



Investment programme report

17 October 2021 – 8 January 2022

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Introduction

We assess the progress of some of our biggest and most important projects



Purpose and scope

Purpose

Transport for London is part of the Greater London Authority (GLA) family led by Mayor Sadiq Khan. We are the integrated transport authority responsible for delivering the Mayor's aims for transport.

Our investment programme is the suite of projects comprising renewals and enhancements to maintain reliability and support growth in London.

Renewing and replacing our assets is our required baseline to maintain our current performance in terms of safety, reliability, capacity, and asset condition. Additional enhancements can unlock new capacity and enable us to use our existing network more intensively.

This supports London's growing population and economy, enhances the quality of life for Londoners and creates jobs and improves skills across the UK.

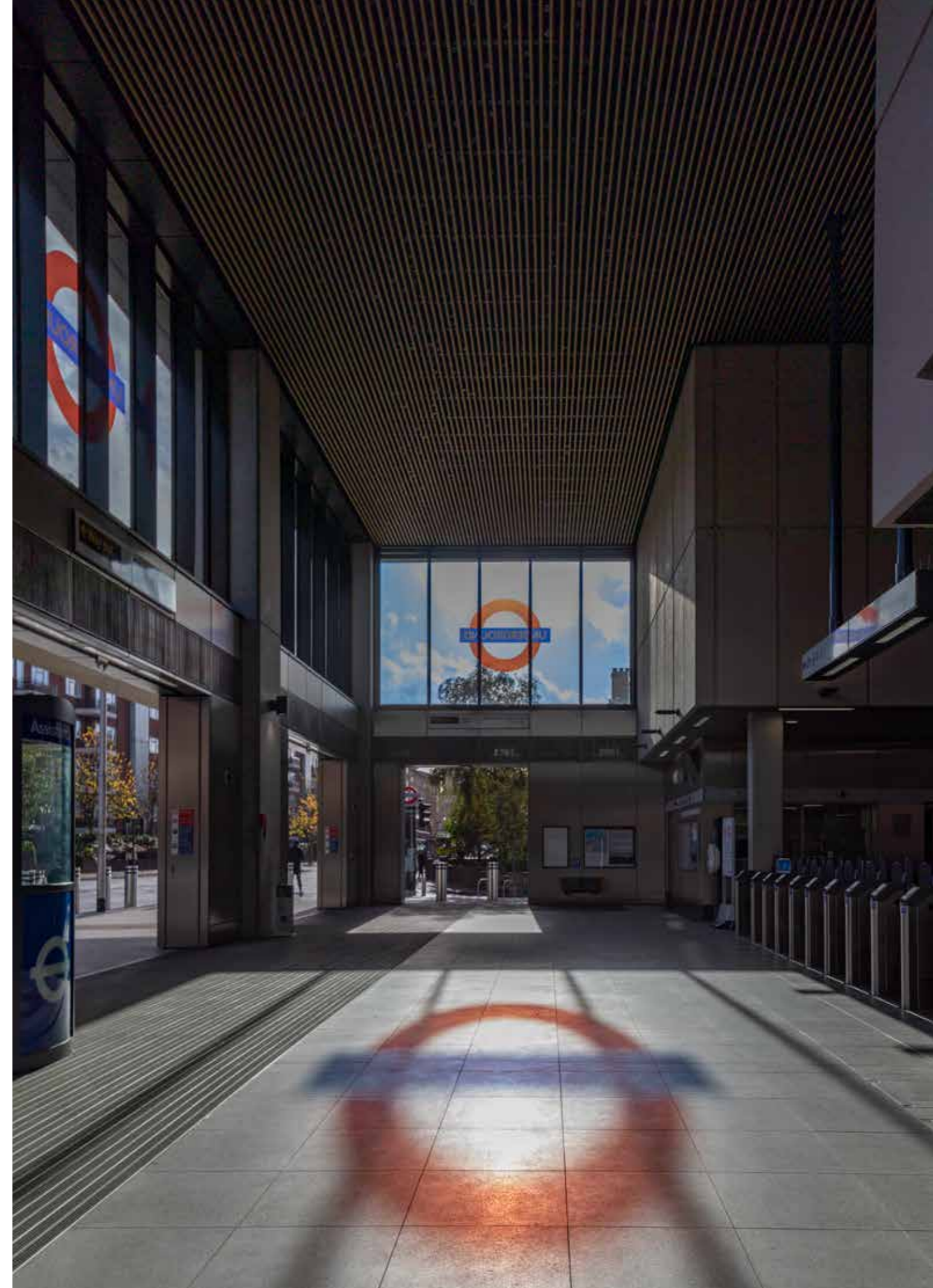
Scope

This report provides an update on the projects that will further enhance our world-class transport services. It covers Periods 8, 9 and 10, which runs from 17 October 2021 to 8 January 2022.

For each key project or programme, the financial and milestone data represent the position at the end of Period 10 and includes commentary on key achievements, progress and challenges. The report also contains updates on notable progress made since the last report.

Financial records of spend to date, authority and estimated final cost (EFC) represent the entire duration of each separate project, programme, or portfolio, except where stated. Where authority is significantly lower than EFC, it has been given for the current stage of works and we will look for further funding authority when appropriate.

Some financial information is commercially sensitive and is redacted.



Our network can help support London's growth and recovery



Our projects include some of our largest construction works

Investment programme delivery structure

Our investment programme is delivered by certain areas of our organisation, which is reflected in the structure of this report.

Major projects

This area is responsible for our largest and most complex projects. It comprises line upgrades, such as the Piccadilly line upgrade and the Four Lines Modernisation programme, as well as network extensions, major station upgrades, the Elizabeth line and Crossrail.

London Underground

This area covers stations, accessibility, track renewals, power, cooling and energy, rolling stock, and signalling and control.

Surface transport

This area comprises Healthy Streets, air quality, public transport and asset investment.

Professional services

Our professional services area comprises Technology and Data, Media and our Growth Fund.

Our performance

We measure the safety and milestones progress of our investment programme schemes



Safety performance

During Quarter 3, we continued to keep our customers and workforce safe during the coronavirus pandemic. This quarter, our priority was to provide reassurance that we continue to operate safe services as London emerges from the pandemic. In parallel, we continued to make progress towards our longer-term safety, health and environmental objectives.

Capital delivery

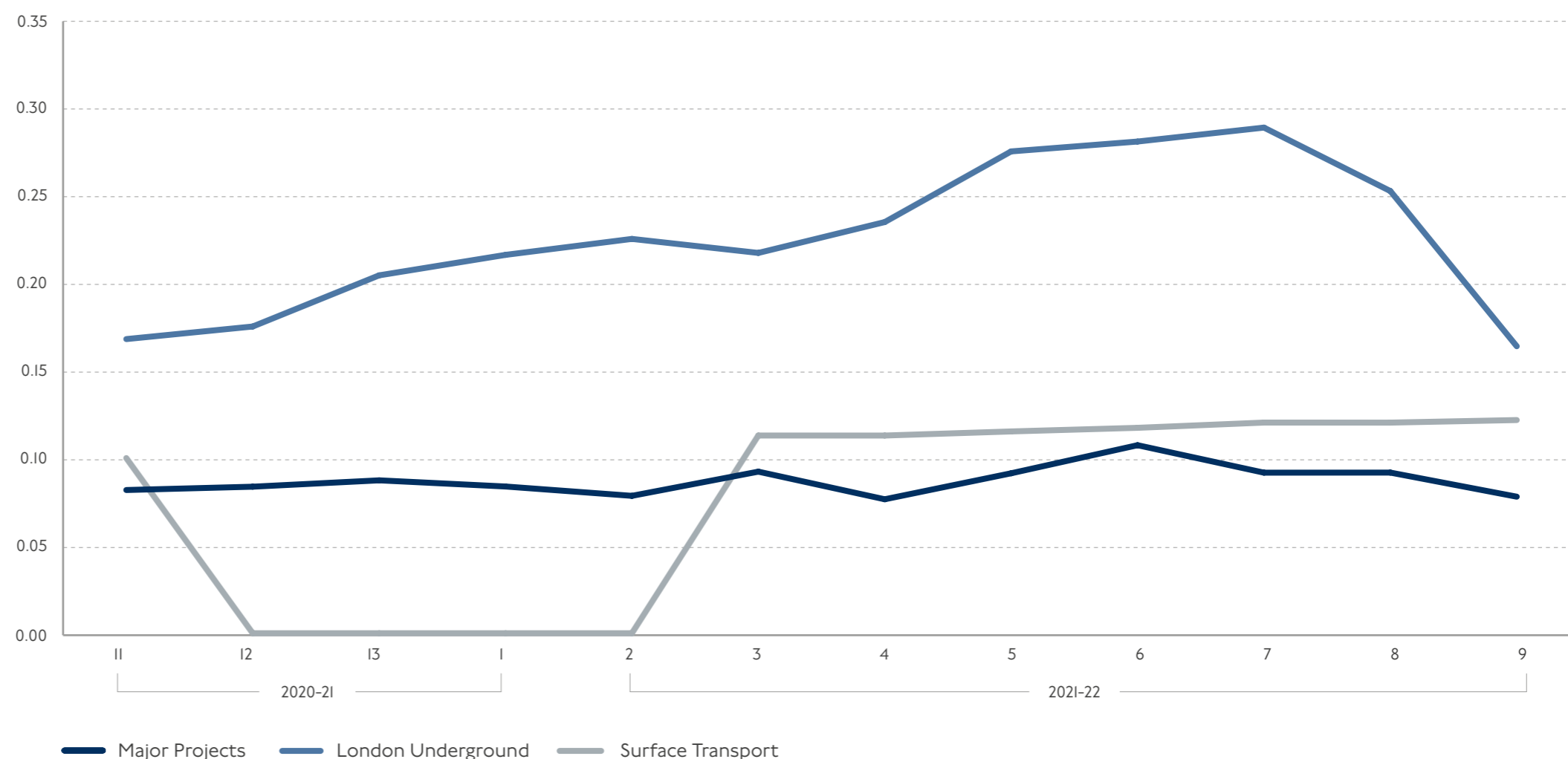
In line with our organisational structure, data reported in this section covers our Major Projects Directorate, Surface transport project and programme delivery and London Underground renewals and enhancements. Data from other areas where construction and maintenance work is done is reported separately in our public transport workforce data.

Quarterly performance

To enable accurate analysis of data, some of our key measurables are quoted as a frequency rate per 100,000 hours worked. Frequency rates are calculated using a moving annual average based on performance over the previous 13 periods.

There were no accidents or incidents reported under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) in our capital delivery teams. As a result, the accident frequency rate fell sharply within London Underground to 0.17, slightly above the target threshold of 0.15. Surface transport and Major Projects saw performance remain relatively stable and both within their respective thresholds of 0.15 and 0.10.

RIDDOR accident frequency rate
(per 100,000 hours worked)

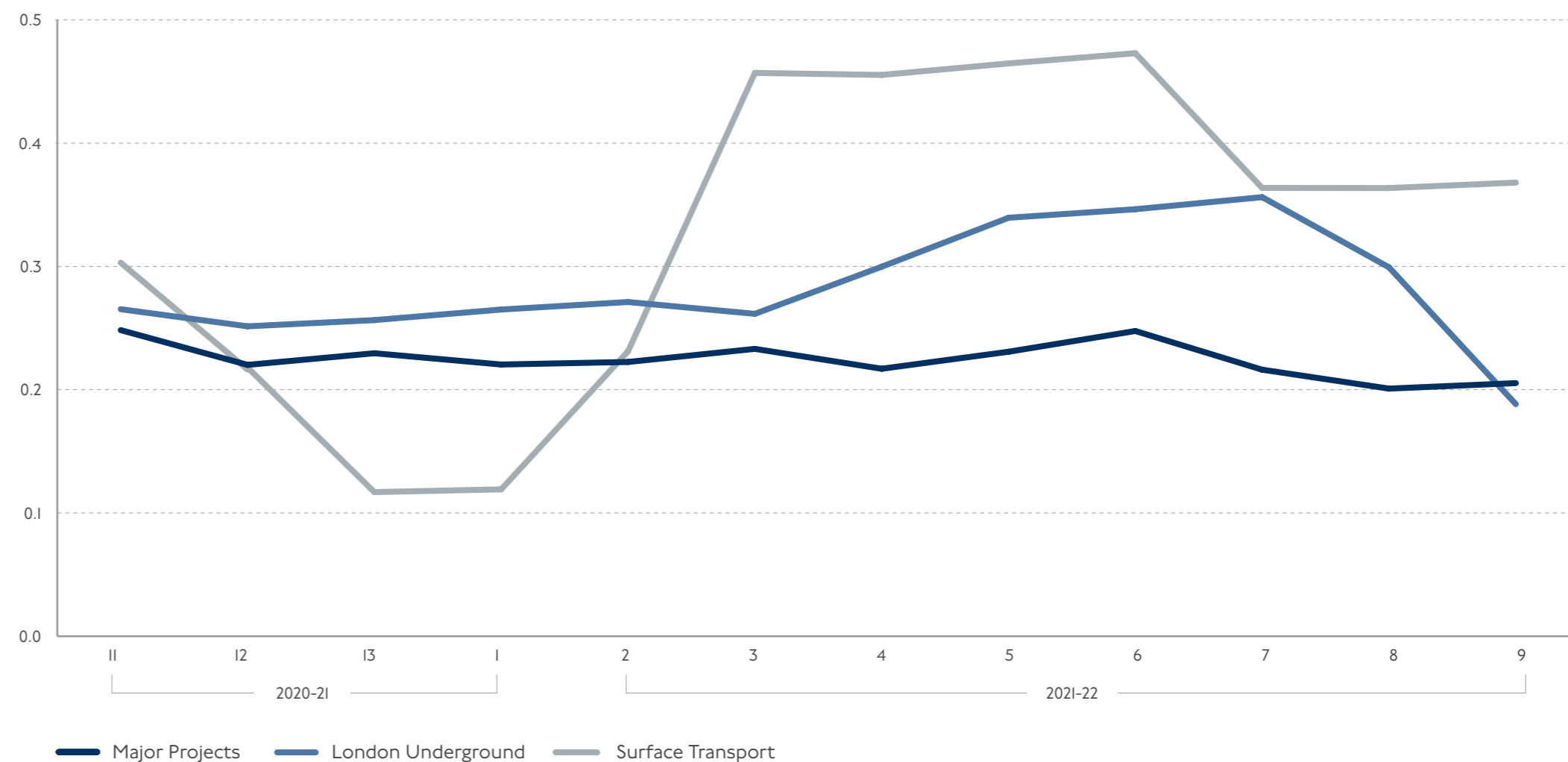


The significant reduction in RIDDOR reportable accidents is an improvement on previous quarters and also an improvement on last year's performance, where there were eight RIDDOR reportable accidents across our capital delivery teams. One highlight was the four million hours worked on the Four Lines Modernisation programme without a RIDDOR reportable incident and 1.5 million hours worked without a lost time incident.

The reduction in RIDDORs is a positive step towards progress in our long-term ambitions, but there were several significant near misses that had the potential to result in serious harm to our colleagues. We are paying close attention to recent increases in incidents caused by attempted violence and assaults on colleagues. High potential or significant near misses are treated in the same way as serious injuries, with full investigations completed, findings shared across our teams or wider industry, and actions taken to prevent harm.

Lost time injuries are those that cause someone to be absent for one shift or more. There was one incident in our capital delivery teams, a significant decrease on the previous quarter. Consequently, the frequency rates fell across London Underground, Major Projects and Surface transport against the 0.20 threshold.

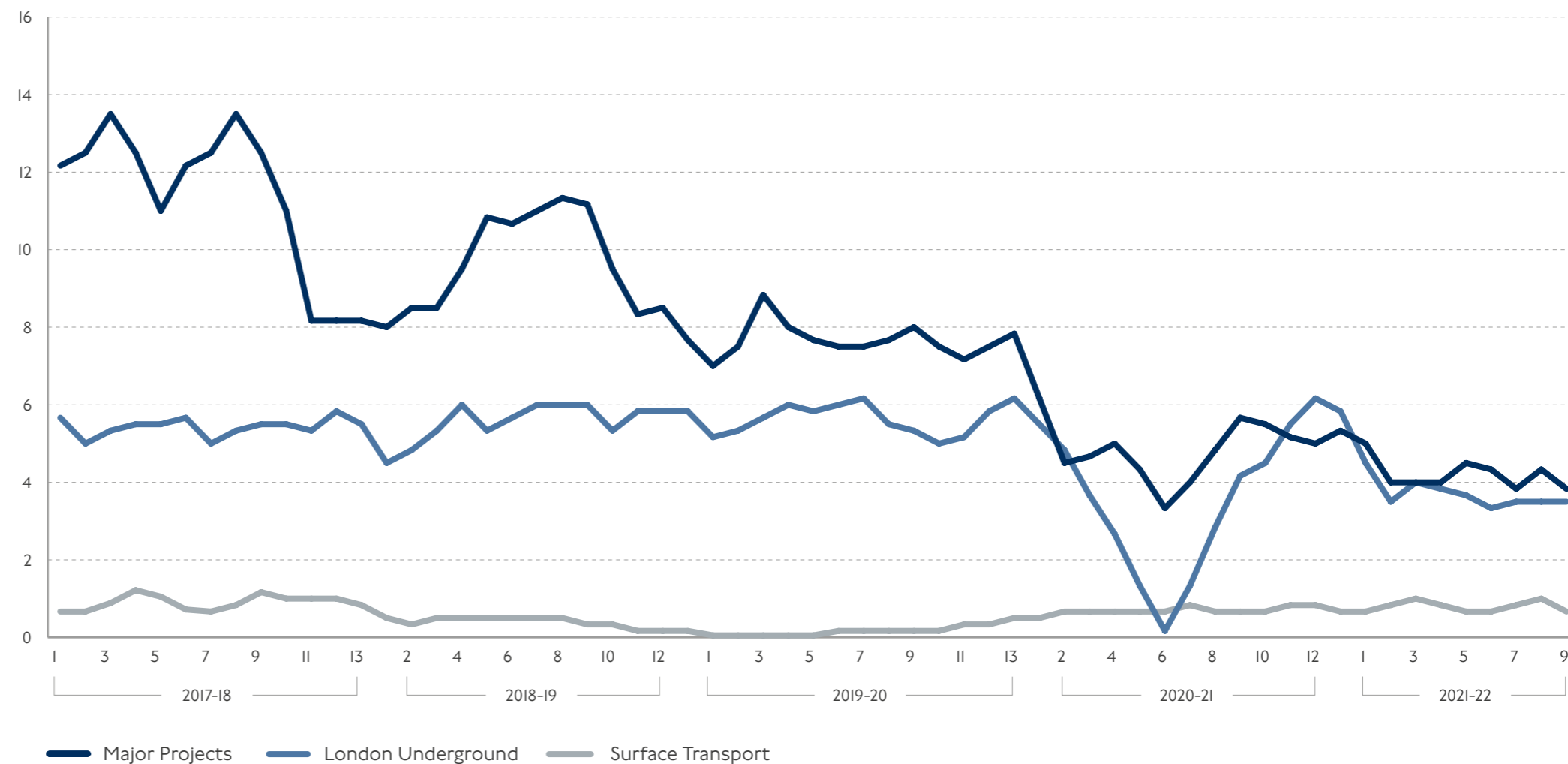
Lost time injury frequency rate
(per 100,000 hours worked)



There were 22 injuries across our capital delivery teams during the quarter, demonstrating a slight decrease on the previous quarter, in-line with the reduction in hours worked. Injuries across remain well below pre-pandemic levels and continue the overall decline since 2017/18.

We are now seeing signs that the number of injuries is beginning to plateau, which is likely to continue over coming quarters, as hours worked on site stabilise.

Total capital delivery physical workforce injuries
(Six-monthly average)



Schedule performance

We have achieved a number of significant milestones throughout the year

Northern Line Extension

On 20 September, two new stations at Nine Elms and Battersea Power Station welcomed their first customers. The two step-free Zone 1 stations are set to dramatically improve the connectivity of these vibrant south London neighbourhoods and contribute to the Capital's recovery from the pandemic.

Piccadilly line upgrade

We have begun assembly of the new passenger trains.

DLR rolling stock replacement programme

The first train for the new fleet has been assembled ahead of testing.

Barking Riverside Extension

We have completed the construction of the viaduct to enable the rail systems to be installed.

Four Lines Modernisation

We launched the passenger service between Monument and Sloane Square, in signal migration area 4.

London Underground

We have developed a decarbonisation strategy.

London Underground asset performance

We have completed the Victoria line train overhaul programme.

London Underground asset renewals

We have installed 75 per cent of our one-person operation cameras on platforms and replaced 16 life-expired traction isolation switches.

Surface technology

We have completed the release of the intelligent transport system 2.0.

Surface assets

Construction work has started on site at the A40 Westway.

Surface air quality

Our Greater London Boundary charge feasibility study has been completed and signed off by our Commissioner.

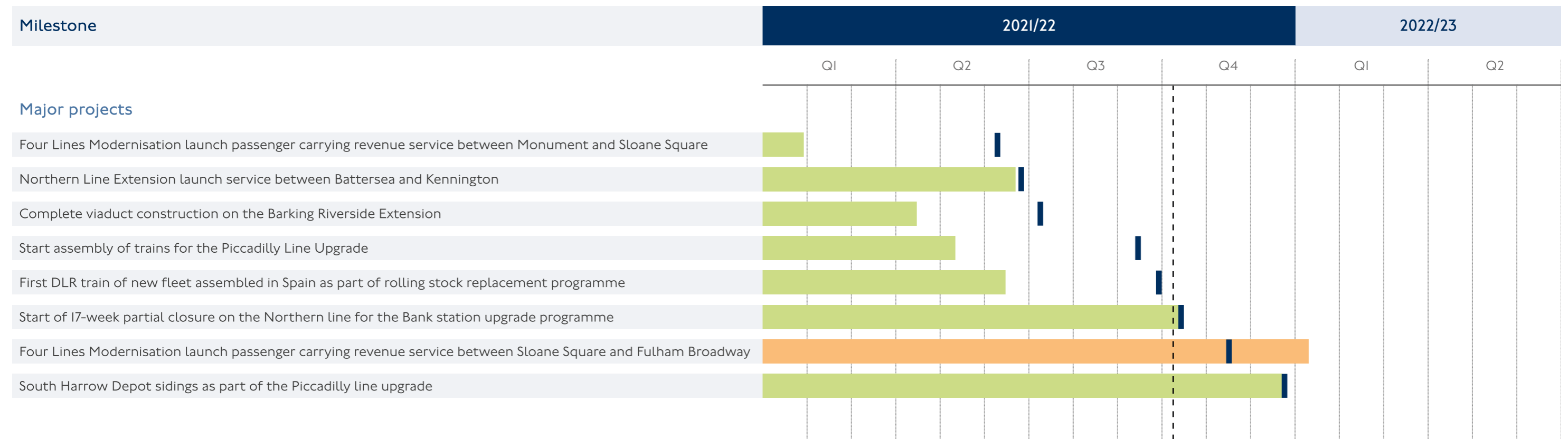
Surface Healthy Streets

We have opened the station entrance on Cowper Street.

Strategic milestones

We forecast that we will deliver 19 out of 23 strategic milestones either on time or early this year

These are our strategic milestones for 2021/22. The hollow box shows when the milestone was due to be met, while the coloured block shows when it was achieved or is forecast to be achieved.



■ Delivered on time or earlier than planned
 ■ Delivered less than 90 days later than planned
 ■ Planned delivery date
 Reporting period cut off by 8 January 2022

Strategic milestones 2021/22 (continued)



■ Delivered on time or earlier than planned
 ■ Delivered less than 90 days later than planned
 ■ Delivered more than 90 days later than planned
 ■ Planned delivery date
 ⋮ Reporting period cut off by 8 January 2022

* Signed off by TfL Commissioner

Milestones forecast to be late

Rotherhithe Tunnel

Owing to the current funding and financing challenges we face, we have paused the tendering process for the detailed design and build stage. We are putting in place some short-term capital interventions to ensure the tunnel remains safe and operable until the main refurbishment project can be progressed.

Four Lines Modernisation

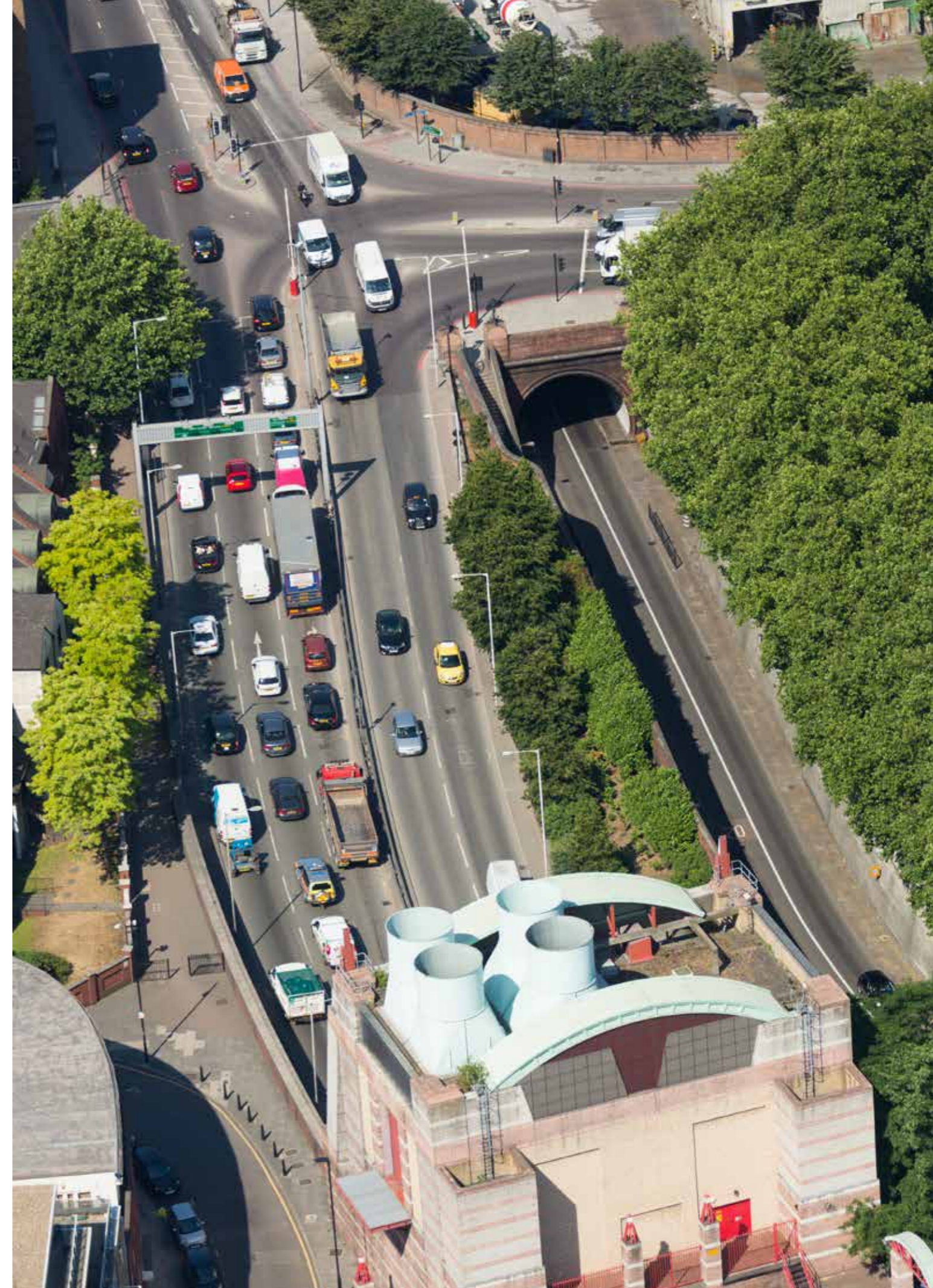
The milestone for signal migration area 5 is forecast to be 49 days later than planned. This is owing to ongoing software issues, which are being reviewed, and to incorporate all functionality for the safety and reliability of the migration area.

London Underground escalators

We have returned 13 out of 23 escalators to passenger service. The remaining 10 escalators are in progress, with six of these forecast to return to service up 61 days later than planned. This is owing to increased complexity of integrating the new assets with the station infrastructure.

Central Line Improvement Programme

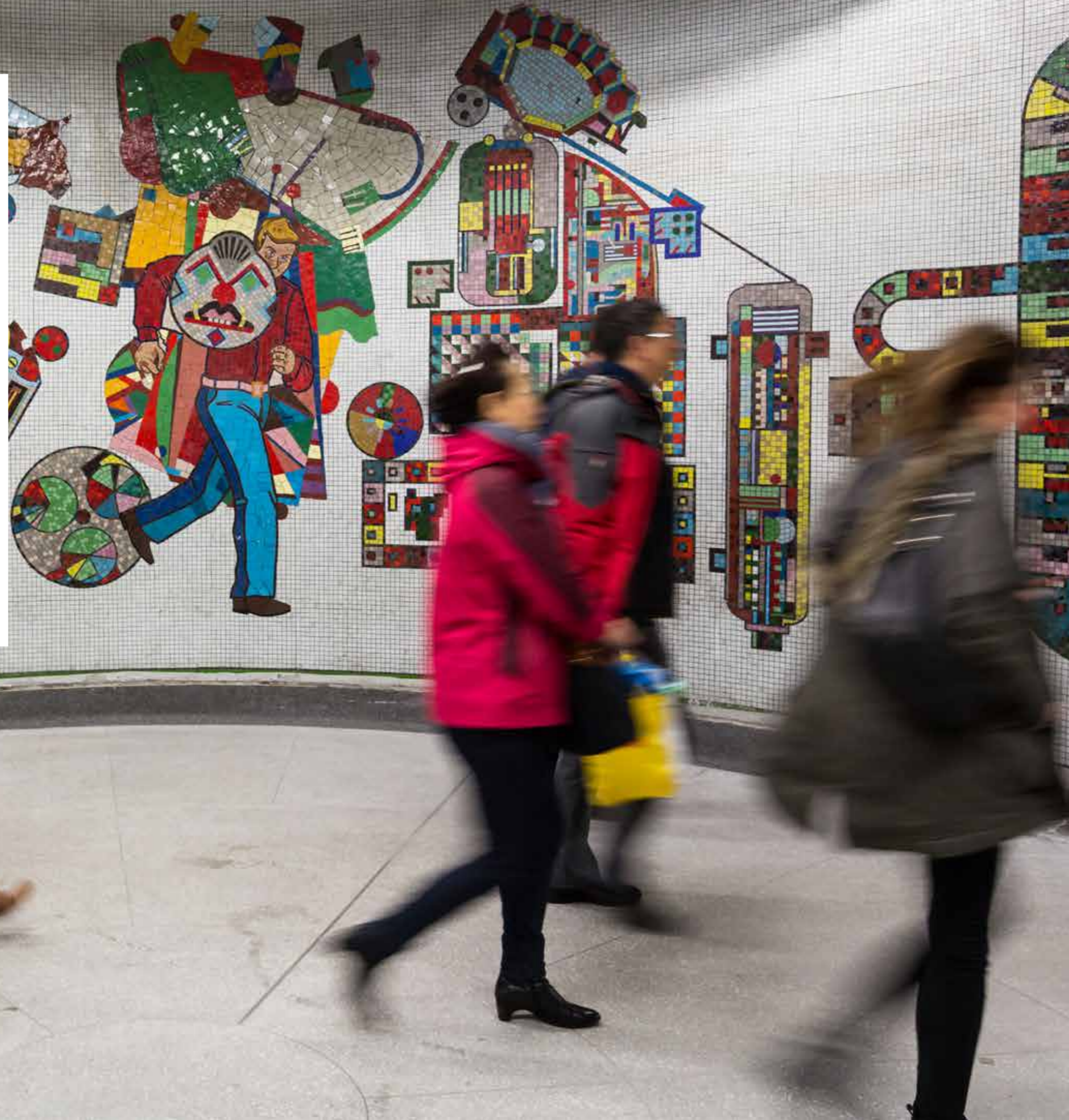
The first train was expected to be in service in March 2022, but the forecast shows this will be 160 days late. The programme continues to be delayed by a lack of resource and an inability to recruit. The team is reviewing the plan to identify delivery dates based on the current available resources and validate the impact to delivery. Although there is a plan to try to recover some of this time, the current forecast shows the first train will be later than planned.



We had to pause some of our major works due to funding issues

Major projects

This portfolio contains our largest and most complex projects. It comprises line upgrades, such as the Piccadilly line upgrade, the Four Lines Modernisation programme, network extensions, major station upgrades, the Elizabeth line and Crossrail



Elizabeth line

On-network stations improvement programme

Forecast completion	Net cost to date (£m)	Net cost to go (£m)	Net EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2022	93	1	94	94	0
Change since last Investment programme report					
No change	1	No change	No change	No change	

Programme update

This programme involves upgrading surface stations on what will form the Elizabeth line route. It comprises step-free access work at seven stations and refurbishment work across the 22 surface stations that we operate.

With all the lift scheme paperwork now accepted, the programme's main focus is on the works being done by our delivery partner, MTR Elizabeth Line. During the Christmas break, MTR and its contractors worked to install new sections of platform canopy at Ealing Broadway and Hayes &

Harlington stations. The plant supplier pulled out the week before Christmas, which meant works at Ealing Broadway had to be replanned with a significant change to the installation. The team still had a very productive shift, working Christmas Day and Boxing Day, and managed to install all the main steelwork, with just some roof sheeting and lighting to complete. At Hayes & Harlington, works went as planned, with canopy steel and roof sheeting installed, leaving only the installation of the permanent lighting to complete as per the original plan.

All numbers are shown as net of income and third-party contributions. Figures are rounded to the nearest £m.



We are refurbishing 22 of our Elizabeth line surface stations

Elizabeth line

Rolling stock

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2025	993	13	1,006	1,149	143
Change since last Investment programme report					
No change	2	(2)	No change	No change	

Programme update

Class 345 trains

We completed the replacement of all seven-car Class 345 trains between Liverpool Street and Shenfield and the 22 nine-car Class 345 trains in December 2021.

Passenger services between Reading and Paddington are being operated by a combination of nine-car and seven-car Class 345 trains while the seven-car trains are progressively taken into Old Oak Common Depot to be converted to nine cars. This programme will be completed in May 2022 for all but a few seven-car trains, which will remain in passenger service until the start of through-running services into the Elizabeth line central section. Services to Heathrow continue to be operated by nine-car Class 345 trains.

Up to 18 Class 345 trains, 12 trains per hour, have been operating timetabled trial operations in the Elizabeth line central section since 20 November 2021 under the full control of the signalling system, which was upgraded on 25 October 2021. We completed a further upgrade to the signalling system on 27 December, in time for trial operations to resume 28 December.

Challenges

The current train control software has not delivered the predicted nine-car Class 345 reliability growth. Train manufacturer ALSTOM delivered the first of two reliability-focused train control software releases on schedule on 17 December ready for installation on the fleet, and all nine car trains were upgraded to this new version by 12 January 2022. There has been an increase in fleet reliability, but not to the level that we anticipated. The second reliability focused software release was approved on 4 February and is in now being put onto trains.



We are running trial operations of our Class 345 trains

Crossrail

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£b)	Variance: EFC versus authority (£m)
2023	15,479	460	15,939	15,789*	(150)

Programme update

Crossrail is the biggest railway infrastructure project in Europe and one of the largest single investments undertaken in the UK. It will deliver 42km of new rail tunnels under London, 50km of new permanent track and 10 new stations. Passenger services will start in the first half of 2022, with initial services between Abbey Wood and Paddington Elizabeth line stations.

We are coming to the end of the first phase of trial operations, which started on 20 November 2021. The next phase will include large-scale exercises across the new railway.

During the festive period, we upgraded the remaining tunnel ventilation system and signalling software, commissioned the latest control and communications software, and replaced voltage transformers. These upgrades provide further increases in operational reliability.

Canary Wharf station was transferred to us on 25 January 2022, which means it can now be fully integrated with the operational network. Nine out of the 10 central stations have now been transferred from Crossrail. Bond Street station will open separately from the rest of the railway and the team is working to get the earliest opening date for this station.

The railway is generally performing well following the completion of tunnel ventilation system works and commissioning of ELRI10 signalling software. The central section is running at 12 trains per hour, which is the initial level of service on the Elizabeth line, with the new signalling software to test reliability and build mileage.

* Excludes on-network works carried out by Network Rail.



Nine central stations have been transferred to us from Crossrail

Four Lines Modernisation

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
Spring 2025	5,110	345	5,456	5,447	(9)
Change since last Investment programme report					
No change	29	(31)	(2)	No change	

Financial commentary

Following the revised authority, which was granted by the Programmes and Investment Committee in July 2021, we have further reviewed the risks and opportunities for the remainder of the programme. Given the complexity of this programme and the extent of the review, we expect this to take some time, during which the estimated final costs will remain dynamic. We will provide an interim update at the meeting on 18 May 2022, followed by a full update at the July 2022 Programmes and Investment Committee meeting.

As part of the review, the software programme has been extensively analysed with our signalling contractor, Thales. This has focused on understanding the risks and the granular metrics, which are essential to improve performance. This review has been fed into the latest programme to help ensure it is realistic and will be the catalyst to drive further collaboration and confidence in our plan.

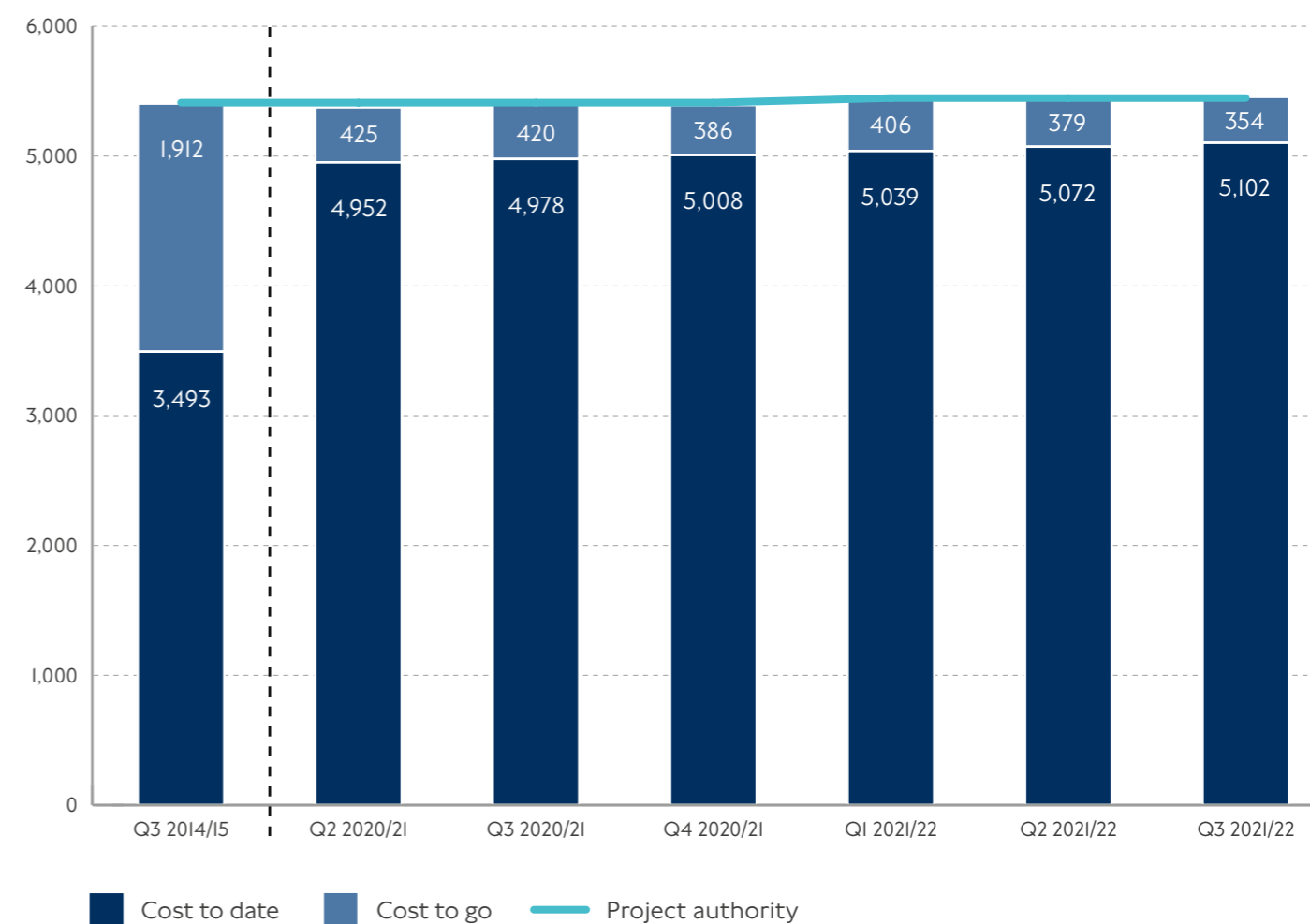
Performance over time

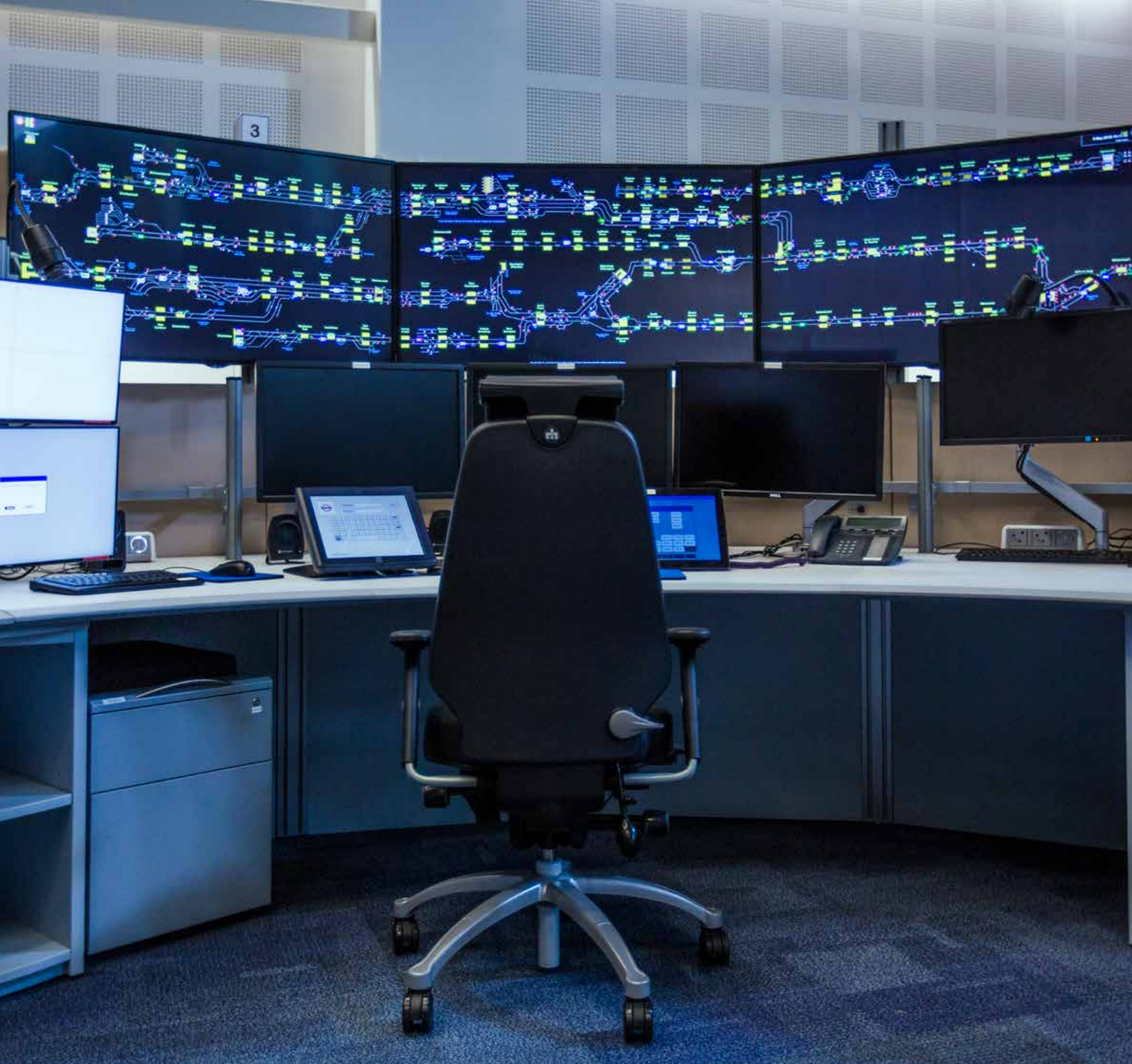
There has been a slight decrease since the last report to £9m over authority, owing to tender savings, risk mitigation and retirement. The EFC remains above authority due to our assessment of the risk of further delay. The EFC is a dynamic forecast based on the current understanding of the cost to go in relation to the remaining scope of work and the associated risks, which considers the entire programme and currently has the final signalling migration area I4 forecast for October 2024, which includes a provision for unknown events.

The EFC and completion date will remain a key area of focus as we seek to further fully understand and develop the risks and opportunities for this complex systems programme and the next six months is critical to informing the likely position.

Estimated financial cost performance over time (£m)

Forecast end date





Programme update

The next section of signalling, between Sloane Square, Paddington, Fulham Broadway and Barons Court, remains on target to go live in spring 2022. This phase, called signalling migration area 5, will involve upgrading the highly complex junction at Earl's Court and will mean the entire Circle line will have been upgraded to the new signalling system. Factory acceptance testing of software for this area was completed in December 2021 and a final weekend of testing, involving engineering and passenger trains, was completed on 10 January 2022.

Software development and testing and infrastructure works for the future signalling migration areas have also continued, with a weekend closure in November 2021 focusing on the installation works between Stepney Green and Becontree, and between Becontree and Upminster, and the commissioning of the Harrow-on-the-Hill integration works needed for signalling migration area 9.

Line upgrades

DLR rolling stock and systems integration

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and Project Authority (£m)	Variance: EFC versus authority (£m)
Summer 2026	145	681	826	863	37
Change since last Investment programme report					
1 quarter later	18	(17)	1	No change	

Financial Commentary

The EFC has remained stable since the last report and spend is in line with current forecasts. The figures include the Housing Infrastructure Funding. Forecast completion date movement is due to the inclusion of the Housing Infrastructure Funding scope, with train 54 due in summer 2026.

Performance over time

The cost and time changes are related to the inclusion of the Housing Infrastructure Funding scope. We have reduced our EFC to reflect procurement savings and taking a proactive stance with the remaining risk exposure as the rolling stock design approaches completion.

Programme update

Rolling stock delivery

Manufacture has started on the new fleet, with 20 car bodies in production. Trains one and two are now assembled, which has enabled static testing to start.

Beckton Depot and network infrastructure

At Beckton, work on the northern sidings continues and an intensive period of

possessions has started in the lead up to the change to the new signalling control system in early 2022. Site works on the substation project started in November 2021. There are some challenges around the depot programme, but these are not expected to impact the train introduction schedule. Signalling software development continues to progress to programme, with the first releases due in spring 2022.

Housing Infrastructure Funding

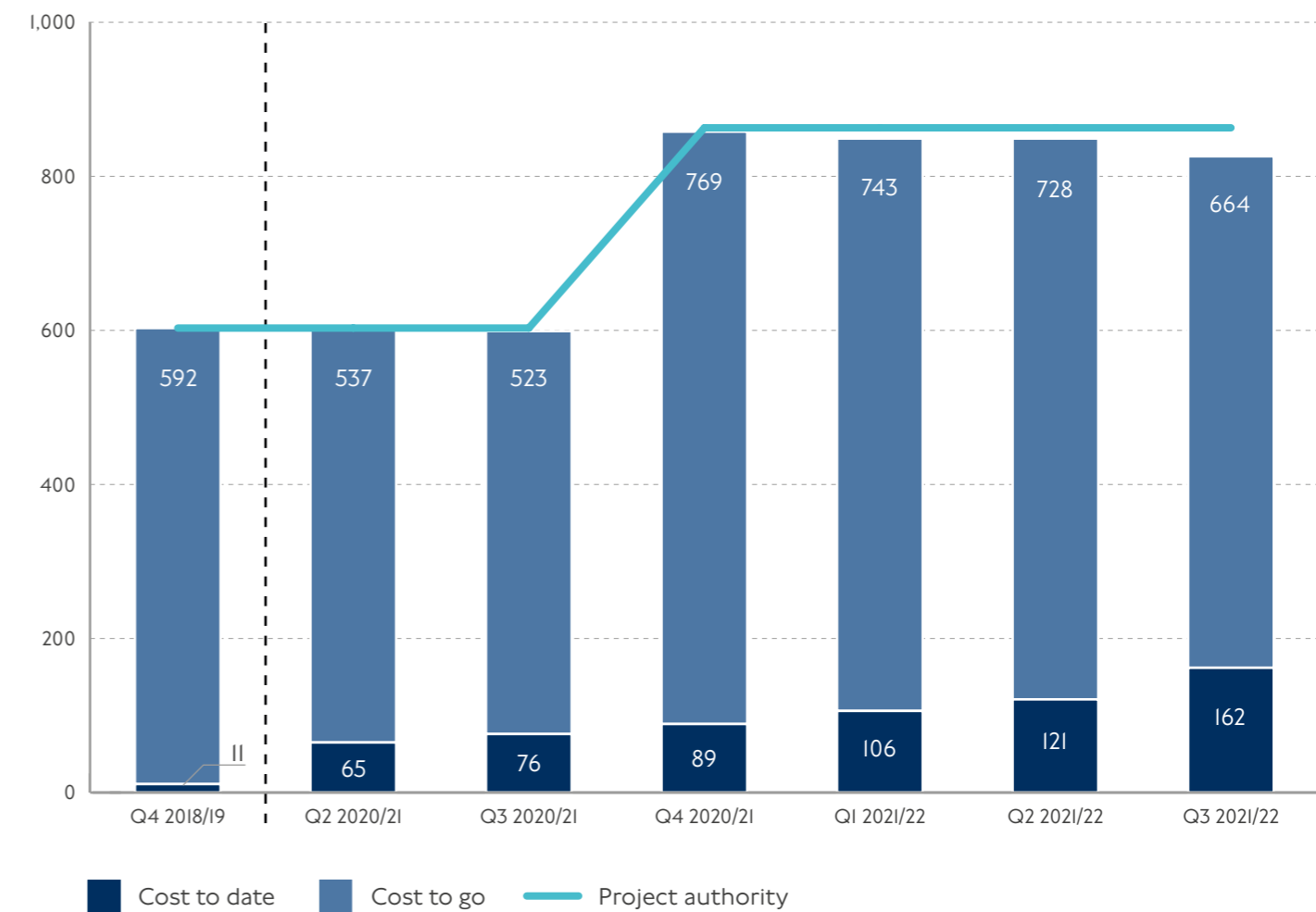
We have exchanged contracts for the acquisition of land at Beckton next to the depot, which is needed for the construction of the additional sidings funded by the Housing Infrastructure Fund. The date for completion is 28 February 2022.

Northern sidings works

There have been delays with the design of the new maintenance building and the possession programme for the northern sidings works. A contingency plan to enable the first trains to be assembled on time has been developed and the train introduction schedule is not expected to be impacted.

Estimated financial cost performance over time (£m)

Forecast end date



Line upgrades

Piccadilly line upgrade

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and Project Authority (£m)	Variance: EFC versus authority (£m)
Spring 2027	383	2,459	2,842	2,994	152
Change since last Investment programme report					
No change	36	(38)	(2)	No change	

Financial commentary

Our EFC has decreased by £2m since the last report. Risks and opportunities are actively managed each period, which results in dynamic changes to the EFC. The main driver for the decrease comes from a review of resource requirements across several projects and efficiencies identified.

Performance over time

The 2020/21 emergency budget decision was to defer the start of third party spend where possible by six months. Owing to this, and the delay to start infrastructure enabling works, the new trains are now expected to begin entering revenue service from spring 2025, as mentioned in the public announcement in March 2021.

We have reduced our overall EFC through the realisation of opportunities and an ongoing focus on value and efficiency generating an authority surplus.

To reflect the progressive reductions in EFC for the first stage programme since authority in May 2018, a decision was endorsed by the Programmes and Investment Committee to reduce the programme's authority by £300m.

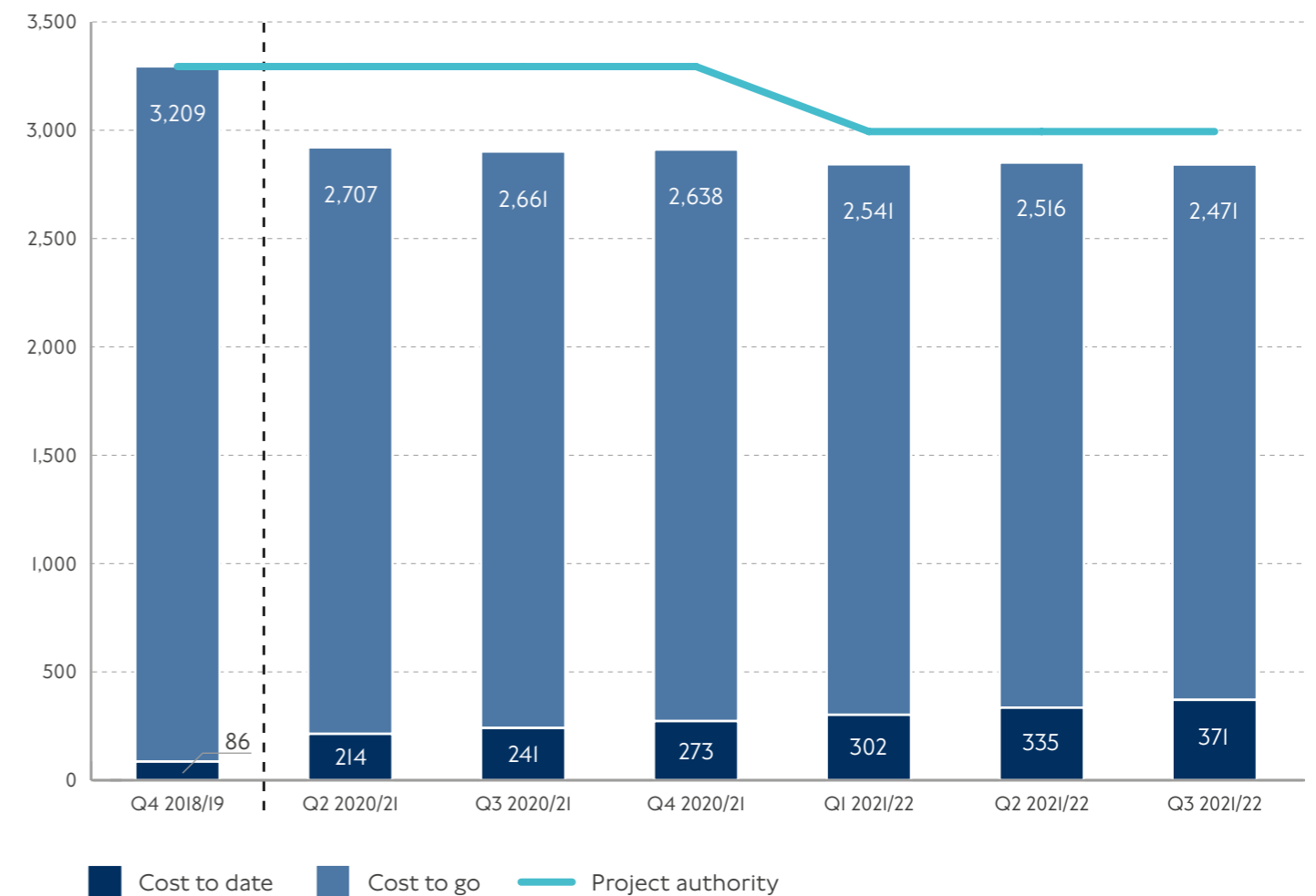
Programme update Power and signalling

The design and build contract for the high voltage power for immunisation works was awarded in November 2021, with work starting on site in December 2021. This contract will deliver the power infrastructure to support the frequency conversion of this equipment, which will ensure it is compatible. Site activities will continue throughout the next quarter.

The procurement of the high voltage power framework is progressing and we are now in negotiation with the tenderers. We expect the final contract award recommendation to be approved in March 2022.

Estimated financial cost performance over time (£m)

Forecast end date



Delivery fleet introduction

The stage one assurance for the new trains was completed on 14 December 2021, ahead of target.

On 15 December, the new Piccadilly line train cab mock-up arrived at the Tunnelling and Construction Academy in East London from Siemens in Germany. It will be in London until the end of March 2022, before moving to the innovation hub at Siemens manufacturing facility in Goole.

Depots and stabling

In December 2021, we awarded the depot delivery integrator contract to the joint venture of Lendlease Construction (EMEA) Ltd & Jacobs UK Ltd. They will support the depot project teams to upgrade the depot. We will take on the roles of client, principal contractor and principal designer.

Northfield Depot

Working in partnership with renewals points and crossing's possession, we completed trackwork at Northfields Depot, including installing ironwork for new points, track section and fixed red-light signals. This is the preliminary work to enable the construction of the new northeast sidings. This was a great opportunity to capitalise on the synergies with the renewals points and crossings project's possession, enabling cost savings and preventing closures.



Our Piccadilly line upgrade project continues to progress

Network extensions

Northern Line Extension

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and Project Authority (£m)	Variance: EFC versus authority (£m)
Autumn 2021	1,095	13	1,107	1,260	153
Change since last Investment programme report					
No change	7	(6)	No change	No change	

Financial commentary

The EFC has remained stable and the variance on spend to date and cost to go reflects the costs that have spent since the last report.

Performance over time

The project is expected to come in £153m under budget, bringing its EFC to £1.1bn, despite the cost pressures brought about by the pandemic.

Programme update

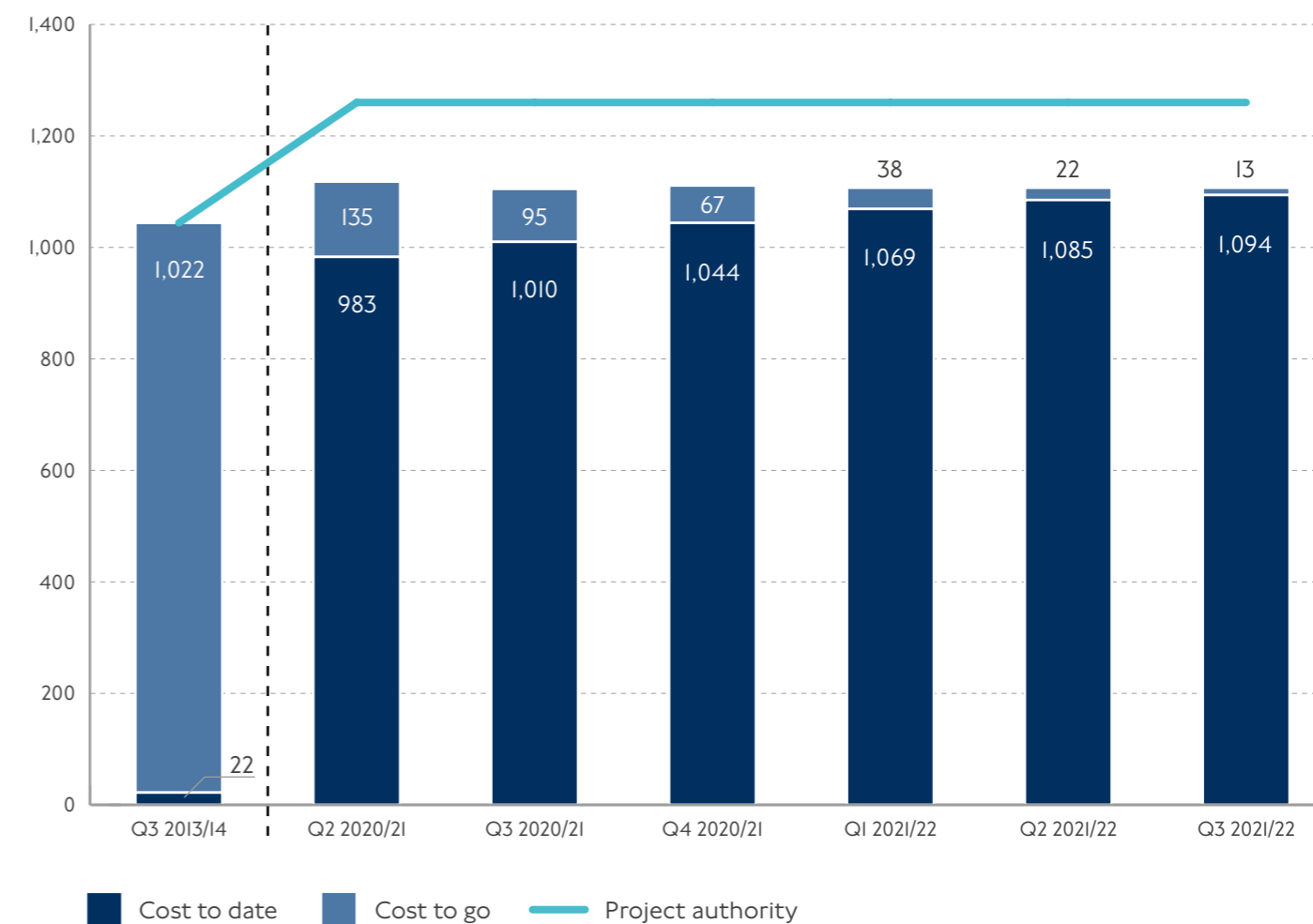
The revenue service launched on 20 September 2021, with the two new stations at Nine Elms and Battersea Power Station welcoming their first customers.

The team is now focused on closing out snagging items, completing assurance documentation, achieving commercial closure and working towards project closure in spring 2022.

In December 2021, we were awarded 'Excellent' for Civil Engineering Environmental Quality Assessment & Award Scheme (CEEQUAL), which is a sustainability assessment awarded by the British Research Establishment. Sustainability was considered at all stages of the project, including efficient use of materials, responsible procurement, and the use of barges to remove construction spoil from site to be used in land reclamation. This award was achieved by the hard work and commitment of Ferrovial Laing O'Rourke and ourselves, with the support from the many suppliers and sub-contractors.

Estimated financial cost performance over time (£m)

Forecast end date



Silvertown Tunnel

Forecast completion	Net cost to date (£m)	Net cost to go (£m)	Net EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
Winter 2025	65	114	180	173	(6)
Change since last Investment programme report					
No change	3	2	5	No change	

Financial commentary

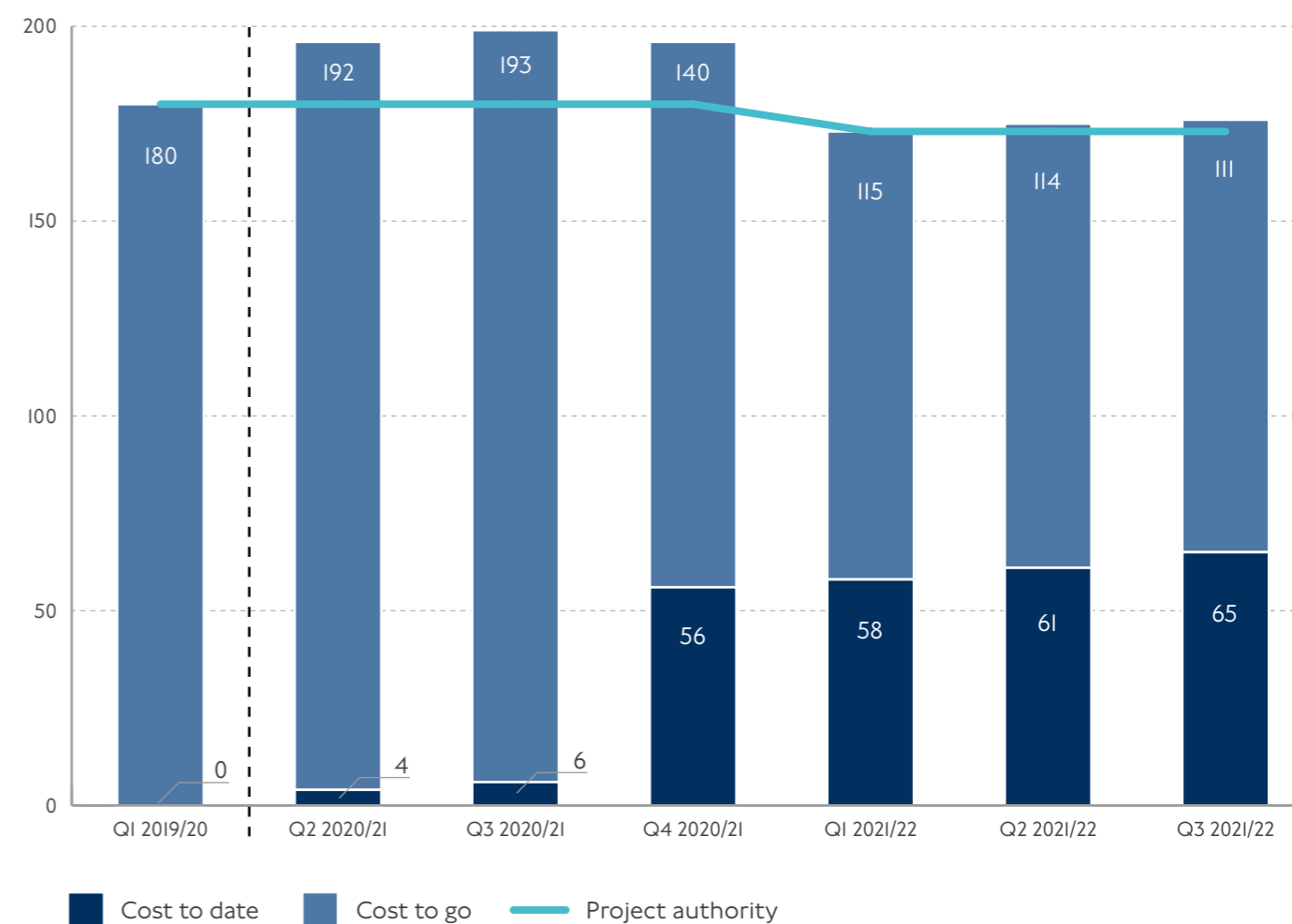
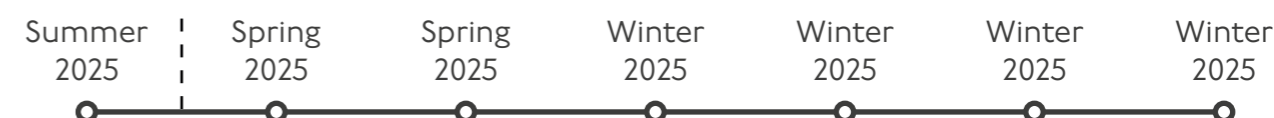
The EFC is currently £6m over the delegated Programme and Project Authority of £173m. The project team continues to seek opportunities to bring this back in line with authority. The main change in EFC since the last report is due to an increase in project risk, which we are looking to mitigate, and an increase in group finance inflation assumptions.

Performance over time

Our forecast end date has been stable since the Programme and Project Authority was approved in May 2019. Our Programme and Project Authority was granted net of third-party contributions. EFC has increased over the last 18 months, owing to additional costs for implementation of road user charging infrastructure. It was reduced in Quarter I 2021/22 after the road user charging infrastructure scope and budget was transferred to surface project and programme delivery to achieve synergies with our other road user charging schemes. Sponsorship will remain with our Major Projects Directorate to ensure project objectives are met.

Estimated financial cost performance over time (£m)

Forecast end date



All numbers shown as net of income and third-party contributions



Works on site are continuing at both Greenwich and Silvertown

Programme update

Contracts are in place for transport and traffic, socio-economic and environmental monitoring, which are part of our development consent order obligations. Environmental monitoring continues, with additional traffic monitoring planned to start early this year. This will support our wider air quality monitoring and is in addition to that required under the development consent order obligations.

We have taken temporary possession of the required land from existing tenants to enable handover of 50 out of 64 sites to our contractor Riverlinx.

Site works continue at both Greenwich and Silvertown, including where the tunnel boring machine launch, rotation and retrieval chambers will be constructed. Excavation works for the three shafts for the tunnel boring machine at Silvertown and where it will rotate at Greenwich continue to plan. The tunnel boring machine has completed factory acceptance testing and the first three sections of outer casing arrived on site on 6 December 2021. It is expected to be assembled on site by late spring 2022 and begin tunnelling shortly afterwards.

Works are also progressing well, with guide wall construction and piling at the south portal and on the replacement of a section of the river wall on the north bank of the Thames to ensure its stability during our tunnelling works. It will also provide additional habitat and future-proofed flood defences to support development plans in the area.

Network extensions

Barking Riverside Extension

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
Autumn 2022	311	20	331	329	(2)
Change since last Investment programme report					
No change	11	(11)	No change	No change	

Financial commentary

The EFC is unchanged from last forecast and still exceeds Programme and Project Authority granted by the Programmes and Investment Committee in December 2020 by £2m. The current authority was based on the minimum EFC of a range at that time and all risks and opportunities to delivering within this are being fully explored before seeking any further uplift.

Performance over time

Our forecast end date has been delayed since Programme and Project Authority was increased in December 2018, following the discovery of uncharted utilities and the Safe Stop as a result of the pandemic. This meant the rail systems works needed to be replanned and Network Rail possessions had to be revised.

Programme update

Delivery of the physical works is well advanced, with the installation of track on the viaduct completed as planned in October 2021. We are installing the remaining rail systems on the viaduct, ahead of the final signalling stage

commissioning planned for April 2022. At the station, the installation, testing and commissioning of systems continues ahead of completing the quality assurances. Our most likely date to enter into service remains autumn 2022.

Viaduct rail systems

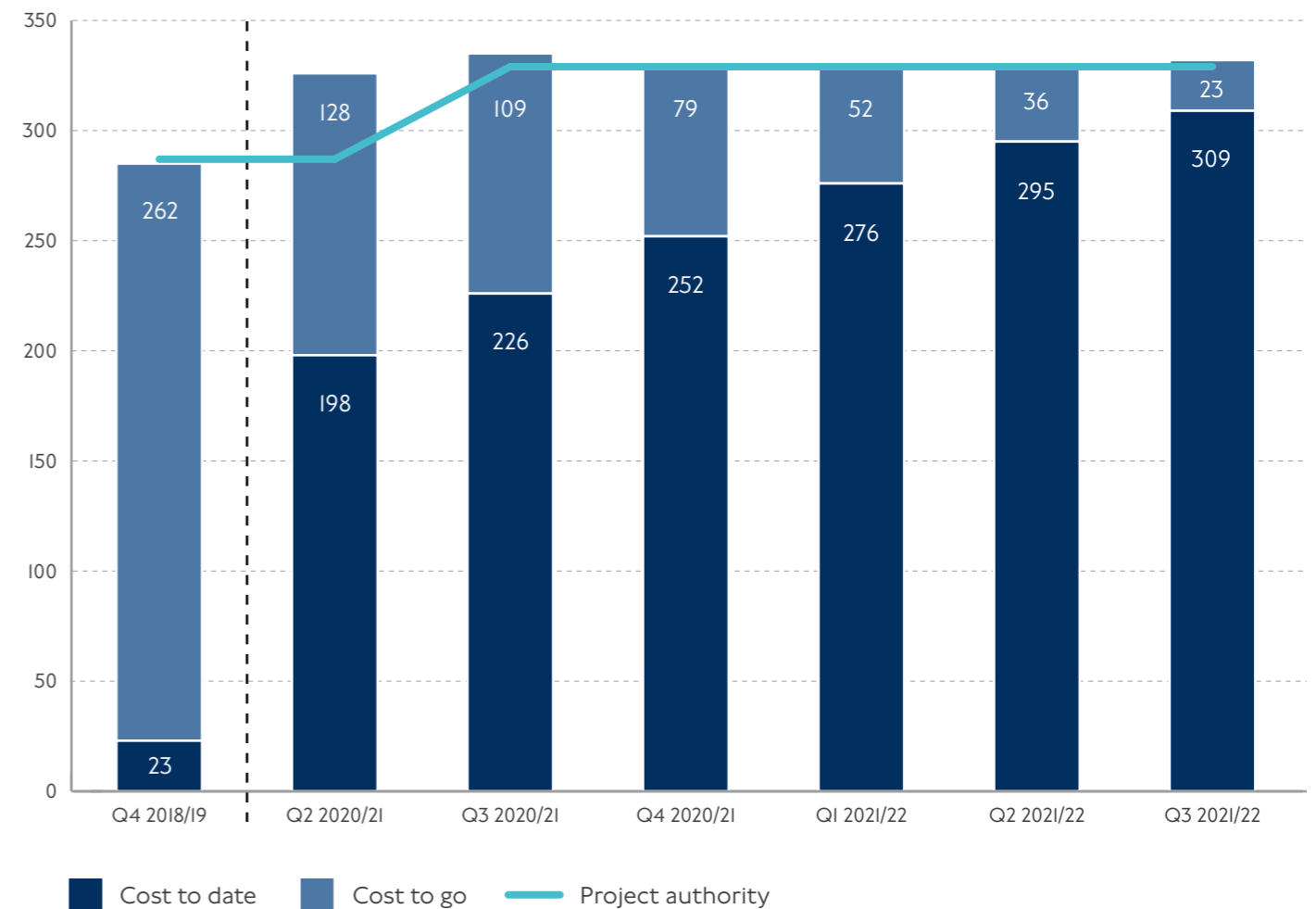
In October 2021, we completed the installation of the track running along the viaduct from the existing Network Rail lines to the new Barking Riverside station. We are now focused on installing telecoms, signalling and overhead line equipment and preparations for the final signalling stage commissioning, which is planned for a series of weekends in March and April 2022.

Station installation

The installation, testing and commissioning of mechanical and electrical equipment at the station has continued and there is an increasing focus on producing and reviewing assurance documentation. Plans for delivering the public areas around the station are being finalised to ensure they are ready for when the station opens.

Estimated financial cost performance over time (£m)

Forecast end date



Major station upgrades

Bank station capacity upgrade

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
Autumn 2022	614	87	702	702	(1)
Change since last Investment programme report					
No change	13	(14)	No change	1	

Financial commentary

The EFC has remained stable since the last report and spend is in line with current forecasts.

Performance over time

Our forecast end date has remained consistent since January 2016. The EFC has increased since authority award in Quarter 4 2015/16, owing to site works being disrupted by the impact of the terrorist attack at London Bridge, additional scope following the discovery of asbestos and the impact of the pandemic. Costs have remained relatively static over the last 18 months, with minor increases driven by the impact of the pandemic and the Safe Stop of all construction works, as well as the discovery of asbestos and the resultant programme delays.

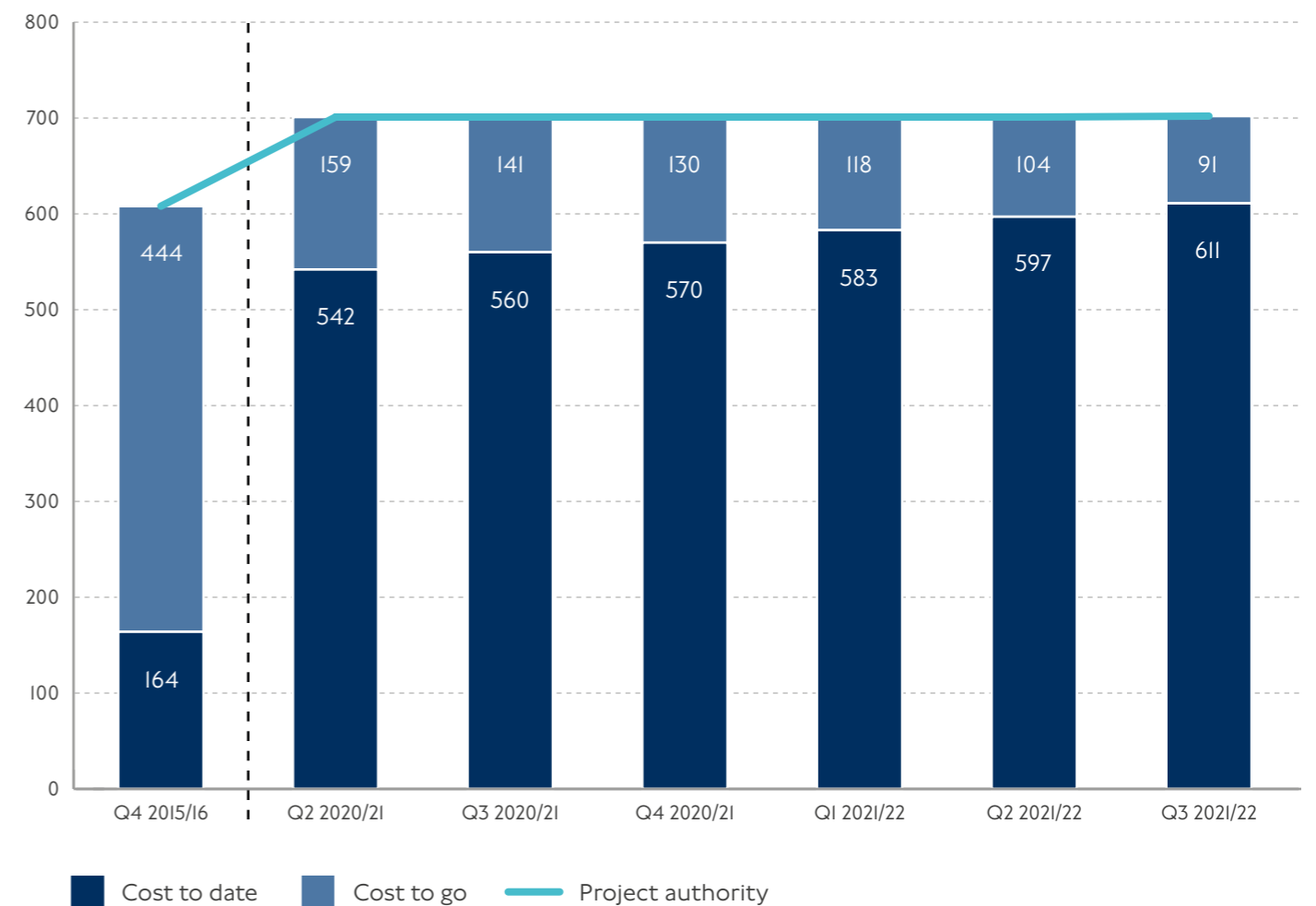
Programme update

The works and preparation for the Northern line Bank branch closure have concluded. We ran an extensive communication, marketing and operational campaign to manage travel demand and minimise the impact on customers. This line closure between Kennington and Moorgate started as planned on 15 January and will last for 17 weeks. At the end of this closure, a new platform and central concourse will be brought into use, which will help relieve congestion on the Northern line platform.

Station wall cladding finishes and floor tiling work continues, although it was impacted by supply chain challenges. The installation of 12 escalators, two moving walkways, power, lighting, fire and communications systems has progressed to plan. The testing and commissioning of all systems is being conducted in tandem to prepare for handover to operations for passenger use. These will be introduced in stages after the planned closure.

Estimated financial cost performance over time (£m)

Forecast end date



Elephant & Castle

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
Spring 2030	7	74	81	81	(0)
Change since last Investment programme report					
No change	Not reported	Not reported	Not reported	Not reported	

Financial commentary

The EFC has remained stable since the last report and spend is in line with current forecasts. Authority for tunnelling works and station box construction was approved by the Programmes and Investment Committee in December 2021.

Programme update

Developer negotiations

Negotiations with the developer were successfully concluded on 23 December 2021, and the development agreement was executed.

Funding

Our funding discussions with third parties, including the GLA and London Borough of Southwark, were successful, which means we have secured the funding for the first stage of works, including the station box, connecting tunnels and early works. The early works planned during the Northern line Bank closure have started on schedule.

Stage two station fit-out remains unfunded but we will seek to secure funding at a later date once the optimum best value scheme has been developed.



Our work will deliver improvements at Elephant & Castle

High Speed 2

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2028	20	42	62	28	(34)
Change since last Investment programme report					
No change	2	(1)	No change	No change	

Financial commentary

Programme and Project Authority is £34m lower than EFC, as it is granted on an annual basis for the following year's spend.

Programme update

Early construction activity is continuing across London and we have been working to mitigate the impacts of its construction traffic on our roads. We have worked closely with High Speed 2 (HS2) and its construction partners to facilitate the construction of tunnels for the new traction power substation and ventilation building at Euston. These achieved breakthrough on two fronts into the piled box structure for the new building and into our existing infrastructure at the other end.

We have completed our review of the Royal Institute of British Architect designs for the new Underground station at Euston, which includes step-free access from the street to the platform. We await resolution of several issues raised to protect our operational requirements.

At Old Oak Common, we are continuing to ensure that the Elizabeth line depot is protected during the large-scale piling and excavation works for the new station. We have put measures in place to protect the operation of bus services during major utilities diversions in the area.

We are actively and collaboratively working with HS2, Network Rail, London Borough of Camden and Lendlease, under the umbrella of The Euston Partnership, to ensure our requirements are satisfied, especially in connection with Network Rail as it begins to develop its plans for the redevelopment of the existing Euston conventional station. This includes assurances on the provision of a new bus station and future-proofing the provision of a station entrance for Crossrail 2.

Railway systems enhancements

Forecast completion	Gross cost to date (£m)	Gross cost to go (£m)	Gross EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
Winter 2027	142	20	162	171	9
Change since last Investment programme report					
No change	1	(33)	(32)	(74)	

Financial Commentary

The EFC and the Programme and Project Authority have both decreased since the last report. The most significant reduction is due to the decision to defer the enhanced signalling for the Jubilee line and fleet improvements.

Programme update

Planning continues for the delivery of Northern line signalling software updates targeted for commissioning on the railway in late 2022. This includes the software changes required at the end of the Bank closure in May 2022.

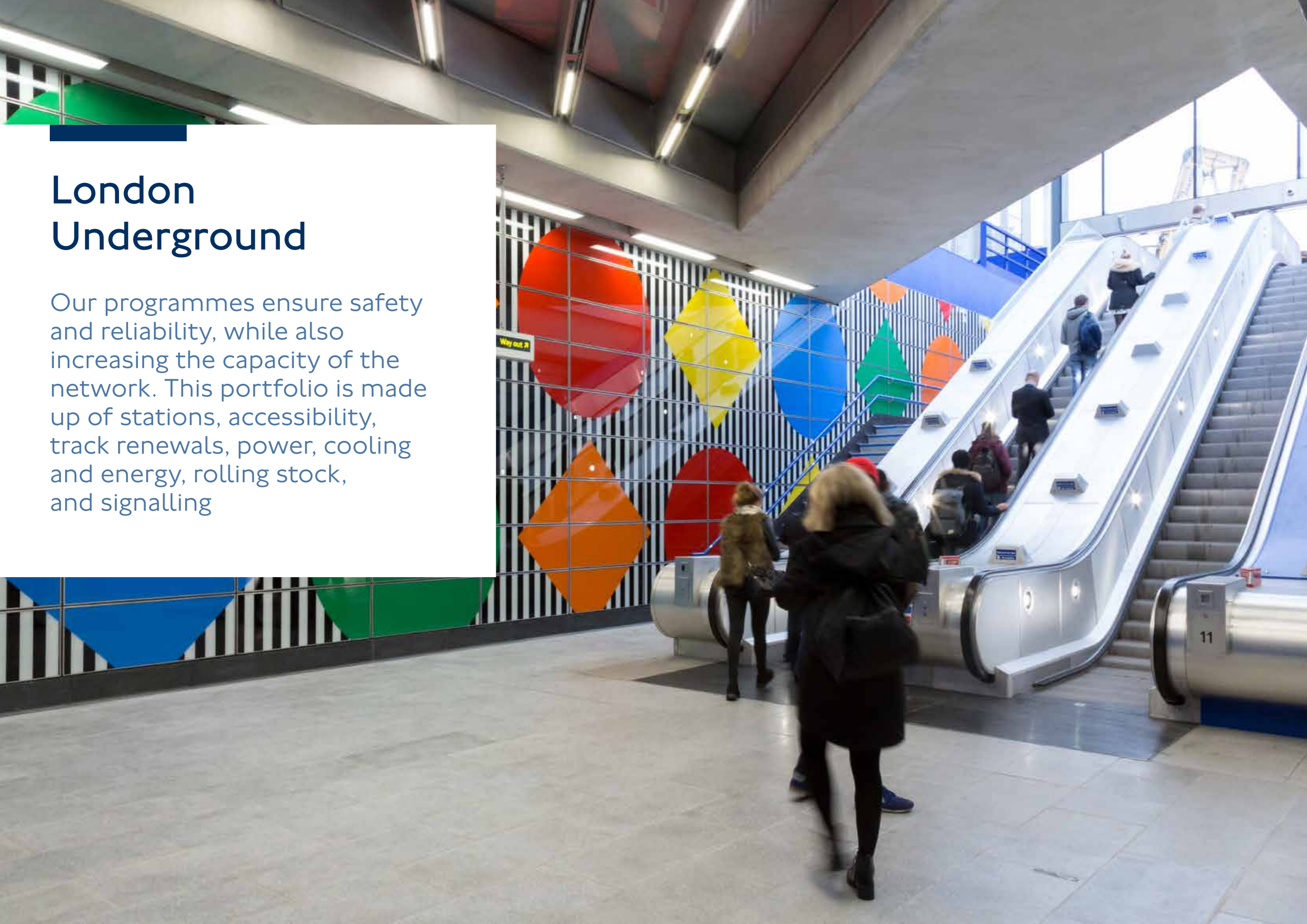
The enhancement work for the Northern line power supply continues and is due to be completed in early 2022. This will provide system capacity and resilience for reliable services during planned or unplanned outages.

The rolling stock works to enable an increase in entry and exit speeds at Neasden Depot are on target for completion in spring 2022. This will support Metropolitan line service uplifts.

Following approval at the Programmes and Investment Committee, the Jubilee line enhanced signalling and fleet improvements, which will enable peak service of 32 trains per hour, has been deferred. Further signalling software updates on the Jubilee line are currently under the initial planning stages.

London Underground

Our programmes ensure safety and reliability, while also increasing the capacity of the network. This portfolio is made up of stations, accessibility, track renewals, power, cooling and energy, rolling stock, and signalling



Enhancements

Station developments

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2023	412	126	538	532	(6)
Change since last Investment programme report					
No change	6	(6)	No change	No change	

Financial commentary

EFC includes uncommitted spend on projects that are in early stages of development. Before committing to any of this spend, we will seek additional authority from the Programme and Investment Committee.

Programme update

Tottenham Hale

The major redevelopment works at Tottenham Hale, which include a new landmark building housing a new integrated ticket hall providing seamless step-free interchange with National Rail, were successfully brought into customer service on 13 December 2021. All remaining works are scheduled to be completed this spring and an official opening will align with this.

Paddington

Civil and structural works continue on a co-funded scheme with Great Western Developments to improve customer access to the Bakerloo line, including an enlarged ticket hall and step-free access to the platforms. Tunnelling works to create a new cross-passage have started and are progressing well and will complete in the spring. The project is due for completion later this year.

Colindale

We have completed the detailed design and early contractor involvement phase for an enlarged ticket hall, with increased gateline capacity and step-free access. Negotiations are ongoing with our preferred contractor to refine price and schedule, including the timing and duration of a station closure and track work. Subject to funding, we propose to seek authority to proceed to award a contract this spring, with site work starting during the summer and completion in 2025.



Our plans for improvements at Colindale station are progressing

King's Cross St Pancras

Negotiations on a developer-funded scheme to upgrade the station entrances on the south side of Euston Road as part of a wider redevelopment of the area are expected to conclude early this year. The delivery timescales for project are still to be confirmed.

Knightsbridge

Fit-out works within the new station entrance are ongoing, including those to the lower passageway connecting the lift shafts. Installation has also begun on the three new lifts. Structural defects were found in work delivered by the developer, Carraig Investments, which have delayed opening the Brompton Road entrance. The developer has now implemented a solution and, in conjunction with London Underground, are progressing mitigation measures to ensure the entrance is opened as early as possible. The project has recently encountered challenges following the insolvency of a key supply chain partner, which has delayed the completion of the step-free-access elements of the project. This critical package of work will now need to be delivered by an alternative supply chain and we are developing recovery plans to mitigate the impact.

Ladbroke Grove

We are developing a scheme to provide increased capacity and step-free access at Ladbroke Grove with the Royal Borough of Kensington & Chelsea. A feasibility study, funded by the borough, was completed in December and identified a preferred option. Dialogue on funding opportunities from the borough are ongoing and exploration of other third-party contributions.

Leyton

We continue to work closely with our key stakeholder, the London Borough of Waltham Forest, to create a new ticket hall, increasing capacity and providing step-free access. This is at an early design stage and will be subject to a review of available funding and a commercial agreement with the borough in 2022. The timing of this depends on wider discussions about our financial position, as we are currently not able to commit to this project.

London Bridge

We are working with a third-party developer, which is proposing to open the Borough High Street entrance to London Bridge Tube station. This would result in reduced congestion at street level, especially on Borough High Street itself. Contractual negotiations are under way pending the outcome of a planning application submitted by the developer.

Notting Hill Gate

We are working with a third-party developer, which has planning consent to redevelop land next to Notting Hill Gate station and will be installing lifts from street to ticket hall level and then to one of the Circle and District line platforms. This would result in step-free access being provided to this platform and stair-free access to the Central line platforms. Negotiations are under way to formalise the contractual and property arrangements.

South Kensington

With our joint venture partner Native Land, we are disappointed that the Royal Borough of Kensington and Chelsea did not grant permission for our plans to restore and enhance the station and surrounding streets, which includes providing step-free access to the Circle and District line platforms. We are currently reviewing all our options.

West Ham

We are working with the developer Berkeley Homes on a new ticket hall from the TwelveTrees Park housing development at West Ham. The developer's enabling works, including piling activity, were successfully completed in November, paving the way for the works associated with the new station entrance to begin later this year.

Walthamstow Central

This project will address capacity limits at Walthamstow Central and support the London Borough of Waltham Forest in its wider regeneration plans. It plans to deliver step-free access and improved customer facilities. Current activity is focused on developing funding options and supporting the developer in its pending construction to safeguard the planned London Underground scheme.

Waterloo

As part of a wider redevelopment at Waterloo that will see Elizabeth House demolished, we are evaluating a project to provide step-free access to the Northern line platforms. Discussions with the developer are ongoing and are expected to conclude in the spring. The lift shaft would be constructed by the developer, however, the fitout of the shaft would be subject to affordability and availability of funding from us in the future.

Stratford

A new southwestern station entrance is programmed to open at Stratford regional station in 2023. It is a collaborative venture with London Legacy Development Corporation, London Borough of Newham and the GLA, who are fully funding the capital works. Concept design is progressing well and scheduled to be completed by March 2022.

Enhancements

Depot construction

Working closely with maintenance and operational teams, the depot construction portfolio delivers a range of enhancement projects focused on improving our depot facilities aligned with various operational and warehousing strategies.

Acton train modification unit

The new Acton train modification unit was brought into us on 25 November 2021. The completion of this project and state-of-the-art facility will enable the heavy overhauls and modernisation of Central line trains as part of the Central Line Improvement Programme to be fully supported and increase production. The new train modification facility will also support the London Underground fleet renewal programme for years to come.

Acton warehouse

Funding approval was granted in December 2021 for the first phase of works on the Acton warehouse and the contract was awarded in January. This will see investigation and works to make the existing structure safe ahead of full demolition. A detailed design phase will follow as well as decisions around construction of a renewed storage facility. Discussions are ongoing to ensure the project meets the strategy for the future use of the Acton Depot and the relocation of business activity from Lillie Bridge Depot and Ruislip redevelopments.

Enhancements

Energy and cooling

Substation ventilation

The upgrade of the cooling capacity within key substations to support the Four Lines Modernisation programme continues. Critical improvements to the final seven substations are ongoing. Onsite works are progressing well at Acton and the design works are nearing completion for Embankment. Sites at Acton and Notting Hill gate are entering commissioning phase and works are planned to restart Embankment and Victoria in the spring.

Waste heat and private wire

These are environmental projects, which form part of our wider energy and carbon strategy, are at an early stage.

The waste heat project builds on our success with the London Borough of Islington in the Bunhill development. It aims to offer the market an opportunity to use currently uncaptured thermal energy from ventilated air on the Tube network to power heating and hot water in buildings, with the potential to serve more than 15,000 households.

Solar private wire will enable us to receive zero-carbon electricity directly from local solar assets, reducing our carbon emissions. The project is focused on direct connection to new-build solar photovoltaic generation. Based on a typical solar generation profile, the opportunity represents up to 64 megawatts of renewable generation, equivalent to five per cent of our annual energy load.

Works are continuing to progress on both projects to establish the route to market and develop the contract strategy, specification documents and the production of a financial and carbon model, which we hope to announce in the spring.

Accessibility

Step-free access

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2023	105	15	120	120	0
Change since last Investment programme report					
No change	2	(2)	No change	No change	

Financial commentary

Financial data is based on the existing scope of the step-free access programme. Subject to consultation and funding the future costs of the programme and EFC may vary to include new projects or scope.

Programme update

We are committed to improving accessibility across the Tube network and, as well as third-party funded work, we have 15 stations in our accessibility programme. Since 2018, we have provided step-free access at Newbury Park, Buckhurst Hill, South Woodford, Mill Hill East, Cockfosters, Amersham, Debden, Ickenham, Wimbledon Park, Osterley and, most recently, Sudbury Hill, which became the 90th step-free tube station on 30 December 2021. Main works and lift installations continue at Harrow-on-the-Hill, which is due to be made step-free in Quarter 4.

The early contractor involvement and detailed design phase on the previously paused step-free projects at Burnt Oak, Hanger Lane and Northolt are progressing. The two-stage approach will provide greater assurance on the future deliverability of the projects. In collaboration with the supply chain, the first phase will focus on completing the detailed design and progressing value engineering opportunities, in addition to refining construction logistics, methodologies, planning and sequencing, ensuring a robust and deliverable schedule and cost estimate are in place. This initial phase will conclude in the spring, ahead of the future decision on moving into full construction delivery.

From 2 November 2021 to 10 February 2022, we held a public consultation on our future step-free access priorities and improvements. The online consultation was supported by live engagement events with key organisations that represent disabled people and other target groups. More than 5,000 responses were received.



We are providing step-free access across more of our stations

Lifts and escalators

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2023	472	119	591	904	313
Change since last Investment programme report					
No change	6	(6)	No change	19	

Financial Commentary

The Programme and Project Authority was increased at the Programmes and Investment Committee in December for essential renewals to existing lift assets that provide step-free access.

Programme update

There are 447 escalators, 259 lifts and four passenger conveyors on the London Underground network. These numbers will grow by 25 per cent by 2026 as a result of major station projects, the accessibility programme and the Elizabeth line. This programme provides the rolling asset renewals to keep these assets in operation.

Maintaining and improving lift and escalator availability requires ongoing refurbishment and renewal. Typically, escalators need replacing every 40 years and lifts every 20 to 40 years, depending on the type. This means we need to replace around 2.5 per cent of our escalator assets and four per

cent of our lift assets each year. This rate will need to increase as the number of assets grows. The interventions carried out are informed by the condition and performance of each asset.

Replacing an escalator or lift is complex. It must be fully dismantled and worked on in a very constrained space, while daily operations in the station continue. When we replace assets, we also try to standardise them where possible to reduce ongoing maintenance costs.

South Kensington

Works continue to replace five life-expired escalators at the station. This means Piccadilly line trains are not stopping at the station until the spring. However, the Circle and District line platforms remain open. All five escalators have now been delivered and works have commenced to assemble and install the new escalators.

Marylebone

We have now removed one of the two original life-expired existing escalators. Works are under way to modify the civils structure of the station to accommodate the new escalator, which is planned to be delivered in March 2022. All works are due to complete in 2023.

Oxford Circus

Refurbishment work to improve the condition and reliability of nine escalators at Oxford Circus began in May 2021 and the fourth escalator was completed in December. All works are due to be completed in 2023.

Jubilee line

The rolling refurbishment programme has now delivered eight refurbished escalators this financial year. Works are ongoing on a further three escalators for completion by April 2022.

Borough and Tottenham Hale

Works to replace the obsolete lift at Tottenham Hale station were successful and the new lift was bought into use on the 22 December 2021.

At Borough, lift replacement works are currently behind schedule due to supply chain issues. However, we brought the first lift into use in January. The second lift is due to be completed in the summer, with works coinciding with the temporary Bank branch Northern line closure to help minimise disruption.

Track renewals

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2023	154	248	402	402	0
Change since last Investment programme report					
No change	30	(30)	No change	No change	

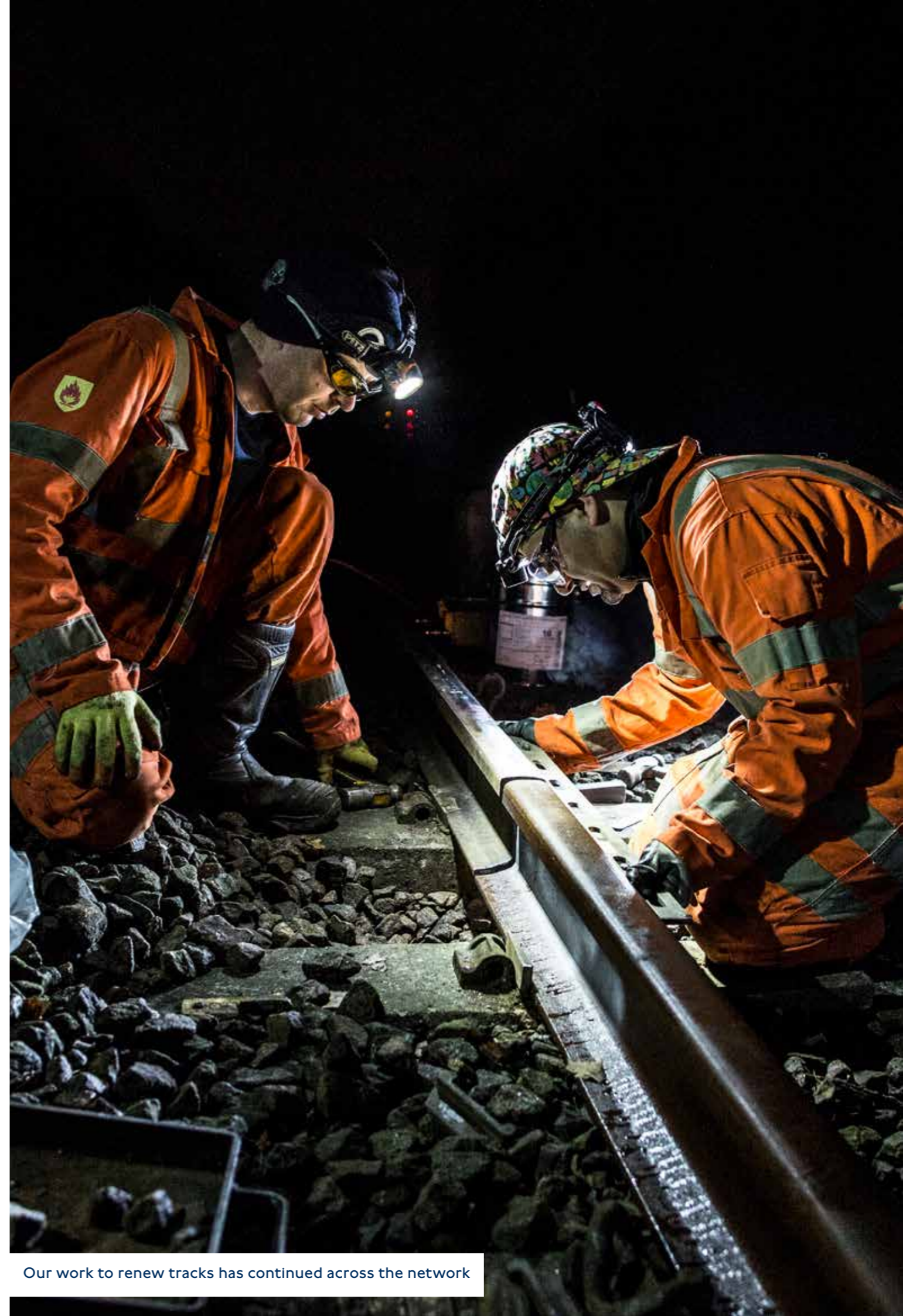
Programme update

We completed our first packages of work at Ruislip depot, which will enable the future requirements and operations of the depot. This included 687 metres of ballasted track renewal, removing seven points and crossing units, and renewing two units. Two further work packages are planned to complete this work.

Between Christmas Eve and 3 January 2022, we renewed 10 sets of points and installed a further two new sets of points at Northfields. These works and renewing life-expired assets will enable the future Piccadilly line trains to be introduced and run safely through the area.

Other track renewals continued during Quarter 3, with our track delivery unit completing 500 metres of new concreted track in the deep Tube areas as well as replacing 900 metres of bullhead rail with the more modern flat-bottom form.

On the open sections of the sub-surface rail, we renewed 900 metres of ballasted track and 100 metres of drainage channels.



Our work to renew tracks has continued across the network

Rolling stock

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2027	255	845	1,100	722	(378)
Change since last Investment programme report					
No change	9	42	51	19	

Financial Commentary

This programme includes developed scope and early stage elements of rolling programmes across five or more years. The EFC changes as projects approach the delivery gate and we get more information on cost.

The change in the fleet programme since the last report comes from improving information on the Central line fleet renewals following the completion of the prototype, and increased understanding of the engineering vehicles locomotive works towards the back end of the timeline.

Programme update

We must ensure all our trains remain safe and operational, which requires certain interventions. Some of these are maintenance activities and others are needed due to changes in regulations, arising safety issues, poor reliability and performance, unacceptable costs or

system obsolescence. To better predict interventions, we have developed a 25-year fleet cost model, which feeds into our long-term capital plan. The model contains various scenarios that map out when each fleet may be replaced and the interventions required to enable them to reach this date.

We are purchasing a new fleet of 94 trains for the Piccadilly line. There are no other confirmed fleet replacements.

Our engineering vehicle fleet supports the track renewal programme. We aim to improve reliability of this non-passenger fleet, responding to component obsolescence problems and supporting our overarching aim of mechanising track-based activities where possible. Our intention is to encourage enhanced productivity and an improved safety culture.



The reliability and safety of our trains is one of our top priorities

Accessibility

Our programme of works on the Bakerloo and Central line fleets is critical to improving accessibility. Both projects continue to progress with detailed design validation through the installation and testing of prototype systems.

We have completed our initial accessibility changes on the first Bakerloo line train, including wheelchair bays, grab poles and flooring. We have also installed LED lighting on this train. We are progressing designs and prototype installation for the passenger information system, and have completed another three four-car units, rolling them out into service.

For the Central Line Improvement Programme, we met our target of successful dynamic testing of the saloon design. The project has also negotiated approvals to replace manual boarding ramps at stations including Marble Arch, Leytonstone, Loughton and Mile End with more this year. The platform ramps will align to the new wheelchair bays being installed on the Central line trains.

Reliability

We will be replacing the unreliable direct current power traction system with a modern, more reliable, alternating current equivalent. After completing extensive offsite eight-car high-speed testing in Old Dalby, we are closing out the testing issues before moving to dynamic testing on London Underground infrastructure. We expect to meet our target of a dynamic train test in Quarter 4. In the meantime, we have all materials procured and have started installation on a further train.

As part of the Jubilee line reliability improvement programme, we have completed the feasibility study on reducing the risk of structural fatigue cracking in the carriage underframe. The project secured authority and capital investment to proceed into concept design and delivery, and the invitation to tender activities have got under way.

Safety

We are working to improve customer safety on the Central and Bakerloo line fleets. The first Bakerloo train with new LED lighting was returned to service in Quarter I. The project has completed three more four-car units, rolling them out for service with no issues and completed a fourth four-car unit on 26 January. After prolonged periods with a technical support shortfall, the project has now secured engineering support to progress residual works designs. Additional facilities are also procured to enable full production early this year.

On the Central line, we have completed the installation and dynamic testing for all electrical systems on one of our trains, which includes the passenger information system, CCTV, data transmission system, and saloon design. LED lighting has been installed and is going through static train testing. Our target of having the first train into service by the end of the financial year is now unachievable due to delivery labour challenges, but progress has been made to start electrical systems scope on the next train. We are working hard to mitigate the resulting impact and improve on the late delivery date of the first train.

Engineering vehicles

We are developing a vehicle that will change the way we replace track by mechanising concrete track renewal in the deep Tube. Made up of three wagons, a prototype vehicle has been fitted with track renewal equipment, handrails and steps. Trials were completed at Ruislip Depot in December and we are running trial shifts on the deep Tube network supporting track renewals.

We are purchasing a new fleet of engineering wagons from the world's largest rolling stock manufacturer based in China. The first four prototype wagons have now been joined by a fifth pre-production wagon, which has started an inspection and quality assurance programme. Once dynamic testing has passed, they will undergo infrastructure testing on the Underground network. The remaining 66 wagons will then enter production in China before they are then shipped to the UK in early 2023.

We purchased two rail-mounted cranes and eight tilting wagons from Kirow in Germany for modular points and crossings renewals. The cranes have been successfully operated within the Ruislip Depot to support local track renewals works. The cranes are undergoing the final stages of approval before being granted a consent to operate for use in open sections of the Underground network. Once this is achieved, sub-surface and tunnel environment approvals will be sought. The cranes and tilting wagons enable us to transport wide track panels from the manufacturer's site to the track renewal location, giving time and quality benefits.

Tender evaluation of the track geometry measuring equipment is well under way with contract award scheduled for spring or summer. The project will mount this equipment to two sets of host wagons, which will be hauled by battery locomotives across the network, replacing the single, life-expired track recording vehicle currently in operation. A new project has also been initiated to reduce the likelihood of unplanned track recording vehicle outages before its replacement.

We are exploring options, supported by a completed early market engagement exercise, to replace the aged, existing battery locomotive fleet. An integrated technical and commercial strategy is being developed to re-engage with the industry and understand market readiness to address the Tube network's multiple operating requirements. These locomotives haul most of our engineering vehicles around the network, but the fleet is close to the end of its extended service life. Part of this project will ensure the existing fleet remains operational while the replacement fleet is being progressed.

Fleet heavy overhauls

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2027	93	509	602	361	(241)
Change since last Investment programme report					
No change	7	14	23	(37)	

Financial commentary

The programme includes both developed short-term scope and early stage elements of continuous work to address state of good repair and periodic activities. The EFC and project authority change as projects approach the delivery gate and cost and schedule clarity increases. To address the current funding pressures on the business the project authority has been reduced to the essential short-term programme needs.

Programme update

This programme delivers large-scale heavy maintenance work on our fleet of passenger and rail adhesion trains

Victoria line

We upgraded the pressurised ventilation fan systems on the first five trains, which provides air in place of air-conditioning and reduces maintenance. The delivery of the first couplers is due to begin and the first train being lifted by the end of February.

Metropolitan line

Physical work is now complete on the first four Metropolitan line trains.

Piccadilly line

On the Piccadilly line life extension works, 77 per cent of the floor scope is now complete. We have started the second lift cycle to take the fleet to end of life.

Jubilee line

Mobilisation continues at Stratford Market Depot, with further recruitment and validation of work instructions. Procurement activities progressed, with orders placed to enable some work to start by late March and further contracts awarded for the main programme in the summer, including a £22m contract to original manufacturer Alstom and £18m to Pullman Rail for wheelset overhaul for both Jubilee and Piccadilly lines. As planned, we continue working on the concession document, which lists the mitigations needed to keep the trains in operation until the heavy overhaul takes place.

Adhesion train

Preparations have continued for our rail adhesion units for the Central line. These apply a substance to manage adhesion levels when leaves fall on the tracks.



We work to maintain our fleets to a safe and reliable level

Renewals

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2025	134	207	341	285	(56)
Change since last Investment programme report					
No change	No change	No change	No change	No change	

Financial commentary

EFC includes uncommitted spend on projects that are in early stages of development. Before committing to any of this spend, we will seek additional authority from the Programme and Investment Committee.

Programme update

This programme covers the essential renewals work for a range of assets across buildings and stations, civils, power, electricals and cooling to ensure safety compliance and continued reliability.

Buildings and stations

We have rolling programmes of targeted interventions to building systems, communications, fire and mechanical assets, and the built environment in stations, buildings and other Underground premises to improve asset condition.

We are starting concept design at Liverpool Street and Charing Cross stations to address water ingress at both stations.

We have completed detailed design to replace obsolete communications equipment at King's Cross St Pancras, including station management systems, local area networks, CCTV, the public address and alarm system, lift intercom system, visual information displays and ticket hall information displays, as well as passenger help points.

We have completed concept design and detailed designs are now progressing to replace station information management systems, public address and voice alarm systems, as well as the passenger help point systems, at London Bridge, North Greenwich, Canary Wharf, Canada Water, Canning Town, West Ham, Southwark and Bermondsey stations.

Staff facilities

We are carrying out targeted renewals of staff welfare facilities at prioritised locations. The renewals will improve the condition of the facilities and the environment. We have begun works at

our first locations and we are progressing procurement to start works at further locations in the next quarter.

Civils

Civils account for 30,000 assets across the network, providing structural support, stability and protection to the railway. The asset base includes more than 16,000 bridges and structures and 235km of embankments and cuttings, as well as tunnels, lighting masks and flood protection assets. We are assessing their condition to improve our understanding of our asset base, which will help us to plan future interventions.

Works are progressing onsite to stabilise the cutting between Grange Hill and Chigwell stations on the Central line to ensure the continued safe running of the railway. We will shortly be beginning feasibility work for future interventions to embankments and cuttings at priority locations.

Power and electrical

London Underground is the largest consumer of power in London. We operate our own high-voltage distribution network and backup power generation capability. Based on the state of the assets and the expected age, we deliver a rolling programme of renewals to maintain the integrity of power delivery to the railway.

Work is under way to replace 22 life-expired uninterruptable power supply units to ensure a continuous power supply to

critical signalling assets on the railway. Detailed designs have been completed with the first seven sites commissioned into service and the remainder planned for later this financial year.

Procurement has started for the replacement of 20 life-expired offline battery power inverter units supplying station emergency lighting systems.

The project will include developing standardised modular equipment, which can be retrofitted into existing installations, and site trials to reduce the installation work and improve value for money.

We have replaced 16 traction isolation switches at Hainault depot to address equipment non-compliances and remove operational restrictions. Detailed design work has started on the next series to be replaced at Ruislip Depot.

Civil works at Greenford substation are complete in preparation for the replacement of the high-voltage switchboard. The switchboard is undergoing quality testing in advance of installation and site acceptance testing in Quarter 4.

Procurement activities for the replacement of the DC traction switchboard at Holborn station have resulted in a single tender return. Evaluation is under way to ensure value for money can be obtained and commencement of works in 2022/23.

Power control

We have nearly completed the replacement of the network-wide power control system. This comprises control centres linking to circuit breakers across the network, which enable train traction control. Initial operator and maintainer training has started, with planned migration to the new system expected in spring 2022.

The first of the control system upgrades on the electricity generators at Greenwich Power Station was completed in October. The second unit is currently undergoing factory testing. The upgrades will continue in 2022/23 and remove obsolescence and improve the long-term reliability of the essential emergency generating plant.

LED lighting

We have continued with the planned conversion of traditional fluorescent lights to low energy LED lighting, improving efficiency and reducing ongoing maintenance costs. A new delivery programme for a further 26 stations to be completed during 2022/23 is in progress, with additional conversions continuing at prioritised train depot locations.

Civils and accessibility

Final preparations are in progress for the construction of a platform hump at Paddington station, including fabrication of new, bespoke fire and interlocking machine room doors. Similarly, final preparations are underway for installation of manual boarding ramps at a number of stations. Construction works are expected to start in the next quarter.



Signalling and control

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2028	97	327	424	307	(117)
Change since last Investment programme report					
No change	I	(I)	No change	No change	

Financial commentary

EFC includes uncommitted spend on projects that are in early stages of development. Before committing to any of this spend, we will seek additional authority from the Programme and Investment Committee

Programme update

Signalling and control systems are essential for the safe and efficient operation of train services. Some date to the early 1960s and are now obsolete and increasingly hard to maintain. We continue to move towards more modern computer-based systems that provide greater service capacity. While these require less day-to-day maintenance compared with traditional electro-mechanical signalling, they do need significant obsolescence-driven renewals during their life.

Large upgrades, such as the modernisation of the Circle, District, Hammersmith & City and Metropolitan lines, are replacing systems across the sub-surface lines. The Jubilee, Northern and Victoria lines have relatively modern, computer-based systems, however as computer technology is fast-paced, the availability of support and spares declines as systems age, and obsolescence risk increases.

On lines such as the Bakerloo, Central, Piccadilly and Waterloo & City, recent financial challenges have seen planned upgrades scaled back, and in response we have developed a targeted incremental approach to renewals and life extension.

This programme has been established to extend the life of current systems and reduce the risk of obsolescence.

Signalling and control life extension

Following the commissioning of replacement central computer servers, the Bakerloo line control system has been running the line with no issues. Decommissioning of the old servers has undergone all necessary steps in advance of its removal, which is expected this spring.

Contracts have been signed and resource mobilisation for the Central line signalling and control system life extension is now under way.

Incremental signalling upgrade

The first five-year tranche of the incremental signalling upgrade programme is progressing well, with concept design starting on updating the Bakerloo line control system.

The Northern line vehicle control centre replacement project is currently reviewing tender returns. This investment will support the reliability of the signal system, and it is expected that a contract will be awarded in Quarter I next year.

The Central line incremental upgrade programme has completed early market engagement with suppliers including further engagement with four key equipment suppliers. Technical evaluation of the findings is under way.

Technology

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2025	95	110	205	95	(110)
Change since last Investment programme report					
No change	6	(6)	No change	No change	

Financial commentary

EFC includes uncommitted spend on projects that are in early stages of development. Before committing to any of this spend, we will seek additional authority from the Programme and Investment Committee.

Programme update

Our technology assets include a network-wide radio system and data network, as well as the software to manage our assets and deliver customer service. The fast-evolving IT market means we must keep software in manufacture support, as well as taking advantage of new technology to improve the way we deliver services.

Networks and connectivity

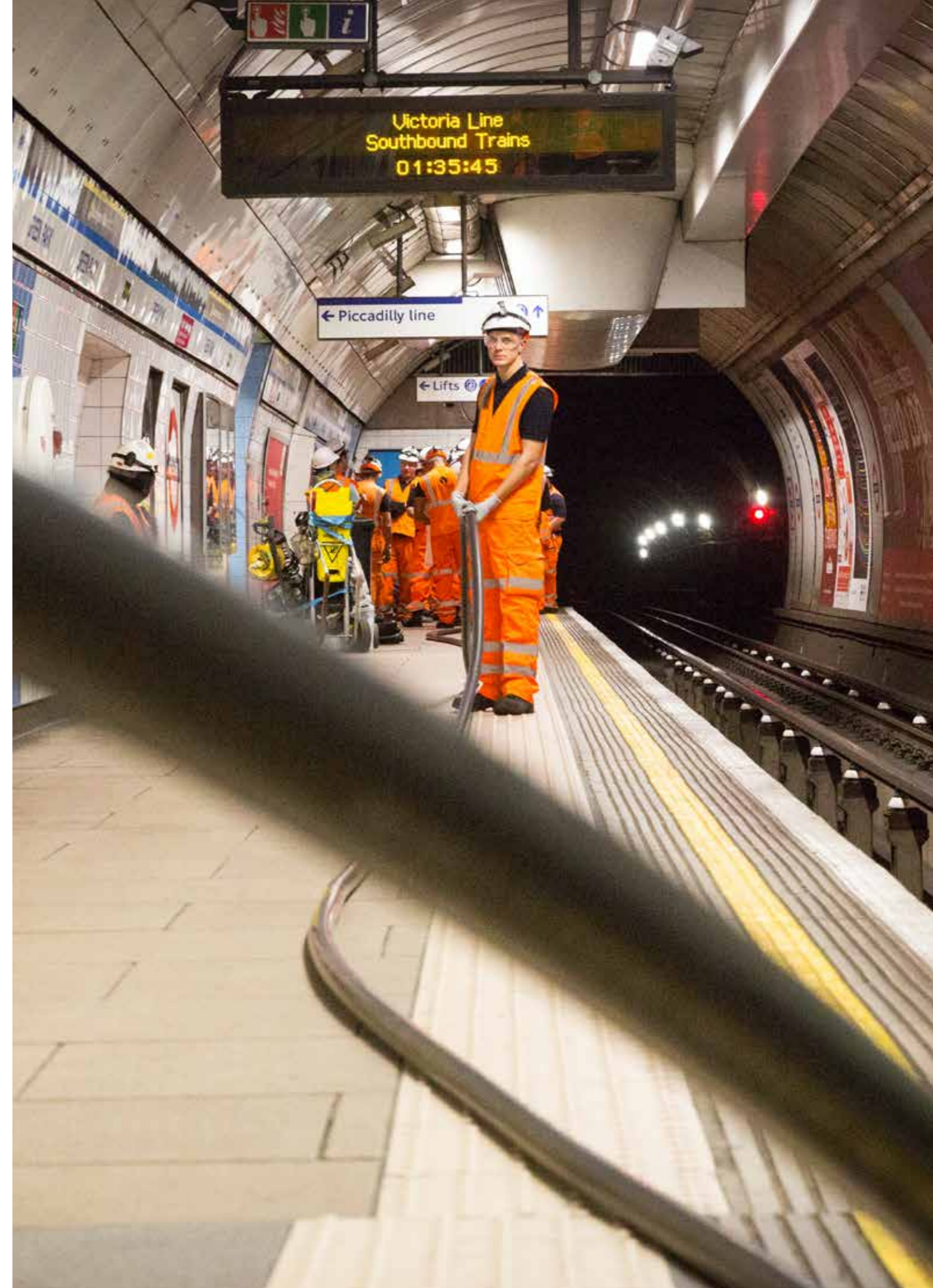
We continue to upgrade key components of our Connect radio system and are now focusing on rolling out new radio hardware base-stations. This second phase is expected to be complete in mid-2023. The Connect system will be able to function into the 2030s. We have installed new hardware at 58 of the required 293 locations and installation is progressing well.

We are also issuing around 7,700 replacement mobile devices to many operational staff, which will be complete in early 2022. More than 5,000 replacement devices have been issued so far. Old devices will either be recycled or donated.

Asset management

To improve our approach to asset management and long-term planning, we are consolidating our asset management information systems into a single platform for London Underground and London Trams. We are now migrating London Underground assets onto this new single platform. This will be anticipated to complete in early 2023. The project is part of an initiative to streamline our approach.

In addition, we are working to improve the quality of our asset condition data by running surveys across a wide range of assets on our network. This work will be complete by mid-2022 and help us improve the planning and co-ordination of essential maintenance works.



We continue to upgrade technology assets across our network

Surface transport

This comprises Healthy Streets, air quality, asset investment, public transport and surface technology



Healthy Streets

Reporting period	Cost to date (£m)	Cost to go (£m)	Forecast cost (£m)	Programme and project authority (£m)	Variance: Forecast vs authority (£m)
2020/21 to 2024/25	246	106	352	309	(43)
Change since last Investment programme report					
No change	25	(410)	(385)	No change	

Financial commentary

The five-year forecast from 2020/21 to 2024/25 has reduced by £385m since the publication of the last report.

The forecast cost reduction reported in this report reflects ongoing uncertainty and funding constraints under a managed decline scenario, in which we continue to forecast the completion of the Old Street Roundabout project and key safety related schemes across the network. Continued investment in active travel will need to form part of a longer-term, sustainable capital funding deal with the Government. The cost forecasted to 2024/25 in this report reflects the managed decline scenario, and is in line with our assumptions made in the recent GLA budget.

Programme update

In March 2021, we largely concluded the rapid delivery of new temporary schemes under the Streetspace for London programme, in response to the challenges of the pandemic. Further Government funding of £100m was allocated to the programme as part of the funding package agreed between the DfT and us for the period from 29 May to 11 December 2021.

We have now remobilised our longer-term Healthy Streets investment programme, while continuing with some temporary and experimental schemes on borough roads via the Government's Active Travel Fund. The continued lack of long-term funding has impacted significantly on the ability to plan, develop and deliver projects, including across London's boroughs, and there are concerns about loss of capacity to deliver in the medium-long term.



We want to encourage more people to cycle and walk in London

A lot has changed since the programme was paused and we are now in a markedly different context. Our approach to Healthy Streets planning and delivery has adapted to reflect this, with a review of some historic schemes to test the best next steps, a new integrated pipeline of future schemes, and learning lessons from the Streetspace for London programme. We have also reviewed our approaches, which has led to the programme and its priorities being reshaped to align with these commitments, which will span the next three years to May 2024.

The continuing Healthy Streets programme will help reduce road danger in line with our Vision Zero action plan, and make it easier to walk, cycle and travel by bus across London. It will accelerate progress towards mode shift, decarbonisation, economic recovery and tackling health inequalities. Healthy Streets will also be an indispensable complement to our other initiatives, such as Vision Zero, Crossrail, the electrification of the bus fleet, and the Ultra Low Emission Zone (ULEZ) expansion, and help power London's wider recovery.

Old Street Roundabout

Construction is progressing at Old Street Roundabout, where a new design which will bring safety improvements for cyclists and pedestrians by providing new and improved crossings, fully segregated cycle lanes, and a new public space with an accessible main entrance to Old Street Underground station and the subsurface shopping arcade.

Construction is continuing with drainage, paving and kerbing on the four approach arms to the junction. The roof strengthening works in the peninsula area

are now completed. Works are continuing with the infilling of the northeast entrance to the station. The south west entrance to the station remains open for public use until May 2022. Works are continuing with the infilling of the northwest entrance ramp and construction of the new passenger lift pit. The concrete shaft for the new goods lift is planned for completion in February, ahead of the installation of the new lift car, which is planned from mid-June 2022.

Construction of the new main station entrance is progressing well with the superstructure works now fully under way. Following installation of the central column and internal stairs in November 2021, temporary supports and propping is being installed ready to receive the four precast concrete arms and steel ring beams that hold up the green roof structure. These works are planned from March 2022 and will be followed with installation of the glazing and roof deck from Spring 2022. The new station entrance is scheduled to open for public use in late May 2022 while work continues on the above roof structure.

Construction of the new bin store and refurbishment of the UK Power Networks substation in the peninsula area have now started. On 11 December 2021, UK Power Networks installed a new transformer and switch gear into the substation, which will eventually provide the necessary electrical power for the newly built assets.

Installation of the critical fire safety systems works in the below surface shopping arcade area, both public and retail, are continuing as planned, with ongoing installation of new mechanical,

electrical and communication equipment. The new shop fronts, smoke grills and smoke detection systems will begin to be installed from February 2022 for the east side retail units.

Completion of the public-facing works remains on track for winter 2022.

Cycleway 4

Construction work along Evelyn Street is progressing slower than planned due to delays from third-party utility diversion works. Additional resources from the utility companies have been requested to mitigate some of this delay. The project however is now 65 per cent through, and completion is planned for summer 2022. The Creek Road Bridge works section of the route, which will be carried out by the Royal Borough of Greenwich, should start in spring this year.

Cycleway 9

Work to transform Hammersmith Gyrotory started on 29 November 2021 and is set to complete in spring 2022. Work along Chiswick High Road from Chiswick Lane to Goldhawk Road, which is being delivered by the London Borough of Hounslow, is progressing well, and is also planned to complete in spring 2022.

Responding to the pandemic

Borough delivery continues, with more than 30km of cycling routes under construction. Hackney completed installation of a new bus gate on Church Street in Stoke Newington, which closes the road to traffic for part of the day and widens pavements for pedestrians. The London Legacy Development Corporation started construction of a new cycle crossing in The Queen Elizabeth Olympic Park.

Work is ongoing to review each temporary Streetspace for London scheme that was delivered over the past 18 months, to consider whether schemes should be retained, altered, or removed from site. These decisions are based on extensive monitoring of the temporary schemes, stakeholder feedback, equalities considerations and alignment to our strategic priorities. The first schemes to have a decision made to retain them as experiments were CS8 upgrade between Lambeth Bridge and Chelsea Bridge, and Bishopsgate. Seven social distancing schemes have been removed since April 2021, including on Battersea Park Road, Finchley Road, and Dalston Kingsland. These decisions have been made where the data has indicated that usage of the scheme is low, or that negative impacts of the scheme outweigh the benefits it provides.

The boroughs have also been reviewing temporary schemes before the end of the relevant Traffic Regulation Orders and making decisions on whether they should be removed or retained, with or without amendments. In March 2021, we published revised guidance to support this process. The conversion of any temporary schemes to permanent, following a borough decision to amend, retain or remove each scheme, will be dependent upon Local Implementation Plan corridors funding, for non-cycling schemes, and borough cycling funding for cycling schemes.



We are introducing lower speed limits to make our roads safer

Lowering speed limits

Lowering the speed of vehicles in London is key to reducing both the likelihood of a collision occurring and the severity of the outcome. This programme is vital to the Mayor's Vision Zero ambition to eradicate fatal and serious injury collisions from London's roads by 2041.

The second phase of the programme is under way, and as detailed in the recently launched Vision Zero action plan progress report, this seeks to reduce the speed by 10mph on more than 140km of our roads. We have already introduced a 20mph speed limit on 80km of our roads, accelerating almost 20km from Phase 2 of the programme to date, including a new 20mph speed limit on A3220 Battersea Bridge and A3212 Chelsea Embankment. There is a further 17km in detailed design, but the continuation of the programme in 2022 will be subject to funding.

Speed limits will be reduced to 20mph by April 2022 on the A13 Commercial Road; A10/A503 corridors in Haringey; A107 corridor and A23 London Road.

The City of Westminster will also see a reduction in speed limits on our roads, with the introduction of 20mph on 13km of roads, including Marylebone Road, Vauxhall Bridge Road and Edgware Road between the A40 and St John's Wood Road. Raised pedestrian crossings will be introduced in six locations, to reduce danger to people walking and increase compliance with the new speed limit, as well as introducing accessibility benefits for mobility impaired customers. Additionally, the temporary

30mph speed limit on the A40 Westway will be made permanent. In addition to this, we are also reducing the A10 Great Cambridge Road, Gants Hill town centre and A4180 Ruislip Road to 30mph, all subject to funding.

Safer Junctions

In April 2017, the Safer Junctions programme highlighted 73 of the most dangerous junctions on our road network, defined as those with the highest vulnerable road user collision rates between 2013 and 2015. Work to 43 of these junctions is now finished, following completion of new pedestrian crossings and cyclist safety improvements at Camden Road/Camden Street. Design work continues on the remaining 30 junctions, including detailed design of York Road Roundabout and Holloway Road/Drayton Park, with these schemes respectively delivering essential motorcycle and pedestrian safety measures, and construction expected in spring and summer this year, respectively, and subject to funding.

Works to introduce a new pedestrian crossing over Battersea Bridge, where a pedestrian was tragically killed at the beginning of the year, were completed on 26 November 2021 at Chelsea Embankment/Battersea Bridge, with the second phase to follow in summer 2022. Subject to funding, we propose to engage on 10 further Safer Junctions by 2024, which will then progress to delivery, depending on the outcome of engagement with local stakeholders.

Air quality

Reporting period	Gross cost to date (£m)	Gross cost to go (£m)	Forecast cost (£m)	Programme and project authority (£m)	Variance: Forecast vs authority (£m)
2020/21 to 2024/25	212	204	416	255	(161)
Change since last Investment programme report					
No change	17	(296)	(279)	No change	

Financial commentary

The five-year forecast cost from 2020/21 to 2024/25 has reduced by £279m since the publication of the last report. This reduction is mainly driven by the announcement that we are moving to a managed decline scenario. We have also delivered cost reductions of £2m within the road user charging schemes, such as the Ultra Low Emission Zone expansion and Congestion Charging and are reviewing the strategy around schemes to encourage more environmentally friendly modes of transport over the next few years.

Programme update

ULEZ expansion

On 25 October, the ULEZ was successfully expanded from central London up to the North and South Circular roads. The new zone is 18 times larger than before, covering a quarter of London and is the largest of

its kind in Europe. On 10 December, we published our first monthly report and initial data shows that the scheme has been highly effective in driving down the number of older, more polluting vehicles on London's roads, with 92 per cent of new vehicles complying with the new standards.

In the first four weeks of operation, we have seen a reduction of 37 per cent of older, more polluting vehicles in the expanded zone each day and are expecting a 30 per cent reduction of nitrogen oxide emissions. This is a huge achievement and supports the Mayor's aim of improving air quality and protecting the health of Londoners, as well as his ambition to make London a net zero carbon city by 2030. We will continue to monitor the impacts of the expanded ULEZ over the coming months and will prepare a six month and overall year report on our findings.



Our projects are designed to help clean up London's air

Congestion Charge changes

Since its implementation in 2003, we have made changes to the Congestion Charge to ensure it remains effective, including changes to discounts and exemptions, charge levels, and days and times of operation. Last year, we made temporary changes to the charge in response to the transport challenges presented by the pandemic, including operating daily until 22:00. Proposals to change the Congestion Charge to ensure it continues to achieve the Mayor's Transport Strategy objectives and to ensure that the Congestion Charge continues to be effective in reducing traffic and congestion in central London have been developed and were consulted on in late 2021. This would improve London's air quality and encourage more journeys to be made by walking, cycling or public transport. The Mayor has now agreed to the proposals that were consulted on. The first phase of changes was implemented on 20 December.

These changes included:

- A daily charge of £15
- No charge applied between Christmas Day and New Year's Day Bank Holiday inclusive. This meant the period from Saturday 25 December 2021 to Monday 3 January 2022 did not carry a charge
- The 90 per cent residents' discount will be re-opened for all eligible residents to register for the discount
- The delayed payment charge will be £17.50, and the deadline will be extended to three days after the day of travel

- The Auto Pay and Fleet Auto Pay discount will be removed
- The reimbursement arrangements that were introduced as part of the temporary changes will be retained or adapted to ensure the most vulnerable people and those involved in caring for them will continue to be protected during epidemics and pandemics. This will also facilitate essential trips made by NHS staff in times of exceptional or extraordinary circumstances including for commuting purposes
- The ability for residents to pay by app or online for multiple consecutive charging days will be removed

The second phase of changes was implemented on Monday 21 February 2022. This phase brings in a change in operating hours to 07:00-18:00 on weekdays and 12:00-18:00 on weekends and Bank Holidays.

Electric vehicle strategy

On 16 December 2021, we published London's 2030 electric vehicle infrastructure strategy. Following on from the 2019 electric vehicle infrastructure plan, the strategy sets out our vision, addresses recent trends and policy changes and estimates the infrastructure needs to 2030, including how this could be delivered. The strategy outlines what London can do using electrification and how we must ensure that infrastructure delivery keeps up with demand, as well as the roles and responsibilities of the public and private sectors in facilitating this.

There are now more than 8,600 public charging points installed across the Capital, which is a third of the UK's total. Through our modelling, we estimate that London will require around 40,000 to 60,000 charge points by 2030. The latest national sales figures released on 6 January show more than 18 per cent of new vehicles purchased as plug in or electric, which when estimated at the London level, fall to the higher end of our electric vehicle sales forecasts used in our modelling.

Electric vehicle infrastructure delivery

The electric vehicle infrastructure delivery programme is a keystone commitment within the strategy, designed to unlock access to land across London for charge point operators to install necessary infrastructure.

Recent focus has been on conducting a detailed market engagement exercise, to help shape specific delivery models and commercial relationships that members of the GLA family, as landowners, could have with the suppliers of electric vehicle infrastructure. This is with a view to finalise a recommended approach in spring 2022, ahead of tendering out sites for delivery. Substantial progress has also been made on reviewing a long list of sites, to determine whether they can progress to the next stage of assessment, in advance of being proposed to the market as viable locations to accommodate charge points.

Zero-emission bus fleet

London continues to see increasing numbers of zero-emission buses joining the overall fleet as we aim for an entirely zero-emission bus fleet by 2034 – three years earlier than our original timeframes, subject to additional Government support. The fleet currently has around 600 zero-emission buses and we hope to get up to 800 in the first half of 2022, subject to vehicle delivery and the essential power upgrades at bus garages across London. This is an important stepping-stone to helping the Government combat the climate change emergency and contribute towards the UK's targets of a 68 per cent cut in CO₂ by 2030, rising to a 78 per cent net reduction by 2035.

We are keeping an open mind towards the technologies we might need between now and 2034, including hydrogen fuel-cell with 20 double-deck vehicles operating on Route 7 between East Acton and Oxford Circus, and some route 245 journeys between Alperton and Golders Green, so that we have the most promising options available for now and later. With appropriate funding support, around 10 per cent of London's fleet could be zero emission by spring 2023, supporting British manufacturing and jobs, and reducing reliance on fossil fuels.

Asset investment

Reporting period	Gross cost to date (£m)	Gross cost to go (£m)	Forecast cost (£m)	Programme and project authority (£m)	Variance: Forecast vs authority (£m)
2020/21 to 2024/25	174	629	803	494	(309)
Change since last Investment programme report					
No change	35	(208)	(174)	No change	

Financial commentary

The five-year cost forecast from 2020/21 to 2024/25 has reduced by £174m since the publication of the last report.

The reduction is mainly a result of us moving to the managed decline scenario (£144m), where a lower level of funding is available for renewal projects. We have also delivered cost reductions of £4m and deferred a number of larger schemes to ensure that an affordable programme can align with our critical asset priorities.

Programme update

Work is under way to ensure the safety and operability of our highest priority assets that need urgent renewals, including critical tunnels, such as Blackwall, and structures, such as the A40 Westway, Brent Cross, Croydon Flyover and Gallow's Corner.

A40 Westway

The A40 Westway is a key strategic route and one of the busiest on our road network. We completed three back-to-back weekend-long closures of 55 hours

of the eastbound carriage way on 28 to 30 November, 3 to 5 December and 10 to 12 December 2021. The remaining weekend closures on the eastbound carriageway took place on 9, 16, 23 and 31 January, and further closures are scheduled on 12, 19 and 26 February and 7 March 2022, before switching to the westbound carriageway later in March. In the meantime, we are working on the structure using single-lane closures. This work is planned to continue until summer 2022.

Westminster Bridge

Hostile vehicle mitigation works began on 15 November 2021, with installation of a new segregated cycle lane and bollards on both side of the bridge. Three of the four phases of works were completed as planned and daytime traffic management was removed in January 2022. Phase three of the works was affected by an outbreak of COVID-19 at the bollard foundry in Scotland, leading to a delay in delivery of the bollards and impacting the completion of this stage. As a mitigation works to install the bollard bases and construct the new segregated

cycle lane will continue as planned and the delayed bollards will be put in place by early March 2022 using off-peak lane closures.

Rotherhithe Tunnel

The design work and preparation of tender documents for the detailed design and build procurement stages of the project is now complete. However, owing to the current funding and financing challenges the organisation faces, the tendering process for the detailed design and build stage has been paused. A series of short-term capital interventions are being put in place to ensure the tunnel remains safe and operable until the main refurbishment project can be progressed. The design of an over-height barrier to improve compliance of vehicles using the tunnel is currently under way and installation started on 31 January 2022.

Hammersmith Bridge

The bridge was re-opened by the London Borough of Hammersmith & Fulham for pedestrians and cyclists to cross and for river traffic to pass beneath in July 2021. After a review, the Hammersmith Bridge Taskforce decided on 25 November that there is no longer a need for a ferry service, which we had started to mobilise. At the request of the taskforce, the contractor has now been stood down and the project stopped. We will continue to work closely with the Government and the council to ensure people can continue to cross the river in this area.

The borough is now progressing the detailed design for the stabilisation works on the bridge, which will make the structure safe and ensure it can remain open for pedestrians and cyclists in the long term. A Memorandum of Understanding between the Department of Transport (DfT), borough and us is expected from the DfT setting out the arrangements for how the works will be funded.

Carriageway renewal

Work to renew 325,000m² of carriageway continues at pace, with 214,549m² delivered by 21 January. Many schemes have been delivered, with large schemes on the A24 Meratun Road and Great Cambridge Roundabout. Schemes in the next quarter include A21 Bromley Road and A3220 Cheyne Walk. Design work to facilitate future renewals is progressing well.

Public transport

Reporting period	Gross cost to date (£m)	Gross cost to go (£m)	Forecast cost (£m)	Programme and project authority (£m)	Variance: Forecast vs authority (£m)
2020/21 to 2024/25	115	186	452	249	(203)
Change since last Investment programme report					
No change	12	(452)	(288)	(289)	

Financial commentary

The five-year forecast reflects a decrease in gross expenditure (£289m) since the last report. The current forecast cost reflects the current funding constraints, as we manage the investment programme under a managed decline scenario.

The portfolio continues to reflect investment delivery for safety and business critical focused renewals across our rail and bus business areas. The forecast also includes replacement of our oldest tram fleet, and investment to encourage more people to use buses.

Programmes to support the new homes and growth in London are subject to third party funding include the Royal Docks, as well as the London Overground Housing Infrastructure Fund, which feature as part of ongoing funding discussions.

Programme Update

London Overground

We have continued to develop concept designs as part of our enhancements programme in East London for infrastructure projects associated with significant housing growth that are funded by both the Housing Infrastructure Fund and developer contributions. The concept designs are forecast to be completed by the end of February 2022.



Our work continues to support the development of East London

Class 710 trains

By December 2021, 50 of 54 Class 710 trains had been delivered by manufacturer ALSTOM and accepted into use by London Overground. The last four trains, two of which are being used by ALSTOM for further train software development, are expected to be delivered between Quarter 1 and Quarter 3 2022/23.

DLR

Both construction and procurement activities for the renewal portfolio continue to gather pace. The team, including our contractors, continue to assess the impact of the pandemic and mitigations, and ongoing testing has enabled us to see minimal impact.

The B92 replacement bogie frame project is progressing well with 83 out of 90 frames being delivered, and an additional 20 being ordered to mitigate bogie cracking.

High voltage projects have been designed and equipment purchased for renewals at Custom House, Royal Mint Street, Bow Church and Beckton.

Good progress has been made on the Poplar and West India Quay station lighting upgrade projects. Migration and final commissioning works are in progress.

Automated people counter installation has been completed at 20 out of 26 stations and will be delivered into service this financial year.

We have replaced the Beckton Depot shore supply equipment and commissioned it into service. Intrusive lighting and power surveys have been completed at several stations, which will enable us to progress with technical documentation for tender.

The lift system upgrade project continued to make good progress, with 13 lifts completed. Following a successful tender process, a contract has been awarded for escalator mid-life overhaul work across 20 DLR stations, along with a lift renewal project for 26 lifts.

Custom House escalators are now being commissioned into service, works have commenced on site to refurbish City airport and Cutty Sark escalators.

Coper, tactile and paving installation has been completed at City Airport station, completing our DfT obligation for Rail Vehicle Access Regulations compliance. Work has now started on Shadwell. Crossharbour station stair tread replacement has been finished. Waterproofing at Limehouse Arches works have been concluded and handed back to the local Council.

Switches and crossovers have been installed at Westferry and commissioned successfully. We have completed 800 metres of rail, including eight new expansion switches between Canning Town and Blackwall, and Canary Wharf and Crossharbour stations. Track fixings continue to upgrade baseplates through critical sites during engineering hours.

The GLA-funded Royal Docks stations programme concept designs have now been approved for Royal Victoria and Beckton Park. GLA funding has been agreed for the next phase of works.

London Trams

Our rolling stock replacement programme will replace the life expiring Bombardier CR4000 trams, which are experiencing declining reliability and have one of the lowest states of good repair categorisations across our fleets. The programme has been assessing the outputs from the Sandilands inquest and has fed these into the current tram market study to understand safety innovations available for modern fleets.

The market study, plus assessments of the current depot and infrastructure, will complete in the autumn ahead of starting the market engagement exercise in Quarter 4.

Installation work for both the wayside and on-tram upgrades to tram communication equipment was paused in December 2021 so that the project team can investigate and rectify an increase in the number of communication faults, which are affecting the reliability of tram operations. This work is a precursor to enabling a correct-side door enable system on the Bombardier CR4000 trams. The next milestone is the completion of the wayside installation works which is now expected in March 2022.

Our renewals programme continues across five asset groups, including rolling stock, power, civils, systems and permanent way infrastructure. The final phase of the Reeves Corner embedded track renewal is planned to be completed during a nine-day part closure of the tramway starting in mid-February 2022. Detailed planning is also under way for the Mitcham to Mitcham Junction ballasted track renewal, which is planned to start during a 10-day part-closure of the tramway in early April 2022.

We installed a new staircase at Morden Road on 19 December and a contract was awarded on 10 December for Birkbeck retaining wall to be replaced, with site works planned to start on 25 February 2022.

Tram 2547, which is a specific type, was transported to Alstom's depot in Ilford and the first phase of condition assessment and a report on the proposed repair works completed on 28 January 2022. The repeat trial-running for the first-in-class Stadler on the CCTV upgrade project was delayed by a technical issue following the installation of the new CCTV, which is being resolved and the roll-out is now forecast for completion by the end of March 2022.



Santander Cycles are seeing record numbers of hires being made

Santander Cycles

Our Santander Cycles scheme continues to go from strength to strength. It has played a crucial role throughout the pandemic, as more and more Londoners have turned to cycling for everyday journeys and exercise and has experienced record usage. On 12 December 2021, the record was broken for the most hires to take place in a calendar year, with 10.58 million hires taken place so far, surpassing the previous best of 10.57 million in 2018. Hires are expected to be close to 11 million for the calendar year. November saw significantly more hires take place than any previous November, with 944,925 hires, almost 20 per cent more than the previous best in 2017. The average daily hires in November was 31,498. This is the first time daily hires in November have averaged more than 30,000. The first 12 days of December were busier than any previous December up to this point.

Since March 2020, we have offered free cycle-hire access codes to NHS staff and other key workers. So far, there have been more than 150,000 promo codes redeemed. The busiest location for NHS code redemption is the docking station on Lambeth Palace Road in Waterloo, near St Thomas's Hospital.

The programme to modernise, electrify and expand the Santander Cycles scheme is continuing as planned. This initiative aims to broaden and increase usage of Santander Cycles, as well as support our financial sustainability plan. It will improve the customer offering with the rollout of 500 e-bikes, flexible fare models and enhanced app functionality.

A systems integration team has been formed and is working with suppliers to integrate the different system components, including the scheme's back-office payment system, e-bikes, website and app. The launch of the 500 e-bikes remains on track for summer 2022.

Options are being explored to expand the geographical footprint of Santander Cycles, with a business case in development to confirm the priority list of areas that would benefit from expansion. Third-party funding has been received from the London Borough of Southwark for an expansion within the borough and design work is under way for potential sites identified.

Technology

Reporting period	Gross cost to date (£m)	Gross cost to go (£m)	Forecast cost (£m)	Programme and project authority (£m)	Variance: Forecast vs authority (£m)
2020/21 to 2024/25	42	199	241	158	(82)
Change since last Investment programme report					
No change	7	(126)	(120)	28	

Financial Commentary

The five-year forecast cost for 2020/21 to 2024/25 has reduced by £120m since the publication of the last report.

The reduction is mainly driven by us moving to the managed decline scenario (£96m), where a lower level of funding is available for renewal projects, and a significantly lower level for enhancement projects. The team have also delivered cost reductions of £17m and a rephasing of the iBus2 project.

Programme updates

Compliance, enforcement and safety

We are continuing to progress the roll-out of deployable enforcement cameras. A trial of cameras in 2020 saw an improvement in compliance of up to 60 per cent in six months. We introduced the first of these cameras on 13 January 2022 at Cambridge Road and expect to have delivered 50 operational by the end of May. We will monitor how successful the cameras are at cutting road danger, reducing congestion, and improving bus journey reliability. Any money we recover from penalty charge notices will be reinvested in maintaining

a safe and efficient road network. The cameras are used for enforcement of civil traffic rules only and are fully compliant with data protection legislation.

We are continuing to develop enforcement and compliance back-office systems using in-house teams. This enables us to replace and improve digital capability, enabling officers to record contraventions through mobile devices on the street, and delivering a case management solution to enforce regulations through prosecutions and advisory notices.

Roads technology

Our new road management systems are delivered within the Surface Intelligent Transport Systems (SITS) programme and enable a multi-modal approach to managing the road network. All road users will benefit from the efficiencies gained by this programme, including those who are walking, cycling, on a bus, in the freight industry or emergency services. The programme remains on track to deliver several vital systems.

Work is continuing on the predictive element of the SITS programme. This aims to revolutionise our approach to managing small to medium-impact incidents. Predictive will enable us to respond to incidents quicker, using innovative modelling technology. This element alone could reduce the cost of delay to people travelling in London by up to £0.4bn over the next 15 years, about one-third of the overall benefits of the SITS programme. Work is continuing to baseline the scope to ensure the system can contribute to the realisation of SITS journey time benefits.

The real-time optimiser will replace the legacy urban traffic control system and will optimise signal timings at almost 6,000 signal-controlled junctions in London. The latest milestone was met in December 2021 with 12 additional junctions now running this software. The Common Operational View Incident Management System has completed its fourth deployment in our Network Management Control Centre, and now includes information on Cycle Hire, tunnels, highways management contract areas, charging zones and rail and sponsored services. This improved situational awareness enables our control centre to better assess the impacts of an incident across different modes and deploy effective management strategies.

Public transport technology

We are maintaining and developing technology to operate our public transport networks and improve customer experience. This includes upgrading the critical technology systems that underpin the bus network, such as the iBus system, which provides real-time information on bus locations. The tender process to select suppliers for the iBus2 software replacement project is progressing well. Bidders who were successful in the earlier selection questionnaire phase have now submitted their proposals, and the team is now evaluating the responses. The evaluation and consensus period will continue until March 2022. Following that, bidders will be shortlisted to progress through to the competitive dialogue phase, planned to start April 2022, where the project team will clarify with bidders their technical and commercial proposals to ensure that any final proposal submitted at Invitation to Submit Final Tender represents the best value for money.

Procurement is progressing for a replacement booking and scheduling system for Dial-a-Ride, which will give passengers the option to book online, and enable us to deliver more trips with the same number of vehicles. A further round of negotiation is under way to hone understanding of value for money. Shortlisted bidders will be invited to submit final tender shortly, with contracts expected to be awarded in summer 2022.

Professional services

This comprises technology and data, media and the TfL Growth fund



Technology and data

Reporting period	Gross cost to date (£m)	Gross cost to go (£m)	Forecast cost (£m)	Programme and project authority (£m)	Variance: Forecast vs authority (£m)
2019/20 to 2022/23	185	141	326	320	(6)
Change since last Investment programme report					
No change	16	(17)	(1)	No change	

Financial commentary

The movement in EFC since the last report is due to other telecoms income and technology development spend being transferred to business-as-usual operating expenditure and surface overprogramming transferred, with iBus2 to surface as part of the revised budget.

The Programme and Project Authority and EFC shown are for financial years 2019/20 to 2022/23, as per the Programme and Investment Committee paper that was approved on 6 March 2021.

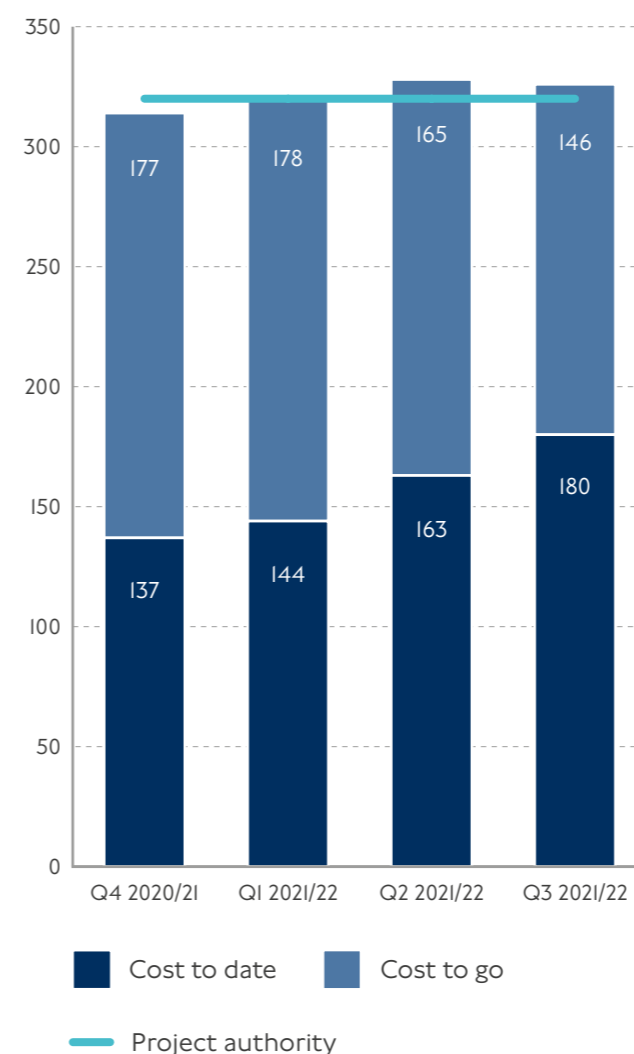
The values are for technology and data funded projects only and exclude the Emergency Services Network, the public cellular network and telecoms

commercialisation projects. Other telecoms spend is included from 2021/22 as it was included within the latest Programme and Investment Committee approval. iBus2 spend is excluded from 2021/22 as it transferred to the Surface programme from 1 April 2021.

Performance over time

Forecast spend for the three-year reporting period has increased above Programme and Project Authority, driven by transfers of other telecoms income to business as usual operating expenditure and Surface overprogramming transferred with iBus2 to the Surface transport portfolio, as part of the revised budget. This will be regularised as part of our submission to this Programmes and Investment Committee.

Estimated final cost performance over time (£m)



Programme updates

Digital workplace

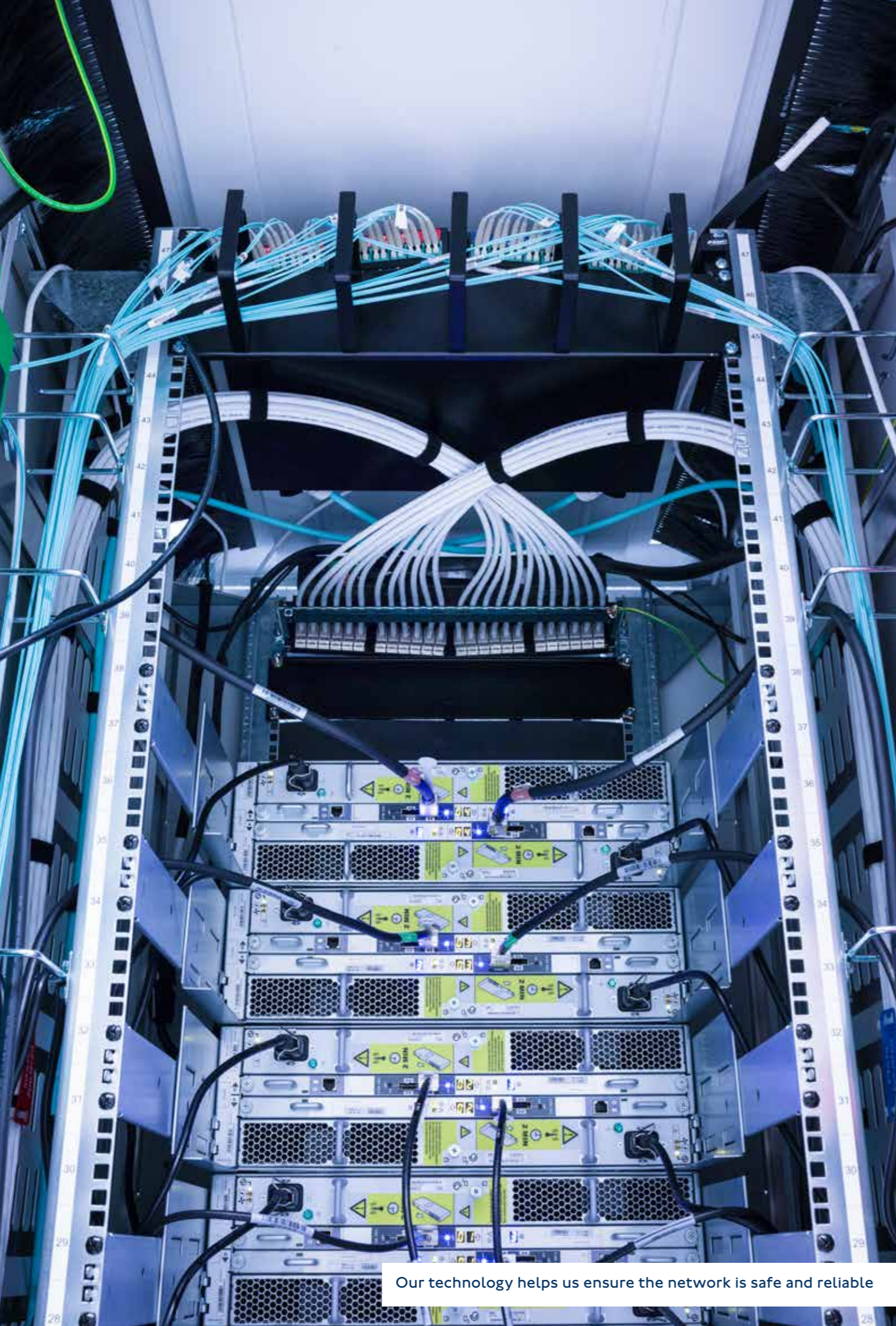
The consolidation of all legacy versions of Microsoft SharePoint sites onto SharePoint Online continues ahead of schedule, with 1,178 of 1,225 sites now completed. This project provides a common, online data platform for all our SharePoint sites, giving improved accessibility, security and eliminating the cost and complexity of managing the obsolete infrastructure, and is planned to complete in March 2022.

Hosting

Work continues to refresh our hosting platforms, however no major milestone achieved this quarter.

Networks

Our new telecoms concessionaire is delivering well, and initial milestone achievement certificates have been issued to BAI in accordance with the contracted schedule. BAI has issued the detailed implementation plan to us for approval. This includes a number of changes that we requested, including the earlier delivery of the tunnel sections and platforms on the Elizabeth line. Two of the four mobile network operators have signed up, Three and EE, ahead of the contractual milestone, while the other two are in final negotiations with BAI. Work has started on the pilot phase of the fibre delivery and small cell product development.



Our technology helps us ensure the network is safe and reliable

The connect programme continues to replace London Underground's operational radio base stations. This two-year project has now replaced 58 of 293 base stations. It is planned to update the core radio software by the end of February 2022, from version 9.0 to 9.1, bringing the system in line with the current supportable version.

We have signed an agreement with Capita to replace the end-of-life data network that provides connectivity to most surface locations and service assets. The scope of this network includes around 4,700 network connections. Good progress is being made on migration activities, with the plan being to have completed migrations by the end of 2022.

We continue to deliver infrastructure to support the Home Office's national Emergency Service Network communications system. In tunnels, we have pulled 418km (99 per cent, unchanged) of the leaky feeder cable, with 414km fixed (98 per cent, up five per cent) and 380km tested (90 per cent, up four per cent) from 422km of tunnels. Fibre installation is now at 414km (98 per cent, up one per cent). Much of the remaining work is dependent on removing existing legacy tunnel telephone assets to create space for our assets and we have identified a five more sections where this is needed and has been planned in. We have completed 96 per cent (up two per cent) of the required station cabling works. We have also installed over 50 per cent of the required low powered radios in the back of house areas of the 4G pilot stations, building on the existing front of house deployment.

Technical service operation

The objective of many projects in this programme are to transition IT infrastructure/services, including:

- Consolidating JNP IT services in our data centres, which is now complete
- Remaining resiliency improvements for business-critical services planned for this financial year, which are progressing to plan
- Initiating projects to replace on-premise and cloud network infrastructure in 2022. This will support and protect our business-critical services.

Other key projects relate to software license management. The contract for the software asset management provider was awarded in September 2021, and the design of the service and implementation are due to complete this quarter. The initiative to optimise Java license usage is under way with a focus on putting processes in place that enable this to continue long term.

Enterprise resource planning

The rollout of myJourney, the new digital home for performance and talent management, has continued with increasing adoption rates across the organisation. This phase of the project will complete by period 13.

In parallel, we have launched the next phase of myJourney, which will replace the core SAP HR system. Project mobilisation, feasibility and market analysis will be undertaken up to June 2022.

Work continues on the new procurement and supply chain system (SAP Ariba) however there are no major milestones to report this quarter.

Contact Centre operations

We continue to focus maintaining the quality and efficiency of our Contact Centre services. Following our re-tender, transition and go live of our new consolidated Oyster customer support contracts in July, we have made increasing progress in carrying out the same activities for our Santander Cycles customer service. Following an evaluation of bids in October, the project has since planned transition to the new contracts and navigating the project through the necessary governance prior to contract award without disruption to the customer service being provided.

Replacing our broader outsourcing framework successfully met necessary governance milestones as planned by the end of 2021. We have received initial feedback on one unforeseen item within the second stage commercial approval governance board which presents a potential significant change in approach. This has initially been taken offline to explore and resolve appropriately as this feedback could significantly complicate the project, associated milestones and other dependant projects in 2023.

Replacing our main, legacy and business critical Lost Property system continues to make progress in line with forecast. It has been requested we go through additional governance for the award of this contract. This additional governance does not adversely impact the project but will need to be managed. In parallel, pre-planning the rollout of the tool with a focus on the planning of the people change continues with excellent progress against plan.

We remain ready and awaiting the appropriate technical resources to develop the automation of our customers' contactless payment card refund enquiries. This is forecast to be completed currently in the first quarter of 2022 but may face slippage if resource is prioritised elsewhere.

Data analytics

We have gone live with our modernised original destination interchange solution. This has been used for a number of years to support business decisions around the bus network. In its simplest form the product captures bus taps and infers where our customers got off the bus, using the next tap that we see on their journey. This helps to plan bus usage across the network. For many years the old solution was not performing effectively but we have taken this and modernised the offering by refreshing the algorithms behind the product and re-platforming on to a modern Azure platform. Following on from go live, we now kick off our parallel run and data assurance window.

During the last month we also went live with another product that enables us to count the boarders and alighters across the tram network, which, due to ungated stations, enables us to monitor capacity on the network.

We have also supported Crossrail in getting reports available to support the launch of trial operations. We continue to work closely with them to ensure feedback is fed in into the final production reports.

The main challenge over the last quarter was resource retention and attraction, due to a buoyant job market in the data field. This has meant that we have had to slow some project work due to under staffing.

Digital

Our TfL Go app now has an App Store rating of 4.7 and a Play Store rating of 4.4. More than 760,000 customers have downloaded the app since it was launched.

In December, we added new functionality to display closed Tube lines in the app, supporting Christmas closures and the Northern line closure from 15 January. We continue to develop account, journey history and payment card functionality with a first phase beta release planned for the end of the financial year.

Our principal challenge is resource retention and attraction in the development teams. This has slowed down the redevelopment of our website, and curtailed our ability to make timely updates to existing digital products like the ESUB.

Growth Fund

Reporting period	Forecast £m
2020/21 to 2029/30	2
Change since last Investment programme report	
No change	No change

Programme update

The current revised budget classifies all Growth Fund schemes as fully meeting the Mayoral objectives but contingent on additional funding. This means that, although all projects have already secured a strong commitment and a significant degree of third-party funding, a further commitment by the Government or other third-party sources is needed to complete the funding packages.

We continue to identify additional funding streams, while supporting all Growth Fund projects with contractual obligations and other urgent milestones by providing case-making and programme-level support.

Challenges

The main challenges continue to centre around ongoing funding uncertainty for Growth Fund projects, which are necessary to unlock new homes and jobs in areas of high need in London. Several projects with previously complete funding packages are currently at risk due to the programme being contingent on additional funding.

As a result, several projects have been delayed or paused in anticipation of funding certainty, while some critically urgent projects have tried to bid for and secure alternative funding contributions over the last couple of months



Our work supports the Mayor's ambitions for all of London

About TfL

Part of the Greater London Authority family led by Mayor of London Sadiq Khan, we are the integrated transport authority responsible for delivering the Mayor's aims for transport.

We have a key role in shaping what life is like in London, helping to realise the Mayor's vision for a 'City for All Londoners' and helping to create a safer, fairer, greener, healthier and more prosperous city. The Mayor's Transport Strategy sets a target for 80 per cent of all journeys to be made by walking, cycling or using public transport by 2041. To make this a reality, we prioritise sustainability, health and the quality of people's experience in everything we do.

We run most of London's public transport services, including the London Underground, London Buses, the DLR, London Overground, TfL Rail, London Trams, London River Services, London Dial-a-Ride, Victoria Coach Station, Santander Cycles and the Emirates Air Line. The quality and accessibility of these services is fundamental to Londoners' quality of life. By improving and expanding public transport and making more stations step

free, we can make people's lives easier and increase the appeal of sustainable travel over private car use.

We manage the city's red route strategic roads and, through collaboration with the London boroughs, we are helping to shape the character of all London's streets. These are the places where Londoners travel, work, shop and socialise. Making them places for people to walk, cycle and spend time will reduce car dependency, improve air quality, revitalise town centres, boost businesses and connect communities. As part of this, the Ultra Low Emission Zone scheme and more environmentally friendly bus fleets are helping to tackle London's toxic air.

During the coronavirus pandemic we have taken a huge range of measures to ensure the safety of the public. This includes enhanced cleaning using hospital-grade cleaning substances that kill viruses and bacteria on contact, alongside regular cleaning of touch points, such as poles and doors, and introducing more than 1,000 hand sanitiser points across the public transport network.

Working with London's boroughs we have also introduced Streetspace for London, a temporary infrastructure programme providing wider pavements and cycle lanes so people can walk and cycle safely and maintain social distancing.

At the same time, we are constructing many of London's most significant infrastructure projects, using transport to unlock much needed economic growth. We are working with partners on major projects like the extension of the Northern line to Battersea, Barking Riverside and the Bank station upgrade.

Working with Government, we are in the final phases of completing the Elizabeth line which, when open, will add 10 per cent to central London's rail capacity. Supporting the delivery of high-density, mixed-use developments that are planned around active and sustainable travel will ensure that London's growth is good growth. We also use our own land to provide thousands of new affordable homes and our own supply chain creates tens of thousands of jobs and apprenticeships across the country.

We are committed to being an employer that is fully representative of the community we serve, where everyone can realise their potential. Our aim is to be a fully inclusive employer, valuing and celebrating the diversity of our workforce to improve services for all Londoners.

We are constantly working to improve the city for everyone. This means using data and technology to make services intuitive and easy to use and doing all we can to make streets and transport services accessible to all. We reinvest every penny of our income to continually improve transport networks for the people who use them every day. None of this would be possible without the support of boroughs, communities and other partners who we work with to improve our services.

By working together, we can create a better city as London recovers from the pandemic and moves forward.

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