("Means") include the design, installation, maintenance, and manner and periods of operation of plant and machinery.
Bluewater	Bluewater Shopping Centre, an out of town shopping centre in Stone, Kent
Chart Datum	The level of water from which charted depths displayed on a nautical chart are measured.

Term	Explanation
CoCP	Code of Construction Practice - provides a framework to manage construction and operational activities so that environmental mitigation commitments are met.
Dart Charge	The Dartford Crossing free-flow electronic number plate recognition charging system (operates between 0600 and 2200).
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs: the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland.
Design principles	Guidance that underpins the design measures that integrate the new road into the local landscape and establishes parameters that must be met in the final design of the road.
DfT	Department for Transport: the government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved.
Disbenefit	A disadvantage or loss resulting from something.
DMRB	Design Manual for Roads and Bridges: A comprehensive manual (comprising 15 volumes) which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (Highways England, Transport Scotland, The Welsh Government or the Department for Regional Development (Northern Ireland)) is highway authority. The DMRB has been developed as a series of documents published by the Overseeing Organisations of England, Scotland, Wales and Northern Ireland. For the Lower Thames Crossing the Overseeing Organisation is Highways England.
EA	Environment Agency: The Environment Agency was established under the Environment Act 1995, and is a Non-Departmental Public Body of Defra. The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. The organisation is responsible for wide-ranging matters, including the management of all forms of flood risk, water resources, water quality, waste regulation, pollution control, inland fisheries, recreation, conservation and navigation of inland waterways.

Term	Explanation
Ecological Clerk of Works	This person(s) would provide advice about ecological and environmental issues during the construction period, monitor the work to ensure site-based construction activities are delivered in accordance with wildlife law and ensure that any necessary permits or licensing is acquired.
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESL – Eastern Southern Link	The Eastern Southern Link (ESL) is an alternative for shortlist Routes 2, 3 and 4 to the south of the River Thames. The route would connect into Junction 1 of the M2 and would pass to the east of Shorne and then northwest towards Church Lane and Lower Higham Road. This route could connect into any of the Routes 2, 3 and 4 north of the river utilising all of the crossing options for these route options.
Fastrack	A bus rapid transit scheme operating in the Thames Gateway area of Kent, operated by Arriva Southern Counties.
FCTP	Framework Construction Travel Plan - sets out a framework to reduce the impact of the project's construction workforce on the road network as a result of travel to and from construction areas and compounds.
GHG	Greenhouse gas emissions are emissions of greenhouse gases that cause climate change by creating a greenhouse effect in the earth's atmosphere.
GIS	Geographic information system: an integrated collection of computer software and data used to view and manage information about geographic places, analyse spatial relationships, and model spatial processes.
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment: A tool developed by the European Commission to help competent authorities (as defined in the Habitats Regulations) to carry out assessment to ensure that a project, plan or policy will not have an adverse effect on the integrity of any Natura 2000 or European sites (Special Areas of Conservation, Special Protection Areas and Ramsar sites), (either in isolation or in combination with other plans and projects), and to begin to identify appropriate mitigation strategies where such effects were identified.
HS1	High Speed 1 rail line (formerly Channel Tunnel Rail Link (CTRL))
Inter-peak	10:00 to 16:00

Term	Explanation
Jacked box tunnelling	Jacked box tunnelling is a method of construction that enables engineers to create underground space at shallow depth in a manner that avoids disruption of valuable infrastructure and reduces impact on the human environment.
Lakeside	Lakeside Shopping Centre, branded as Intu Lakeside, is a large out-of-town shopping centre located in West Thurrock, in the borough of Thurrock, Essex just beyond the eastern boundary of Greater London.
Location A	The location for LTC route options close to the existing Dartford crossing.
Location C	The location for LTC route options connecting the A2/ M2 east of Gravesend with the A13 and M25 (between Junctions 29 and 30) north of the River Thames.
London Gateway	A new deep-water port, able to handle the biggest container ships in the world, and part the London Gateway development on the north bank of the River Thames in Thurrock, Essex, 20 miles (32 km) east of central London.
London Resort	A proposed theme park and entertainment precinct on the Swanscombe peninsula, Kent, being developed by London Resort Company Holdings. Construction could begin in 2022 with the opening estimated for 2024.
LTC	Lower Thames Crossing: a proposed new crossing of the Thames estuary linking the county of Kent with the county of Essex, at or east of the existing Dartford Crossing.
LWS	Local wildlife site
Mainline	The through carriageway of a road as opposed to a slip road or a link road at a junction Mardyke A small river, mainly in Thurrock, that flows into the River Thames at Purfleet, close to the QEII Bridge.
NCR	National Cycle Route: a cycle route part of the National Cycle Network created by Sustrans to encourage cycling throughout Britain.
NMU	Non-motorised user, e.g. pedestrians, cyclists, equestrians.
NO_2	Nitrogen dioxide.
NPSNN	National Policy Statement for National Networks: The NPSNN sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.

Term	Explanation
NSIP	Nationally significant infrastructure project: major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, major road projects etc.
OLEMP	Outline Landscape and Ecology Management Plan - sets out the management regimes, management expectations and monitoring requirements for parcels of land that perform specific landscape and ecological mitigation functions for the project, such as habitat creation or visual screening.
oMHP	Outline Materials Handling Plan - sets out the approach and high-level principles for handling construction materials and waste.
ONS	Office for National Statistics: the executive office of the UK Statistics Authority, a non-ministerial department which reports directly to the UK Parliament.
OSWMP	Outline Site Waste Management Plan - sets out the overarching principles and procedures that would be applied for the management of waste during the construction of the project.
OTMPfC	Outline Traffic Management Plan for construction - outlines the approach to carrying out temporary traffic management for the safe construction of the project and the management measures to reduce the impact on local communities.
pcu	passenger car units. This is a metric to allow different vehicle types within traffic flows in a traffic model to be assessed in a consistent manner. Typical pcu factors are: 1 for a car or light goods vehicle; 2 for a bus of heavy goods vehicle; 0.4 for a motorcycle; and 0.2 for a pedal cycle.
PEIR	Preliminary Environmental Information Report
PLA	Port of London Authority: a self-funding public trust established by The Port of London Act 1908 to govern the Port of London. Its responsibility extends over the Tideway of the River Thames and its continuation (the Kent/ Essex strait). It maintains and supervises navigation and protects the river's environment.
PM	16:00 to 19:00
PM_{10}	Particulate matter (in this example, particulates smaller than 10μm that can cause health problems).
PoTLL	Port of Tilbury London Limited, operator of the Port of Tilbury

Term	Explanation
PRoW	Public Right of Way: A right possessed by the public, to pass along routes over land at all times. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. The mode of transport allowed differs according to the type of public right of way which consist of footpaths, bridleways and open and restricted byways.
Ramsar	A wetland of international importance, designated under the Ramsar convention.
REAC	Register of Environmental Actions and Commitments - identifies good practice and essential mitigation that will be adopted during the construction and operation of the project.
RSPB	Royal Society for the Protection of Birds: A charitable organisation that works to promote conservation and protection of birds and the wider environment through public awareness campaigns, petitions and through the operation of nature reserves throughout the United Kingdom.
SAC	Special Area of Conservation: defined in the European Union's Habitats Directive (92/43/EEC), also known as the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora. SACs are to protect the 220 habitats and approximately 1000 species listed in annex I and II of the directive which are considered to be of European interest following criteria given in the directive.
Setting	This is defined in the National Planning Policy Framework as 'The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of the asset, may affect the ability to appreciate that significance or may be neutral.'
SPA	Special Protection Area: A designation under the European Union Directive on the Conservation of Wild Birds.
SPZ	Source protection zone: EA-defined groundwater sources (2000) such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.
SRN	Strategic Road Network, the core road network, managed in England by Highways England.
SSSI	Site of Special Scientific Interest: A conservation designation denoting an area of particular ecological or geological importance.
SuDS	A sustainable drainage system designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges.

Term	Explanation
TAG	Transport Analysis Guidance: national guidance document produced by the Department for Transport.
TBM	Tunnel boring machine, machine used to excavate tunnels with a circular cross section.
tCO2e	Tonnes of carbon dioxide equivalent; a standard unit for measuring carbon footprints. The idea is to express the impact of each different greenhouse gas in terms of the amount of CO2 that would create the same amount of warming.
TfL	Transport for London: created in 2000, the integrated body responsible for London's transport system.
ULH	Utilities Logistics Hubs
V/C	Volume over Capacity (volume/capacity)
VMS	Variable Message Sign, typically mounted on a portal gantry.
WNIMMP	Wider Network Impacts Management and Monitoring Plan - summarises the work undertaken to date to identify and assess areas of the road network where monitoring and potential interventions may be necessary to better manage additional traffic as a result of the project.
WSL - Western Southern Link	The Western Southern Link (WSL) is an alternative for shortlist Routes 2, 3 and 4 to the south of the River Thames. The route would connect into the A2 to the east of Gravesend and would go to the west of Thong and Shorne and east of Chalk towards Church Lane and Lower Higham Road. This route could connect into any of the Routes 2, 3 and 4 north of the river utilising all of the crossing options for these route options.

Construction visualisation key

Symbol	Feature
	Utilities
	**Utilities working area** Area where works to divert utilities are required.
	**Utility Logistics Hub (ULH)** Area to support specific utility works. Used mainly for large materials lay-down and storage.
	**New pylon** Construction activity associated with constructing a new overhead line pylon.
	**Pylon to be restrung** Construction activity associated with restringing an existing overhead line pylon.
	**Temporary pylon** Construction and demolition activity to facilitate process of relocating overhead power lines.
	**Pylon to be removed** Construction and demolition activity associated with an existing overhead line pylon to be permanently removed.
	**Construction activity associated with existing overhead power lines to be removed** Usually found in places where existing overhead lines are to be buried.

Symbol	Feature
	**Substation** New temporary or permanent substation required to power the construction and/or permanent works.
	Main Works
	**Highway/tunnel construction working area** Shows the outline of the permanent civil engineering works for the highway/ tunnel and associated structural earthworks.
	Compounds
	**Welfare** Area containing welfare facilities for personnel (for example offices, canteens, washrooms).
	**Plant and materials** Area for construction machinery and construction materials.
	Access
	**Road used for construction traffic – long term** Existing road to be used for construction traffic throughout the construction period.
	**Road used for construction traffic – short term** Existing road to be used for construction traffic only until haul routes are established (up to 2 years).

Symbol	Feature
	**Road used for the utility works** Existing road to be used for utilities traffic.
	**Utility works access route** Temporary access route constructed to attend specific utility works areas.
	**Haul routes, compound access routes** Temporary private access tracks required to access and build the highway works.
	**Light vehicle access road** Temporary private access track required for environmental mitigation works.
	**Secondary access** Alternative access route to a works area or compound for use in case of emergency.
	**Construction vehicle crossing point** Place where construction traffic crosses or joins the local road network.
	**Compound parking** Parking areas for construction vehicles and workers' and visitors' cars. Can also include haul routes and utility works access routes.

Symbol	Feature
	Earthworks
	**Soil storage** Area to temporarily store and manage earthworks.
	**Permanent earthwork** Beneficial re-use of excavated material to create recreational areas around the north tunnel entrance (Tilbury Fields) and south tunnel entrance (Chalk Park).
	**Temporary earthwork** Temporary stockpile of excavated material to be removed from site or relocated elsewhere in the area.
	**Temporary/lagoon with perimeter access road** A lagoon for the temporary storage of water prior to discharge into the existing ditch network.
	Boundaries
	**Compound hoarding** General hoarding required to control access and security. Shown at 2.4m high.
	**Environmental fencing or bunding** Environmental barrier or bund required to mitigate noise and/or visual impact. Shown at 3m height.

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