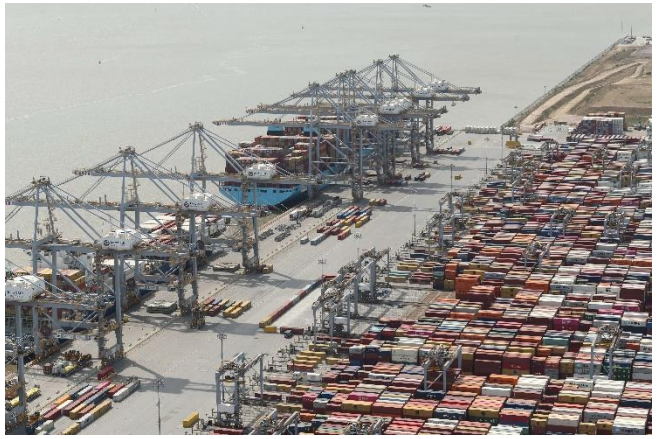
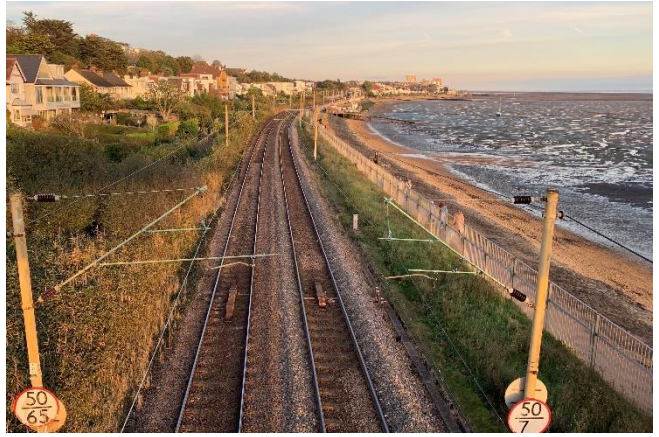
c2c

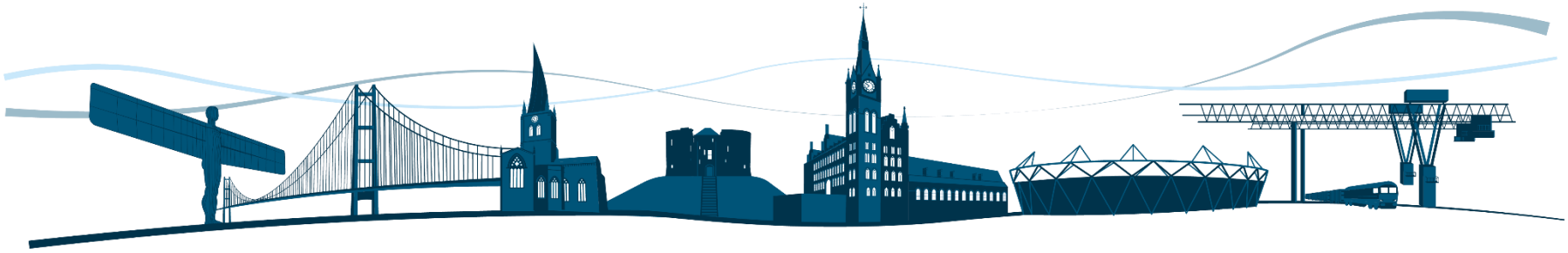
NetworkRail

Essex Thameside Strategic Advice

October 2025







Contents

1. Executive summary

Overview

The Essex Thameside corridor is a major rail route into London on the north Thames estuary serving Southend-on-Sea, Basildon, Grays and Tilbury as well as areas of East London such as Barking and Dagenham. The corridor is a nationally important freight route vital to the UK economy, connecting multiple terminals, including the major ports of Tilbury and London Gateway, to inland destinations nationwide.

This study builds upon and updates the findings of the 2020 Essex Thameside Study published on the eve of the Covid-19 pandemic. The 2020 study forecasted high passenger growth, necessitating short-term increases in capacity to meet rapidly rising demand, which was leading to high levels of crowding on trains. At that time, passenger crowding was becoming severe, with standing passengers on almost all trains in the three hour morning peak.

The timing of the previous study's recommendations are now out of date in light of reduced peak hours demand versus 2019 levels, along with growth in freight traffic, principally driven by the rapid development of London Gateway and the establishment of a long-term Freight Growth Target. These factors resulted in updated strategic advice for this line of route being considered a high priority for 2025.

This study therefore provides new estimates of how both passenger and freight demand is expected to change over the next 25 years. The study outlines what timetable, rolling stock, station and infrastructure improvements will be required to accommodate demand and facilitate growth, and when they will likely be required.

Developed in collaboration with partners including train operator, c2c, the Department for Transport, Transport for London, Transport East, Essex County Council and freight operators, this study is intended to provide partners with information to make the case to funders for investment in the railway in South Essex and East London in order to meet growing demand, facilitate housing and employment growth and support the local and national economy, both in the short- and long-term.

Demand

Growth in freight demand is expected to require up to 154 train paths (two-way total) by 2040 and 198 by 2050, a rise from around 125 paths a day today. This is consistent with the trajectory required to meet the government's Freight Growth Target of at least 75% by 2050. Demand for rail freight is highly responsive to changes in the national and international economy, construction industry and shipping industry, meaning long-term demand is challenging to predict. Partners have advised that the trajectory to meet the Freight Growth Target may undersell the underlying potential of rail freight demand on the corridor, as London Gateway and the Port of Tilbury invest in further expansion, including in rail terminals.

Passenger demand is expected to grow by around 24.5% by 2033 from a 2023 base, and by up to 80% by 2050. This has been informed by a detailed demand forecast commissioned by c2c which accounts for drivers including population and employment growth. Beyond 2033, central and high growth scenarios provide a range of likely growth outcomes for the longer term.

Freight interventions

Potential for further growth in rail freight is high, but accommodating significant numbers of additional freight services is likely to be challenging due to constraints on the rail network, especially across North London. A phased package of capacity upgrades including signalling headway reductions, junction upgrades and level crossing closures is required to provide more capacity for freight services. Furthermore, increased cross-country capacity between the Port of Felixstowe and the Midlands could allow growth in Essex Thameside freight by reducing the number of services to and from Felixstowe which travel via London.

Decarbonisation of rail freight will require improvements to the traction power supply on the Essex Thameside corridor and across London to support more electric and bi-mode locomotives. Electrification of the branch line to London Gateway also remains an option.

Passenger service improvements

Passenger demand on this corridor is dominated by traditional peak hours commuter traffic, with off-peak and contra-peak flows experiencing low demand in comparison. Even with the reduction in peak hours demand post-Covid, it is expected that capacity increases will be required throughout the study period when applying suitable seating and crowding targets to prioritise a high standard of customer experience.

In the short-term, timetable optimisation should be explored to try to balance passenger occupancy between services via Laindon, together with train lengthening up to a maximum of 12-cars on the most popular services, based on the Class 357 trains c2c currently operates.

Longer term, more services will need to operate as 12-car trains in peak hours, as demand uses up available capacity. A new fleet is expected to be required by 2040 at the latest, and by this date in either growth scenario it is expected that the majority of services in the morning peak would need to be 10-car length, based upon the Class 720 also currently operated by c2c.[1] It is likely that train lengthening will be suitable for capacity needs until the mid-2040s, after which, if demand continues to rise as expected, additional services will be required in peak hours, which would require a signalling headway reduction between Barking and Upminster.

The study has primarily explored timetable and rolling stock-led improvement options rather than frequency-led options as these are likely to be more affordable. Frequency-led options, enabled by signalling improvements are likely to be affordable only with a planned signalling renewal.

Station upgrades

Growing peak hours demand will also necessitate improvements to station pedestrian capacity, as higher numbers of passengers board and alight at the most popular stations. West Ham station is the highest priority for a major improvement, driven by the high volumes of passengers who interchange between c2c and Jubilee Line services in peak hours. A whole station redevelopment is recommended, planning for which should commence without delay for delivery in the first half of the 2030s. Pedestrian capacity could become an issue at London Fenchurch Street and Barking in the 2040s.

Barking station is one of the busiest in the country but lacks step-free access to all platforms. An accessibility scheme to provide lift access to all platforms, combined with an interchange capacity upgrade, should be prioritised.

Delivery

The Essex Thameside corridor has significant growth potential across both passenger and freight services. The short-term improvements required (by around 2033) should be considered for development in the short-term so they can be implemented in time to meet demand. A plan for longer term needs (2040 and beyond), including for freight-enabling infrastructure, should also be considered in the short-term, as these will be complex programmes of infrastructure enhancements, which will take time to establish. Delaying this development will delay their implementation and the ability to grow the rail freight sector.

It is expected that while some funding may be available from other sources, including a future Greater Essex mayoral combined authority, funding primarily from central government will be required to develop and deliver the options set out in this study. Due to constraints in available funding, this could be challenging to secure, however.

During development of this study, the operator, c2c has transferred into public ownership, now part of the Department of Transport Operator ahead of full public ownership under Great British Railways (GBR). This move provides an opportunity for the industry to work together in a more integrated way to take forward the infrastructure and rolling stock related improvements in the medium-term.

[1] Note, a 10-car Class 720 is the same length and has higher capacity than a 12-car Class 357.


CONTEXT

2. Strategic Advice for the Essex Thameside rail corridor

This section sets out the context for this study, including its problem statement and aims amongst the current rail policy landscape, along with an overview of the rail geography and its passenger and freight services.

2.1. Rail industry planning, study aims, and purpose

Network Rail has a responsibility to plan the future needs of the railway in the short-, medium-, and long-term and across all parts of the network for both passenger and freight needs. This is achieved through the development and publication of targeted studies of particular geographies and themes, working with relevant industry partners to ensure the correct questions are being asked to deliver robust strategic advice with widespread support. A 'whole industry' approach is sought, ensuring all elements of the rail system are assessed, including infrastructure capability, rolling stock, depots, connectivity and so on. This enables Network Rail to advise on behalf of the industry how required and aspired outcomes can be met for the study geography in question.

Several drivers exist to undertake this piece of strategic advice, and Network Rail has worked with industry partners, including c2c, Transport East and local authorities to define the following problem & opportunity statement.

There is potential for significant growth in both passenger and freight demand on the Essex Thameside corridor, much of which is influenced by central government policy;

- **Passenger demand:** High housing growth is expected, underpinned by central government policy to increase housing targets across many local authority areas, which combined with the impacts of the Covid-19 pandemic, means Network Rail's advice on passenger demand is out of date. Furthermore, with passenger rolling stock now 25 years old and leases due to expire within the next four years, robust forecasts of capacity requirements will be needed to ensure that fleet replacement is correctly specified.
- **Freight demand:** demand for rail freight haulage, particularly in the intermodal sector, is expected to grow rapidly, which partly reflects commercial decisions taken by shipping lines in the short-term. Additionally, central government has set a target to grow rail freight by at least 75% by 2050 and as an established major freight route, this corridor is expected to contribute significantly to meeting the target. This traffic will need to align with an intensifying passenger service across London.
- **Governance and funding:** Significant changes to local government including the creation of a Greater Essex mayoral authority complete with a transport budget is proposed. This could be an opportunity to unlock funding and enable faster delivery of rail improvements in this area. Private funding as part of local development could also be a mechanism to progress smaller corridor improvements. Close collaboration with Transport for London will also be essential, especially at the route's shared interchange stations – Barking and West Ham.

It is, therefore, essential to update Network Rail's strategic advice, working with local partners to assess future needs and aspirations across both passenger and freight services to address these challenges and harness the opportunities.

This study provides insights and advice across a number of areas;

- how demand and travel patterns on the Essex Thameside corridor have changed since 2020;
- how housing and population growth could increase passenger demand along the corridor;
- what impact growing demand is likely to have on future train service requirements, and the different ways this demand can be accommodated;
- how stations will need to be improved to serve greater numbers of passengers;
- how an increase in rail freight demand could be met on the corridor and across London, meeting the government's target for a minimum 75% increase in rail freight by 2050;

- what supporting rail systems, such as traction power, signalling, depots & stabling and level crossings will need to be improved to accommodate additional passenger and freight trains;
- when improvements will need to be delivered, and;
- how improvements could be funded.

To provide focussed answers, a headline strategic question, and multiple sub-strategic questions across three themes have been established with partners;

Headline

How is passenger and freight demand on the Essex Thameside corridor likely to change over the next 25 years, what improvement options are likely to be required and when will they be needed?

Freight Services

- How can the Essex Thameside corridor and connecting cross-London infrastructure be improved to provide a basis for long-term rail freight growth?
- How can improvements elsewhere in East Anglia also improve rail freight potential on Essex Thameside?

Passenger Services

- When is it likely that capacity-focussed improvements will be required, and what improvement options could be implemented?
- How have passenger journey habits changed post-pandemic and how can we make the Essex Thameside network more attractive for a wider range of users?

Stations

- How can major stations be improved and when would improvements be required by based on current expected increases in demand?
- How might the railway be able to work with the private sector to encourage investment into stations?

These aims and strategic questions align with policies from central and local government, as well as the region's sub-national transport body, Transport East, as set out below.

Government priorities

- Improving **performance on the railways** and driving forward rail reform.
- Improving bus services and **growing usage** across the country.
- **Transforming infrastructure** to work for the whole country, **promoting social mobility** and **tackling regional inequality**.
- Delivering **greener transport**.
- Better **integrating transport** networks.

Transport East priorities

- 'Decarbonisation for passenger and freight', including **encouraging modal shift** and shifting away from diesel.
- 'Growing towns and cities', including **increasing capacity and frequency**.
- 'Rural and coastal', including better **connecting coastal communities**.
- 'Unlock international gateways', including mode **shift to rail freight**.

By aligning with these regional and national objectives, it ensures the study is asking the right questions and will give answers and evidence to questions relevant to local and national funders alike.

This study has been developed on behalf of the rail industry and its stakeholders. A remit was prepared by Network Rail and reviewed and endorsed by members of the Regional Investment Review Group (RIRG), which was also used as a governance channel for progress updates and endorsement of overall findings. Specific working groups were set up with local partners to discuss and endorse particular topics such as demand forecasts, train service options, findings and recommendations.

Following on from this introductory section, the document is split into sections focussing on **enabling freight growth**, **meeting demand on passenger services** and **accommodating passengers at stations**, before drawing findings together in the final summary section.

2.2. Corridor overview

The Essex Thameside corridor, shown in purple below in Figure 1 is a compact, but heavily used mixed-use railway carrying large numbers of passengers particularly concentrated during traditional peak commuting hours and high volumes of freight traffic during interpeak hours, evenings and overnight. The route consists of three parts;

- the **Main Line** between London Fenchurch Street and Shoeburyness via Basildon;
- the **Tilbury Loop** between Barking and Pitsea via Grays, which is used to access to all of the corridor's freight facilities, and;
- the **Ockendon Single Line** between Upminster and Grays.

This section describes the corridor in more detail, including its infrastructure, its freight and passenger services, local people's travel habits and current industry financial position.

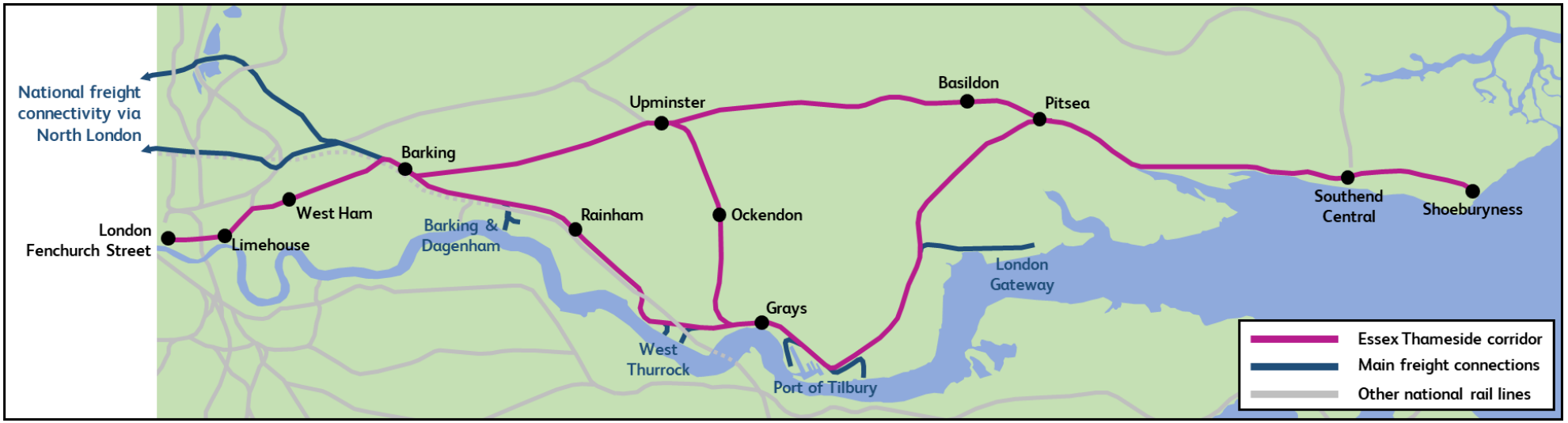


Figure 1 – The Essex Thameside corridor, including its main freight branches and onward cross-London routing west of Barking.

2.2.1. Infrastructure

The Essex Thameside corridor is a relatively short route, running east-west on the north side of the Thames estuary. The Main Line between London Fenchurch Street and Shoeburyness via Basildon is 39.5 miles. The Tilbury Loop is 24.5 miles and the Ockendon Line is 6.5 miles. All routes are at least double track except for the line via Ockendon, which is single line apart from a passing loop at Ockendon station. The approach to London Fenchurch Street is four track for just under a mile, and short three track sections exist at Laindon and Leigh-on-Sea stations.

Complex infrastructure exists around Barking station where the Main Line and Tilbury Loop meet on the east side, and the Gospel Oak-Barking Line branches from the Essex Thameside corridor on the west side. Several bridges exist to grade-separate tracks, including London Underground tracks, and allow cross-platform interchange between the Underground and c2c Main Lines.

Multiple junctions exist on the Tilbury Loop connecting into various freight terminals and yards, especially in the Dagenham, Purfleet and Tilbury areas. The Thames Haven branch line to London Gateway port branches off the Tilbury Loop near Stanford-le-Hope.

Conventional colour light signalling is provided on the whole route. Most of the route has a headway of three minutes, meaning a train cannot follow another until three minutes has elapsed. The section between Barking and London Fenchurch Street has a two minute headway, giving greater capacity and timetabling flexibility west of where the Main Line and Tilbury Loop join.

The route is fully electrified from a passenger perspective, and all passenger trains are electric Class 357 and Class 720 units. Most freight services operate under diesel traction, with some services hauled by bi-mode diesel/electric locomotives.

Thirty-nine level crossings exist on the route, most of which are on the Tilbury Loop. Several of these crossings are to be closed by the Anglia Level Crossing Reduction Programme.[2]

Pitsea Junction, where the Main Line and the eastern end of the Tilbury Loop join.

The route has a maximum line speed of 75mph, though much of the route's published maximum permitted speed is below this. For example, much of the Tilbury Loop's line speed is 60mph. Differential speed limits for freight also exist, with freight typically limited to 50mph maximum. Full details of infrastructure layouts and permitted speeds can be found in the Sectional Appendix.[3]

2.2.2. Rail services

The corridor is one of the country's most significant freight routes, handling a wide variety of commodities to and from a range of freight sites along the Thames estuary. The most significant sites are London Gateway and the Port of Tilbury, with the former seeing up to 38 trains arriving and departing on its busiest days in summer 2025.

All freight trains to and from Essex Thameside terminals must pass through Barking and across London via either the Gospel Oak-Barking Line (also known as the Tottenham & Hampstead Line) or via the Great Eastern Main Line, joining it at Forest Gate Junction, and then onto the North London Line at Stratford. Both of these routes are heavily used passenger routes for London Overground, Elizabeth Line, Greater Anglia services and freight services originating from the Port of Felixstowe, so the needs of several service groups must be balanced and aligned for Essex Thameside freight services to be routed through.

The reach of freight to and from Essex Thameside is nationwide, with paths in the timetable to and from terminals in all five of Network Rail's Regions, hauling intermodal containers, construction materials, road vehicles (automotive), metals and waste, as shown overleaf in Figure 2. Intermodal and construction materials are by far the biggest market sectors, with a wide array of destinations served across these two markets particularly across the Midlands, North West and Yorkshire. A limited amount of freight arrives at Ripple Lane Exchange Sidings from Europe via the Channel Tunnel.

[2] Essex, Havering and Hertfordshire level crossing reduction order, Network Rail.
[3] National Electronic Sectional Appendix, Network Rail.

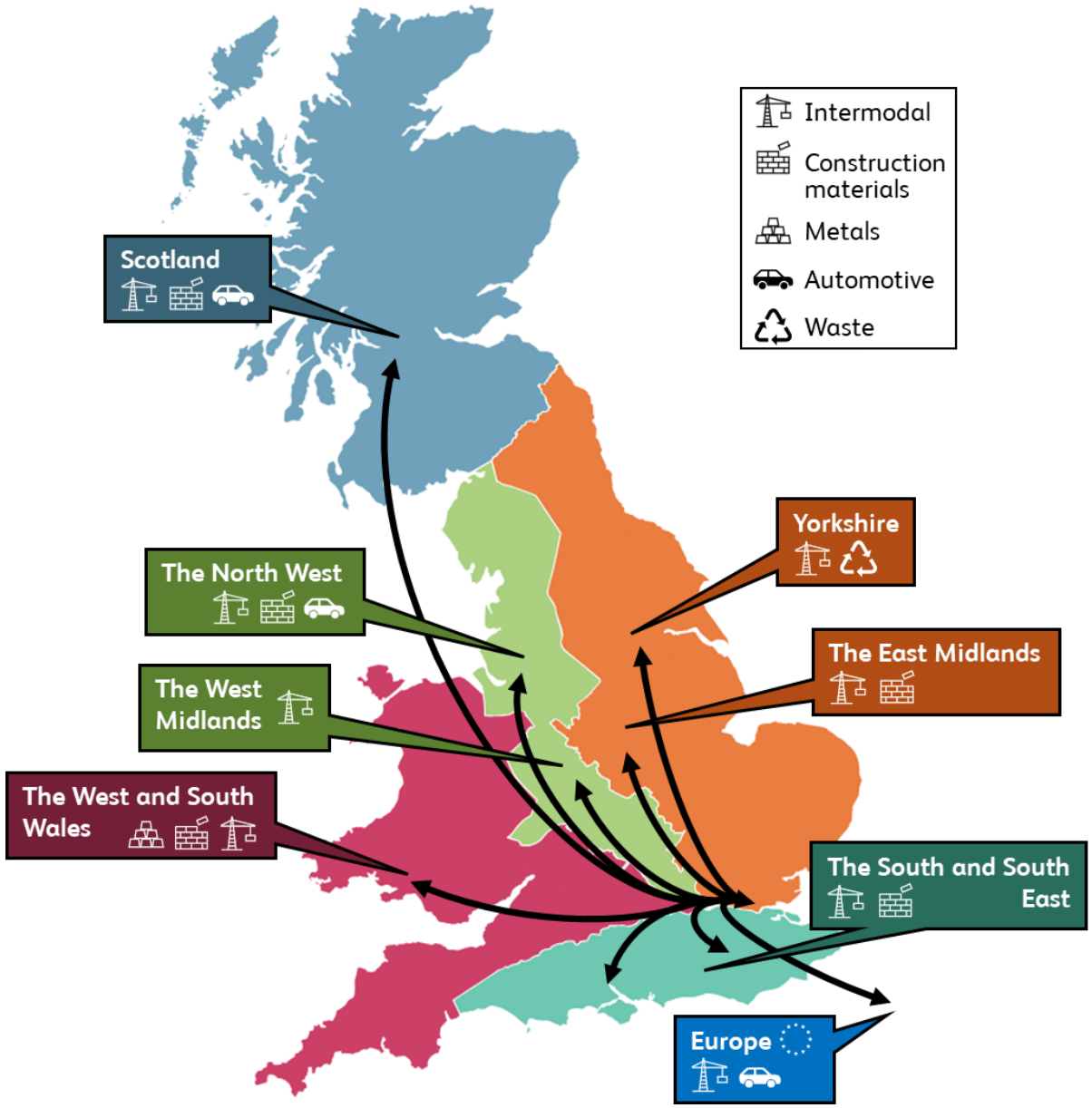


Figure 2 – National and international rail freight connectivity.

As of summer 2025, around 60 paths exist Tuesday-Friday in each direction (for around 120-125 total), and up to around 50 paths in each direction exist on Mondays and Saturdays. These paths are not spread evenly throughout the day but tend to be concentrated in the middle of the day between 10:00 and 15:00, and overnight been approximately 21:00 and 07:00, with up to six paths in one direction per hour.

At other times, particularly during peak passenger hours total numbers of freight paths tend to be lower, totalling between zero and three, as track capacity on the Essex Thameside corridor and other interfacing parts of the network is more intensively used for passenger services. As freight runs as required, on average about half of these paths are typically used on any given day, with around 30 trains in each direction operating Tuesday-Friday, and around 60 % of these going to or from London Gateway. Mondays and Saturdays are slightly quieter, with around 20-25 trains operating in each direction.

In early 2025, structural changes in the global shipping industry led to changes in shipping demand at London Gateway and the Port of Felixstowe, resulting in a small decline in rail freight traffic at Felixstowe and an increase at London Gateway. In the short-term, this is leading to rising demand for paths to and from London Gateway. The impact on the rail network and what is being done to accommodate these changes on the corridor is outlined in sections 3 and 4.

Passenger services on the route are operated by c2c and have a regular off-peak pattern on three routes to/from London Fenchurch Street as follows;

- 4 trains per hour (tph) to/from Shoeburyness via Laindon shown in Figure 3 below in red;
- 2tph to/from Southend Central via Ockendon shown in blue, and;
- 2tph to/from Grays via Purfleet shown in green.

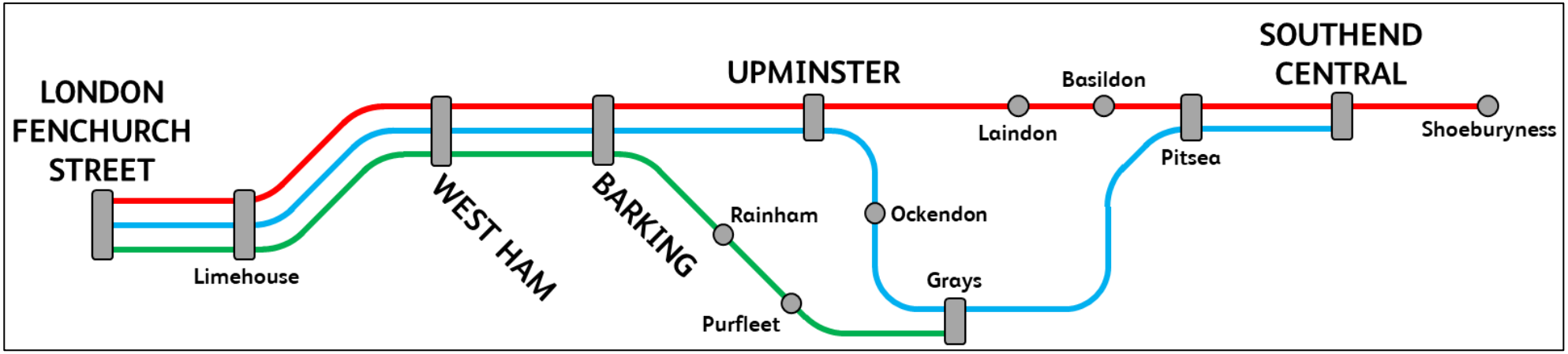


Figure 3 – Typical off-peak c2c service structure.

During peak hours service frequency increases on all routes up to a combined maximum, as of the May 2025 timetable, of 19tph in the morning high peak hour (arrivals at London Fenchurch Street between 08:00 and 08:59). Service structure also changes during peak hours with alternative routings offered as well as limited stop services on the route via Laindon to offer faster journey times, especially to and from the Southend-on-Sea area.

The route is relatively self-contained from a passenger perspective, with no regular weekday connections to any other parts of the National Rail network, but has several important interfaces with routes operated by Transport for London (TfL) and its concessions, as listed below;

- **Upminster**, for the London Underground (LU) District Line and the Liberty Line of the London Overground to Romford;
- **Barking**, for the LU District and Hammersmith & City Lines and the Suffragette Line of the London Overground between Gospel Oak and Barking Riverside;
- **West Ham**, for the LU Jubilee, District and Hammersmith & City Lines, and the Docklands Light Railway (DLR) between Stratford International and Woolwich Arsenal;
- **Limehouse**, for the DLR between Bank/Tower Gateway and Beckton, Lewisham and Woolwich Arsenal

No direct connectivity with TfL's rail network exists at London Fenchurch Street, though Tower Hill Underground station and Tower Gateway DLR stations are nearby. The corridor's London rail connections are shown overleaf in Figure 4. Outside of London, the main towns including Grays, Basildon and Southend-on-Sea have multiple local bus routes calling near their railway stations, offering multimodal options across a much wider area.

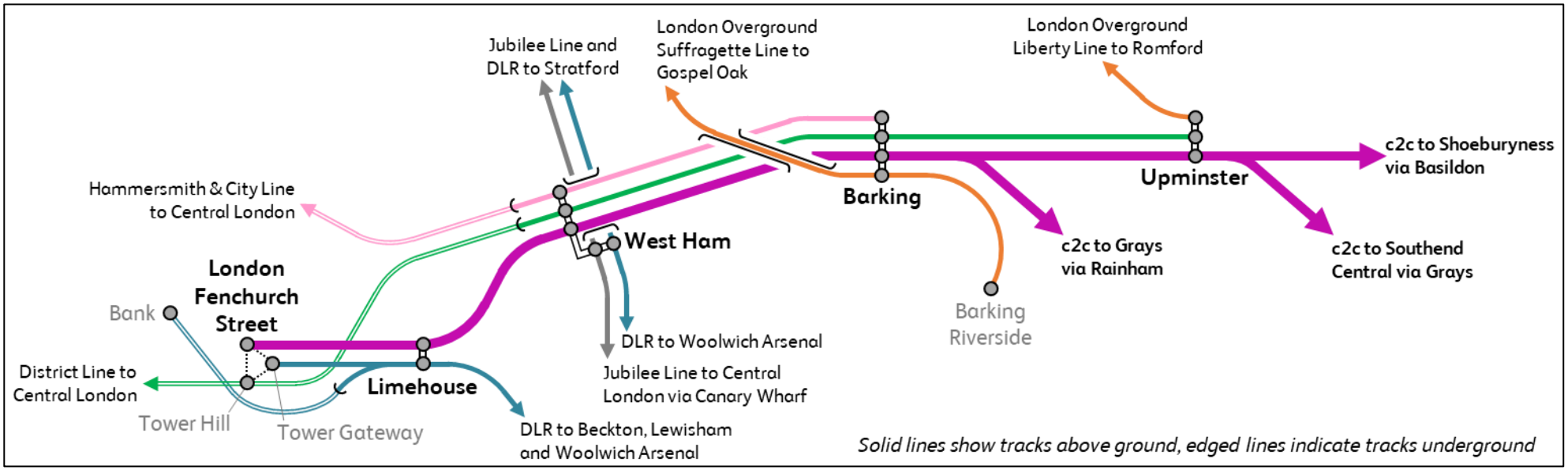


Figure 4 – Connections between the Essex Thameside corridor (in purple) and other rail services on the TfL network.

Overall, the typical level of service on the corridor throughout the day is as shown in Figure 5. This includes all in-service c2c and London Overground passenger trains as per the May 2025 timetable, as well as a representation of passenger empty coaching stock (ECS) movements (which can differ day-to-day and be used for purposes including driver training) and typical maximum freight paths per hour at the time of writing.

The totals shown are the sum of paths in hourly time bands in both directions at Barking, where all passenger and freight trains pass. This shows the high levels of passenger service in the peaks, influenced by the intensified c2c service, and the higher numbers of freight and ECS paths between the peaks, and during the evening and overnight. London Overground services passing through Barking operate at a steady 4tph except at the very beginning and end of service.

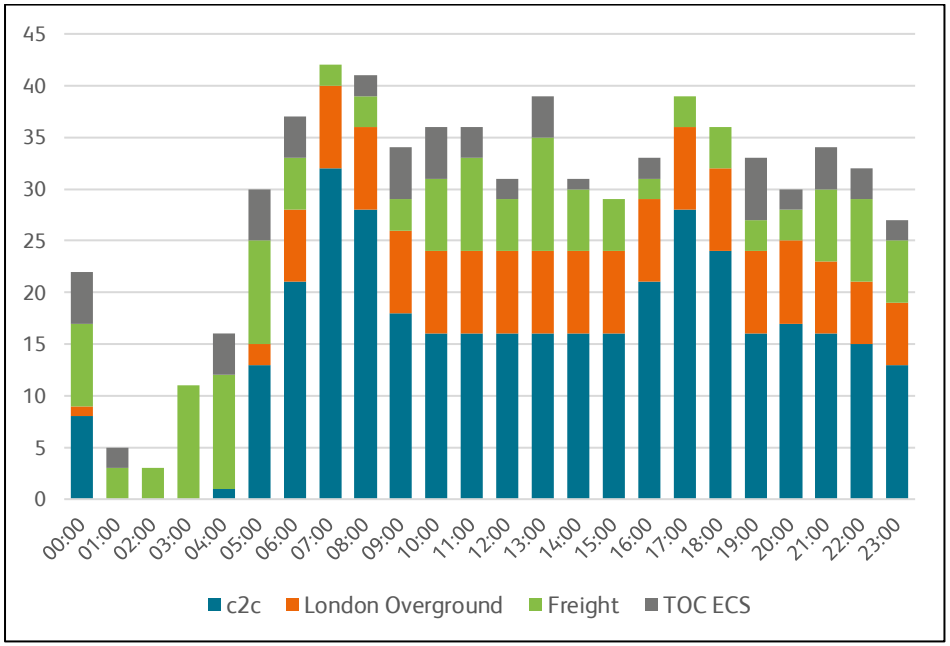


Figure 5 – Profile of services operated on the Essex Thameside corridor.

2.2.3. Population and travel habits

Multiple sources can be reviewed to provide an overview of the corridor's population, catchment and the propensity for people to choose rail.

Office for National Statistics (ONS) population data

The Essex Thameside corridor serves heavily populated areas within parts of east London and Southend areas, as well as several large towns in South Essex, including Basildon and Grays. At the time of the last census in 2021 there were around 1.86 million people living in the local authority areas the corridor passes through.[4] However, these 1.86 million people do not all live within easy access of the railway, and for some in London and Southend-on-Sea, other rail options are more convenient.

Network Rail analysis shows that around 450,000 people live within walking distance (1.5km) of the Essex Thameside corridor, some of whom are also close to Southend Victoria and Prittlewell stations on the Southend Victoria branch line to and from London Liverpool Street via Shenfield. The only significant population clusters in South Essex beyond 1.5km from the railway are the northern fringes of Southend-on-Sea, Leigh-on-Sea, Benfleet and Basildon, which sit between the Essex Thameside corridor and the Southend Victoria branch, plus Canvey Island and northern areas of Tilbury and Grays. These areas total around 150,000 people who can access the railway by bike, bus or car. Therefore, in South Essex a total population of around 600,000 are within either direct local catchment or can make a short multi-modal journey to reach their nearest station.

Within London, where many more public transport options exist and people may live within walking distance of more than one station, a catchment is not as straightforward to define, but at least 125,000 have Upminster, Barking, West Ham or Limehouse as their closest station. On top of this, at least 200,000 more live near to District/Hammersmith & City Line stations west of Upminster, such as Hornchurch, Dagenham Heathway or East Ham.

Rail industry usage statistics

Usage statistics published by the DfT help to illustrate the profile of usage throughout the day, showing when more people are travelling. The Essex Thameside corridor is a well-known busy commuter railway with lower off-peak passenger usage. Figure 6 below shows the typical usage profile at London Fenchurch Street in 2024. While not representative of the whole corridor, it illustrates how usage is dominated in the peak hours, and how comparatively quiet trains are during the off-peak periods and contra-peak directions. The faint dotted lines indicate 2019 usage and show how usage has declined post-pandemic but has maintained the same broad shape throughout the day.

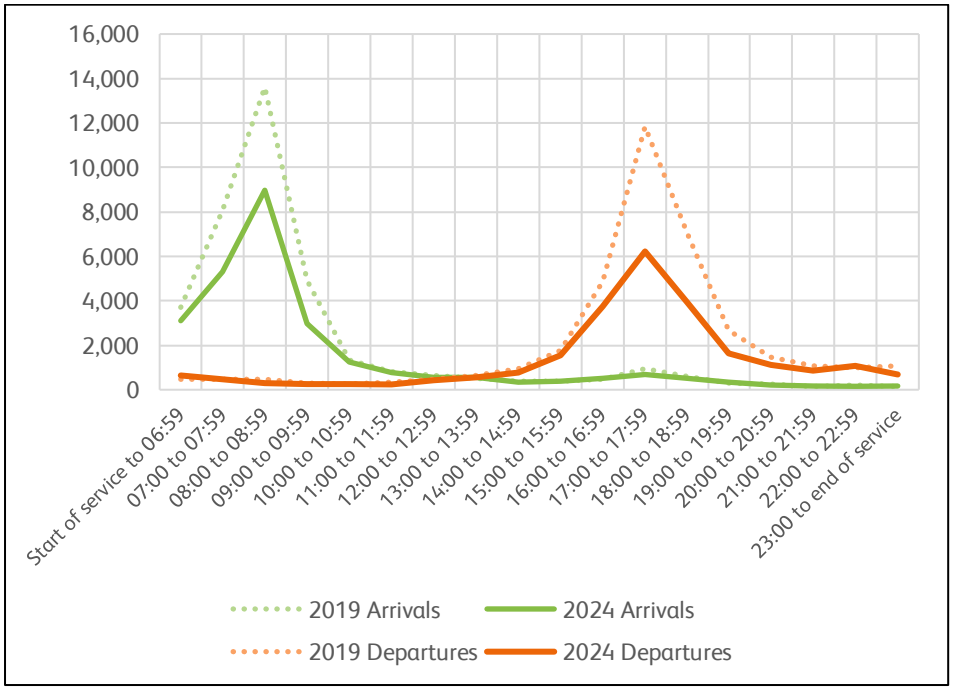


Figure 6 – 2024 arrivals and departures profile at London Fenchurch Street.[5]

[4] As reported in dataset TS007, from the ONS for the City of London, Tower Hamlets, Newham, Barking & Dagenham, Havering, Thurrock, Brentwood, Basildon, Castle Point and Southend-on-Sea.

[5] Chart produced from dataset RAI0203 – Central London arrivals and departures by rail in on a typical autumn weekday, by station and time band from the DfT.

The Office of Rail and Road (ORR) publishes origin and destination data which estimates how many people travel between each station across the country and can be analysed to illustrate the dominant passenger flows on any route. For this line the top ten flows in 2023/24 are as shown opposite in Table 1.

The top journeys are dominated by flows to/from or within London and mean that the busiest stations are at the London end of the corridor, as illustrated below in Figure 7. There are no stations with very low usage (the lowest being the small village of West Horndon with 0.3m) and most of the towns have at least a million entries and exits. The seven closely located stations in the Southend area (Leigh-on-Sea to Shoeburyness) have a combined total of 8.1m.[6]

Station pairing	Two-way total
Barking <> West Ham	5,079,334
Upminster <> London Fenchurch Street	1,175,192
Benfleet <> London Fenchurch Street	985,452
Upminster <> West Ham	849,432
Leigh-On-Sea <> London Fenchurch Street	802,298
Barking <> London Fenchurch Street	788,000
Barking <> Limehouse	783,550
Grays <> London Fenchurch Street	759,252
Laindon <> London Fenchurch Street	689,940
Basildon <> London Fenchurch Street	687,652

Table 1 – Top ten station pairings on the Essex Thameside corridor in 2023/24.[7]

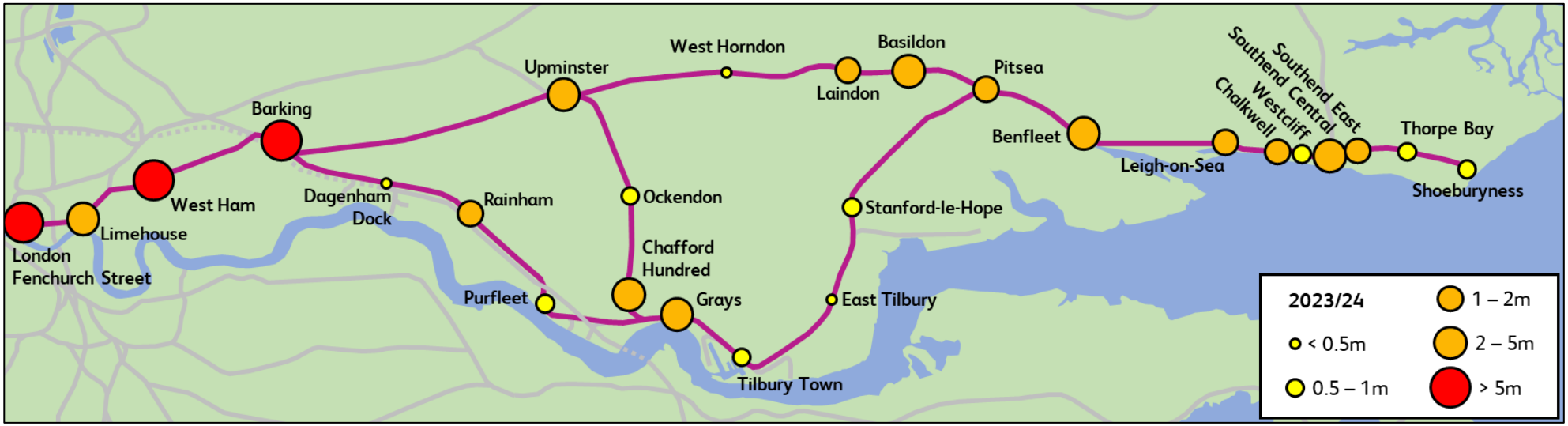


Figure 7 – 2023/24 National Rail station usage on the Essex Thameside corridor.

The three busiest stations on the route in 2023/24 by National Rail entries and exits are;

1. Barking – 13.2m
2. London Fenchurch Street – 10.4m
3. West Ham – 9.6m

[6] Statistics quoted and diagram produced from 2023-24 Estimates of station usage from the ORR Data Portal. This also includes London Overground users at Upminster and Barking.
[7] Table produced from the Origin and destination matrix (ODM) 2023-24 from the Rail Data Marketplace.

These figures do not include usage for London Underground or Docklands Light Railway passengers, which are counted separately by TfL. Therefore, at the four Essex Thameside stations which have in-station interchange with the TfL network, actual footfall will be higher than the ORR's estimates suggest, particularly at Barking and West Ham, which in 2023 had 15.1m and 5.3m TfL entries and exits respectively.[8] The estimate for Barking station will also include passengers using the London Overground Suffragette Line service between Gospel Oak and Barking Riverside, which according to the ORR's Origin and Destination Matrix, make up a significant portion of flows to and from Barking station.

Travel patterns, especially for commuting, have changed since the Covid pandemic and the ORR's entry and exit statistics illustrate this. More on how travel patterns have changed since 2019 is included below in section 2.4.

Census travel to work data [9]

The national census captures people's travel choice to and from work, which helps to give a picture of how local people choose to travel for what is often people's most regular journey. For the 2021 census, on this corridor a higher than average percentage of people use the train to travel to work, with most local authority areas recording a mode share of between 5.5 and 9%. This is highest in the London Boroughs of Newham and Barking & Dagenham and typically reduces eastwards along the corridor.

This mode share compares favourably with most other areas north and west of London, which tend to record a mode share of between around 1.5 to 4% by local authority area on average. The only areas recording a similar mode share are across South and South East London where up to 9 or 10% is typical within Greater London boroughs. These areas have a very extensive and intensive suburban rail system and a limited reach of other mass transit modes such as the London Underground.

Furthermore, away from the London commuter belt, rail mode share percentages tend to be less than 1% apart from nearer some of the larger urban areas such as Birmingham, Manchester, Leeds or Cardiff, where the share may rise to up to around 2.5%. This shows how comparatively strong the travel to work rail mode share is on the corridor.

As the 2021 census was conducted during one of the national Covid lockdowns, it is inevitable that responses to the travel to work question was skewed by people's experiences during the pandemic.[10] Responses to the same question in the 2011 census, which could be more accurate of current (2025) travel trends than those reported by the 2021 census, show that the percentage mode share for the train is higher in all local authority areas, with the biggest differences in the South Essex authority areas.[11] For example, the mode share recorded in Basildon local authority area was almost 11% lower in 2021 (5.6% vs 16.5%)

As it is possible that the 2011 census is more reflective of 2025 travel trends than the 2021 census, a brief analysis of origins and destinations from the 2011 census has been undertaken to build up a picture of where people are travelling for what is often the most regular journey people make.[12] It must be noted however, that this data is now 14 years old, so will not reflect some changes in travel patterns due to local housing or employment developments, such as the rapid growth at London Gateway port, which opened in 2013, after this data was gathered. The 2011 data shows that;

- In all areas the majority of people work locally (including working from home) in the same or a nearby local statistical area.
- These local journeys to work are mostly made by car or on foot.
- For journeys which are taken by rail, the overwhelming majority of these are to central London, with additional London-bound travel (partly) by rail to other parts of the city, most notably Canary Wharf.

[8] Station entry and exit data for TfL stations is available on the TfL website.
[9] 2021 census mode shares quoted in this section are summarised from the ONS travel to work dataset, available here.
[10] The ONS details how responses are likely to have been influenced here.
[11] 2011 census travel to work data from the ONS website, available here.
[12] The analysis by Datashine offers an interactive way of viewing 2011 census travel to work data.

Very few local rail journeys are recorded, despite most stations being well connected to each other with frequent services, especially in the peak hours where service frequency is increased. A small number of rail journeys to the centre of Southend-on-Sea are recorded originating in Benfleet, Canvey Island and other parts of the Southend conurbation. In addition, a small number of journeys are made on the Tilbury Loop to Purfleet, an area of high employment including large industrial sites, distribution centres and Purfleet docks. These journeys originate in Stanford-le-Hope, East Tilbury and Grays.

This supports the rail industry data outlined above, with both datasets indicating the majority of rail journeys on this route are to and from central London, some of which are multi-modal. These overall trends are likely to have remained over the last 15 years since the 2011 census, however the exact mode shares may have shifted.

2.2.4. Industry Geographic Financial Model

Section 2.1 highlights the whole-industry approach taken by Network Rail and partners in the production of this strategic advice. A major component of whole-industry planning is working towards the financial sustainability of the rail industry, factoring in considerations such as operating costs and the maintenance and renewal of railway infrastructure. As rail reform continues in line with the government's consultation launched in early 2025,[13] Great British Railways will continue to prioritise value for rail users and taxpayers.

The Industry Geographic Financial Model (IGFM), an industry tool which enables the finances any portion of the rail network to be examined, has been reviewed to provide an overview of the financial situation of the corridor. The IGFM shows that existing services do not take enough fare revenue to cover costs, despite passenger services often being busy in peak times.

As shown above in Figure 6, usage is low in off-peak periods and overall usage is still notably under 2019 levels, reducing fare income. At the same time, industry costs have risen meaning that in the 2023/24 financial year, the Essex Thameside corridor required an operating subsidy of over £130m when accounting for all income and costs, including Train Operating Company and Network Rail operating costs, as well as Network Rail infrastructure renewals. This compares with a subsidy of only £4m in 2019/20. Growing passenger demand, especially recovering peak hours travel is therefore critical to returning to a sustainable long-term financial situation on this corridor.

It is important to note that the IGFM does not account for the social value of the railway, its environmental or wider economic benefits.

2.3. Summary of findings from 2020 Essex Thameside Study

One of the primary drivers for this study is to update Network Rail's previous strategic advice, which was compiled in 2019 and early 2020, where growth in peak hours commuting over the previous decade was beginning to result in heavily crowded trains. As the serious impact of the pandemic on commuting by rail (on which this line is largely dependent from a revenue perspective) became apparent, the study's demand-led advice was no longer robust, mainly in terms of the timeframes which were attached to the recommendations. The main findings from the 2020 study are set out below.

Demand

From a 2018 base, passenger demand was forecast to grow by 35% across the whole corridor by 2050, with 9% growth expected by 2025. Freight demand was expected to be predominantly driven by the intermodal sector, with an average of 6 paths per hour in each direction required during typical freight operating hours by 2050.

Passenger services

To accommodate passenger demand growth in peak hours, three options were recommended for further development: a signalling upgrade to operate more trains, operating more 12-car services or a reconfiguration of seating layouts to enable trains to carry more passengers. Staged improvements were expected to be needed from 2025.

[13] 'A railway fit for Britain's future' consultation, Department for Transport.

Stations

Based on dynamic pedestrian flow modelling, London Fenchurch Street and Barking were expected to need capacity improvements by 2025, and West Ham by 2027.

Freight services

It was expected that the level of freight growth by 2043 could be accommodated on the Essex Thameside corridor without any specific capacity enhancements. The study cautioned that growth to/from Thameside ports would be constrained by capacity elsewhere, most notably across north London, and that level crossing risk could prevent more services from operating, even if track and signalling capacity wasn't an issue.

Following on from the 2020 study, the options to accommodate growing passenger demand from were proposed to be developed further within the Rail Network Enhancements Pipeline, however with the significant decline in demand during the pandemic, this proposal was not taken forward. The options themselves at a high level remain valid, however their timing is now incorrect, and a revised detailed analysis and timeline is now required.

2.4. Recent and short-term developments

Since the previous study, several notable rail and non-rail developments which influence both passenger and freight usage have been delivered, initiated or proposed. Several rail developments are also progressing in the short-term. A summary of demand and financial changes is also provided in this section.

2.4.1. Rail and non-rail developments

Barking Riverside

Barking Riverside station opened in July 2022 to support the ongoing regeneration of the local area south east of Barking town centre on the banks of the River Thames. The station has been a success with 945,000 entries and exits in its first full year of operation (2023/24). Up to 20,000 homes are expected to be built on the site.[14]

Barking station

Barking station was identified in the previous Essex Thameside study as needing more gateline capacity by 2025 in order to accommodate growing numbers of local and interchanging passengers. c2c is in the process of delivering a package of improvements at the station, including a second gateline, due to be completed by the end of 2025.

Freight developments

The rail freight market is ever evolving, with several developments taking place since the previous study. Tilbury 2, an expansion of the Port of Tilbury with its own rail connection for handling both construction materials and intermodal containers was opened in January 2022. Tilbury 2 now has a variety of timetabled connections with intermodal routes to Daventry and Trafford Park in Manchester the most regularly used. London Gateway announced £1bn of investment in two extra berths and a second rail terminal in October 2024.[15] A further expansion at Tilbury – 'Tilbury 3' – has now also been proposed, as shown below in Figure 8.[16]

Figure 8 – Proposed site of Port of Tilbury expansion in red.

[14] Barking Riverside.
[15] DP World.
[16] Forth Ports.

In early 2025, a major reorganisation of shipping alliances took place, with the net effect that more ships will berth at London Gateway, and rail freight demand on the Essex Thameside corridor will rise in the short-term. Network Rail is currently working with ports and freight operators to identify additional paths to allow more containers to continue their journeys by rail.

Housing developments

At the time of the previous study several large housing developments and regeneration schemes were underway across the corridor. Some of these are still underway, and a review of local housing targets suggests a significant amount of housebuilding is due over the next generation. In summer 2024, decisions made by central government adjusted housebuilding targets nationwide. Annual targets have changed as shown below in Table 2.

Local Authority	Previous Method	New Method	Change (Absolute)	Change (%)
Tower Hamlets	5,190	2,177	-3,013	-58 %
Barking & Dagenham	2,979	1,295	-1,684	-43 %
Newham	4,188	2,178	-2,010	-48 %
Havering	2,385	1,922	-463	-19 %
Thurrock	1,158	1,066	-92	-8 %
Brentwood	511	691	180	35 %
Basildon	1,039	1,291	252	24 %
Castle Point	349	685	336	96 %
Southend-on-Sea	1,173	1,372	199	17 %

Table 2 – Summary of annual housing targets across the Essex Thameside corridor.[17]

Table 2 shows that four of the five of the South Essex local authority areas have seen their targets increase. The percentage changes vary significantly but the absolute change in number of houses (in South Essex local authorities) is similar across all areas apart from Thurrock, where a slight decrease is shown. The combined annual increase in South Essex is an additional 875 houses a year compared to the previous method. Within London, all four boroughs see a reduction in their targets, with the biggest reduction in Tower Hamlets, where 58 % fewer homes are targeted.

The net effect of these changes is that it is expected that the population will grow faster along the corridor than previously assumed (assuming the targets laid out are met). As a result, it is expected there will be a higher catchment of potential customers on the Essex Thameside corridor. This is despite the reduction in targets and therefore lower rate of population growth across London, where, as explained in section 2.2.3, passengers have a much greater choice in public transport mode. These housebuilding targets have been accounted for within the passenger demand forecast undertaken for this study.

This, combined with a minimum additional 1.2 million sqm of office accommodation in the City of London by 2040, and an additional 283,000 sqm in Tower Hamlets by 2038 have the potential to contribute to rising passenger demand,[18] especially during traditional peak commuting hours. This study's passenger demand forecast can be found in section 6.

2.4.2. Passenger usage

As demonstrated previously in Figure 6, the trend in passenger numbers at London Fenchurch Street is particularly tidal, with a large influx of passengers in the traditional morning peak and an exodus of passengers in the traditional evening peak, with comparatively few passengers at other times. Looking at the same dataset in a different way reveals how usage has changed over time during different periods of the day and to what extent each period has recovered post-pandemic. Figure 9 overleaf shows how this tidal usage at London Fenchurch Street has changed between 2011 and 2024 in different portions of the day, showing the arrivals profile in the morning, two-way traffic in the middle of the day, and departures profile from the late afternoon onwards. This shows that during the 2010s usage was growing at all times of the day up to 2019 (shown in black) and that the most pronounced changes in usage since then have been in the peaks, quantified in Table 3.[19]

[17] Housebuilding target analysis provided by Transport East.
[18] Draft City of London Local Plan, April 2024 and Draft Tower Hamlets Local Plan, Autumn 2024.
[19] Analysis in Figure 9 and Table 3 from dataset RAI0203 – Central London arrivals and departures by rail in on a typical autumn weekday, by station and time band from the DfT.

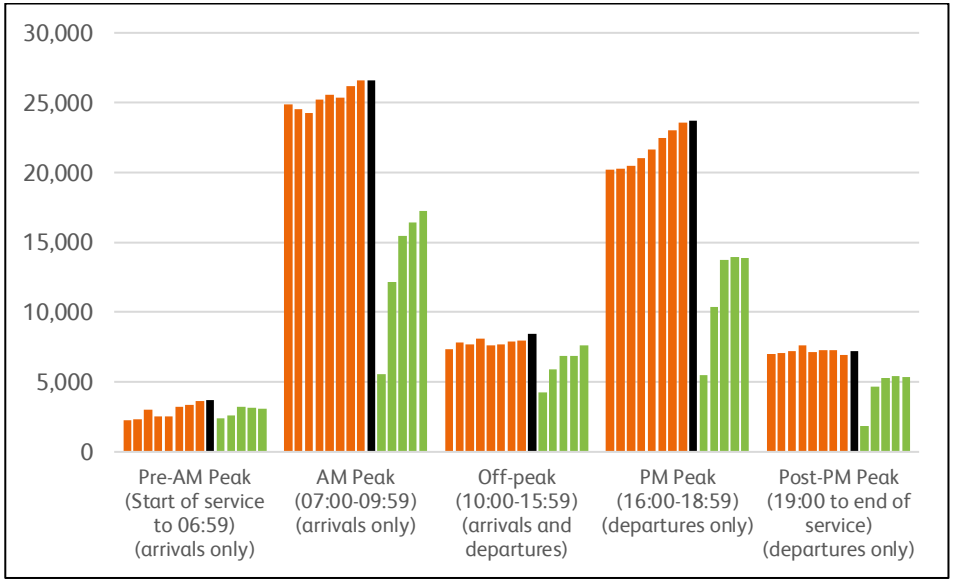


Figure 9 – Trend in usage at London Fenchurch Street by time of day, 2011-2024.

	Pre-AM Peak (Start of service to 06:59)	AM Peak (07:00-09:59)	Off-peak (10:00-15:59)	PM Peak (16:00-18:59)	Post-PM Peak (19:00 to end of service)
	Arrivals only	Arrivals only	Arrivals and departures	Departures only	Departures only
Percentage change	-16.5 %	-35.2 %	-9.9 %	-41.5 %	-25.9 %
Absolute change	-613	-9,373	-835	-9,857	-1,874

Table 3 – Change in usage at London Fenchurch Street by time of day, 2024 vs 2019.

Both the absolute change and the percentage changes in the three off-peak periods are much lower than the two peak periods, confirming that the overall drop in usage on this corridor is driven by a decline in peak hours travel. Again, this is only data for London Fenchurch Street station, but as the origin or destination of most passenger flows on the corridor, it provides a useful barometer of overall trends.

The ORR's station entry and exit statistics also help to illustrate the extent of the decline in usage across the corridor. For most stations their 2023/24 usage was at around 75-80 % of 2019/20 levels. London Fenchurch Street is only at 59 % of its 2019/20 level, again demonstrating the decline in commuter traffic to and from central London.

Despite this sharp decline in usage, the corridor is showing signs of growth. Quarterly data showing the number of passengers travelling on c2c services is published by the ORR and is shown below in Figure 10.

This illustrates the overall long-term trend of usage on the route, with steady growth between 2011 and the end of 2019, followed by a sharp drop due to the pandemic, a short period of strong recovery, and a return to a similar rate of steady growth albeit carrying fewer passengers than before 2020. The latest data shows that the total volume of passengers on c2c trains is currently similar to 2011 or 2012 levels, and around 75 % of 2018 levels. This study projects future expected demand from this initial period of recovery. More on how demand is expected to change can be found in section 6.

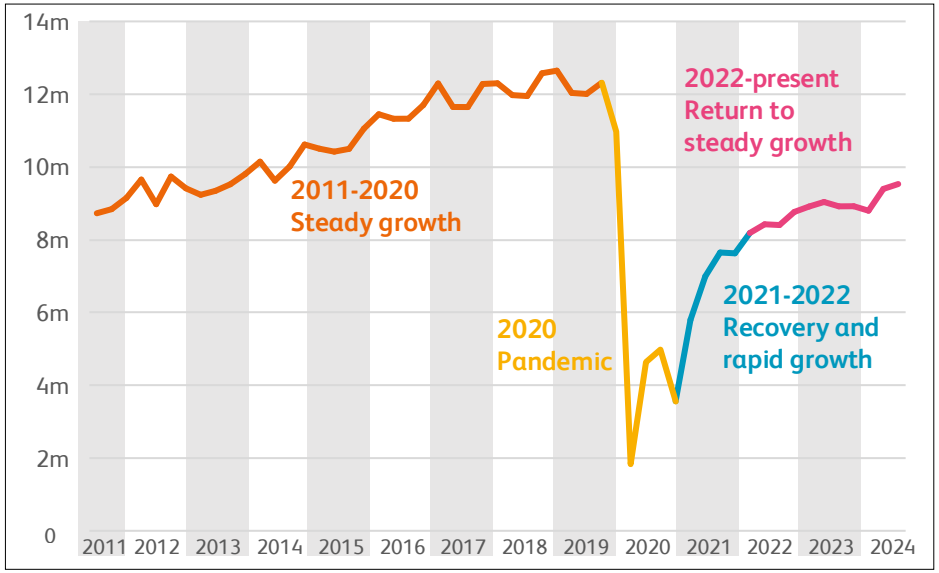


Figure 10 – Passengers travelling on c2c services each quarter (millions) 2011-2024.[20]

[20] Chart produced from Table 1223 – Passenger journeys by operator from the ORR Data Portal.

FREIGHT

Expected growth

- Up to 154 paths in both directions needed by 2040, and 198 by 2050 to meet government target
- Higher and earlier growth possible as per port growth plans

Main barriers to growth

- Multiple level crossings on the Essex Thameside corridor
- Lack of regulation points between different rail corridors
- Lack of onward track capacity across North London
- Mixing with Felixstowe freight due to lack of cross-country capacity

Headline options

- Level crossing upgrades and closures
- Signalling upgrades on North London Line and Gospel Oak-Barking Line
- Junction upgrades at Kensal Green and others
- Third line through Camden Road station
- Regulation points at Ripple Lane and potentially elsewhere
- Traction power upgrades to support more electric freight
- Electrification of the Thames Haven branch line
- Cross-country capacity upgrades to allow Felixstowe freight to be diverted away from London

3. Freight demand forecast

As explained in section 2.2.2, the Essex Thameside corridor is a nationally important rail freight route, home to two major ports at Tilbury and London Gateway, but is also home to many other rail-connected wharfs and terminals which handle a variety of cargoes. Government policy promoting rail freight growth and private investment by terminal owners, especially at London Gateway and Tilbury, means that the potential for rail freight growth, especially for intermodal containerised consumer goods is high.

In December 2023 the government established the Freight Growth Target, which was endorsed and adopted by incoming Labour government in July 2024. The target is to increase the amount of freight hauled by at least 75% by 2050. It is expected that while some of this target will be met by operating services more efficiently with higher path utilisation and longer and heavier trains, the greatest component of freight growth will be from operating additional services. It is expected that more paths, often requiring investment to increase capacity, will be required to meet the target.

To advise how the rail Freight Growth Target could be met and forecast the potential size and shape of the rail freight market in Great Britain by 2050, MDS Transmodal (MDST) was commissioned to carry out market analysis focussing on the core rail freight markets nationally – intermodal, construction materials and energy & fuel. MDST's advice forms the industry's primary tool for rail freight forecasting in the long-term, enabling strategic advice to be given consistently across Network Rail's regions on what investments are likely to be required to meet future growth and government targets. Several scenarios were modelled by MDST, with the scenario most closely reflecting the rate of growth required to meet the government's Freight Growth Target chosen as the baseline for consideration in this study.

For the Essex Thameside corridor, Table 4 above sets out the **total number of train paths** required to meet the Freight Growth Target by both 2040 and 2050. By 2050, almost 200 paths a day are forecasted to be required. For comparison, the total number of paths which operate in summer 2025 is up to around 125 a day.

	2040	2050
Class 4	105.3	138.7
Class 6	48.5	58.9
Total	153.8	197.6

*Table 4 – Total freight **paths** per day required on the Essex Thameside corridor – **sum of both directions**.*[21]

The paths shown in Table 4 are a **sum of both directions**, calculated at Barking, where the maximum number of freight trains pass before branching off to various terminals further east, and splitting between the two cross-London routes to the west. In calculating these future path requirements, path utilisation assumptions were agreed with freight operators, at 85% for Class 4, and 45% for Class 6.

Freight trains do not always fit into a consistent hourly operating pattern like passenger trains usually do, but for the purposes of long-term planning, an assumption of an 18 hour operating window is normally made to advise the total paths which need to be accommodated in a typical hour. This 18 hour operating assumption is chosen to reflect the fact that much fewer freight services operate during the peak passenger periods where passenger service frequency is often increased, including on this corridor, but include the overnight period. Here, freight paths in peak passenger periods reduce to a maximum of one or two paths in the peak flow direction, down from typical levels of three to six in off-peak hours.

Using this methodology, the average paths required in a typical off-peak hour is as shown in Table 5 below, both as a two way 'raw' value divided from the overall total, and a one way whole number, rounded up to advise the minimum average number of paths to plan for in each direction by 2040 and 2050.

	2040		2050	
	Two way total (raw value)	**One way total (rounded up)**	**Two way total (raw value)**	**One way total (rounded up)**
Class 4	5.9	3	7.7	4
Class 6	2.7	2	3.3	2
Total	8.6	5	11.0	6

Table 5 – Average freight paths per hour required on the Essex Thameside corridor in future reference years.

[21] Freight trains are typically split into two Classes: Class 4 trains are freight services permitted to operate up to 75mph, normally intermodal services, and Class 6 trains are freight services limited to 60mph, normally heavier trains carrying bulk materials.

Forecasts used for the Essex Thameside study published in 2020 advised that by 2035 four freight paths an hour would be required, and six paths by 2050.

4. Future freight needs

This section will detail what improvements will need to be made to provide sufficient capacity in both the short- and long-term.

4.1. Meeting short-term demand changes

Demand in the short-term is likely to rise, driven by the structural changes in the global shipping industry which has resulted in ships previously destined for the Port of Felixstowe instead docking at London Gateway, shifting rail demand as a result. Furthermore, enabled by DP World's £1bn investment at London Gateway, the port will have capacity for up to 50 rail services in each direction by 2027 when its second rail terminal is expected to be fully operational. The Port of Tilbury also has expansion plans, which could generate additional rail freight demand in the short-term.

Network Rail and freight operators have worked to include a small number of additional paths in the timetable, which could enable up to 25 trains to and from London Gateway per day, maximising the use of the existing rail terminal and the first phase of delivery of the new rail terminal in the short-term.

Further capacity analysis of the railway between Essex Thameside and Wembley on the WCML and Finsbury Park on the ECML has identified an additional 16 daily westbound paths and 22 eastbound paths which could operate on top of the upcoming December 2025 timetable. Most of these paths are in the evening or overnight, indicating no spare timetable capacity for more daytime trains, which is primarily constrained by capacity across North London. Practical constraints mean not all paths will be commercially or operationally viable because of misalignment with capacity at terminals and on connecting routes.

Increasing utilisation of current available paths is also fundamental to raising the number of services operating in the short-term. Utilisation varies day by day but currently typically stands at around 50% on average for Class 4 services, short of the target of 85% aspired to and used as a basis for the long-term forecasts. It is, however, recognised that aspects such as shared 'Y' paths,[22] terminal capacity, rolling stock and driver availability and end user demand will influence when trains can operate.

Beyond these short-term timetable changes and maximisation of existing available capacity and paths, changes to the infrastructure to create more capacity will be required.

4.2. Preparing for long-term growth

As Essex Thameside freight trains travel nationally – some as far as Glasgow – some consideration of onward pathing away from the Essex Thameside corridor needs to be taken into account when advising what additional services could be operated in future years. To provide suitable advice for this corridor, interaction with other traffic across London needs to be considered, which includes freight traffic which operates on the Great Eastern Main Line principally to and from the Port of Felixstowe, and London Overground, Greater Anglia and Elizabeth Line passenger trains.

It must also be acknowledged that there is a ceiling to capacity on the cross-London routes via the North London Line and the Gospel Oak-Barking Line without significant, unrealistic infrastructure changes.[23] These are both two-track routes through an urban environment with little scope to provide significantly more infrastructure, and, especially on the North London Line, carry an intensive passenger service.

Creating capacity for Felixstowe services to operate cross-country is also important for establishing options to grow Essex Thameside freight, as this would allow some Felixstowe services to be rerouted away from London,

[22] A 'Y' path is a timetabling strategy where paths between different destinations share a path for some of their journey and branch off to different destinations part way along the route. As these paths are shared for part of the journey only one service can run at a time. Some freight timetables are constructed like this to offer efficiencies and flexibility between freight terminals.

[23] Such as grade separated junctions within London, four tracking either of the London orbital routes, or dedicated freight lines north of London. Proposals such as this are not considered viable due to spatial, engineering and cost constraints.

benefiting the Thames ports. To provide industry advice for the long-term, this section will therefore consider;

1. **Capacity needs on the Essex Thameside corridor**, primarily advised by the number of paths required to meet the Freight Growth Target;
2. **Non-capacity needs on the Essex Thameside corridor**, such as level crossing restrictions and traction power capability;
3. **Off-corridor improvement options**, which would have either a direct or indirect beneficial impact on Essex Thameside freight capacity.

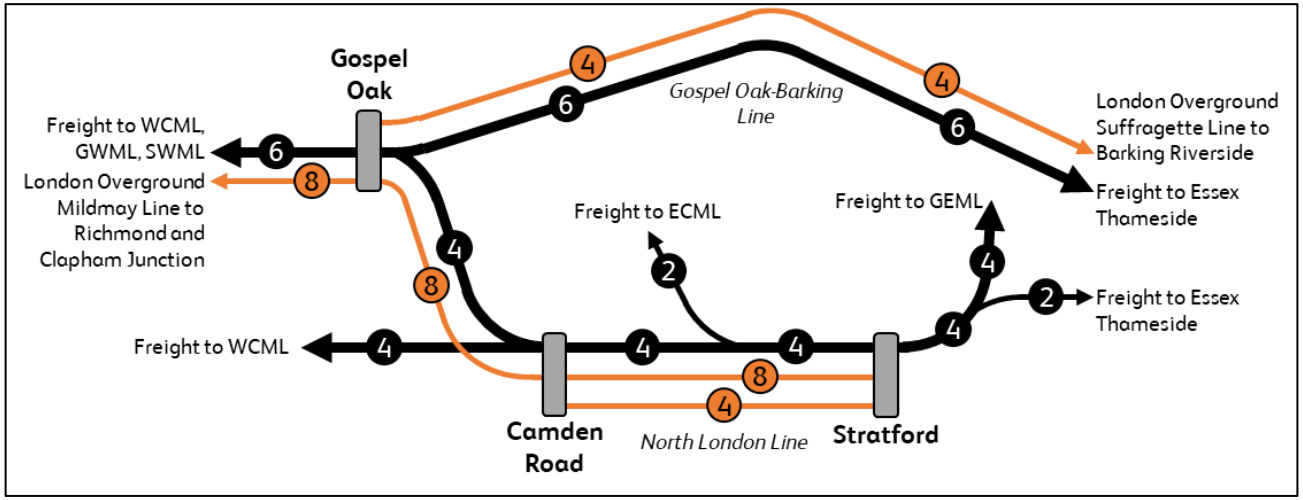


Figure 11 – Long-term freight and passenger ITSS as specified in Network Rail's London Rail Freight Strategy. The numbers refer to paths per hour in one direction. Note, freight paths do not sum due to 'Y' path assumptions.

4.2.1. Maximum cross-London capabilities

Before establishing advice on how to meet expected demand in the long-term it is important to understand the practical maximum number of paths across London which could be made available (with some achievable infrastructure upgrades) alongside likely future passenger service levels. This was assessed by Network Rail's London Rail Freight Strategy (LRFS), a summary of which was completed in 2021 and published on Network Rail's website.[24]

The LRFS tested an off-peak indicative train service specification (ITSS) as per Figure 11 above, built upon a series of 'Y' path assumptions (defined above) and frequency improvements for London Overground passenger services on the North London Line advised by Transport for London. If all 'Y' path assumptions work perfectly, up to eight freight trains per hour could theoretically operate across London to/from Essex Thameside – six on the Gospel Oak-Barking Line and two on the North London Line via the GEML. This, however, is an unlikely maximum given that this would require 'Y' paths to be used consistently in favour of Essex Thameside traffic, limiting freight to/from the GEML, as two paths to/from Essex Thameside are 'Y' paths shared with the GEML. A more robust maximum is therefore up to six freight trains an hour from Essex Thameside, mostly using the Gospel Oak-Barking Line.[25]

It must be noted that any Essex Thameside freight which uses the GEML and North London Line via Stratford must cross the GEML amongst intensive Elizabeth Line and Greater Anglia passenger services. Currently, few services are pathed this way, limited generally to trains to and from Yorkshire via the East Coast Main Line.

To meet the ITSS shown in Figure 11, some achievable infrastructure upgrades are required, which are set out below in section 4.2.4.

4.2.2. Capacity needs on the Essex Thameside corridor

In the longer term, as per section 4.2.1 above, a total of six paths, which would need to be enabled by infrastructure improvements across London, is likely the upper limit of paths which could be consistently accommodated during daytime off-peak hours. This aligns with the long-term path requirements to meet the Freight Growth Target set out in section 3.

Network Rail's previous strategic advice assessed the capability of the track and signalling infrastructure east of Barking to be able to accommodate

[24] London Rail Freight Strategy Summary Report, Network Rail, 2021.
[25] Note, any freight ultimately routed between Essex Thameside and the East Coast Main Line must travel via Stratford and the North London Line.

growing freight traffic alongside the off-peak passenger service. This exercise tested the maximum capability of the current track and signalling infrastructure and advised that this was sufficient to meet these long-term needs. As the long-term requirement has not increased since this analysis was undertaken and no significant infrastructure changes have been made, no new capacity analysis has been undertaken, however this previous advice has been reviewed and advised to be sound.

Track and signalling capabilities are however not the only determining factor behind whether a timetable can be implemented, and section 4.2.3 below will examine the capability of other elements of the rail systems on the Essex Thameside corridor.

4.2.3. Non-capacity needs on the Essex Thameside corridor

This subsection will advise on other non-capacity factors which will determine whether increasing numbers of freight trains can reliably operate on the route.

Level crossings

The Tilbury Loop features many level crossings which must be crossed by freight services on their journeys to and from Essex Thameside terminals. These include public roads, including access roads to industrial areas or docks, and footpath crossings.

Upgrades and closures to level crossings on the Tilbury Loop will be needed to allow additional freight services to operate, some without any further changes to the network, such as signalling headways. Recent assessments have highlighted priority schemes at nine level crossings,[26] most of which are closures. While level crossing upgrades and closures would increase the overall numbers of freight services which can operate, if multiple closures are required, this is likely to come with a significant cost, especially where alternative access routes, such as pedestrian or road bridges, are required. It is recommended that detailed assessments are carried out, including into the number of additional services which could be enabled, and whether replacement structures would be required.

Decarbonisation

The running lines of the Essex Thameside corridor and its core interfacing routes across London and beyond are all electrified, however the vast majority of freight is currently hauled by diesel locomotives, with a very small number of bi-mode diesel/electric locomotives operating to and from Tilbury. A small number of locomotive swaps take place en route, such as at Wembley or Crewe, to enable electric only locomotives to partially take advantage of electrified routes.

The UK government is committed to net-zero carbon emissions by 2050. For the railway, this includes reduction and removal of CO_2 emissions from rolling stock by using greener forms of traction. The government's Transport Decarbonisation Plan and Rail Environment Policy Statement include a commitment to the delivery of a net-zero railway by 2050, with sustained reductions in emissions along the way. Several methods of decarbonising traction exist, however, electrification with overhead line is currently the only viable solution for fully decarbonising heavy freight trains for main line operations. It is important to note that modal shift to rail currently brings significant environmental benefits over road transport, until such a point in time when HGV decarbonisation takes place.

Network Rail published its Traction Decarbonisation Network Strategy (TDNS) in 2020,[27] which set out how each unelectrified route nationwide could be decarbonised by 2050. For this study area, TDNS recommended that the Thames Haven branch should be electrified to benefit long-distance intermodal freight. Network Rail is currently reviewing and refreshing the findings of the TDNS, taking into account particularly the progression of battery technology, which can be supported by partial electrification. It is still expected, however, that full electrification will remain the only viable solution to fully decarbonise rail freight traffic for main line operations, with last mile operations being more likely to be powered by alternative sources, such as the battery or diesel component of bi-mode locomotives. This is due to the complexity and cost associated with electrifying terminals for the purpose of enabling electric-only locomotives to operate within these areas in a self-powered manner.

[26] Rainham, Purfleet, St. Clements, Grays, Low Street, Coal Road, East Tilbury, Mucking, and The Bridleway (Smiths) level crossings.
[27] Traction Decarbonisation Network Strategy Interim Programme Business Case, Network Rail, 2020.

The electrification of the Thames Haven branch is the primary potential electrification opportunity on this part of the network. The main benefit of electrifying the branch would be to allow existing electric-only locomotives, such as the Class 90, to run into London Gateway's rail terminal, as opposed to requiring locomotive swaps en route. This would give access to other fully electrified intermodal terminals in Manchester, Liverpool and Mossend (Glasgow), however, further electrification elsewhere in the country would be needed to make a significant change in rail freight decarbonisation and make electric traction a viable possibility on the majority of routes. For example, to travel between Essex Thameside and the many intermodal terminals in the Midlands and Yorkshire, electrification of other lines, such as the lines from Nuneaton to Birmingham, and Peterborough to Doncaster via Lincoln, would be required. The short chord between Carlton Road Junction and Junction Road Junction would need electrifying to be accessible to electric-only locomotives travelling between the Gospel Oak-Barking Line and the MML. A variety of other lines nationally would need electrifying to support electrically hauled flows of other cargoes, such as construction materials.

In recent years, capabilities in multi-modal traction in both the passenger and freight sectors have developed rapidly, offering an alternative to costly electrification by overhead line in some areas, including the Thames Haven branch. Currently, a fleet of ten bi-mode (diesel and electric) Class 88 locomotives operated by Direct Rail Services are used nationally, which occasionally run into Tilbury 2. These run on electric traction where overhead lines exist, and then switch to diesel when transferring between the running line and the terminal. Thirty new bi-mode Class 99 freight locomotives are expected to enter into service in late 2025 with GB Railfreight.[28] In addition, Rail Operations Group has received ten tri-mode (electric, diesel and battery) Class 93 locomotives. Introducing these bi- or tri-mode locomotives on this part of the network could effectively decarbonise rail freight journeys between the Essex Thameside corridor and freight terminals accessed via the WCML by taking advantage of the already electrified network and operating in a self-powered manner within terminals.

With the rise in capability and preference for multi-modal locomotives with alternative traction for last-mile operations, combined with the limited

New Class 99 bi-mode locomotives.

number of ageing electric-only locomotives, this weakens the case for the electrification of the Thames Haven branch, as diesel or battery operation would be suitable on this short line. On this basis, no other Essex Thameside terminals are expected to be economically viable candidates for electrification (at least with public sector-led funding) as they are closer to the electrified running lines and would also be ideal candidates for bi-mode locomotives, running in diesel or battery mode inside the terminals themselves, as demonstrated by current operations to and from Tilbury 2.

Traction power

In order to serve an expected rise in electric freight trains operating, the traction power systems which supply electricity to the overhead lines must be capable of supporting them, otherwise diesel services must remain in operation so the system is not overloaded. The Essex Thameside corridor has four traction power feeder stations at West Ham, Barking, Dunton and Southend. The interfacing London orbital routes are fed from feeder stations in Bow and Acton.

Analysis has been carried out to simulate the addition of up to two electrically hauled freight trains an hour in each direction amongst the existing off-peak

[28] First Class 99 Locomotives Arrive in the UK, GBRf.

passenger service pattern, either as a pair of Class 90s operating in tandem, or a Class 99. This simulation has concluded that some uplift in electric freight could be accommodated in off-peak hours without any power supply upgrades on the corridor, which is consistent with the relatively low numbers of freight trains expected to transition from diesel haulage in the short- to medium-term. Running freight trains with electric locomotives in peak hours would likely be challenging to accommodate, and further modelling would be required to identify possibilities. Operating restrictions currently exist to limit the number of electric freight trains in the morning peak.

Longer term, to meet the aspiration of fully decarbonising the rail freight sector and removing diesel from all but last-mile operations within terminals by 2050, the traction power supply on the corridor will need to be upgraded. This is because the existing feeding capability will be exceeded, especially Barking feeder station, which supplies the Tilbury Loop. Options to provide more supply would include;

- rearranging the feeding areas of the four Essex Thameside supplies to balance the power draw more evenly. This could be undertaken to provide enough power for a modest increase in electric freight operations in the medium-term, or;
- replacing one or more existing supplies with a new higher capacity supply, suitable for an all-electric operation aspired to in the long-term.

Due to the current relative scarcity of electric and bi-mode freight locomotives and lack of electrification on other parts of the national network, it is not expected that traction power upgrades will be required in the short-term. However, it is also unclear exactly when they would be required, as, ultimately, the rate of uptake of electric and bi- or tri-mode freight locomotives, driven by any potential governmental policies, as well as progress with electrifying other parts of the network, will drive the timings of the traction power improvements required. Collaboration between freight operators and Network Rail will be required to ensure the pace of traction decarbonisation is supported by power supply capacity, and operators can make best use of their assets.

Across London, the Gospel Oak-Barking Line is fed from Barking feeder station as far as South Tottenham, after which the supply is fed from Acton. The North London Line is fed from a supply at Bow, near Stratford, as far as Camden Road, where it also transitions to the Acton supply. In the short- to medium-term, up to two electrically hauled freight trains per hour in each direction could be accommodated, though capacity of the Bow feeder station, which also supplies the GEML, will be nearing its limit.[29]

To support increased electrical load in this area, Pudding Mill Lane feeder station will require commissioning into operational service between Bow and Gidea Park, reducing the pressure on Bow feeder station and increasing the overall capacity in East London.[30] This would enable sufficient long-term capacity for this part of the network. These works are estimated to require up to £10m in funding and 2-3 years to fully deliver.

It is important to consider that while traction power does not pose a significant near-term constraint in this specific geography, traction power capability needs to be considered at a national level for freight purposes. Further analysis would be required to demonstrate end-to-end capability to support greater quantities of electric freight, especially if future freight rolling stock only has last-mile alternative traction capability.

Performance

A high performing and reliable railway is of critical importance to all stakeholders. Consistently strong performance is essential to build and maintain a reputation for quality service that passengers and freight operators can rely on and use regularly. The Essex Thameside corridor has developed a reputation for being one of the consistently strongest performing passenger lines in the country, with performance data published by the ORR showing consistently high punctuality for c2c passenger trains. For example, as a simple illustration, c2c trains arriving within 3 minutes of their timetabled arrival time is around 92-94% in recent quarters, contrasting with a national average varying between 81 and 87%.[31]

[29] The capacity of Bow feeder station is also influenced by the demand for electrically hauled passenger or freight services on the GEML and North London Line. If services on these lines increased, this could also drive a supply upgrade. It should be noted that peak Greater Anglia services on the GEML are currently up to 4tph lower than they were in 2019.
[30] The Pudding Mill Lane substation was built for the new sections of railway built for the Elizabeth Line, along with a currently unused connection for the GEML.
[31] Various passenger performance statistics are available on the ORR's Data Portal.

For freight operators, Network Rail data shows that around 80-85% of freight trains destined for a terminal on the Essex Thameside corridor arrive within 15 minutes of their scheduled arrival time. For freight departing Essex Thameside terminals, right time departures stand at around 85-90%. These figures compare with national figures of around 82-87% and 76-81% respectively. Punctuality of arrivals is therefore slightly lower than the national average, and departures are above the national average. The lower arrival punctuality is perhaps not surprising due the corridor's location and the length of journey trains have to reach their destination. Performance is also a concern in the short-term on the North London Line due to the level of traffic on the line.

It is important that this level of performance does not decline, and that where possible it can be improved. There is a concern that increasing freight traffic, which travels long distances and must mix with several other train services, could lead to performance declining, and with less empty space in the timetable, fewer opportunities for timetable recovery would exist, leading to delays and a deterioration in overall performance. Ensuring that additional freight trains will be reliable and won't negatively impact existing services is therefore essential in further detailed train and infrastructure planning activity.

As timetables on different routes may not always align to enable trains to be easily planned between them, to maximise potential capacity and performance it is beneficial to be able to hold trains at strategic interfaces between corridors and enable high quality, reliable paths to be planned between them. This can help to ensure performance can be as high as possible for both interfacing routes, particularly on a network which is getting busier.

Vital to improving performance on Essex Thameside and the London orbital routes is the development of such a site on the Essex Thameside corridor to hold freight trains ahead of a westbound journey across London. An existing series of shorter sidings at Ripple Lane, strategically located near the interface between the Tilbury Loop and the London orbital routes, is proposed to be redeveloped to be suitable for modern freight trains up to 775m long. This can enable a train departing one of the Essex Thameside terminals to be held clear of the running lines for a path across London which may not be viable without the yard. Other regulation options could also be available which should be explored when developing the Ripple Lane scheme further.

A modern yard in this location could also be beneficial for other activities such as splitting and joining trains, locomotive changes, crew changes, refuelling, as well as opening up more opportunities for receiving trains from Europe via the Channel Tunnel, if built to the larger continental loading gauge used by European freight trains. Ensuring it is electrified will also maximise rolling stock and timetable flexibility.

Existing yards at Wembley and Acton perform similar roles for trains heading east towards the Essex Thameside terminals and elsewhere.

A further option to improve freight performance could include doubling of the single track line between Upminster and Grays. This route is currently gauge cleared for freight and available as a diversionary route, though doubling of the route would potentially increase its utility during unplanned or planned disruption. This may also be beneficial for increasing peak hours passenger services.

When developing long-term strategic advice for the industry, it is usually not possible to reliably model how additional trains may perform, because a well-developed timetable is required to provide accurate advice over and above the strategic level investigations carried out at this stage. Detailed performance modelling is therefore typically carried out much closer to timetable implementation when these detailed timetabling exercises have been undertaken. On this corridor it could, however, be beneficial to test some generic pathing assumptions based on adding further trains into today's timetable to understand how the network could perform with more frequent services (both freight and passenger), and also understand if any infrastructure improvements (such as passing loops, or changes in line speed, including differential speeds) could be made to offer additional service recovery options.

4.2.4. Off-corridor challenges and opportunities

Due to the long-distance nature of freight, it is important to consider whether any improvements need to be made on interfacing routes to enable growth in freight traffic. While the Essex Thameside corridor is the geographic focus of the study, this subsection will examine what improvements outside its geographic area need to be prioritised to enable increased traffic to travel beyond the corridor.

Cross-London challenges and opportunities

As all Essex Thameside freight traffic must travel via the North London orbital routes and mix with different intensive passenger routes, the success of Essex Thameside freight therefore depends on the capacity and capability of these cross-London routes and the number of other trains which operate upon them. This corridor is regularly operating at around 90% track utilisation or above with little capacity to reliably introduce additional services for most of the day.

Section 4.2.1 explained that the realistic maximum number of paths which can be regularly accommodated during off-peak daytime hours across London is likely to be six, mostly operating via the Gospel Oak-Barking Line. To enable this level of traffic to operate, a series of core improvements listed below are required across North London, which would benefit not only Essex Thameside freight, but other freight routes and passenger services as well.

- **Reduce headways to a consistent 3-minute gap** on the North London Line and Gospel Oak-Barking Line to allow trains to run closer together.[32]
- **Reinstate a third track between Camden Road station and Camden Road East Junction** with associated platform face at Camden Road station. This would enable platform 2 to be converted into a centre turnback accessible from both directions, with the new platform 3 line clear for through traffic, including freight.
- **Increase speeds across Kensal Green Junction** to achieve a 3-minute junction margin (currently 4 minutes) improving capacity and performance of North London Line for freight and passenger services. Speeds are currently 10-15mph with a target speed of 35-40mph.

These core improvements are required to meet the level of freight and passenger demand which will be expected from the 2040s in order to meet the Freight Growth Target. It is recommended that further development takes place in the short-term for this package of upgrades so that the railway does not constrain growth, and ideally enables growth on a higher trajectory than the Freight Growth Target-meeting trajectory presented in this study.

A freight service from Essex Thameside approaching Gospel Oak Junction.

Additionally, complementary infrastructure improvements at Harlesden Junction, Gospel Oak Junction and Stratford, along with improved gauge clearance and strengthened structures to carry larger and heavier loads are recommended. These options are explained further in the LRFS summary document on the Network Rail website.[33] When developing the core options, consideration should be given as to whether any of the complementary options should also be progressed, as well as other potential options.

It is essential that these improvements take place to grow rail freight traffic to and from the Essex Thameside corridor and meet the government's Freight Growth Target, as well as ensuring future passenger capacity requirements in North London are met. Without them, the high growth potential of South Essex freight sites, including the intermodal ports, could be constrained, or

[32] Note, the section on the North London Line between Gospel Oak and West Hampstead stations would need to remain at 4-minutes due to safety-related restrictions in Hampstead Heath tunnel.
[33] London Rail Freight Strategy Summary Report, Network Rail, 2021.

more of their onward traffic would need to travel by road, with the negative congestion and polluting consequences this entails.

Cross-country challenges and opportunities

East Anglia is home to another of Britain's busiest ports, with the around 52 freight trains arriving and departing the Port of Felixstowe each day in summer 2025. Most of these trains travel cross-country via Bury St Edmunds and Ely, linking up with various terminals in the Midlands or North of England, but a significant minority – around 14 a day – also travel via London, interacting with traffic to and from the Essex Thameside corridor on the Great Eastern Main Line and North London Line.[34]

The cross-country route is currently operating at or close to maximum capacity, and Network Rail, the rail freight industry and various other local and national partners have long been advocating for an increase in capacity on the cross-country corridor to drive a growth in rail freight to and from the Port of Felixstowe. However, it is important that proponents and funders recognise that improvements to cross-country capacity could also benefit Essex Thameside traffic by enabling some existing Felixstowe traffic to be diverted away from London.

A staged programme of investment, known as the Felixstowe to the Midlands and the North (F2MN) programme has been developed by Network Rail on behalf of the rail industry to incrementally increase capacity for freight on this cross-country route, as well as improving some passenger routes. The first stage of the F2MN programme includes upgrades to infrastructure at Haughley Junction (north of Ipswich), expected to cost up to £30m, and in the Ely area, expected to cost up to £550m. Together with signalling improvements between Ely and Peterborough, this would deliver capacity for an additional 12 freight trains in each direction per day. Further phases, including doubling of the route between Soham and Ely, and other capacity gains further west between Peterborough and Nuneaton would deliver additional freight paths.

It is possible that rather than being an overall net gain of 12 freight trains in each direction a day for Felixstowe traffic, that some of the existing traffic

Ely North Junction.

routed via London could instead be diverted cross-country, where practical and beneficial to do so. This would therefore release some paths for the benefit of the various terminals on the Essex Thameside corridor, sharing the benefit more widely and distributing rail freight traffic more evenly.

Similarly, East West Rail (EWR) also offers an opportunity to transport more Felixstowe traffic cross-country and releasing cross-London traffic for the benefit of Essex Thameside. Two freight paths a day in each direction are planned to be included as part of the overall timetable solution, which would be of benefit to the limited amount Felixstowe traffic which travels to Wales or the South West. This traffic is currently routed via London, and if, re-routed, additional paths may be possible to and from Essex Thameside.

Although not included in the scope of the EWR project, an east-to-north facing chord from EWR to the West Coast Main Line at Bletchley would provide

[34] Note, these figures have reduced from around 70 a day, 20 of which travelled via London, since the changes to shipping markets in early 2025.

further routing options for Felixstowe freight trains to/from the West Midlands, North West and Scotland, also potentially offering opportunities to remove some traffic routed via London for the benefit of Essex Thameside freight. This chord could cost in the region of £160m and have the ability to provide around 15 paths a day between Felixstowe and the Midlands and North West. Other improvements, such as greater capacity in the Newmarket area may also be required.

In summary, it is critical that funders recognise that improvements which at first glance may appear to exclusively benefit other freight flows could have a great benefit to the Thames ports and other South Essex freight terminals, if a 'whole system' approach of determining complementary investment options and allocating capacity is taken. If a package of cross-London and cross-country freight-orientated improvements were prioritised a freight routing situation could emerge whereby the vast majority of Felixstowe traffic is routed cross-country via the existing cross-country corridor and the EWR corridor (being utilised to its full potential), leaving the cross-London corridors largely clear for growing Essex Thameside freight.

Some other minor flows to/from destinations on the GEML, such as the aggregates terminals at Chelmsford, Marks Tey and Ipswich would still require paths via London so it is not possible or practical for all GEML freight to be re-routed away from London. Also, some capacity for Felixstowe services via London would also be desirable from a diversionary perspective for when part of the cross-country route is closed on a planned or unplanned basis, and paths would still fit in the timetable on the 'Y' path basis previously described. Figure 12 opposite shows the optimal primary routing solutions for intermodal traffic which forms a majority of freight trains operating on these routes.

It should be noted that gauge enhancements would be required on the Midland Main Line to enable direct intermodal flows between Essex Thameside and the East Midlands. If this is not possible then these flows will still need to travel on the West Coast Main Line via Birmingham.

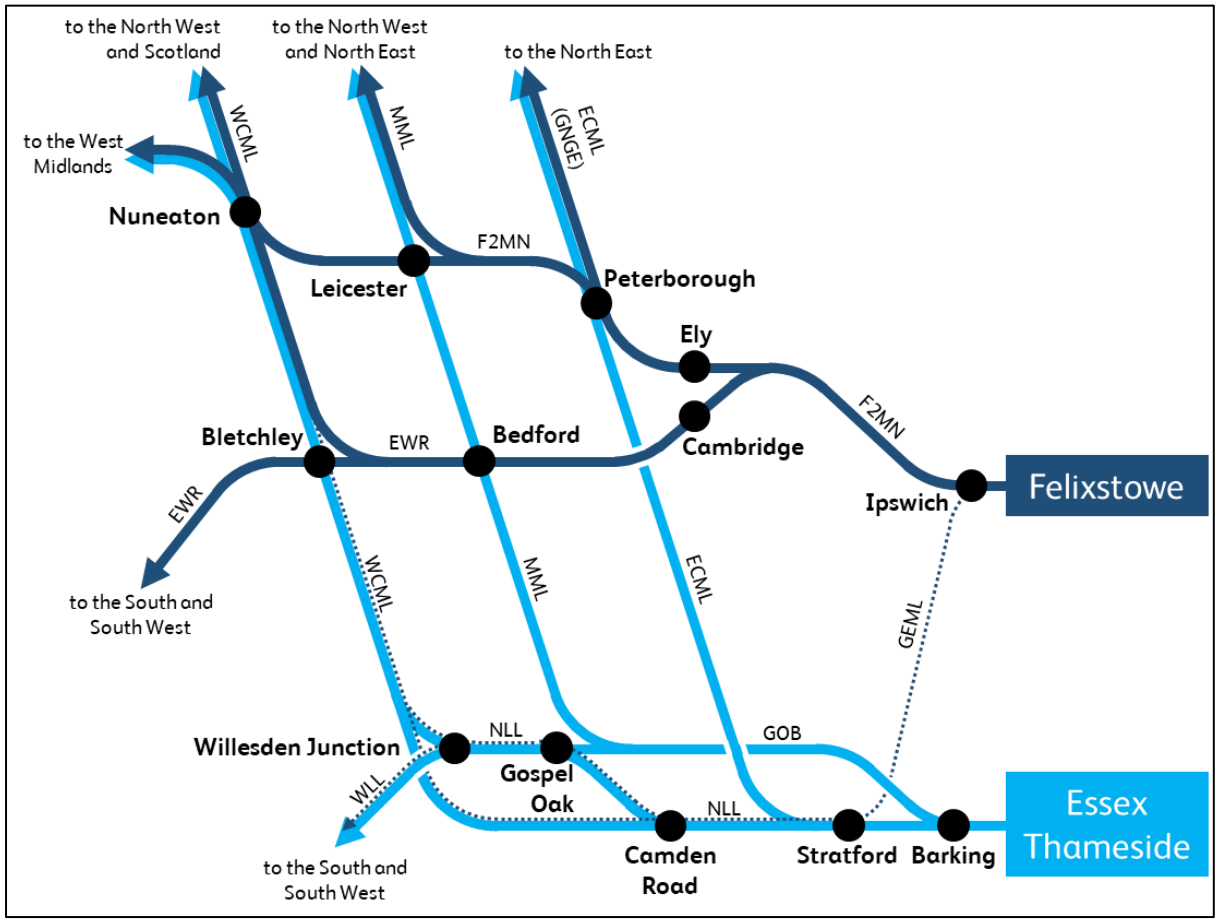


Figure 12 – Optimal split in traffic for most Essex Thameside and Felixstowe intermodal traffic, enabled by capacity and capability investment in both routes.

4.3. Other considerations

4.3.1. Improvements in the context of a national freight system

The analysis in this section outlines improvements which could be made in South Essex and the immediate connecting network across North London, as well as the interface with Felixstowe freight. These areas have been included to demonstrate how options on other parts of the network can drive growth

in a separate area. This, however, is not exhaustive and progressing options on other parts of the network may also need to be required. For example, W10 or W12 gauge clearance on the southern end of the Midland Main Line and its connection to the Gospel Oak-Barking Line would open up the route to intermodal traffic, enabling the routing option shown above in Figure 12. Electrification is a further opportunity which needs to be considered with a national perspective.

4.3.2. Higher growth and port growth plans

Demand for rail freight haulage is highly sensitive to market conditions in the wider national and international economy, construction industry and shipping industry, as demonstrated by the recent changes in shipping traffic between Felixstowe to London Gateway. Therefore, long-term forecasts are not without a degree of uncertainty, and it is possible that the improvements to enable the level of service expected to be required by 2040 or 2050 may be required sooner or later than advised.

Industry partners have advised that the forecast presented in this study is towards the lower end of what the market could deliver if the rail network could accommodate more traffic, and that an ambitious delivery of enabling upgrades should be prioritised to harness this potential. What is clear, however, is that cross-London and cross-country capacity improvements will be required to meet and ideally exceed the government's Freight Growth Target, and that funders have a choice as to when to enable this growth.

The Port of Tilbury (PoTLL) is a nationally significant multimodal freight hub handling 13 million tonnes annually across multiple sectors, including intermodal, construction materials, metals, recycling and automotive. While rail only currently accounts for around 5% of port throughput, the Port of Tilbury plans to grow this to 29% by 2030 as part of its growth strategy, facilitated by growth of the port estate, including new railheads. PotLL projects that demand for rail services would grow from around 31-38 trains per week (arrivals and departures) today up to 78-95 in 2030, focussed on the construction materials, automotive and recycling markets. Increased construction materials handling capabilities could assist with significant infrastructure projects such as the Lower Thames Crossing.

PoTLL's growth aspirations also include generating up to £400m of private investment across the port estate, creating up to 1,000 jobs, as well as contributing towards reducing HGV movements and CO_2 emissions.

At London Gateway £1bn worth of investment is currently in delivery, which includes two new shipping berths and a new rail terminal designed to provide enough terminal capacity to approximately double rail freight traffic up to around 50 departures a day, and will create 400 permanent jobs. The new terminal is expected to be operational by the end of 2026. Additionally, customers including Tesco and CMA CGM are opening new distribution centres at London Gateway, further driving rail freight potential.

These plans show that there is very high underlying growth potential at the two busiest ports in South Essex. While some additional trains could be possible without major changes to the network – through better use of existing paths as well as a modest number of additional paths – the full rail growth ambitions of both ports are unlikely to be realised without more fundamental upgrades to the network, particularly across North London.

This could not only constrain and slow potential rail freight growth, including towards meeting the government's freight growth and decarbonisation targets, but also constrain investment in the local economy and jobs market.

4.3.3. Off-peak passenger needs

These forecasts account for off-peak passenger service uplifts on the North London Line expected to be needed to accommodate a rise in passenger demand between Stratford and Camden Road. No uplift in passenger trains on the Gospel Oak-Barking is expected to be required in the off-peak where freight trains mostly operate. Likewise, no demand-driven increase in off-peak passenger services on the Essex Thameside corridor are expected to be needed. However, if more passenger trains are planned to operate on any of these routes, due to either higher than expected off-peak passenger growth, or an aspiration to provide a more frequent convenient service to passengers, this could have an impact on the overall number of freight services that are able to operate, and ability to meet or exceed the Freight Growth Target.

5. Freight recommendations summary

This section has set out the various improvements required to grow the railway's capacity and capability to handle more freight trains to and from Essex Thameside terminals alongside other freight traffic and growing passenger needs. Consideration of decarbonising traction and what that would mean for traction power supply capabilities has also been given. In summary, it is recommended that the following improvements are considered;

Short-term

Level crossing upgrades and closures

Activation of Pudding Mill Lane power supply to the GEML

Medium-term

Rearrangement of traction power feeding areas to balance power draw (subject to the rate of uptake of electric or bi-mode locomotives)

Ripple Lane Nodal Yard and other regulation points

Electrification of the Thames Haven branch (to be considered in context of uptake of bi-mode locomotives)

The package of 'core' cross-London capacity upgrades and consider additional options

The first phase of the F2MN programme

Long-term

A new high capacity traction power feeder station in Barking area

The Bletchley chord and other supporting enhancements

The majority of these improvements are recommended to be delivered by around 2040 (and ideally sooner) in order to ensure network capacity and capability is able to meet, and ideally exceed and proactively facilitate faster rates of growth. Some improvements could be considered for earlier delivery to address some of the current North London Line performance concerns as well as traction power capacity in the Stratford area. Where possible, delivery of enhancements alongside renewals should be considered to make best use of limited available funding. Earlier delivery should be considered to meet and enable faster demand growth.

Precise phasing, as well as costing, of these improvement options would need to be developed by project delivery specialists during business case development, however it is clear that level crossing upgrades and closures could provide some early capacity gains and should be delivered first. It is advised that these recommendations are treated as a 'package', including the F2MN programme, each contributing a benefit to an overall freight growth objective across the East, rather than as individual schemes.

In the short-term, scenario-based performance and simulation modelling could be carried out to identify any other performance-led needs on the Essex Thameside corridor.

Expected growth (peak hours)

- 24.5 % 2023 – 2033
- Between 58 % and 80 % 2033 – 2050

Main challenges

- Lack of rolling stock to operate longer trains
- Adequate depot and stabling facilities
- Short bay platforms at Grays and Shoeburyness
- 3 minute headway between Barking and Upminster

Headline options

- Lengthen trains (up to 240m – 12 or 10-car – maximum length)
- Optimise timetable to provide more station calls without additional trains
- Extend platforms at Grays and Shoeburyness
- Renew fleet
- Improve signalling headways and increase frequency

PASSENGER

6. Passenger demand forecast

Passenger demand forecasting is conducted to advise future train service options to meet future levels of expected demand and ensure the industry can plan necessary investment in rolling stock or infrastructure to accommodate it well in advance. For this study, Network Rail has analysed bespoke modelling carried out by consultants Steer for Trenitalia UK, the pre-nationalisation parent company of c2c, and reviewed by Network Rail analysts.

Steer's work forecasts future passenger demand on all Monday-Friday c2c services in both directions from a 2023 baseline level of demand. The analysis uses observed passenger loading data from a selection of Wednesdays (typically the busiest day of the week on c2c services) to calibrate the industry's standard demand modelling tool, MOIRA, to remove inaccuracies in the standard model and reflect as best as possible the baseline and future level of demand. This allowed a forecast of passenger demand out to 2033 to be created, giving a robust single forecast scenario for the short-term. This forecast accounts for passenger growth from several drivers, including;

Growing local employment

Increasing road congestion

Increasing affluence

Local population growth from housebuilding

Beyond 2033, two scenarios projecting potential growth have been analysed to reflect longer term uncertainties in forecasting and to provide a range of advice on potential needs by 2040 or 2050. These are a 'Central Growth' scenario and a 'High Growth' scenario. Figure 13 opposite illustrates the expected trajectory of passenger growth from 2023 to 2050 following the fall after 2019. This shows;

- the significant fall in demand between 2019 and 2023 in green;[35]
- the short-term forecast as far as 2033 (with intermediate modelled years in 2027 and 2030) in orange, and;
- the two long-term scenarios in pink and blue.

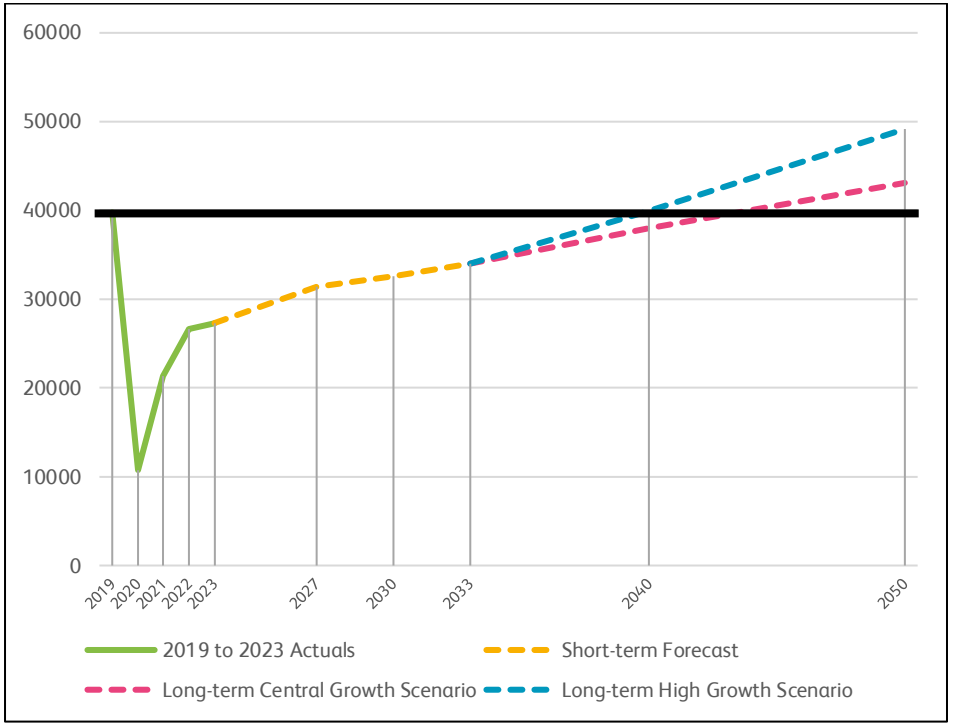


Figure 13 – Expected passenger demand in the three hour morning peak (07:00-09:59 arrivals at London Fenchurch Street).

The short-term forecast suggests a slight uptick from the growth seen between 2022 and 2023 as far as 2027, and then reducing slightly between 2027 and 2033. Longer term, the 'Central' long-term scenario continues a similar growth rate as the 2027-2033 forecast, and the 'High' scenario reflects a situation where demand grows more rapidly, for example due to rapid housebuilding and population growth.

Based on these scenarios, it can be expected that total demand across the morning peak will return to 2019 levels between around 2040 and 2043, illustrated by the trajectories crossing the thick black line, again demonstrating the significant fall in peak hours demand following the pandemic. Table 6 below shows the approximate growth rates expected from 2023 to the study's reference years – 2033, 2040 and 2050.

[35] 2019-2023 data from RAI0213 – Peak rail capacity, standard class critical loads and crowding on a typical autumn weekday in London by station, annual from 2011, DfT.

Timeframe	Average yearly growth	Overall growth
2023 to 2033	2.2 %	24.5 %
2033 to 2040	1.6 – 2.3 %	11.9 – 17.3 %
2040 to 2050	1.3 – 2.1 %	13.3 – 23.3 %
2023 to 2050	**1.4 – 2.2%**	**57.8 – 80.0%**

Table 6 – Summary of passenger demand growth rates based on the three hour morning peak (07:00-09:59 arrivals at London Fenchurch Street).

These growth rates result in approximate levels of demand at the critical load point[36] as shown below in Table 7 for the high peak hour and three hour peak. Just over half of the demand is on trains on the route via Laindon, with the routes via Purfleet and Ockendon having a similar amount at just under a quarter each.

Year	High peak	Three hour peak
2033	14,700	34,000
2040	16,500 to 17,200	38,000 to 39,900
2050	18,700 to 21,300	43,100 to 49,200

Table 7 – Expected total demand at the critical load point by reference year on a typical Wednesday.

7. Future passenger capacity needs

While the demand summary in section 6 may appear to indicate no issues are forecast until at least the late 2030s when making a comparison with 2019 levels of demand, it is important to note that between 2010 and 2019, DfT crowding statistics show that 100 % of services arriving in the morning high peak into London Fenchurch Street had standing passengers, and up to 89 % in the three hour peak. While standing passengers on all services is not unexpected, DfT data also reveals that in total, up to around one third of passengers arriving in London were standing, indicating that heavily loaded trains were common.[37] This issue was recognised at the time, and was one of the drivers for conducting the previous study in 2019. It is important that being below total 2019 demand is not misconstrued as meaning there are no issues with peak hours passenger capacity.

The analysis undertaken in this study aims to provide the basis for high quality customer service and reduce the need for passengers to stand in the peak periods and eliminate standing entirely for passengers travelling from further away. The commonly accepted threshold for morning peak standing is that no passengers should be standing from stations further than 20 minutes from the end destination. For this corridor, it is deemed that passengers from the stations indicated in Table 8 and everywhere east must be able to have a seat.

Route	Seating cordon	Typical journey time to London Fenchurch Street
via Laindon	West Horndon	32 mins
via Purfleet	Dagenham Dock	22 mins
via Ockendon	Ockendon	31 mins

Table 8 – Standing thresholds across the three routes.

The 20 minute threshold would ordinarily include Upminster on the roues via Laindon and Ockendon, which is around 24 minutes from London Fenchurch Street. However, this has been deliberately excluded as the volume of passengers boarding at Upminster would otherwise mean that a much greater number of seats would be required, particularly in the later years of the forecast. Also, its location within the London travel zones and at the end of the London Underground District Line lends itself to a metro style service where some standing is acceptable. Instead, West Horndon and Ockendon have been identified as the suitable cordon point, at and east of which all passengers should be seated.

As the busier of the two peaks, the morning peak from the start of service up to 10:00, has been analysed to provide strategic advice on when capacity-driven service improvements will be required. The analysis is based upon the December 2019 timetable structure as this is the highest capacity timetable which has been operated on this route to date. The current May 2025 timetable operates one less train via Laindon in the high peak.

The subsections below consider each of the three routes in turn for all three reference years (2033, 2040 and 2050). Where rising demand is resulting in timetable or infrastructure intervention potentially being required by 2033,

[36] The critical load point is the point on a train's journey where it is at its busiest.
[37] Data from dataset RAI0213 – Peak rail capacity, standard class critical loads and crowding on a typical autumn weekday in London by station, annual from 2011, DfT.

further interrogation of the demand forecast has been undertaken to estimate how far in advance of 2033 the improvements may be required.

For 2033, it is assumed that the primary train type used on the corridor will be the existing Class 357.[38] As a baseline, it is assumed that all peak services operate as an 8-car train and where demand exceeds capacity, either in total, or all seats are taken east of the seating cordon shown above in Table 8, a 12-car unit is recommended.

An alternative 2033 scenario is also analysed based on using a fleet of Class 720s, using a 5-car unit as a baseline and using the same assessment criteria to recommend longer services. For 2040 and 2050, the baseline rolling stock is assumed to be a 5-car Class 720, as by 2040 the Class 357 fleet will be 40 years old – around the usual maximum expected life of modern passenger trains – and due replacement. The Class 720 has been chosen as an alternative baseline as it offers different operational options, has a mix of 2+2 and 3+2 seating and is also currently operated by c2c.

Where train lengthening is not sufficient to meet projected capacity needs on a given service, timetabling and train service alterations will be considered before infrastructure upgrades as these are expected to be more affordable, contributing to the objective of the railway becoming more financially sustainable.

It is important to note that the cars which make up a Class 720 are 24m long versus 20m long in Class 357s. Therefore, as shown in Figure 14 below,[39] the 5-car Class 720 is equivalent in length to six 20m Class 357 cars, and a 10-car unit is approximately the same length as a 12-car Class 357. Overall space in the Class 720 is slightly higher as less space is taken up by exterior doors and vestibules, gangways connecting coaches, and driver cabs. Partial 2+2 seating with a wide aisle also allows more standing space.

7.1. via Laindon

Also known as the 'Main Line', this route has the most services and also the most varied timetable structure of the three routes, with trains originating at several different stations and making varying calling patterns in order to distribute passengers and speed up journey times for passengers from the eastern end of the route. As a result, the critical load on these services can differ substantially, both in terms of its location and number of passengers, with some services much busier than others. A potential strategy to pursue could be to balance loadings across services through timetable changes, though noting that this will likely create winners and losers in terms of journey times and may present operational challenges.

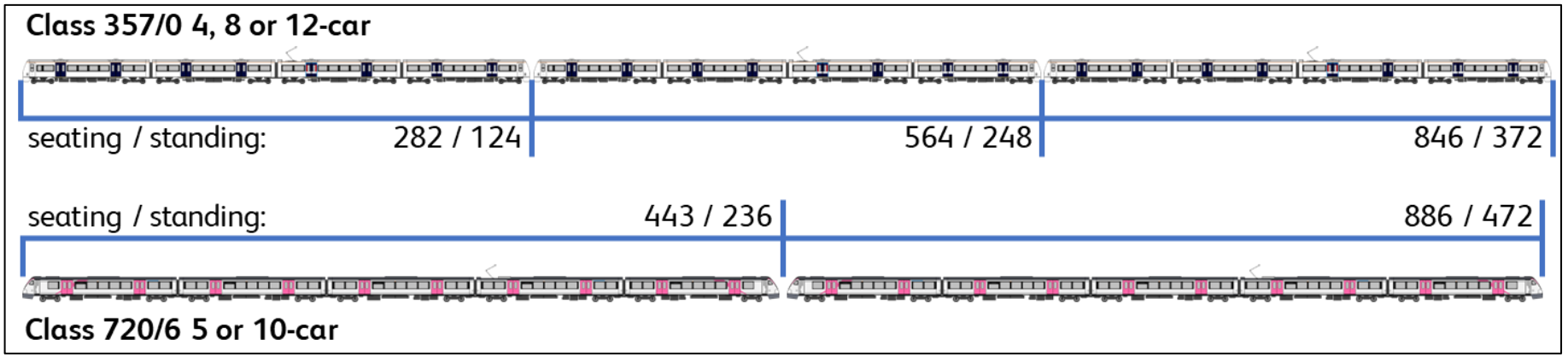


Figure 14 – Illustration of total capacity of Class 357 and 720 trains.

[38] Specifically the Class 357/0, though it is noted that higher density Class 357/3 with fewer seats and more standing space is also operated by c2c.
[39] Class 357 and Class 720 images from Wikimedia Commons.

7.1.1. 2033

By 2033 the busiest services are expected to carry just over 1,000 passengers at their busiest point, whereas the quieter trains are expected to carry around 500-600. Total demand at the critical load point across all services arriving in London before 10:00 is expected to be around 22,500, including around 7,900 in the high peak hour.

To satisfy demand and provide sufficient seats for passengers from beyond Upminster, at least 5/12 high peak trains via Laindon will need to be 12-car length. This is a reduction on 2019 levels, where 8/12 operated as 12-car. In the shoulder peaks, however, 8/24 are required to be 12-car versus 3/24 in 2019, reflecting similar levels of demand outside of the usual high peak, particularly before it.

If using 720s then 11/12 high peak trains would need to be 10-car, because, as illustrated by Figure 14 above, the 5-car Class 720s do not have as much capacity as an 8-car Class 357. As a result, many services would likely have lots of spare capacity if using a fleet of Class 720s in 2033. If operating more services at 10-car length, then it may be necessary to either extend the shorter 183m bay platform at Shoeburyness, which is currently only long enough to receive 8-car Class 357s, or provide a new platform at least 244m long to the north.

Extending the existing platform is unlikely to be feasible as it is constrained at both ends by the rail connection to the carriage sidings at the west end and by blue badge car parking spaces, cycle parking and the station building to the east. Therefore, if another long platform was required, it may be necessary to extend the station northwards onto Network Rail land currently covered by bushes and small trees, as shown below in Figure 15. If another platform is provided, and the existing one is no longer required, the track could be recovered and the land reused for the benefit of station facilities, such as car parking.

It is expected that three services will have all of their seats taken east of the standing cordon, even if operating as 12-car trains. Two of these are projected to have all seats taken by Basildon, around 37-39 minutes from London Fenchurch Street, as shown in Table 9 below.

Origin	Origin time	Time at London Fenchurch Street	All seats taken by
Shoeburyness	06:48	07:48	Laindon
Shoeburyness	07:39	08:47	Basildon
Shoeburyness	08:00	09:05	Basildon

Table 9 – 2033 services via Laindon over seating capacity east of the cordon.

Unless some passengers redistribute themselves to other services to avoid the busier trains, additional capacity will need to be found to ensure all passengers can be seated from stations such as Basildon and Laindon. Adjusting calling points of services either side of the busiest services to add in more calls at stations including Basildon, Pitsea and Benfleet should be considered as a priority to avoid adding additional services into the timetable. This could

Figure 15 – Overview of Shoeburyness station and potential future platform needs. Existing shorter platform shown in blue, with potential location of future platform in orange.

include moving the starting point of some of the trains which start at Laindon back to Leigh-on-Sea or Southend Central and the trains which start at Leigh-on-Sea back to Southend Central.

The aim of this would be to spread passengers more evenly by adding more station calls at the busiest stations, reducing the load on the busiest services. Detailed analysis of the many combinations of options which could exist would need to be carried out to assess the impact on timetabling, including aspects such as numbers of trains and drivers required, and passenger behaviour.

Additional trains could also be considered but given the lighter loading of some existing trains, the most cost-effective option would be to try and nudge passengers towards these services with timetable changes. Additional trains would require signalling headway improvements to provide a consistent 2 minute headway between London Fenchurch Street and Upminster, which is unlikely to be deliverable or affordable before 2033.

7.1.2. Additional 2027 analysis

As the forecast is indicating that some services will be beyond seating capacity of a 12-car train and a timetable modification will be required before the study's first reference year of 2033, further analysis has been undertaken to establish more accurately when these improvements will be needed. This has indicated that all seats will be taken on the three services shown in Table 9 east of the standing cordon by 2027. As such, timetable optimisation and a return to 12tph via Laindon in the high peak should be prioritised as soon as possible.

7.1.3. 2040

By 2040, with the December 2019 calling pattern,[40] the busiest trains are expected to be carrying over 1,100 passengers, with total demand expected to be between 25,200 and 26,400 depending on growth scenario across all services before 10:00. Between 8,500 and 9,200 passengers are projected in the high peak hour.

At least 9/12 high peak trains will need to be 12-car length if the Class 357 fleet was still in service. If using Class 720s then all of these would need to be 10-car to avoid standing beyond the cordon. Most of the services before the high peak would also need to be 12- or 10-car, again reflecting the relatively high demand in the period before the traditional high peak hour. Assuming fleet replacement takes place by 2040, the 244m platform at Shoeburyness shown in Figure 15 would be required. Operational solutions should also be sought to avoid a costly infrastructure intervention.

In both the Central and High growth scenarios five services will have all of their seats taken east of the standing cordon, as shown in Table 10 below, with some slight differences in location where all seats are taken depending on growth scenario. Two services have all their seats taken by Benfleet, 38-43 minutes from London Fenchurch Street.

Origin	Origin time	Time at London Fenchurch Street	All seats taken by
Shoeburyness	06:25	07:35	Laindon
Shoeburyness	06:48	07:48	Laindon (C) Benfleet (H)
Shoeburyness	07:39	08:47	Basildon (C) Pitsea (H)
Leigh-on-Sea	08:04	08:56	Laindon
Shoeburyness	08:00	09:05	Benfleet

Table 10 – 2040 services via Laindon over seating capacity east of the cordon.

As with the 2033 level of demand, it is possible that sufficient capacity could be provided through timetable changes to provide more options for passengers in the area between Southend-on-Sea and Basildon, noting that this would increase journey times for some passengers, and would need detailed investigation to establish options. By this date, additional services could be an option to consider, particularly in a high growth scenario, which would require signalling upgrades to be delivered.

[40] Note that any changes made before 2040 to attempt to rebalance loadings would influence the figures quoted in this section.

7.1.4. 2050

After 2040, in both the Central and High growth scenarios, almost all trains before 10:00 would be expected to be at their maximum length, so by 2050 more trains will be needed to ensure capacity keeps up with demand and passengers can still be seated. Total demand at the critical load point before 10:00 is expected to be between 28,500 and 32,600 depending on growth scenario, with 10,000 to 11,400 in the high peak hour. Multiple adjacent services are projected to be either above or near maximum capacity, either in total or above the maximum seating capacity available east of Upminster, leaving fewer timetable alteration options.[41]

The levels of demand projected in the first of the three high peak hours (07:00 to 07:59 arrivals at London Fenchurch Street) suggest that its (December 2019) 10tph structure would need to be increased to 12tph, as per the December 2019 high peak. This is to cater for growing demand in the area between Basildon and Southend-on-Sea. To accommodate additional services in the high peak and allow trains to run closer together west of Upminster, re-signalling of the route will be required.

Analysis conducted for the previous study revealed that up to 24tph could be operated in the section west of Barking where all three Essex Thameside routes converge, giving up to an additional 4tph, and up to an extra 3,544 seats based on the 10-car Class 720. 24tph is considered the maximum which could be operated with London Fenchurch Street's four platforms and equates to a service between Barking and London Fenchurch Street on average every 2 ½ minutes.

Analysis of the projected 2050 loadings suggest that at least an extra 2tph would be required if using a full 10-car Class 720 fleet. The requirement for further services would depend on the effectiveness of timetable changes suggested to be implemented before 2040, such as reorganisation of station calls, including extending existing Laindon starters further east.

7.2. via Purfleet

During the morning peak, the services via Purfleet normally originate at either Southend Central or Pitsea and call at all stations on their journeys towards London Fenchurch Street. Services run at 4tph in each of the three peak hours, with the critical load point tending to be on departure from Barking. With fewer services and a more uniform service pattern, the pattern of passenger loading is more typical of what is found in peak hours services with a sharp peak during the high peak hour and lower usage in the two shoulder peaks.

7.2.1. 2033

By 2033, most trains across the three hour peak are expected to carry around 600-650 passengers at the critical load point, with a clear peak up to 1,050 passengers on one of the high peak services on departure from Barking. Total demand across the four high peak services is expected to be around 3,300 at the critical load point, and up to around 8,700 on all services before 10:00.

To meet demand and provide seating for all passengers boarding at or east of Dagenham Dock, 3/4 services will need to be 12-car by 2033 if using a Class 357 fleet. This compares to the December 2019 timetable baseline of an all 8-car service. If using Class 720s, all will need to be 10-car to ensure all passengers from east of Dagenham Dock can be seated (again due to the lower capacity of a 5-car Class 720 vs an 8-car Class 357). If operating to this service specification, no services are expected to have standing passengers east of the Dagenham Dock cordon.

7.2.2. 2040

By 2040, most services are forecast to be carrying between 700 and 900 people, with the busiest service potentially carrying over 1,200. Overall demand at the critical load point in the high peak is projected to grow to between around 3,700 and 3,800, and between 9,700 and 10,200 across the high peak and whole pre-10:00 period respectively, depending on growth scenario.

[41] Note that any structural timetable changes before this date would influence how passengers use the service, influencing total passengers on each service.

In both scenarios, assuming the Class 720 was now operating fully on this corridor, all services in the high peak would need to be 10-car, along with multiple services in the shoulder peaks, with many services tipping over maximum capacity of 5-car in the shoulder peaks by this date in both scenarios. If operating a full 10-car service across services arriving at London Fenchurch Street between 07:00 and 08:59, no services are expected to have standing passengers east of the Dagenham Dock cordon.

7.2.3. 2050

By 2050, under the Central scenario most services are projected to be carrying around 800 to 1,000 passengers each and around 1,350 on the busiest service, just under a 10-car Class 720's published maximum capacity of 1,358. In the High growth scenario demand rises over 1,500 on the busiest service, well above maximum capacity. Overall demand across the high peak is forecast to be between 4,100 and 4,700 depending on scenario, and between 11,000 and 12,500 before 10:00.

In the Central scenario, demand at Dagenham Dock on three of the high peak services is forecast to be just under the seating capacity of a 10-car Class 720, and significantly exceeding it in the High growth scenario with all seats taken by Rainham, as shown below in Table 11.

Origin	Origin time	Time at London Fenchurch Street	All seats taken by
Southend Central	06:46	08:05	Dag. Dock (C) Rainham (H)
Southend Central	07:04	08:20	Rainham (H)
Pitsea	07:52	08:50	Rainham (H)

Table 11 – 2050 services via Purfleet over capacity.

To accommodate the level of projected demand in both 2050 scenarios, another service is required in the high peak hour, making a total of 5tph, all operating as 10-car trains. Adding in another service into the timetable will require the signalling headway enhancement between London Fenchurch Street and Upminster as previously described.

7.3. via Ockendon

Most of the services before 10:00 via Ockendon start at Grays and all services operate an all-stations calling pattern, except for one service before the high peak which doesn't call at Barking. Due to this consistent calling pattern, the critical load point is almost always on departure from Barking and has a pronounced peak in the high peak hour compared to the shoulder peaks. The route therefore shares similar loading characteristics with the route via Purfleet.

7.3.1. 2033

By 2033, the busiest services across the morning peak are projected to carry between 900 and 1,100 passengers at the critical load point. Total demand is expected to be around 3,500 across the four high peak services, rising to 9,100 across the whole period before 10:00. 3/4 high peak trains, as well as the service immediately before the high peak hour (arriving 07:59) will need to be 12-car length, assuming services are operated with Class 357s. This is largely due to demand from passengers joining at Barking, pushing demand over the maximum capacity of an 8-car Class 357. This compares with an all 8-car service in the 2019 timetable. If using Class 720s, then all of the high peak services would need to be 10-car, along with several services before the high peak.

Extending trains to 12- or 10-car for services starting at Grays will require the 163m bay platform at Grays station to be extended by at least 81m.

As per Figure 16 overleaf, extending to the east is highly unlikely to be possible due to step-free access ramps and a taxi rank. Extending to the west is likely to be feasible but could require the track and overhead line running into the bay platform to be moved to allow for sufficient platform length and width. Concept design work would be required to fully understand the options and any difficulties.

Figure 16 – Overview of Grays station and potential future platform needs, including the minimum platform extension length require, in orange.

Alternatively, it may be possible to make timetable changes to start services from further east of Grays, though this would require timetable investigations and would likely require more trains in circulation, increasing operational costs. If services could not be extended, then multiple services would likely experience very heavy loading on departure from Barking, potentially with passengers left behind and/or displaced onto other services.

7.3.2. Additional 2027 analysis

As the forecast is indicating that an infrastructure upgrade could be required before the study's first reference year of 2033, further analysis has been undertaken to establish more accurately when this will be needed. This has indicated that three high peak services, plus one in the first shoulder peak will need to be 12-car to avoid trains going over maximum capacity of an 8-car train. Only one service (the 08:29 arrival at London Fenchurch Street) is expected to be significantly over capacity of an 8-car train by 2027, with the other three only minimally breached. The critical load point is also at Barking, with the train emptying out from West Ham onwards. Therefore, the densest levels of crowding would only be experienced for around 5-6 minutes.

For the 08:29 arrival, which is forecast to see a very high level of crowding (again only between Barking and West Ham), a timetabling option to see if this service could be operated as a 12-car should be sought to avoid the cost of extending the platform at Grays in the short-term.

7.3.3. 2040

By 2040, the busiest services are projected to be carrying between 1,000 and 1,300 passengers depending on growth scenario, with total demand across the high peak up to around 4,200 and up to around 10,700 across all services before 10:00. Several more shoulder peak services are projected to be needed to be 10-car services, assuming Class 720s are in full operation by this date.

Apart from some additional 10-car services in the shoulder peaks, no additional interventions are expected to be needed between 2033 and 2040, assuming the bay platform at Grays has already been extended around 2033.

7.3.4. 2050

Growing demand between 2040 and 2050 is forecast to push several trains beyond maximum carrying capacity, necessitating additional services to be added to the timetable to provide more capacity and spread demand across more services. At least one additional 10-car service would be required in the high peak hour by 2050, bringing the total to 5tph via Ockendon. As the maximum capacity is breached by passengers boarding at Barking, other options to manage this demand could exist, such as adding more calls at Barking to trains operating on the route via Laindon. Demand for seats from Ockendon, Chafford Hundred and Grays is expected to be able to be met with four 10-car trains, though as demand for seats is getting close to maximum seating capacity on at least one service, a fifth train would undoubtedly provide some relief and greater passenger comfort.

Adding another train onto the Ockendon line will require the signalling headway enhancement between Barking and Upminster as previously described. Timetable analysis suggests that a fifth 'up' service could be added to the timetable on the single line between Grays and Upminster amongst the existing 2tph operating in the 'down' direction without any other infrastructure changes, although the services cannot be evenly spaced. Detailed analysis of how this would mix with the services via Laindon at Upminster East Junction and the fifth service's return route from London Fenchurch Street would need to be carried out. Options to double track part or all of the line could be investigated if even spacing was needed to manage demand. Doubling of this route could also offer a more useful diversionary route during planned or unplanned disruption for both passenger and freight services.

Grays station, with a train occupying the 8-car bay platform.

7.4. Summary of suggested train service and supporting infrastructure improvements

This section brings together the findings from the three routes by reference year for all arrivals before 10:00 at London Fenchurch Street. Appendix 1 includes a train-by-train view of the train lengths and additional services expected to be needed to meet demand across the whole peak period based on the forecasts analysed in this study.

7.4.1. 2033

Table 12 below summarises the proposed service frequency and minimum train lengths which should be in operation by 2033 to meet expected demand. Two rolling stock options are presented – the baseline Class 357 position and a comparison for the Class 720. As c2c currently operates a limited number of Class 720s, in reality, some Class 357s would be substituted for Class 720s. For example, an 8-car Class 357 with plenty of spare capacity could instead be operated with a 5-car Class 720.

Route	Arrival time at London Fenchurch St.	Recommended minimum train length				
		Class 357 Baseline			Class 720 Comparison	
		4-car	8-car	12-car	5-car	10-car
via Laindon	Pre-08:00	1	9	6	9	7
	08:00-08:59	0	7	5	1	11
	09:00-09:59	1	5	2	6	2
via Purfleet	Pre-08:00	3	4	1	7	1
	08:00-08:59	0	1	3	0	4
	09:00-09:59	1	3	0	4	0
via Ockendon	Pre-08:00	3	4	1	6	2
	08:00-08:59	0	1	3	1	3
	09:00-09:59	2	2	0	4	0
TOTAL:		**11**	**36**	**21**	**38**	**30**
Core timetable needs • Return to 20tph high peak hour timetable. • Optimise calling patterns via Laindon to redistribute passengers between trains and reduce loadings on busiest services.						
Core infrastructure needs • Platform extension at Grays to support 12- or 10-car trains via Ockendon (if timetable solution is not possible).						

Table 12 – Summary of 2033 rolling stock and infrastructure options.

Mostly 8-car Class 357s would be required to operate the morning peak service, supported by 12-car units mainly on services arriving in London between 08:00 and 08:59. A small number of 4-car units would suffice on services at the very beginning and end of the pre-10:00 period, however for operational reasons, it may be preferable to run some or all of these as 8-car units, for example if they go on to form an 8-car service later in the morning, reducing the need to join trains together during service.

Alternatively, a new fleet could potentially be procured to operate the same number of services, assessed by this study as a Class 720. The differing capacity levels of the trains would mean almost all (18/20) high peak services would need to be 10-car in 2033, and this would require a platform intervention at Shoeburyness as well as Grays. Simply, in 2033 5-car Class 720s are not capacious enough to replace 8-car Class 357s. Therefore, to avoid providing too much capacity and costly station changes at Shoeburyness, 2033 may be too soon to procure a new fleet operating in 5- or 10-car formations.

A return to a 20tph high peak timetable and optimisation of the route via Laindon should be considered for implementation ahead of 2033 to account for growing demand in the late 2020s. A platform extension will be required to support more longer trains at Grays, though operational options may also exist.

7.4.2. 2040

Table 13 opposite summarises the proposed service frequency and minimum train lengths which should be in operation by 2040 to meet both the expected demand in the Central and High growth scenarios. By this date, the Class 357 fleet is expected to be around life expiry, and a new fleet will be required around this date.

By 2040, it is expected that if using a Class 720 or similar unit, a full 10-car operation would be required in the high peak, and many of the services pre-08:00 would also need to be 10-car length. With relatively low levels of demand in off-peak periods, 5- or 10-car services may offer operational simplicity with just two joined units rather than three for a maximum c.240m train length, as well as a good capacity uplift in off-peak periods (versus a 4-car train), securing off-peak capacity needs for the long-term. Fewer cars overall (and therefore fewer wheelsets, doors, couplers, driver cabs etc.) relative to equivalent 12-car capacities may also offer maintenance cost savings.

Route	Arrival time at London Fenchurch St.	Recommended minimum train length (Class 720)			
		Central growth case		High growth case	
		5-car	10-car	5-car	10-car
via Laindon	Pre-08:00	4	12	2	14
	08:00-08:59	0	12	0	12
	09:00-09:59	5	3	2	6
via Purfleet	Pre-08:00	7	1	4	4
	08:00-08:59	0	4	0	4
	09:00-09:59	4	0	3	1
via Ockendon	Pre-08:00	4	4	4	4
	08:00-08:59	0	4	0	4
	09:00-09:59	4	0	4	0
TOTAL:		**28**	**40**	**19**	**49**
Core timetable needs • Further timetable and calling point optimisation on via Laindon.					
Core infrastructure needs • New or extended platform at Shoeburyness to support more 12- or 10-car trains.					

Table 13 – Summary of 2040 rolling stock and infrastructure options.

No additional services are forecast to be required by 2040 if trains are lengthened to their upper limit and calling points can be optimised on the route via Laindon. Additional services via Laindon (as well as some train lengthening) could be considered, but would require signalling headway improvements between London Fenchurch Street and Upminster.

7.4.3. 2050

Table 14 overleaf summarises the proposed service frequency and minimum train lengths which should be in operation by 2050 to meet both the expected demand in the Central and High growth scenarios. The figures in red indicate additional trains expected to be required on top of the baseline service level.

Route	Arrival time at London Fenchurch St.	Recommended minimum train length (Class 720)			
		Central growth case		High growth case	
		5-car	10-car	5-car	10-car
via Laindon	Pre-08:00	2	14 +2	1	15 +2
	08:00-08:59	0	12 +2	0	12 +2
	09:00-09:59	2	6	2	6
via Purfleet	Pre-08:00	3	5	3	5
	08:00-08:59	0	4 +1	0	4 +1
	09:00-09:59	2	2	2	2
via Ockendon	Pre-08:00	3	5	3	5
	08:00-08:59	0	4 +1	0	4 +1
	09:00-09:59	4	0	4	0
	TOTAL:	**16**	**52 +6**	**15**	**53 +6**
Core timetable needs • Additional 2tph via Laindon in the first shoulder peak. • Additional 2tph via Laindon in the high peak. • Additional 1tph via Purfleet in the high peak. • Additional 1tph via Ockendon in high peak.					
Core infrastructure needs • Re-signalling to provide 2 minute headway between London Fenchurch Street and Upminster.					

Table 14 – Summary of 2050 rolling stock and infrastructure options.

The needs to meet the demand growth in both the Central and High growth scenarios are very similar, partly due to the capacity boost given in 2040 with a Class 720 fleet. By 2040 the capacity of the 2019 timetable structure (with calling pattern optimisation via Laindon) is maximised by train lengthening, meaning additional services will be required between 2040 and 2050 to meet any additional demand. The demand forecasts suggest an additional 2tph in both the 07:00-07:59 and 08:00-08:59 arrivals periods at London Fenchurch Street on the route via Laindon, and 1tph each via Purfleet and Ockendon in the high peak hour, giving a 24tph timetable in the high peak. To meet the new 24tph structure, greater signalling capacity is required to be delivered by the mid-2040s to be ready for greater capacity needs expected around 2050.

7.5. Points of note

The findings outlined above are based on a single forecast as far as 2033, then two scenarios for the longer term. Preference for maximising the capacity of the existing infrastructure has been given before turning towards expensive infrastructure upgrades. This section outlines important points of note, and other potential options funders could explore.

7.5.1. Passenger distribution

The figures do not account for exactly where passengers board trains and assume an even distribution along the length of the train. It is also assumed that passengers take every available seat before standing occurs. In practise this is not how passengers behave, with savvy commuters often choosing to board their train nearest to where their exit will be at their destination station, and some passengers crowd at the entry point to a platform, rather than distributing themselves along its whole length. These nuances mean that interventions may be required slightly earlier than the dates suggested by the data as some portions of trains may become much busier than others.

Also, proposed initial changes are not accounted for in future forecast years – so the proposed 2033 timetable optimisation for the route via Laindon may mean the 2040 and 2050 crowding figures are not as severe as indicated.

7.5.2. Rolling stock

This study has based its longer term findings on a high capacity commuter train (Class 720) representative of London commuter routes and used by c2c as a potential successor to the existing Class 357 fleet. Alternative options would of course be available (including future evolution of the Class 720), with differing levels of seating and standing capacity. Fundamental rolling stock specifications will need to be considered and decided by the operator and funders on aspects such as;

- Train length and multiples thereof, i.e. 4-car or 5-car or even fixed formation units circa 240-250m in length;
- Seating configuration, such as;
    - Narrow 2+2 seating with wide aisle;
    - Wider 2+2 seating (e.g. with arm rests) with narrower aisle;
    - 3+2 seating with narrow aisle, or;
    - Partial longitudinal seating such as on the Elizabeth Line's Class 345 trains.

Each of these will have various benefits and disbenefits across aspects including seating capacity, standing capacity, passenger comfort, capital cost, operational cost and flexibility of operations. A combination of layouts could also be used.

It has also not been considered practical to assess trains longer than the existing fleets, around 240m long. This is due to the significant amount of infrastructure work which would be required at most or all c2c stations to lengthen platforms, and other knock-on amendments which would be required to various infrastructure, including track geometry, positioning of points, signals and overhead lines.

7.5.3. Standards

Similarly, a policy decision could be made to relax passenger standards by moving the cordon where passengers are deemed to need a seat further to the east, or planning to a denser degree of acceptable standing, for example. Both these options would increase carrying capacity, easing the need to make timetable changes, but at the expense of passenger comfort and satisfaction, so are not considered to be a principal option. More densely loaded trains could also negatively impact on performance and journey times, as trains may need to dwell longer to allow boarding and alighting to take place.

7.5.4. Train frequency

The maximum frequency of service on current infrastructure is 20tph, with another 4tph expected to be feasible with signalling upgrades. The approach highlighted above prioritising timetable and train length changes is advised to minimise significant infrastructure expenditure before the life expiry of signalling equipment. It is recommended that when the signalling is renewed, modern ETCS is deployed with an operating headway of 2 minutes at least on the section between London Fenchurch Street and Upminster. After this delivery, more train frequency options will be available. Funders may wish to consider an earlier signalling upgrade to open these options sooner. This may be of particular benefit if asset reliability of the current signalling system begins to decline impacting performance not only of passenger trains, but also freight.

7.5.5. Fare structures

As the railway integrates track and train under GBR, an opportunity arises to review fare structures as a potential method of managing demand, both in the peak and off-peak periods. This should be assessed alongside the timetable, fleet and infrastructure options outlined in this section.

7.6. Important considerations

This subsection outlines other critical matters which will require consideration when delivering any passenger capacity upgrades.

7.6.1. Fleet size and depot capacity

c2c currently operates 74 4-car Class 357s and 10 5-car Class 720s. To operate the quantity of trains and in the lengths indicated above, c2c has advised that more units would be required, even to operate the 2033 specification. Decisions therefore may need to be made regarding fleet in the short-term, which could include;

- Work within the confines of the existing fleet, and make decisions on which services could be operated as 8-car, with higher than desirable levels of crowding likely on some services. This may include the services via Ockendon which tend to only be heavily crowded for the short stretch between Barking and West Ham;
- Lease existing units from another train operator or from storage, though availability of suitable modern rolling stock is likely to be limited, and compatibility and practicality of having another Class of train is questionable;
- Procure additional units (most likely Class 720s to align with the existing fleet), or;
- Replace the whole fleet (most likely Class 720s or similar).

Longer term, to operate the 2040 timetable, between 73 and 76 5-car Class 720 units are projected to be required, rising to 88 units by 2050. Several additional units would be required on top of these figures as trains cycle through planned maintenance schedules. It would be expected that a fleet

size around this magnitude would need to be procured when a fleet renewal is made.

c2c currently operates two depots at East Ham and Shoeburyness, with East Ham being the focal point for engineering and Shoeburyness mainly used for light maintenance, stabling and train presentation. With a larger fleet likely to be needed to operate longer and additional peak hours services, more capacity for stabling and maintenance is likely to be required, subject to detailed investigations. Both depots are constrained on all sides, meaning if more stabling or maintenance space was required, the possibility of expanding existing sites is very unlikely and a new facility may be needed. Detailed analysis of depot requirements will need to be carried out alongside specification of a new fleet.

East Ham depot.

7.6.2. London Overground services

Careful consideration of future London Overground needs would also need to be given when planning for future trains via Purfleet, as these services share infrastructure through platforms 7 and 8 at Barking. Growing demand driven by housing and population growth, especially at Barking Riverside, is likely to necessitate peak hours capacity increases which may also need to be accommodated alongside any frequency increase in Essex Thameside services.

7.6.3. Other network infrastructure

Traction power

Traction power systems are not expected to require a capacity enhancement to enable additional high peak hour passenger services, though assessments should be carried out when proposing additional or extended services to ensure sufficient capacity exists. It is likely that in the longer term, power supply upgrades will be needed for growing numbers of electric freight locomotives, as highlighted in section 4.2.3.

Level crossings

Before any timetable change, particularly for additional services as recommended in the long-term, its impact on level crossings will need to be risk assessed, and any appropriate mitigations carried out. It is likely that even with 5tph in the high peak hour on the route via Purfleet, this will be lower than the number of trains in many off-peak hours once freight trains are also accounted for. Nevertheless, risk assessments will still be required to take account of specific timetable structures as well as differing levels of road use in peak periods.

Level crossings also exist on the route via Laindon, including several between Benfleet and Leigh-on-Sea. These will also need assessing ahead of extending services that start at Laindon further east, as recommended for 2033.

As highlighted in section 4.2.3, it is expected that increasing numbers of freight trains will drive level crossing closures on the Tilbury Loop.

Signalling operations

Most of the Essex Thameside corridor is a double track railway, with infrastructure to overtake or turn around trains limited to a few fixed points, including Laindon and Leigh-on-Sea stations, both of which have a third track and platform and are used as an origin and terminating point for some services in the peaks. Currently, signalling and driver only operation (DOO)

equipment does not fully reflect operational needs for 10/12-car services, however given the low numbers of services which turn in these platforms, ordinarily operated by 8-car services, no major operational issues currently occur. If 10/12-car services were to begin turning around at either station, as may be needed as per the demand forecast, then changes to the signal and DOO positioning, including small platform extensions may be needed to ensure efficient operations.

Additionally, at London Fenchurch Street and Shoeburyness, track circuits known as 'Lime Street Controls' may need modifying. These are a series of track circuits which alert the signaller to what length of train is occupying a platform, and therefore what length of train could be signalled into the remainder of the platform. These track circuits are positioned for 4/8/12-car trains, such as the Class 357. A 5-car Class 720 would occupy the first track circuit, but not the second, giving an inaccurate view to the signaller about the length of train occupying the platform. Therefore, the mixed fleet presents some operational difficulties at these terminus stations. Network Rail and c2c are currently working on options to improve operations.

7.6.4. Temporal differences

Evening Peak

The passenger recommendations of this study have been based on the morning peak, being the busiest part of the day. Demand in the evening peak (departures from London Fenchurch Street between 16:00 and 18:59) is typically spread more widely over the three hours (and beyond). Even so, it is likely that similar timetable strengthening measures will need to be taken in the evening peak to ensure demand is well spread and that some services aren't excessively busier than others.

Off-peak, contra-peak and travel to non-London destinations

As explained in section 2.2.3, the Essex Thameside corridor is a very London commuter-orientated route, with much lower levels of demand in the inter-peak hours and evenings. Likewise demand on contra-peak services (i.e. heading away from London in the morning peak) is low. Boarding and alighting estimates which form part of this study's passenger demand forecast also reveal travel in the morning peak to any destinations other than Barking, West Ham and London Fenchurch Street is relatively insignificant, and could be accommodated without specific service improvements.

As a result, no capacity-driven changes are expected to be required in the short- or long-term in these off-peak periods or for serving non-London destinations.

Weekday differences

Steer's analysis found that Tuesdays, Wednesdays and Thursdays are the busiest days of the week, with numbers of passengers on Mondays around 20% lower than an average Wednesday, and Fridays around 33% lower. If these trends continue, consideration could be given as to whether a full peak hours service is offered on Mondays or Fridays. This could be a way to reduce some operating costs, and therefore the overall subsidy required, and such a decision would have to be weighed up against factors including passenger confidence and convenience.

Saturdays and Sundays have not been modelled, but overall demand would not reach the same heights as the weekday peak periods. Monitoring of Saturday and Sunday demand, including seasonal demand should be undertaken and acted upon if required.

8. Connectivity and off-peak

Connectivity is a topic of growing importance as funders and transport operators try to encourage modal shift and increase the mode share of sustainable public transport journeys, both in terms of local journeys and over longer distances. It is important to remember that rail is best at transporting large numbers of people over longer distances, and is not always competitive with other modes for short, local journeys. Growing off-peak usage from its current low base is also an objective for this part of the network.

8.1. Local journeys

By far, most journeys on this corridor are to or from London, but some notable local rail flows outside of London do exist, as shown in Table 15 overleaf. For all but one of these pairings direct connectivity exists all day every day with

at least 2tph frequency. A change at Grays is sometimes required for passengers travelling between Tilbury Town and Chafford Hundred. The only parts of the c2c network which don't have direct connectivity all day but could feasibly do so are stations on the two loop lines via Ockendon and Purfleet. Interchange is possible at Grays with reasonable connection times, normally around 20 minutes in both directions.

Station pairing	Journeys (2023-24)
Laindon <> Basildon	299,792
Grays <> Tilbury Town	282,288
Benfleet <> Southend Central	271,328
Grays <> Chafford Hundred	177,836
Basildon <> Southend Central	164,534
Westcliff <> Southend Central	101,324
Shoeburyness <> Southend Central	100,034
Pitsea <> Southend Central	96,120
Pitsea <> Basildon	92,240
Tilbury Town <> Chafford Hundred	90,614

Table 15 – Top 10 local flows outside of London (i.e. excluding London flows to/from stations west of Upminster).[42]

Referring back to census data as summarised in section 2.2.3, there are some notable commuting flows in certain sections of the corridor outside of London;

- Within the Purfleet – Grays – Tilbury conurbation;
- Within the Laindon – Basildon conurbation, and;
- Within the Leigh-on-Sea – Southend-on-Sea – Shoeburyness conurbation.

Most of these journeys would, however, be short journeys where rail would not be a practical option and journeys by other modes, including car or bus, would be quicker and more convenient. For example, if an end-to-end journey by car would take someone 20 minutes, assuming journey time was of most importance, many would be unwilling to make a 15 minute walk to their nearest station for a 10 minute train journey and have another walk at the other end. For many, local rail journeys would only be feasible if another factor or priority takes precedence (such as cost, avoiding road congestion or lack of car ownership) or for those whose starting point and/or destination are close to stations. Within these areas, good rail connectivity already exists, as demonstrated by the rail journeys recorded above in Table 15, but it is unreasonable to expect rail to take a significant mode share of very short journeys.

Chalkwell station and Chalkwell beach.

8.2. Wider connectivity

As already discussed, the Essex Thameside network is relatively self-contained from a passenger perspective and has limited interface with the rest of the national rail network, with its other main links being to the TfL network from Upminster westwards. East of Upminster, there are no links with other lines on weekdays,[43] so passengers travelling from most parts of the corridor to

[42] Table produced from the Origin and destination matrix (ODM) 2023-24 from the Rail Data Marketplace.
[43] On Saturdays and Sundays two trains an hour operate to/from London Liverpool Street via Stratford offering direct connectivity to the Westfield shopping centre and Queen Elizabeth Olympic Park.

anywhere else nationally will require a journey through London or will need to travel somewhere other than their local station to begin their journey – a process known as 'railheading'. Such an example of railheading in this area would be a passenger in Basildon starting their rail journey at Chelmsford to travel to Norwich to avoid a journey interchanging in London. Buses exist to make certain connections with towns to the north, and the Southend Victoria branch line also offers rail connections via Shenfield.

Public transport connectivity with Kent on the south side of the Thames estuary is notably poor, with no convenient rail service available. Again, to make a rail journey between South Essex and Kent requires a journey into London to join either the Southeastern service on HS1 at Stratford International or other routes from London Bridge. No straightforward options exist to improve this, however. Calling HS1 at a new interchange station north of the Thames, or routing services between HS1 and the Essex Thameside corridor via the existing connections near Dagenham have been suggested. While these ideas could increase local connectivity, it is questionable whether they would make the best use of capacity on both routes.

For example, creating a new interchange north of the Thames between HS1 and the Essex Thameside corridor would add several minutes to the journey time on a Southeastern high speed service on a 140mph section of line. This may have timetabling implications, including with international services to and from mainland Europe; a market which is expected to grow with new prospective operators exploring options for new services. Reduced journey times to Stratford and central London versus existing c2c services and onward connections might also lead to a significant amount of abstraction, overloading domestic HS1 services.

Crossing HS1 trains onto the Essex Thameside corridor using the existing connection near Dagenham is likely also not the best use of limited capacity on both lines. Trains heading onto HS1 would need to be capable of at least 140mph to ensure they fit in with other HS1 services, and trains heading the other way would need to remove at least one existing service out of the c2c timetable during the high peak, which would add further pressure to existing Essex Thameside trains already operating with high levels of demand, as demonstrated in sections 6 and 7.

Various other proposals exist to connect Essex and Kent by rail or light rail through a tunnel under the Thames to offer much faster local connectivity, for example between Grays and Ebbsfleet, as part of a metro style service on both sides of the Thames. These options may offer much greater benefits to local connectivity on both sides of the river, while safeguarding the service of the core London markets enabled by both existing services. However, such proposals will inevitably require a significant capital investment.

8.3. Off-peak

Although no capacity related improvements are expected to be needed in the off-peak, it is recognised that growing off-peak demand is a prime objective of c2c. Passenger research consistently highlights that convenience and cost are some of the factors which influence people's decisions to use the railway.

On convenience, all stations currently have at least a 2tph service in the off-peak. Raising this frequency would mean greater operational costs and, on the Tilbury Loop, services would also need to fit amongst growing freight demand. Nevertheless, this could be something funders may wish to consider.

Competitive pricing and simpler ticketing are also other ways to encourage off-peak demand. Contactless payments are now possible across the whole c2c network, meaning passengers can tap in with a debit card at any c2c station, and tap out at any other station across London and the South East, including TfL stations, which also have contactless payment capabilities. Moving into public ownership, opportunities to reduce off-peak fares could be trialled to encourage more off-peak journeys.

9. Passenger recommendations summary

This section has set out how the morning peak train service will need to evolve to meet growing demand and maintain a quality travelling experience. It is expected that in the short- and medium-term, sufficient capacity during the peak periods can be provided through timetable and rolling stock changes, supported by some platform extensions to enable longer services to operate. It is recommended that the following timetable and infrastructure improvements are delivered to cater for expected demand at each of the study's reference years;

As soon as possible:

20tph

Return to December 2019 frequencies

12

More services operated by 12-car trains

Optimise calling patterns via Laindon to redistribute passengers between trains and reduce loadings on busiest services

Investigate possibility of starting at least one high peak service via Ockendon east of Grays to allow 12-car operation

By 2033:

12

More services operated by 12-car trains (noting this will require additional rolling stock to be procured)

Platform extension at Grays to support multiple 12- or 10-car trains via Ockendon

By 2040:

Full fleet renewal (assumed to be Class 720 or similar) and potential depot capacity increase

10

More services operated by 10-car trains

Further timetable and calling point optimisation on route via Laindon

New or extended platform at Shoeburyness to support more 10-car trains

By 2050:

10

More services operated by 10-car trains

Re-signalling to provide 2 minute headway between London Fenchurch Street and Upminster

Additional 2tph via Laindon in the first shoulder peak

Additional 2tph via Laindon in the high peak

Additional 1tph via Purfleet in the high peak

Additional 1tph via Ockendon in high peak

The timings of the above recommendations are driven by analysis of the demand forecast. There may be opportunities to introduce some of the service or infrastructure improvements ahead of these dates, particularly if alignment with other planned works, such as a signalling or track renewals, can be found. This is likely to have particular benefit in cost of enhancements, particularly important in terms of making enhancements delivery more financially sustainable.

STATIONS

Main challenges

- Inadequate interchange capacity at West Ham by early 2030s
- Lack of clear improvement option at West Ham due to spatial constraints
- Inadequate interchange capacity at Barking by the late 2030s
- Poor step-free access at Barking
- Lack of exit capacity at London Fenchurch Street (long-term)

Headline options

- Station redevelopment at West Ham in collaboration with TfL
- New interchange bridge with lifts to all platforms at Barking

10. Station capacity needs

There are 26 stations on the Essex Thameside corridor, ranging from relatively simple local or suburban stations in most of South Essex, to larger, more complex town/city stations such as Southend Central or Grays, up to busy urban stations within Greater London west of Upminster, all of which have a connection to TfL's network (if including London Fenchurch Street's out-of-station interchanges). The busiest stations, which are expected to experience worsening passenger congestion requiring future significant upgrades are London Fenchurch Street, West Ham and Barking.

The previous study indicated that by the mid to late 2020s these three stations would all require capacity enhancements to ensure they can still operate effectively and safely. Due to the reduced level of demand post-pandemic outlined in this study, some issues are now not as prevalent, however with rising demand they are expected to re-materialise, and the investment need has simply been deferred. This section gives an overview of the corridor's three main stations, and outlines expected pedestrian capacity issues and solutions using demand data taken from the updated passenger demand forecast.

10.1. London Fenchurch Street

London Fenchurch Street is the London terminus of the Essex Thameside corridor, consisting of four platforms (two island platforms) elevated on a viaduct. These platforms join a viaduct-level concourse with the main ticket office, ticket gateline and retail outlets. Escalators, stairs and a lift take passengers down to the main Grade II listed entrance on Fenchurch Place, which provides the primary access to and from the City of London. A second entrance on Coopers Row offers access to and from the centre of the platforms and provides the closest interchange with Tower Hill Underground station and Tower Gateway DLR station. Step-free access is only possible via the main entrance.

Being the terminus station on a heavily commuter-orientated route, pedestrian flows are overwhelmingly tidal with thousands of exits and few entries in the morning peak, and the opposite in the evening. In the morning peak congestion can occur particularly around the central staircases.

The previous study highlighted that by 2025, growing numbers of passengers would be lengthening platform clearance times and additional stair and gateline capacity would be required to meet Network Rail's station capacity planning guidance. With demand at London Fenchurch Street reducing significantly, it is now estimated that significant capacity improvements would not be needed until at least the early 2040s.

As shown opposite in Figure 17, opportunity to modify the station and provide more capacity within its current footprint is

Figure 17 – London Fenchurch Street.

severely constrained by the island platform layout and its positioning on a viaduct surrounded by other buildings, including two office buildings – 8 Fenchurch Place and 1 America Square – built above the station.

As a result, conceptual investigations into re-siting the station further east for the purpose of providing more platforms for higher service frequencies and more circulation space for growing passenger numbers was highlighted in the previous study. No further development work on this has taken place and it is highly unlikely this sort of development would be feasible without significant passenger growth and third party interest and funding. However, due to the local constraints, it is unclear what meaningful improvements could be made on the existing site if needed.

10.2. West Ham

West Ham is a critically important and extremely popular interchange between c2c and TfL services, which offers onward connectivity for South Essex passengers to a variety of destinations including Stratford and Canary Wharf on the Jubilee Line. The station has a complex layout with four island platforms and eight platform faces across two levels in an L shape, shown opposite in Figure 18. This can be particularly challenging for interchanging passengers with reduced mobility, as, although the station is step-free, three lifts need to be used to go between the high and low level platforms.

Access to the c2c platforms from the concourse and entrance is by two narrow staircases (shown below in Figure 19) and a lift at the London-end of the platform. These stairs act as a bottleneck, resulting in congestion on the stairs and the London-end of the platform, particularly during peak hours. In the morning peak, crowding can occur as passengers heading down to the concourse queue to clear the platform.

Passengers leaving the platform typically choose the first (and most obvious) stair they encounter, which is inefficient utilisation of the aggregate stair capacity. It also induces some people to bypass the queue in order reach the further stair, walking close to the platform edge to do so. Passengers heading onto the c2c platform also tend to use the first stair they encounter, which (for the reason noted above) also happens to be the less busy option. This also causes them to walk close to the platform edges when they arrive onto the platform and increases their risk of exposure to passing trains.

To avoid overcrowding, alighting passengers must clear the platform before the next train arrives, which in the peak periods can be just two minutes behind if operating on minimum signalling headways.

In the evening peak congestion can also occur as passengers coming up the stairs fail to move along the platform, partially blocking the circulation space and forcing people to wait or walk closer to the platform edge. The c2c island platform itself is also

Figure 18 – West Ham.

narrow, especially around the stair and lift access, which restrict passenger circulation space, and these issues can be exacerbated in times of disruption.

Figure 19 – Narrow stair access to West Ham's National Rail platforms. A lift is situated behind the nearest staircase.

As with London Fenchurch Street, the opportunity to provide more space for passengers is exceptionally challenging. This is because the island platform layout, as well as being surrounded by other property, including adjacent TfL lines and housing. This means there is no simple way to widen the platform or its stairs, or simplify the interchange with the low level platforms. Joint station ownership with TfL also means identifying and delivering any improvement solution must be a joint endeavour between Network Rail and TfL.

The previous study suggested that passenger congestion on the stairs and the London end of the platform would become severe by 2027. By this date it was expected that the platform would not clear before the next train arrives in parts of the morning peak. To ensure this does not occur, improved interchange between the high and low level platforms was recommended. Updated analysis for this study suggests that crowding at West Ham in the morning peak will become a serious problem again in the short-term, with increased stair capacity expected to be required in the early 2030s to meet Network Rail's station capacity planning guidance.

Two concepts developed by TfL in 2017 were tested in the previous study, and while both provided improved pedestrian flow, the constructability and impact on adjacent property would be highly challenging. The previous study also highlighted the potential to make use of land to the north west of the station – the only land around the station not yet built upon – to partly move the high level platforms into, potentially giving an opportunity to design a highly spacious and simpler interchange, suitable for the long-term. This would also be a complex and costly undertaking, but appears to be necessary to explore given the spatial constraints around the existing station area and lack of significantly impactful quick wins.

Clearly, an enhancement on the scale suggested above would be undeliverable in the short-term, so other short-term options to mitigate crowding around the top of the stairs may need to be explored. This could potentially include a short platform extension to the north east to allow trains to call away from the most congested parts of the platform by the stairs, with the aim of reducing the numbers of passengers waiting in that area. While this wouldn't improve the bottleneck on the stairs themselves, pedestrian flow and safety could be improved, especially if platform edge fencing was also installed.

Network Rail has worked with TfL to ensure potential future station needs for the land to the north west of the station are incorporated in the London Borough of Newham's new Local Plan. This ensures that these potential needs are known to any prospective developers of this site. It is recommended that Network Rail's development and strategic planning teams work in the short-term with c2c, TfL and the London Borough of Newham to develop a credible transformational proposal for the station and its surrounding undeveloped land.

10.3. Barking

Barking is another important interchange between c2c and TfL services, including the London Overground to the growing neighbourhood at Barking Riverside. Access to the station's eight low level platforms is through a large, Grade II listed entrance building, completed in 1961. c2c services use four platforms; two for trains via Laindon or Ockendon and two for the Tilbury Loop. London Overground services and freight trains also pass through the Tilbury Loop platforms. London Underground services use three platforms,

and a final bay platform on the National Rail network is generally unused since the London Overground service was extended to Barking Riverside.

A bridge and a dive-under for the westbound District Line either side of the station ensures that cross-platform interchange with the up/down Main Line is possible, however passengers on Tilbury Loop services or the London Overground who wish to change onto the London Underground must interchange via the footbridge or subway.

A single lift to platform 1 (the unused bay platform) provides a limited, sub-standard step-free offering. To access the other seven platforms, a ramped subway must be navigated, and seeking assistance from staff is recommended. This subway does not see significant usage, with interchanging passengers preferring to use the footbridge. This wide offering of interchange opportunities, combined with increasingly high numbers of entries and exits can result in congestion on the footbridge during peak hours. Therefore, improvements to interchange capacity are expected to be needed.

The previous study recommended that a second ticket gateline should be installed in the short-term to double the entry and exit capacity and reduce a pinch point on the footbridge where passengers entering and exiting the station mix with those interchanging. c2c is currently working to deliver this alongside investing in a refurbishment of the listed entrance building, which is expected to be complete by the end of 2025. The previous study also recommended that by the mid-2030s, a more spacious interchange bridge should be provided, which would also be essential for providing direct lift access to all platforms.

The new demand forecast carried out for this study indicates that the requirement for greater interchange capacity has moved back into the mid-2040s, however earlier delivery of a combined capacity and accessibility scheme is recommended to improve the station for those who would benefit from step-free access and secure the station's long-term capacity needs.

11. Station accessibility and facilities

Being the gateway to the railway for passengers, it is important that stations are welcoming and have well maintained modern facilities in order to give a good first impression of the railway. Depending on the station, its location and its catchment, the appropriate provision of facilities will vary, but to ensure the railway is welcoming to all passengers, it is important that accessibility features are provided at all stations. This section provides an overview of priority accessibility and facility enhancements across the corridor.

11.1. Step-free access

Of the 26 stations on the corridor, 21 are fully step-free, including stations where

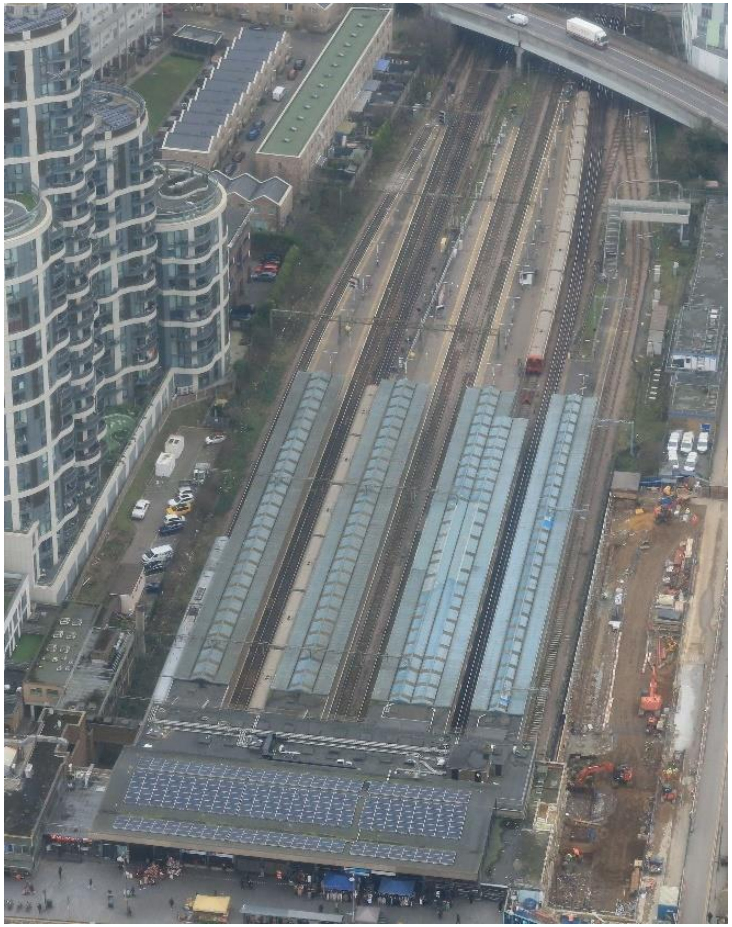


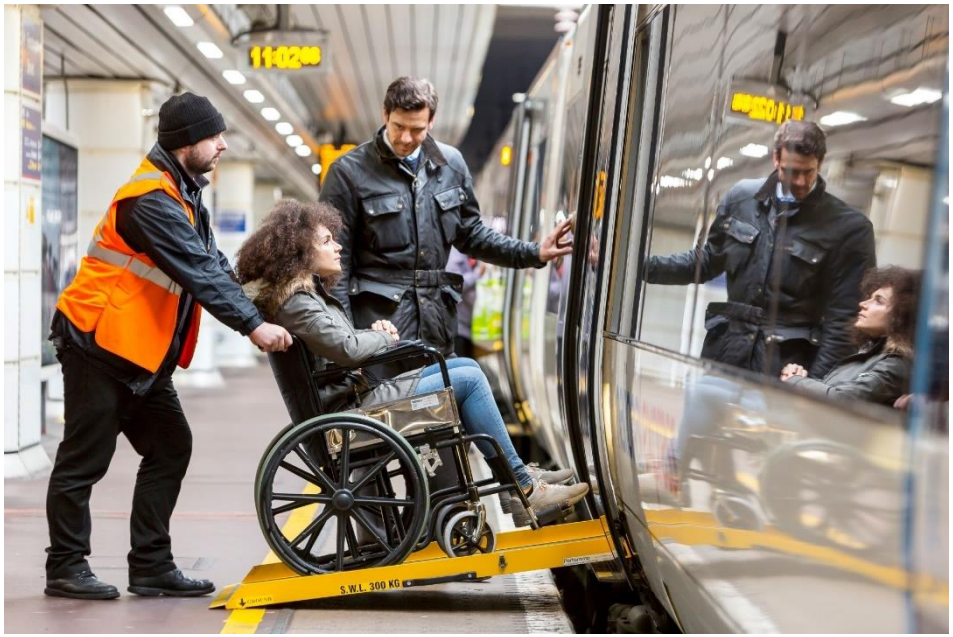
Figure 20 – Barking.

different platforms are accessed from either side of the railway, such as Southend Central. Four stations – Laindon, Limehouse, Pitsea and Tilbury Town – have benefited from funding from the DfT's Access for All (AfA) programme to date, with three more stations – Chalkwell, Grays and Southend East – all set to become step-free by the end of 2026 with further AfA funding.[44] This will bring the total number of fully accessible stations on the corridor to 23, leaving only Ockendon, Upminster and West Horndon lacking step-free access to all platforms

Upminster currently has no lift to platform 6 for the London Overground Liberty Line service to Emerson Park and Romford. Passengers requiring step-free access are advised to use local buses instead, which operate frequently between the stations. Ockendon and West Horndon currently have no step-free access from their station entrances over the railway to the platforms on the opposite side. As part of significant housing developments planned near West Horndon station, station upgrades, including a new entrance on the south side and a bridge with lifts could be delivered, and Network Rail and c2c are working with the developers to define and agree the scope of works. At Ockendon, platform 2 is only used when trains in opposite directions are timed to pass at the station, with trains normally using the accessible platform 1 bi-directionally.

One of the stations classed as step-free is Barking, which has a single lift to take passengers between the street level entrance and the platforms below. This lift serves only platform 1 directly, with passengers encouraged to seek assistance from staff to assist them via the ramped subway for access to platforms 2-8. This is clearly a substandard provision for a station which in 2023/24 recorded over 28 million entries and exits across National Rail and London Underground services, and is a major East London interchange hub between various lines. The station is a priority step-free improvement option, which would likely be best delivered alongside required capacity improvements outlined in section 10.3.

If these improvements at Barking, Upminster, Ockendon and West Horndon stations are delivered, plus potential upgrades to stations like Southend Central and Westcliff, where step-free access between platforms is not currently possible, this will help to realise the ambition of universal step-free access on the Essex Thameside route.



11.2. Other accessibility and facility improvements

It is not only provision of step-free access which can make stations more accessible for a wider range of people. Modern, high quality facilities including information systems, waiting facilities, toilets and security & lighting can all help to make stations more accessible. Between 2021 and 2023, accessibility audits were carried out at all stations nationally to assess the status of key enabling facilities, with the data then refreshed by train operators, including c2c, in 2024. For stations within the study area, facility provision is generally good, with no overall trend of missing recommended facilities across the 26 stations. The audits also recorded the quality of the facility, rating it as either 'high' or 'low'. When assessing the quality, some trends do emerge, with a substantial proportion of stations recording 'low' quality for the following facilities:

[44] Note, Ockendon was due to be upgraded alongside Chalkwell, Grays and Southend East, but this project has now been deferred due to funding challenges.

- **Accessible toilets** – often due to the size of the room being below standard.
- **Customer information screens (CIS)** – due to no screens at low levels.
- **Consistent lighting** – parts of the station with different types or brightness of light.
- **Sheltered multimodal interchange** – transitions between the station entrance and drop-off bay, bus stops or taxi ranks not sheltered.
- **Accessible ticket counters** – lack of accessible counters, demountable card readers or ability for all to see displayed price.

It is recommended that packages of improvements are identified in more detail across the 26 c2c stations and included as appropriate in operators' improvement plans for stations. Some of these options could be candidates for contributions from local developers via local authorities' planning processes.

12. Stations recommendations summary

The demand forecast produced for this study suggests that the need to make significant capacity improvements has been delayed compared to what was indicated in Network Rail's previous strategic advice, most notably at London Fenchurch Street, with the forecast suggesting a shifting of demand towards West Ham which has more convenient, direct interchange opportunities with the TfL network.

As a result, improvements at London Fenchurch Street and Barking may not be needed until the 2040s, depending on the rate of demand growth. Conversely, an improvement at West Ham will still be required in the short-term as it remains a popular interchange with the London Underground. While a capacity upgrade at West Ham is a high priority, improvements to provide the scale of capacity uplift required will not be easy to deliver. Engagement with TfL, the London Borough of Newham and possibly the private sector will likely be required to transform the station, and it is recommended that a masterplanning exercise to identify improvement options and funding streams is conducted in the short-term.

Accessibility at Barking station remains poor, and an accessibility scheme to enhance the station should be a delivery priority for the 2030s. This is ahead of a requirement for a capacity enhancement, but as the most efficient delivery strategy would be to provide both of these improvements at the same time, a wider interchange bridge would best be provided at this time, meeting both of these fundamental needs.

Step-free provision at several other stations should also be delivered, meeting the ambition of a fully step-free Essex Thameside corridor. Provision of other accessible facilities is generally good, however improvements to the quality in some cases could be made.

Planning for major station schemes clearly takes time, and it must be ensured that these upgrades are provided ahead of when they are expected to be required.

By 2033:

Whole station redevelopment at West Ham to support growing demand from interchanging South Essex passengers

By 2040:

Enlarged bridge at Barking to support growing interchange demand, alongside lifts to all platforms to improve accessibility

Additional entrance/exit capacity at London Fenchurch Street to support growing demand

SUMMARY AND NEXT STEPS

13. Overall study findings and next steps

This study has assessed what improvements can be made on the Essex Thameside corridor to benefit both passengers and freight users, and when they should be delivered. Its primary focus has been on how the industry can accommodate rising numbers of peak hours passengers, including its impact on major London stations, as well as growing demand for rail freight, which has the potential to be high, especially if rail enhancements are prioritised in the near term. This section summarises the study's recommendations and options for next steps.

13.1. Response to the Headline Strategic Question

This study has sought to answer the Strategic Questions agreed with the Eastern RIRG and study partners at the outset of the study, listed in section 2.1. The Headline Strategic Question, designed to be an overarching question for the whole study is answered below.

How is passenger and freight demand on the Essex Thameside corridor likely to change over the next 25 years, what improvement options are likely to be required and when will they be needed?

Forecasts suggest both passenger and freight usage will grow significantly over the next 25 years, necessitating various improvements to the peak hours passenger service structure and the infrastructure upon which both passenger and freight trains operate.

To meet the government's rail Freight Growth Target, around 200 train paths a day are expected to be required by 2050, up from around 125 paths today, resulting in an average of six paths per hour per direction in typical freight operating hours. To meet this increased level of demand and maintain good levels of performance, a range of freight-focussed improvements are expected to be required, many of them away from the Essex Thameside corridor across London and at complementary parts of the rail network, such as Ely. To build up to this target over the next 25 years, capacity upgrades will need to be delivered in the short- and medium-term. Strong potential exists to exceed this target, with the ports of Tilbury and London Gateway embarking on significant investment programmes. Investing in freight capacity sooner would enable faster growth, meeting the Freight Growth Target early and boosting both the local and national economy.

For passengers, from a 2023 baseline, around 24.5% growth is expected in the short-term by 2033, and between 58% and 80% expected by 2050. When planning for high quality service level, meeting a strict seating requirement and ensuring trains are not over-capacity, these rates of growth will necessitate train lengthening and timetable changes to be made, even in the short-term. This is despite the drop in demand following the Covid pandemic. Providing good reliability is upheld, the existing Class 357 fleet is likely to be sufficient until around 2040, whereupon replacement and expansion of the fleet will be required. Longer-term, once trains are operating at their maximum length, train frequency will need to be increased, enabled by signalling headway enhancements. Forecasts suggest that frequency options will not need to be implemented until the mid-2040s, but could be an option once signalling improvements are made, assuming a headway improvement can be made alongside a renewal. These improvements will be confined to the peak hours, with off-peak and contra-peak demand even in the long-term expected to be accommodated with the existing service level.

Station improvements will be required at London Fenchurch Street, Barking and West Ham, with West Ham most in need of improvements in the near term. Due to the severe complexities in delivering an improvement at West Ham, development work here should be prioritised. Poor step-free access at Barking remains a concern and a scheme combined with increasing interchange capacity should also be prioritised for the shorter term. It is important that the rail industry continues to engage with the private sector to harness potential third party investment. As the recommendations set out in this study are progressed into further development, opportunities to do this will be explored.

13.2. Timeline of recommended improvements

Figure 21 below illustrates the approximate required delivery date ranges of the improvement options recommended by this study, principally based on the demand forecasts outlined. The lengths of the bars indicate the approximate time windows within which improvements or changes could be delivered, not necessarily the length of the delivery period, which would need to be defined in further development. Higher rates of growth would result in earlier delivery being required.

For the freight-orientated enhancements especially, it is possible that earlier, proactive improvements would enable earlier growth, meeting the government's Freight Growth Target early and contributing towards wider targets around modal shift and the environment.

Figure 22 overleaf shows how these improvement recommendations apply to the geography of the corridor

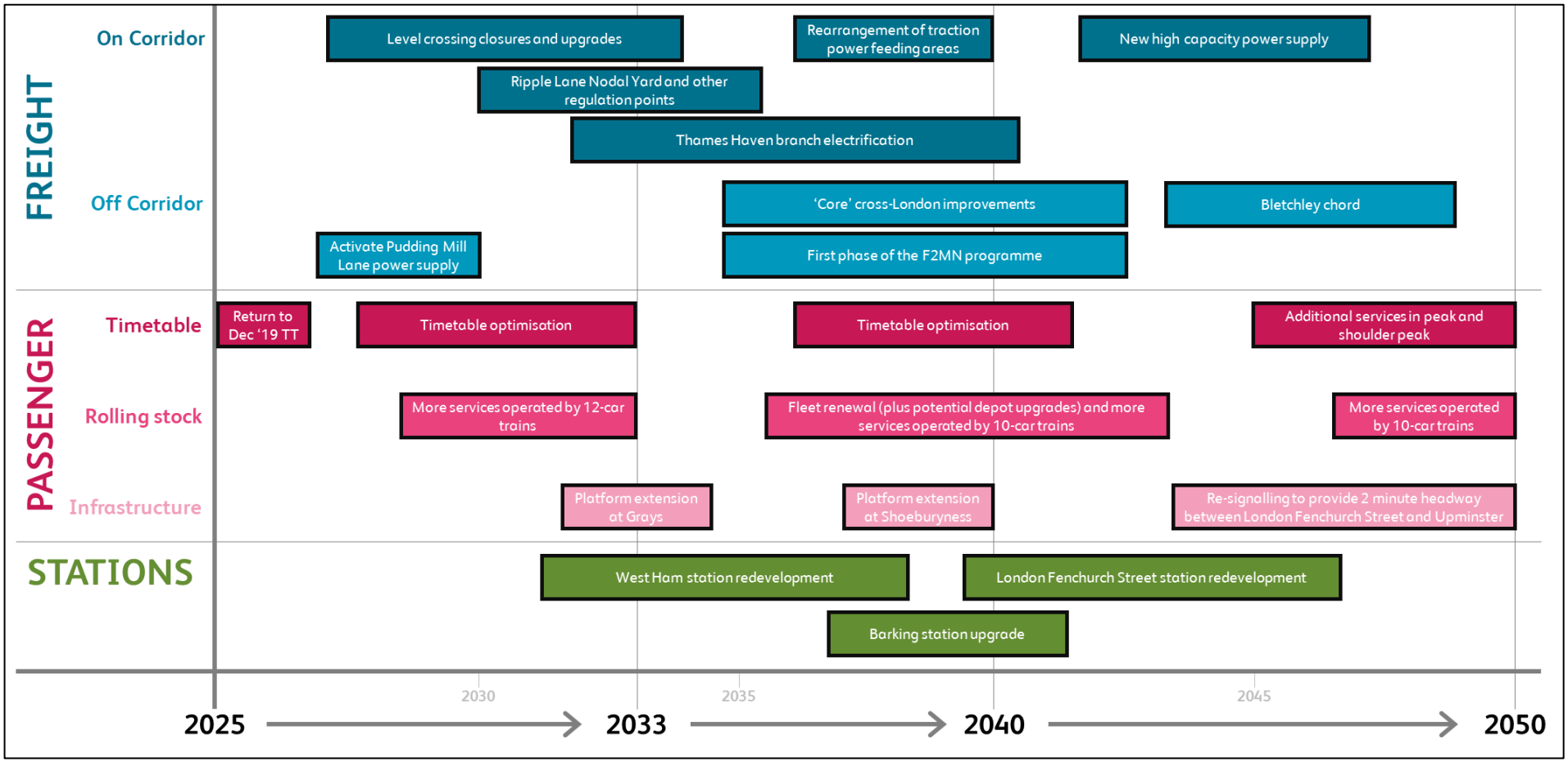


Figure 21 – Summary of all recommendations for the Essex Thameside corridor, and approximate recommended delivery windows.

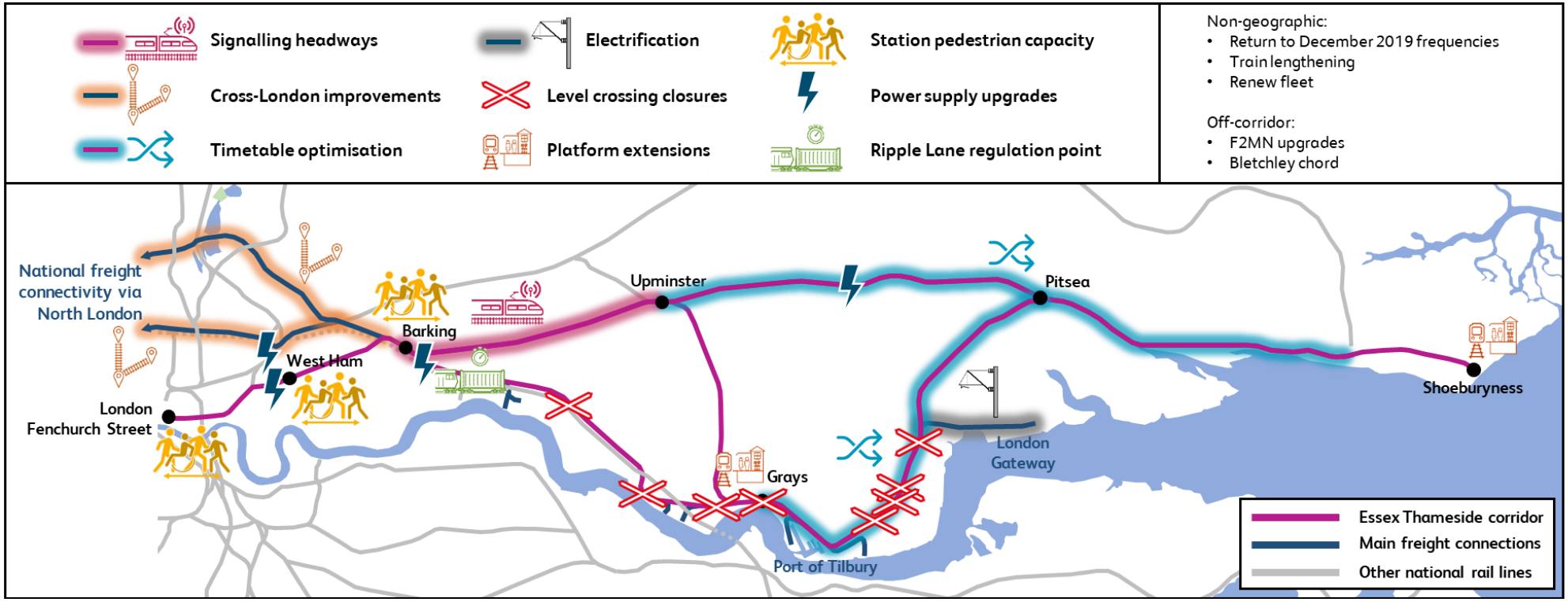


Figure 22 – Geographic illustration of study recommendations.

13.3. Next steps

This study has outlined the improvements required across the Essex Thameside corridor which would meet demand and enable growth. Potential demand growth for freight services is high and despite the significant impact of the pandemic on passenger demand, expected growth in peak hours means that improvements, some of them significant, will be required in the short-and medium-term.

Detailed development is required to establish a robust development and delivery programme incorporating these options. This programme has the potential to become complex due to the multitude, magnitude and variety of the options across the passenger and freight sectors.

Inaction in transforming these options into a well-developed programme for both passenger-focussed and freight-focussed risks stunting growth on this part of the rail network. Failing to improve passenger services, especially during peak hours, as well as major stations, risks alienating passengers and reducing satisfaction due to overcrowding at peak times, failing to harness a growth opportunity linked to local growth, particularly from housebuilding.

Failure to invest in freight-focussed options on and beyond the Essex Thameside corridor will stifle the ability to transport freight from the corridor's growing ports by rail, leading to more HGV movements in South Essex, and a risk of missing decarbonisation targets and the government's Freight Growth Target.

Options identified in this study have been considered in the context of the financial sustainability of the railway and set out in staged manner where the capacity and capability of the existing network is maximised. In the short- to medium-term, the improvements which are highlighted as being required by 2033 should be developed further as a matter of priority.

- The **redevelopment of West Ham station** needs to be considered in detail due to the urgency and scale of the improvement expected to be needed. It is recommended that a Decision to Initiate is requested from the DfT to begin detailed development under the industry's Rail Network Enhancements Pipeline, working closely with strategic stakeholders including c2c, TfL and the London Borough of Newham.

- **The morning peak should return to the December 2019 timetable frequency** and **timetable optioneering** should also be commenced without delay to understand what possibilities exist to redistribute passengers between services via Laindon in the short-term. This should pay close attention to simulating how passengers may react to various timetable adjustments. Possibilities surrounding timetable options could also influence the timing of the platform extension which would be needed to support 12/10-car trains starting or terminating at Grays.

- **Monitoring of demand and lengthening trains**, particularly on the route via Laindon, within the confines of the existing fleet should be undertaken where required.

- **Level crossing upgrades and closures** and **full commissioning of the Pudding Mill Lane feeder station** should be prioritised in the short-term to enable more freight trains to operate in the short-term and facilitate more electric freight trains to operate to and from Thameside terminals.

- **Development of the cross-country and cross-London freight-focussed capacity upgrades** should also begin, given their ability to enable growth in freight traffic in the long-term, and the volume of detailed planning which will be required to ensure the correct combinations of options are chosen.

On top of the deliverables highlighted, passenger demand in the peak hours should be monitored and tracked against the forecast analysed in this study to gauge whether demand is changing quicker than suggested, and therefore whether this study's recommendations may need to be implemented sooner.

13.4. Funding

The options identified have been produced collaboratively with industry partners to deliver a collective view on what is required for the Thameside corridor to deliver its future outputs. Network Rail will continue to work with funders to refine credible options that meet the needs of passengers and freight users, that drive social and economic benefits and that fit with the long-term needs of a decarbonised reliable railway system.

Development and delivery funding will be required to take forward the options outlined. It should be noted that since the Covid-19 pandemic, development and delivery funding for rail projects from central government has been constrained, with most enhancements funding focussed on a small number of nationally significant programmes such as East West Rail and the Transpennine Route Upgrade. It is, therefore, unlikely that development of all options to meet passenger demand and enable freight growth on this part of the network can be achieved in the short-term.

Greater devolution in the area covered by this study, in particular, from a future Greater Essex mayoral combined authority (expected to be in place from May 2026), may offer the opportunity for improvements to be taken forward. It is essential that the industry continues to work together to develop the case for rail in supporting the government's wider objectives. For some improvements, collaborative funding packages, including private sector investment may be possible and should be sought as the industry seeks to make the case for these enhancements.

Appendix 1 – Minimum AM peak train length requirements

Table 16 below shows the recommended minimum train lengths to operate a service with no standing east of each route's designated cordon, also ensuring demand does not go over the maximum capacity of the train type. The service structure is as per the December 2019 timetable.

Route	Service (December 2019 timetable)	Time at Fenchurch Street	*Dec-19*	2033 (Cl. 357 option)	2033 (Cl. 720 option)	2040 (C)	2040 (H)	2050 (C)	2050 (H)
Pre-AM peak – arrivals before 06:59 at London Fenchurch Street									
via Laindon	0415SRYFST	05:20	*8*	4	5	5	5	5	5
via Ockendon	0406TPBFST	05:23	*4*	4	5	5	5	5	5
via Purfleet	0453GRYFST	05:28	*8*	4	5	5	5	5	5
via Ockendon	0435TPBFST	05:53	*8*	4	5	5	5	5	5
via Purfleet	0525GRYFST	06:00	*8*	4	5	5	5	5	5
via Laindon	0459SRYFST	06:04	*8*	8	5	5	5	5	10
via Laindon	0513SRYFST	06:19	*8*	8	5	5	10	10	10
via Ockendon	0508TPBFST	06:26	*8*	8	5	5	5	10	10
via Purfleet	0553GRYFST	06:29	*8*	4	5	5	5	5	5
via Laindon	0528SRYFST	06:33	*8*	8	5	10	10	10	10
via Laindon	0538SRYFST	06:37	*8*	8	5	10	10	10	10
via Purfleet	0548PSEFST	06:44	*4*	8	5	10	10	10	10
via Laindon	0544SRYFST	06:49	*8*	8	5	10	10	10	10
via Ockendon	0615GRYFST	06:54	*8*	8	10	10	10	10	10
Early shoulder peak – arrivals between 07:00 and 07:59 at London Fenchurch Street									
via Purfleet	0534SRYFST	07:00	*4*	8	5	10	10	10	10
via Laindon	0557SRYFST	07:06	*12*	12	10	10	10	10	10
via Laindon	0607SRYFST	07:11	*8*	12	10	10	10	10	10
via Ockendon	0631GRYFST	07:14	*4*	4	5	5	5	5	5
via Purfleet	0556TPBFST	07:17	*4*	8	5	5	10	10	10
via Laindon	0611SRYFST	07:21	*8*	12	10	10	10	10	10
via Laindon	0635LESFST	07:25	*8*	8	5	10	10	10	10
via Ockendon	0611SOCFST	07:29	*4*	8	5	10	10	10	10

Route	Service (December 2019 timetable)	Time at Fenchurch Street	*Dec-19*	2033 (Cl. 357 option)	2033 (Cl. 720 option)	2040 (C)	2040 (H)	2050 (C)	2050 (H)
via Purfleet	0652GRYFST	07:32	*4*	8	5	10	10	10	10
via Laindon	0625SRYFST	07:35	*8*	12	10	10	10	10	10
via Laindon	0638TPBFST	07:38	*4*	8	5	10	10	10	10
via Laindon	0704LAIFST	07:41	*8*	8	5	5	10	10	10
via Purfleet	0645PSEFST	07:44	*8*	12	10	10	10	10	10
via Ockendon	0701GRYFST	07:47	*8*	8	5	10	10	10	10
via Laindon	0648SRYFST	07:48	*12*	12	10	10	10	10	10
via Laindon	0641SRYFST	07:53	*8*	12	10	10	10	10	10
via Laindon	0708LESFST	07:56	*8*	8	10	10	10	10	10
via Ockendon	0717GRYFST	07:59	*8*	12	10	10	10	10	10
via Laindon	Additional service		N/A					10	10
via Laindon	Additional service		N/A					10	10
High peak hour – arrivals between 08:00 and 08:59 at London Fenchurch Street									
via Laindon	0702SRYFST	08:02	*12*	8	10	10	10	10	10
via Purfleet	0646SOCFST	08:05	*8*	12	10	10	10	10	10
via Laindon	0731LAIFST	08:08	*8*	8	10	10	10	10	10
via Laindon	0721LESFST	08:11	*8*	8	10	10	10	10	10
via Ockendon	0731GRYFST	08:14	*8*	12	10	10	10	10	10
via Laindon	0718SRYFST	08:16	*12*	12	10	10	10	10	10
via Purfleet	0704SOCFST	08:20	*8*	12	10	10	10	10	10
via Laindon	0712TPBFST	08:23	*12*	8	5	10	10	10	10
via Laindon	0737LESFST	08:26	*12*	12	10	10	10	10	10
via Ockendon	0747GRYFST	08:29	*8*	12	10	10	10	10	10
via Laindon	0729TPBFST	08:32	*12*	8	10	10	10	10	10
via Laindon	0731SRYFST	08:35	*12*	12	10	10	10	10	10
via Purfleet	0735PSEFST	08:38	*8*	8	10	10	10	10	10
via Laindon	0804LAIFST	08:41	*8*	8	10	10	10	10	10
via Ockendon	0801GRYFST	08:44	*8*	12	10	10	10	10	10
via Laindon	0739SRYFST	08:47	*12*	12	10	10	10	10	10

Route	Service (December 2019 timetable)	Time at Fenchurch Street	*Dec-19*	2033 (Cl. 357 option)	2033 (Cl. 720 option)	2040 (C)	2040 (H)	2050 (C)	2050 (H)
via Purfleet	0752PSEFST	08:50	*8*	12	10	10	10	10	10
via Laindon	0745SRYFST	08:53	*8*	8	10	10	10	10	10
via Laindon	0804LESFST	08:56	*12*	12	10	10	10	10	10
via Ockendon	0818GRYFST	08:59	*8*	8	5	10	10	10	10
via Laindon	Additional service		N/A					10	10
via Laindon	Additional service		N/A					10	10
via Ockendon	Additional service		N/A					10	10
via Purfleet	Additional service		N/A					10	10
Late shoulder peak – arrivals between 09:00 and 09:59 at London Fenchurch Street									
via Purfleet	0744SOCFST	09:02	*4*	8	5	10	10	10	10
via Laindon	0800SRYFST	09:05	*12*	12	10	10	10	10	10
via Laindon	0834LAIFST	09:11	*8*	8	5	5	5	5	5
via Ockendon	0831GRYFST	09:14	*8*	8	5	5	5	5	5
via Purfleet	0819PSEFST	09:17	*4*	8	5	5	5	10	10
via Laindon	0815SRYFST	09:20	*8*	12	10	10	10	10	10
via Laindon	0836LESFST	09:25	*4*	8	5	5	10	10	10
via Ockendon	0847GRYFST	09:28	*8*	8	5	5	5	5	5
via Purfleet	0834PSEFST	09:32	*8*	8	5	5	5	5	5
via Laindon	0834SOCFST	09:35	*4*	8	5	5	10	10	10
via Laindon	0834SRYFST	09:40	*4*	8	5	10	10	10	10
via Ockendon	0902GRYFST	09:44	*8*	4	5	5	5	5	5
via Purfleet	0849PSEFST	09:47	*4*	4	5	5	5	5	5
via Laindon	0850SOCFST	09:50	*8*	4	5	5	5	5	5
via Laindon	0849SRYFST	09:54	*4*	8	5	5	10	10	10
via Ockendon	0917GRYFST	09:58	*8*	4	5	5	5	5	5

Table 16 – Recommended minimum train lengths by reference year.

October 2025

Network Rail – Eastern Region