



Investment programme report

9 January 2022 – 31 March 2022

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Introduction

Our investment programme comprises projects to maintain reliability of the network and support growth in the capital



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.

Scope

This report provides an update on the projects that will further enhance our world-class transport services. It covers Periods 11, 12 and 13, which runs from 9 January to 31 March 2022.

For each key project or programme, the financial and milestone data represent the position at the end of Period 13 and includes commentary on key achievements, progress and challenges. The report also contains updates on notable progress made since the last report.

The data displayed differs dependant on whether the programme or portfolio has a finite scope to deliver.

For projects with a finite scope, financial records of spend to date, authority and estimated final cost (EFC) are provided which represent the entire duration of the programme or portfolio, except where stated. For these projects, a completion date is also provided, indicating the year and season that the specified event will occur. Seasons align to the Astronomical seasons with Winter covering January, February and March; Spring covering April, May and June; Summer covering July, August and September and Autumn covering October, November and December. For ongoing portfolios which aggregate a number of different projects, financial records of spend to date and forecast cost are provided for a discrete period of time.

Where financial information is commercially sensitive, it has been redacted. Performance over time graphs illustrating financial performance over the last four quarters have been introduced across all the programmes in the report. The commentary beside each graph explains any specific trends or changes to trends over a snapshot in time.



A royal launch for the transformational Elizabeth line in May



Our projects help improve and modernise customer experience

Investment programme delivery structure

Our investment programme is delivered by the following areas of the business: Major projects, London Underground, Surface transport and Professional services. The report is structured to reflect this.

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, asset investment and technology.

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 the quarter, we have progressed with the implementation of measures to improve our short and long-term safety, health and environmental performance. We have continued to perform well on most of our safety metrics.

Coronavirus remained the top cause of short-term absences, significantly increasing from 30 per cent in Quarter 3, to 59 per cent in Quarter 4. Mental health and musculoskeletal-related health remained the top two causes of long-term absence, which is in line with the national average. Following the Government's decision to remove Plan B restrictions from 19 January 2022, we have been able to gradually return to the office. We have continued to make lateral flow tests available to our staff.

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.



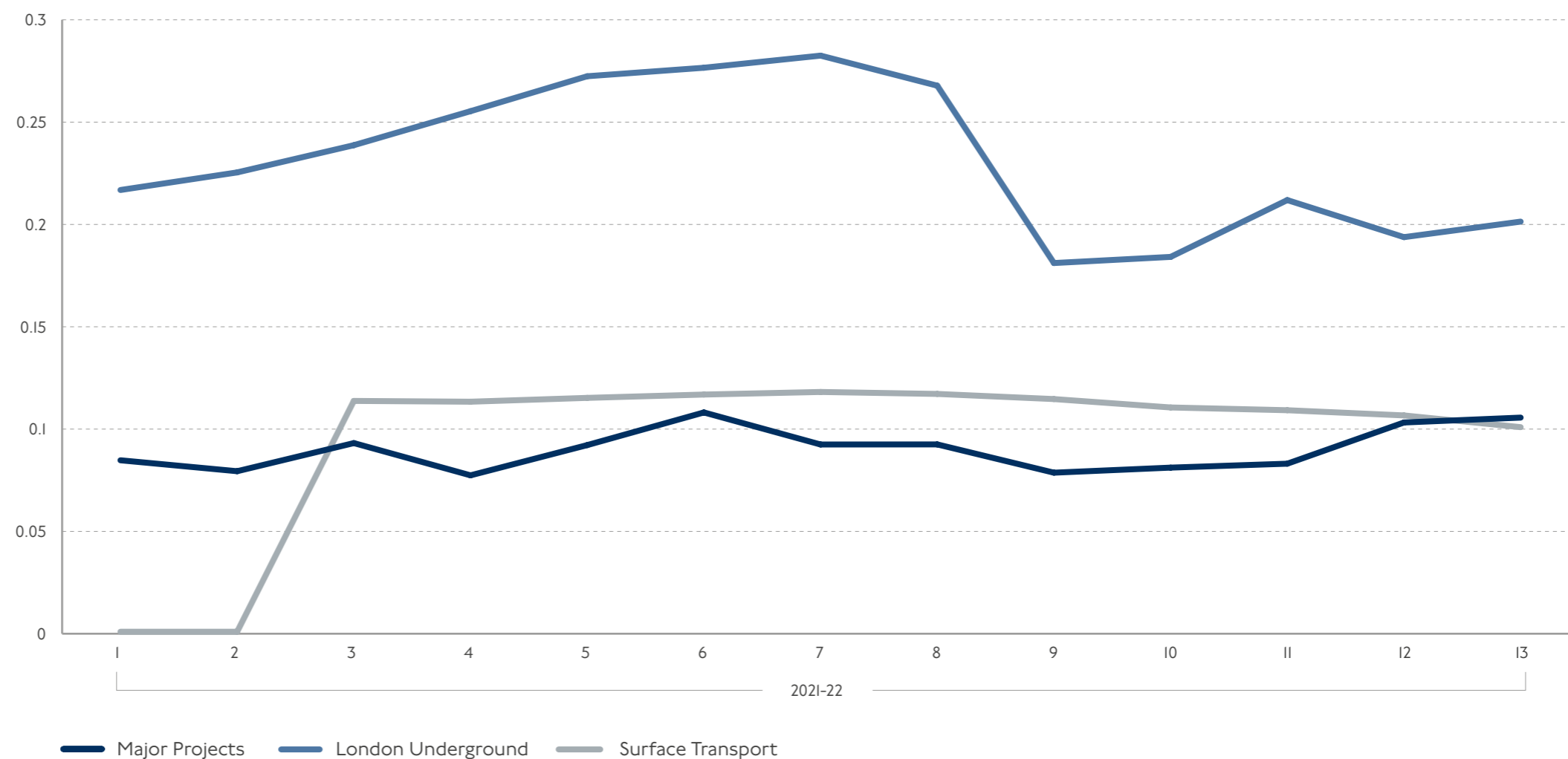
We continue to perform well on most of our safety metrics

In Quarter 4, there were four incidents reported under the RIDDOR in our capital delivery teams. This included two in the Major projects area and two in London Underground. Consequently, the accident frequency rates marginally increased in both areas, ending the quarter at 0.11 and 0.20 respectively. In Surface transport, the accident frequency rate fell to 0.10 due to no RIDDORs being reported during the quarter. As a result, Major projects and London Underground failed to meet their respective annual floor targets (thresholds) of 0.10 and 0.15, while Surface transport threshold of 0.15 was achieved.

While annual thresholds were not met in two of our capital teams, the accident frequency rate remained relatively stable on the previous year, with 15 RIDDORs in total reported compared with 14 in 2020/21. As further major projects conclude, along with a shift towards more reactive maintenance work, it is likely that our incident rates will continue to plateau in the coming quarters. As such, it remains essential that we closely analyse the root causes in order to identify safety improvements across our teams.

This year, the top immediate causes of RIDDORs in our capital teams were manual handling and slips, trips and falls. The most common root causes identified related to poor quality risk assessment or task planning, deviation from safe systems of work and substandard change management. In the majority of cases, TfL acts as the client under the Construction (Design and Management) Regulations 2015, with a third party appointed as the principal contractor.

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



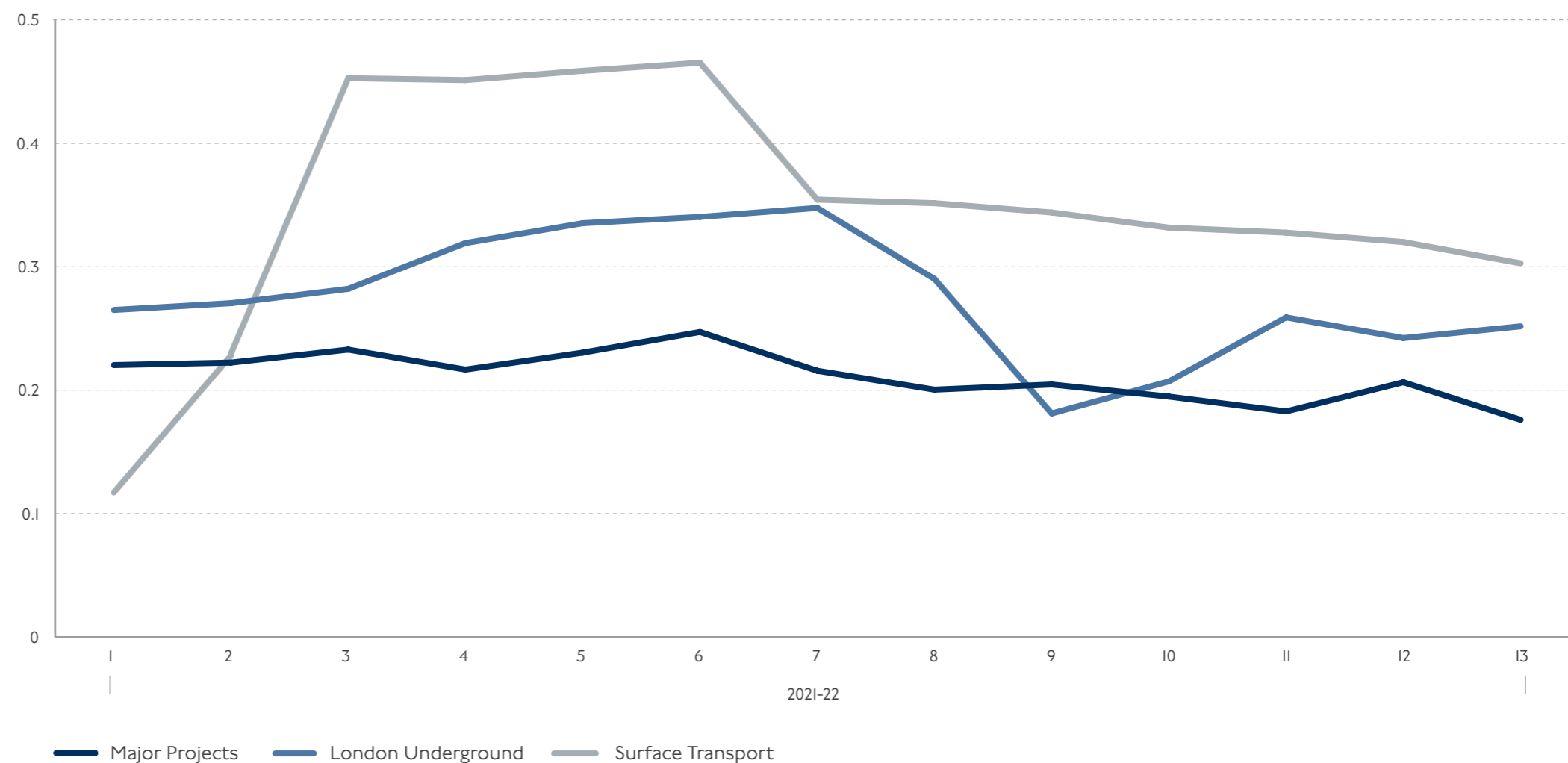
As such, it is imperative that we continue to work closely with the supply chain to share learnings from these incidents, enabling them to address root causes at source, and make adjustments to our assurance and supplier management processes to drive improved performance.

Lost time injuries (LTIs) are injuries which cause an employee to be absent for one or more shifts. There were seven LTIs reported in our capital teams during Quarter 4, an increase of six on Quarter 3. However, this increase is not reflected in the lost time injury frequency rates during the quarter due to rates being calculated based on average performance over the last 13 periods.

In total there were 24 LTIs in 2021/22, a decrease of two on 2020/21. Consequently, the rate for Major projects finished the year at 0.18, below the floor target (threshold) of 0.20. However, the threshold of 0.20 was not achieved in Surface transport and London Underground, with rates ending the year at 0.30 and 0.25 respectively. While not all thresholds across capital teams were met in 2021/22, there has been a significant long-term decline in the number of LTIs, falling from 53 in 2018/19.

Immediate and root causes of LTIs during 2021/22 were generally consistent with RIDDOR analysis, with changes to design, without consideration of how they could affect safe systems of work, also identified as a contributory factor in a number of incidents.

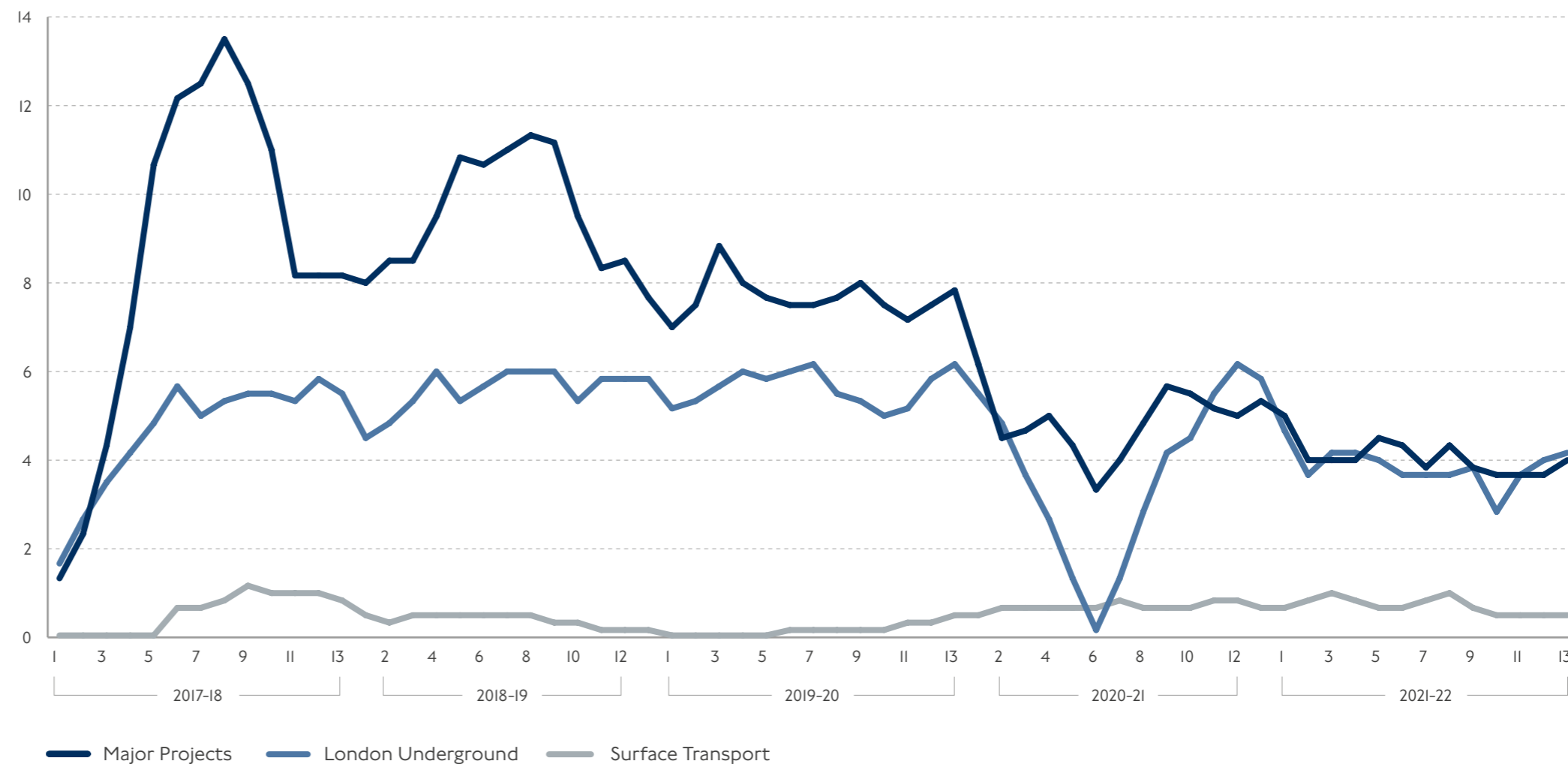
Lost time injury frequency rate
(per 100,000 hours worked)



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 teams 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 the coming quarters, as hours worked on site stabilise.

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





The Northern line now extends to Battersea Power Station

Schedule performance

We have achieved a number of significant milestones throughout the year

Northern Line Extension

On 20 September 2021, 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

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 rail systems to be installed.

Four Lines Modernisation

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

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.

16 life-expired traction isolation switches have been replaced, and we have installed 8km of new track and 18 new sets of points across the network.

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

The expansion of the world-leading ULEZ to the North and South Circular roads has now gone live.

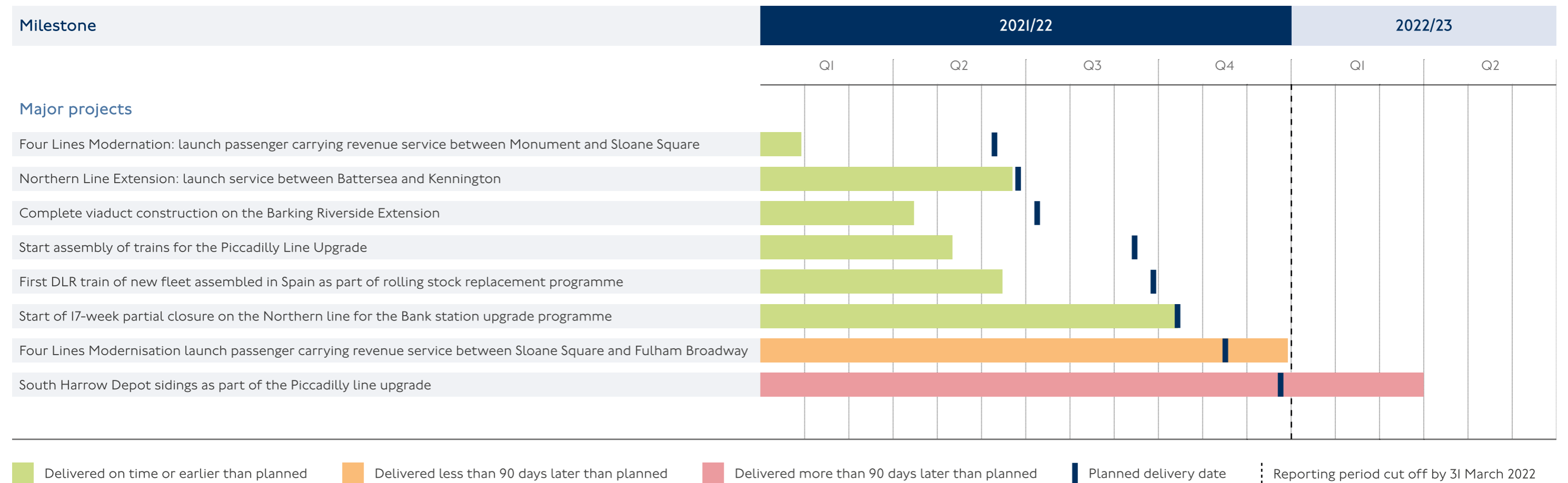
Surface Healthy Streets

We have opened the station entrance on Cowper Street and 5km of improved bus lanes have been achieved as part of the Bus Priority Programme.

Strategic milestones

We have delivered 17 out of 22 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.



Strategic milestones 2021/22 (continued)



* Signed off by TfL Commissioner

While we have delivered 17 out of 22 strategic milestones either on time or early this year, we have continued to be subject to challenges resulting from the current funding uncertainty.

In November 2021, due to a lack of long-term funding security, we have moved to a 'managed decline' scenario for budgeting which restricts expenditure to committed enhancements and only the most essential renewal projects.

In response to the funding challenges and the need to drive capital efficiency, we have put into place several initiatives. These include improving project controls, implementing a new performance measurement baseline and improving investment planning. This ensures we only start the right projects and consider all available delivery options. We are also developing a strategic investment outcome framework to link the benefits to projects and show progress against them; this is a key input for the enhancement prioritisation work for the 2022/23 budget.

Other initiatives include benchmarking projects focused on setting savings targets, reporting improvements, and a review of governance focusing on clarifying accountabilities and decision-making responsibility to speed up processes so that projects run more smoothly. We are also looking at a long-term strategic engineering resourcing review to deliver efficient engineering outcomes.

While we await the decision on future funding certainty, we are continuing to seek efficiencies both via capital delivery and through business as usual activities, some of which may impact the projects and programmes in this report.

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 implementing a series of short-term measures, such as the recently installed over-height vehicle barrier, to ensure the tunnel remains safe and operable until the main refurbishment project is progressed.

Four Lines Modernisation

The milestone for signal migration area five was achieved on 27 March, which was 35 days later than the baseline date. The delay was due to ongoing software issues, which are being reviewed, and to incorporate all functionality for the safety and reliability of the migration area.

Piccadilly Line Upgrade

The South Harrow sidings milestone has been delayed by 110 days, due to late delivery of the signal and electrical designs and extended signal installation durations.

London Underground escalators

We have returned 17 out of 23 escalators to passenger service. The 18th escalator was returned to service 28 days later than planned due to a premature component failure. The remaining five escalators are in progress, with these forecast to return to service up to 61 days later than planned. This is owing to the 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 current forecast shows this will be more than 160 days late. The programme has been impacted by resourcing challenges, but work continues to recover time and deliver the project as quickly as possible.



We have returned 17 out of 23 escalators to service

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)
Winter 2022	94	0	94	94	0
Change since last Investment programme report					
No change	I	(I)	No change	No change	

Performance over time

The forecast end date represents delivery of upgrades at the surface stations on the Elizabeth line route.

Since the programme and project authority was awarded in 2015/16, our forecast completion date has been delayed by approximately two years due to the pandemic and delays to Network Rail's works in the western section. Despite this, our estimated forecast cost has remained relatively stable.

Programme update

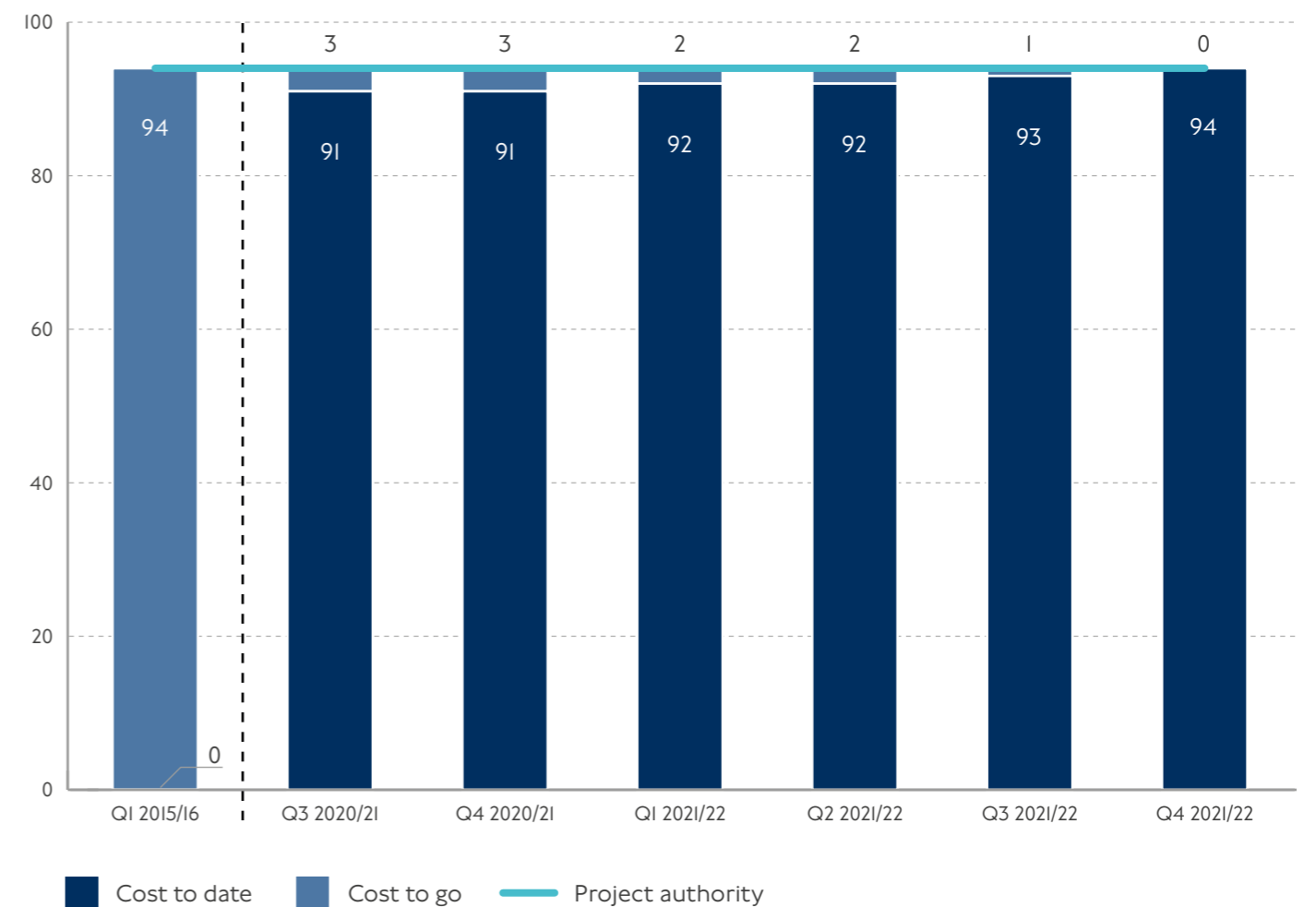
This programme involves upgrading surface stations on what will form the Elizabeth line route. It comprises step-free access work at seven stations and refurbishment work across the 22 surface stations that we operate.

As per the last update, focus on the On Network Station Improvement programme has been completing the last parts of the work being delivered by our station operator, MTR.

Physical work on the programme is now complete. In support of this we have already agreed a final account position on the main contracts and are working with MTR to close the project from a paperwork point of view.

Estimated final cost performance over time (£m)

Forecast completion date



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

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)
Winter 2025	996	10	1,006	1,149	143
Change since last Investment programme report					
No change	3	(3)	No change	No change	

Performance over time

The forecast end date represents the delivery of Elizabeth line rolling stock and depot, including all additional changes. Since the authority award in 2013/14, our forecast end date has been delayed by approximately four years due to delays to the overall Crossrail programme.

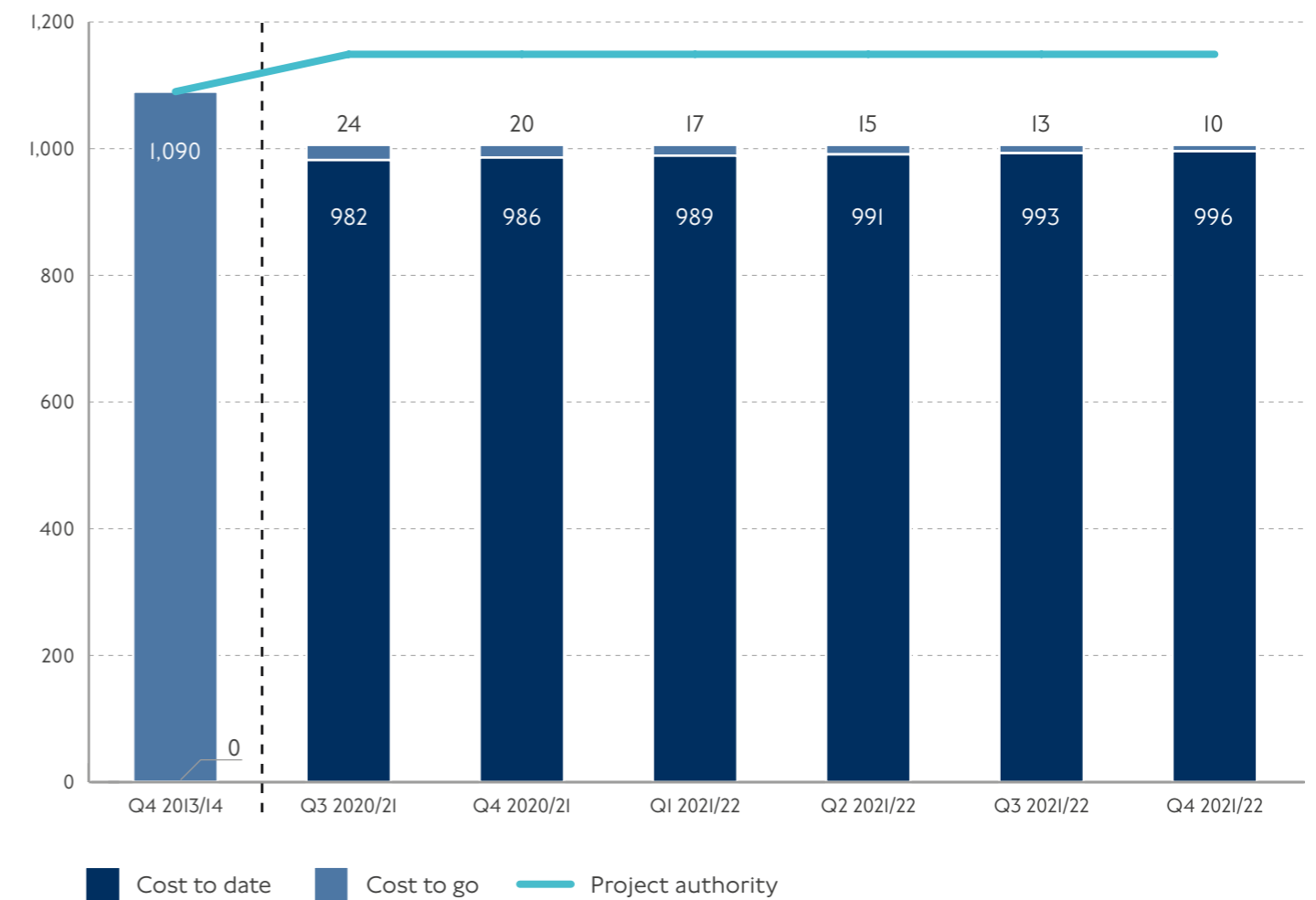
Our authority increased in 2018/19 when five additional units were added. Since the authority was awarded in 2013/14, the EFC has dropped from £1,090m to £1,006m. This is because the trains have subsequently been part of a sale and leaseback arrangement. These trains are now being leased from 345 Rail Leasing Limited on a 20-year lease agreement and the costs are being charged to operational costs.

Programme update

The Elizabeth line opened for service on 24 May. This ground-breaking project will transform travel across London and the southeast by dramatically improving transport links, cutting journey times, providing additional capacity and transforming accessibility, with spacious new stations and walk-through trains. It will initially operate as three separate railways, with services from Reading, Heathrow and Shenfield connecting with the central tunnels from autumn this year.

Estimated final cost performance over time (£m)

Forecast completion date



Passenger services between Reading and Paddington have been operating with 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-car trains. All seven-car trains have now been converted apart from three which will continue to serve the shorter platforms at Paddington mainline station until the start of stage five through-running services into the Elizabeth line central section later in 2022. Services to Heathrow, and between Liverpool Street and Shenfield, continue to be operated by nine-car Class 345 trains.

The line is operating 12 trains an hour (up to 18 Class 345 trains) between Paddington and Abbey Wood, Monday to Saturday from 06:30 to 23:00. It is anticipated that progressive incremental updates will continue to be made to the train and signalling systems beyond the start of service, and we have provided for this in the rolling stock project through to 2025.

Challenges

Fleet reliability has improved, but not to the level that was previously anticipated. A new suite of reliability-focused software is being installed on the fleet by the manufacturer, Alstom, which is expected to deliver a significant improvement.



The Elizabeth line has dramatically improved journey times

Crossrail

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 2023	15,609	354	15,963	15,789*	(174)
Change since last Investment programme report					
2 quarters	98	(98)	No change	No change	

Crossrail is the biggest railway infrastructure project in Europe and is one of the largest single investments undertaken in the UK.

Financial commentary

The forecast end date has moved out by approximately six months due to the risks associated with implementing auto-reverse, the additional functionality required for operational resilience, the reliability of rolling stock and infrastructure, and handover and assurance with Network Rail.

Performance over time

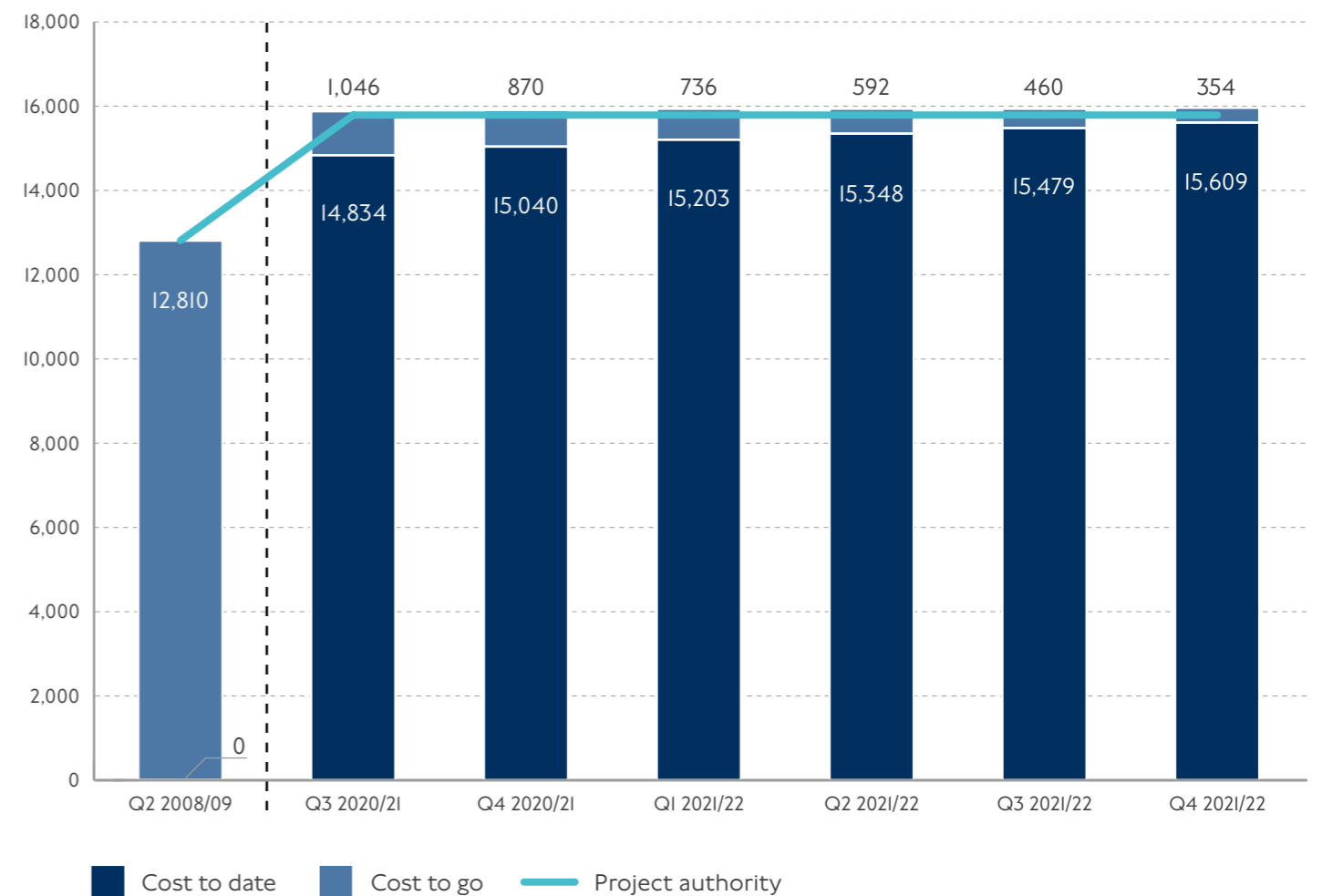
The reported forecast end date represents operation of a full service from Reading and Heathrow through the central section to Shenfield and Abbey Wood, with a peak service of 24 trains per hour.

The original forecast end date was autumn 2019. However, the schedule at the time assumed that installation of critical systems, construction of stations, and testing and commissioning could all be completed in parallel towards the latter stages of the programme, which ultimately was not achievable and led to a delay in completion. On top of this, the coronavirus pandemic had an impact on productivity in 2020, although this has been mitigated from a schedule and cost perspective.

Since setting Delivery Control Schedule 1.2 in August 2021, costs have remained largely stable due to active management of the EFC. The programme has been able to realise a number of opportunities and risk retirements over this period, however increasing cost pressures at Bond Street and Canary Wharf stations has meant there has been no favourable movement overall in the EFC.

Estimated final cost performance over time (£m)

Forecast completion date



* Excludes on-network works carried out by Network Rail

Programme update

The transformational Elizabeth line opened on 24 May 2022 to an incredible reception from Londoners and transport enthusiasts around the world. Hundreds of thousands of customers used the railway on its first day of operation, taking advantage of the seamless journeys through the heart of London on the new central section. The Elizabeth line is a historic, once-in-a-generation addition to London's transport network that will not only change how people travel in London but will support the creation of new jobs and economic growth throughout the country.

This ground-breaking project will transform travel across London and the southeast by dramatically improving transport links, cutting journey times, providing additional capacity and transforming accessibility, with spacious new stations and walk-through trains. It will initially operate as three separate railways, with services from Reading, Heathrow and Shenfield connecting with the central tunnels from autumn this year.

It is currently operating 12 trains an hour between Paddington and Abbey Wood, Monday to Saturday from 06:30 to 23:00. Work will continue in engineering hours and on Sundays for a series of testing and software updates to take place in preparation for more intensive services from the autumn.

The celebratory response to the opening saw around 260,000 journeys made on the new central section between Paddington and Abbey Wood across its opening day, clearly showing its popularity. Across the whole line, which stretches from Reading and Heathrow in the west to Shenfield and Abbey Wood in the east, more than 460,000 journeys were made.

Customers travelled from all over the country and indeed the world to be part of the historic opening of the line, while Londoners showed their enthusiasm at stations across the capital hours before the opening. Huge lines of people queued for hours at a number of stations across the line before opening to ensure they were able to be among the first to use the inaugural trains on the Elizabeth line.

The enthusiasm for the Elizabeth line is clear, as is the transformational impact it will have on London. The railway has opened up new journey options, will support jobs and deliver a huge economic boost, not only for London but for the whole country. The increase in central London's rail capacity of 10 per cent is the largest single increase in decades and will support the capital's regeneration and recovery from the pandemic.



Central London's rail capacity has now increased by 10 per cent

Line upgrades

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)
Autumn 2024	5,140	318	5,458	5,447	(11)
Change since last Investment programme report					
No change	30	(27)	3	No change	

Financial commentary

Following the revised authority, granted by the Programmes and Investment Committee in July 2021, the project manager expects the final signal migration area I4 to still be completed in autumn 2024.

The EFC has increased by £3m since the last report, this is principally due to procurement related delays for works at the Neasden Heavy Maintenance Facility and Thales contract inflation.

We are providing a full update at this July Programmes and Investment Committee meeting. As part of the full update, the software programme will be extensively analysed with our signalling contractor, Thales.

Performance over time

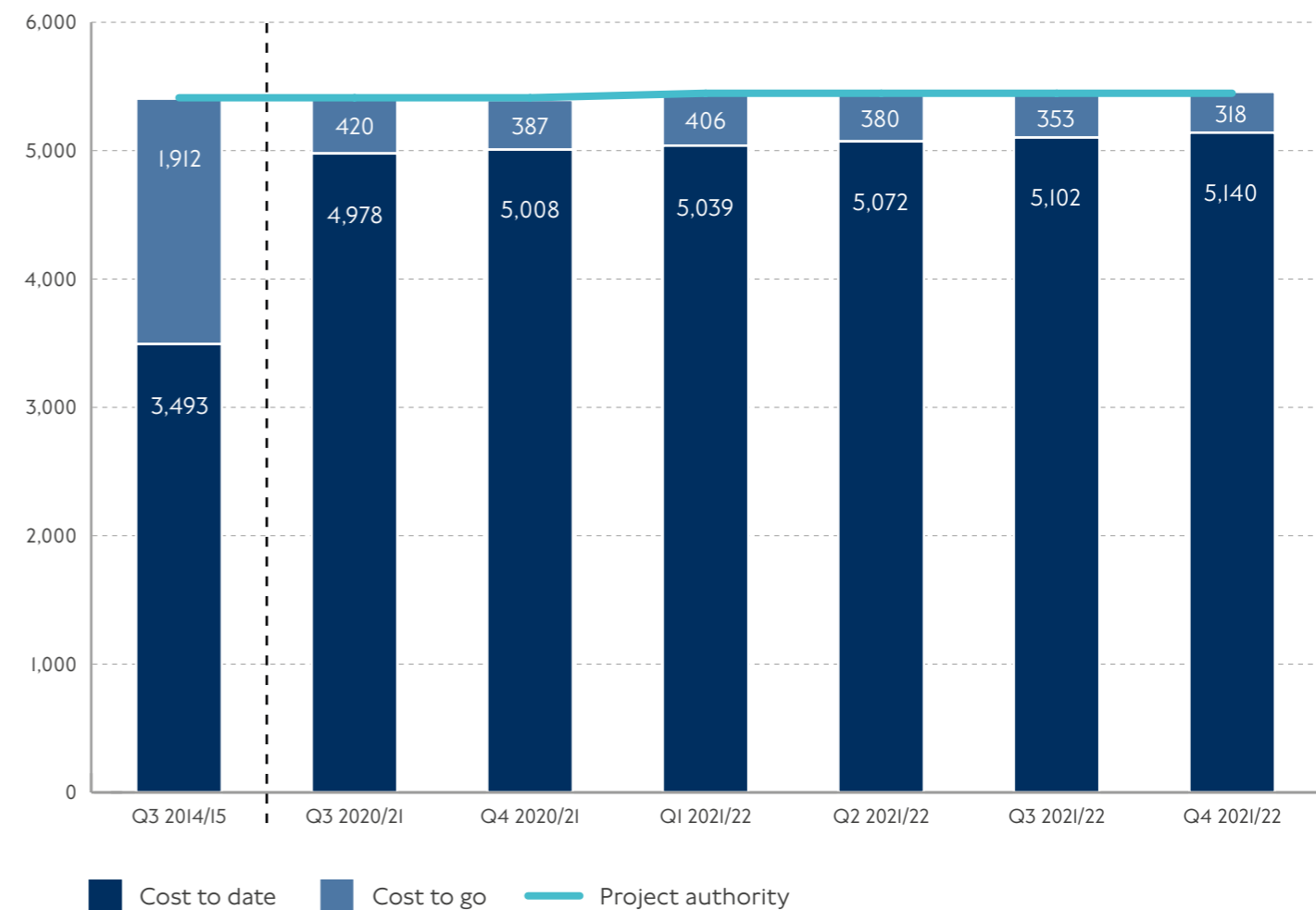
The forecast end date in the performance over time graph has been updated with historical data being restated since the last investment programme report. In previous reports, the commercial close out of our signalling contract was used as the completion date. The forecast end date now reflects when the final signal migration area I4, between Rayners Lane and Uxbridge, will be brought into service.

Recognising the change in reporting approach, since the award of the signalling contract in July 2015, our completion date has been delayed by 18 months. Delays are principally due to challenges with complex software development, testing and commissioning, closure availability and the impact of the coronavirus pandemic.

Our estimated final cost has remained relatively static over the same period while we develop our forecasts based on our understanding of the cost to go in relation to the remaining scope of work and the associated risks, which considers the entire programme.

Estimated final cost performance over time (£m)

Forecast completion date





Programme update

The section of signal migration area five, between Sloane Square, Paddington, Fulham Broadway and Barons Court, went live on 27 March 2022. This will enable a timetable improvement, making journeys on average five per cent quicker, to be implemented on the Circle and District lines between Monument, Fulham Broadway, Barons Court and Paddington (signal migration areas four and five) in September 2022. This was a major achievement for the programme as it involved upgrading the highly complex junction at Earl's Court and completed the implementation of communication-based train control across the entire Circle line.

Since commissioning the signalling upgrade, the underlying system performance has been good but a specific software issue, safely mitigated by operational restrictions, needed resolving and the software required an update. This diverted resources from the development and testing of software for the future migration areas. Mitigations are being developed and the overall schedule impact is being assessed. As a consequence, commissioning signal migration areas six and seven later this year at the eastern end of the District line is currently under review.

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	182	645	827	863	36
Change since last Investment programme report					
No change	37	(36)	1	No change	

Financial commentary

While our EFC is £36m under programme and project authority, since the last report it has increased by approximately £1m, mainly due to inflationary pressure on material costs. We are reviewing opportunities and mitigations to minimise the impact of this increase.

Performance over time

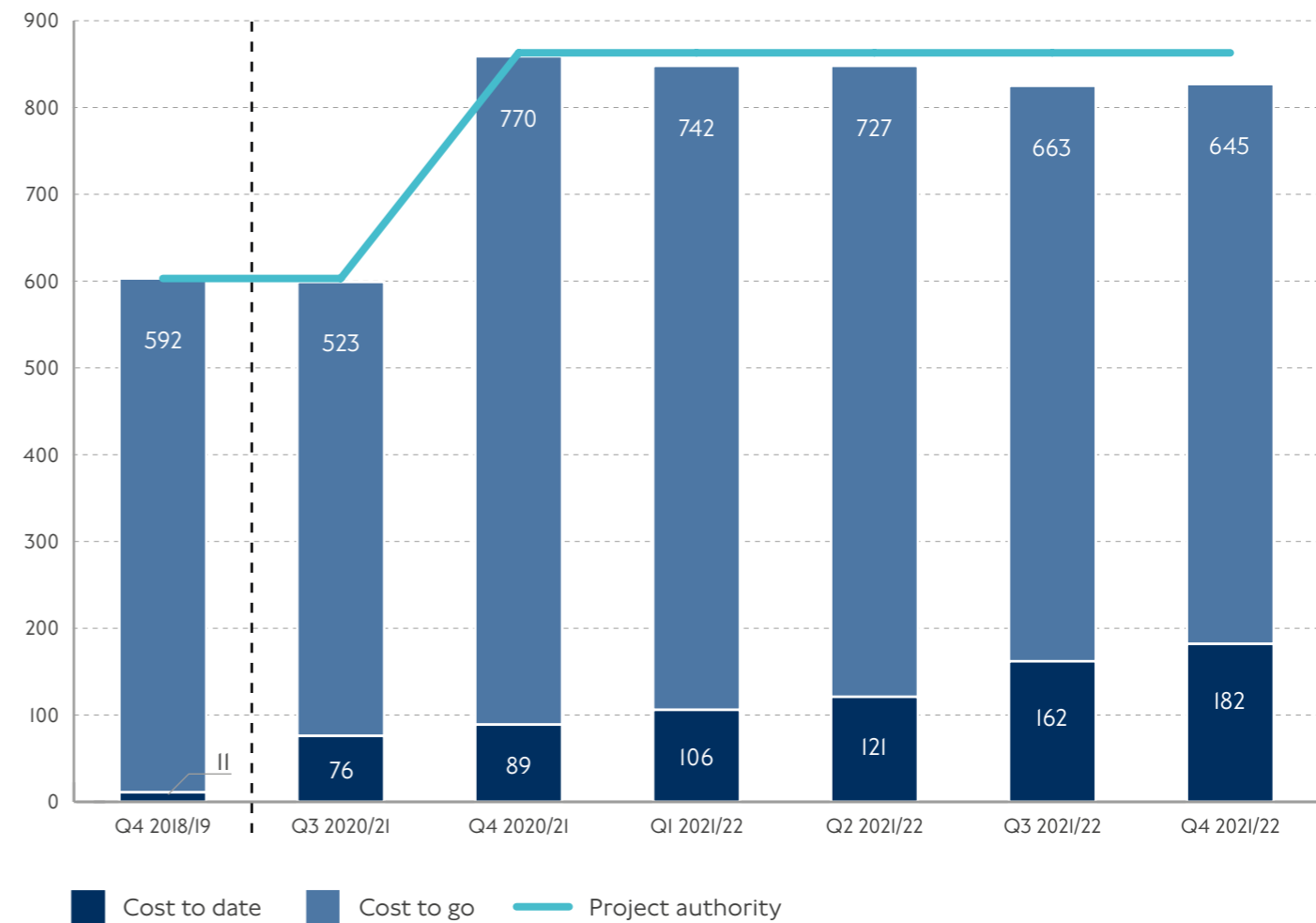
The forecast end date in the performance over time graph has been updated, with historic data being restated since the last Investment programme report. The forecast end date now reflects the final new DLR train being brought into service rather than the commercial close out of the contract.

Since the original grant of programme and project authority in 2019, we have increased our scope to include an extra 11 trains, which are being funded by the Department for Levelling Up, Housing and Communities, taking the total number to 54 new trains.

We reduced our estimated final cost to reflect procurement savings and by taking a proactive stance with the remaining risk exposure as the rolling stock design approaches completion.

Estimated final cost performance over time (£m)

Forecast completion date



Programme update

Rolling stock delivery

Dynamic testing of the new rolling stock is proceeding to plan on the manufacturer's test track in Spain.

Beckton depot and network infrastructure

Work on the northern sidings at Beckton has undergone an intensive period of track work to support the lead up to the changeover to the new signalling control system. In advance of the works, the sidings affected by the changeover have now been physically disconnected from the depot. Over the Easter weekend, we completed the changeover of the depot signalling from the old programme logic control system to the new operating system. This work involved commissioning all the existing signalling assets onto the new system and paves the way for the sidings works to continue.

Housing Infrastructure Funding

We have completed the acquisition of the land at Beckton next to the depot. This is needed for the construction of the additional sidings funded by the Housing Infrastructure Fund. The focus is now on the submission of the planning permission to allow works on the land to begin later in the year.



We are carrying out dynamic testing of new DLR rolling stock

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)
Winter 2027	425	2,400	2,825	2,994	169
Change since last Investment programme report					
1 quarter earlier	42	(59)	(17)	No change	

Financial commentary

Our EFC has decreased by £17m since the last report, owing to procurement efficiencies. Our risks and opportunities are being actively managed each period, which results in changes to the EFC. Our forecast completion has improved from spring 2027 (April to June 2027) to winter 2027 (January to March 2027). This was achieved by performing an in-depth review of the critical path to completion and driving schedule efficiency.

Performance over time

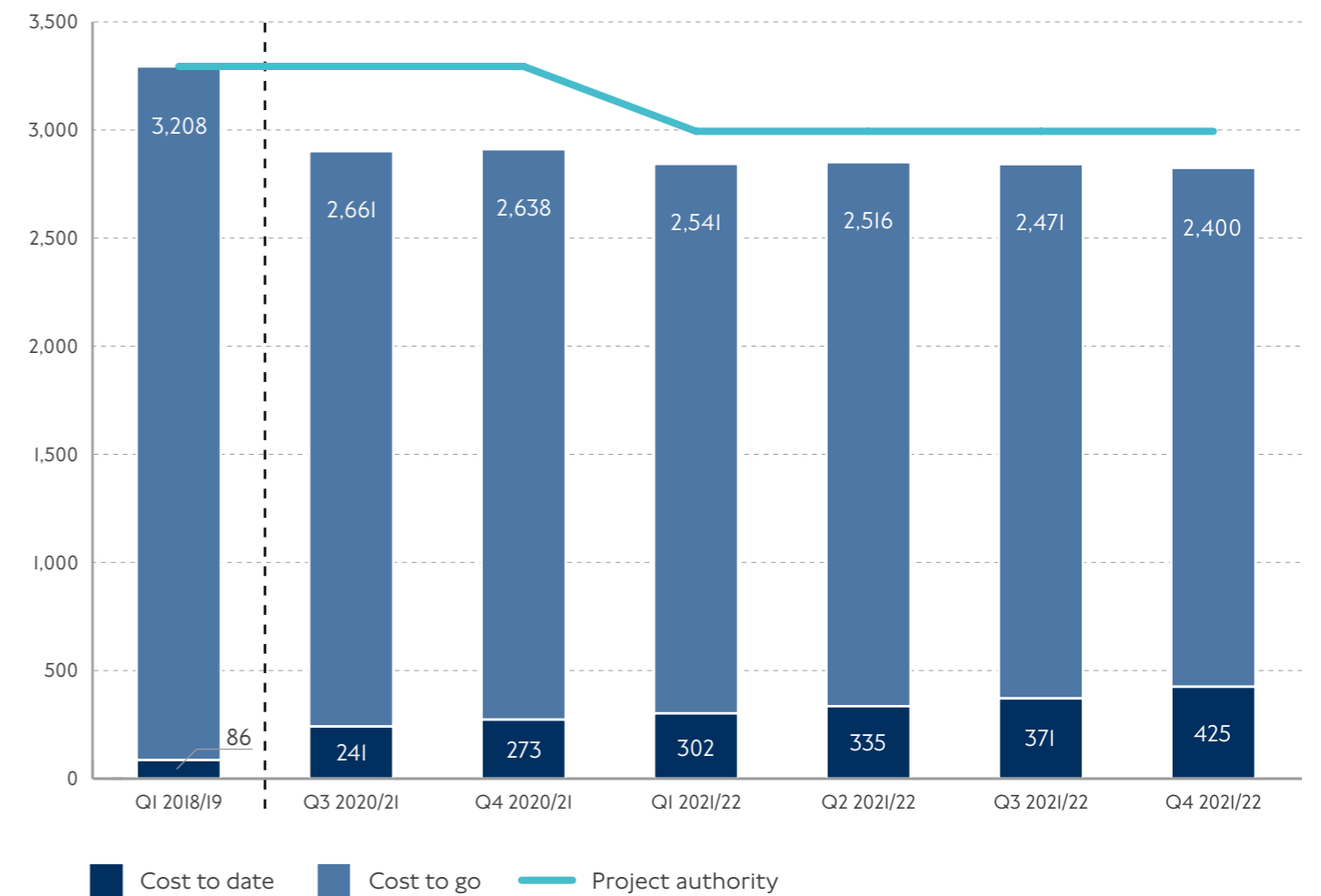
The forecast end date represents the date when the new Piccadilly line trains and all supporting infrastructure is in use. Since authority was originally awarded in

May 2018, our forecast end date has been delayed from 2026 to 2027. This was driven by a decision to defer the start of third party spend where possible by six months to help mitigate funding challenges due to the pandemic. As a result of an in-depth review of the critical path activities and driving schedule efficiency, the forecast completion has been brought forward from spring 2027 to winter 2027. The new trains are now expected to begin entering revenue service from summer 2025.

Despite the impact of the pandemic, we have reduced our overall EFC through the realisation of opportunities, an ongoing focus on value and efficiency, and reduced contract costs.

Estimated final cost performance over time (£m)

Forecast completion date





The delivery of the new Piccadilly line trains is ahead of schedule

Programme update

Power

All bidders for the high voltage power framework have been notified of the results. The ten-day mandatory stand-still period, prior to the award, has been completed and the successful and unsuccessful bidders have been notified.

Delivery fleet introduction

The Mayor and Chief Capital Officer visited Goole in March accompanied by a group of journalists. The visit provided an opportunity to showcase the new Piccadilly line upgrade trains via the cab and saloon mock-ups both now located in Goole, as well as highlighting that investment in London supports jobs and growth throughout the UK.

Manufacture of the new trains continues as planned and included testing the robotic painting machine.

Depots and stabling

We now have a revised programme for South Harrow sidings with the first four roads due to be commissioned in early July and the remaining eight roads to follow in winter 2022.

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)
September 2021	1,098	9	1,107	1,260	153
Change since last Investment programme report					
No change	3	(3)	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 been 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.

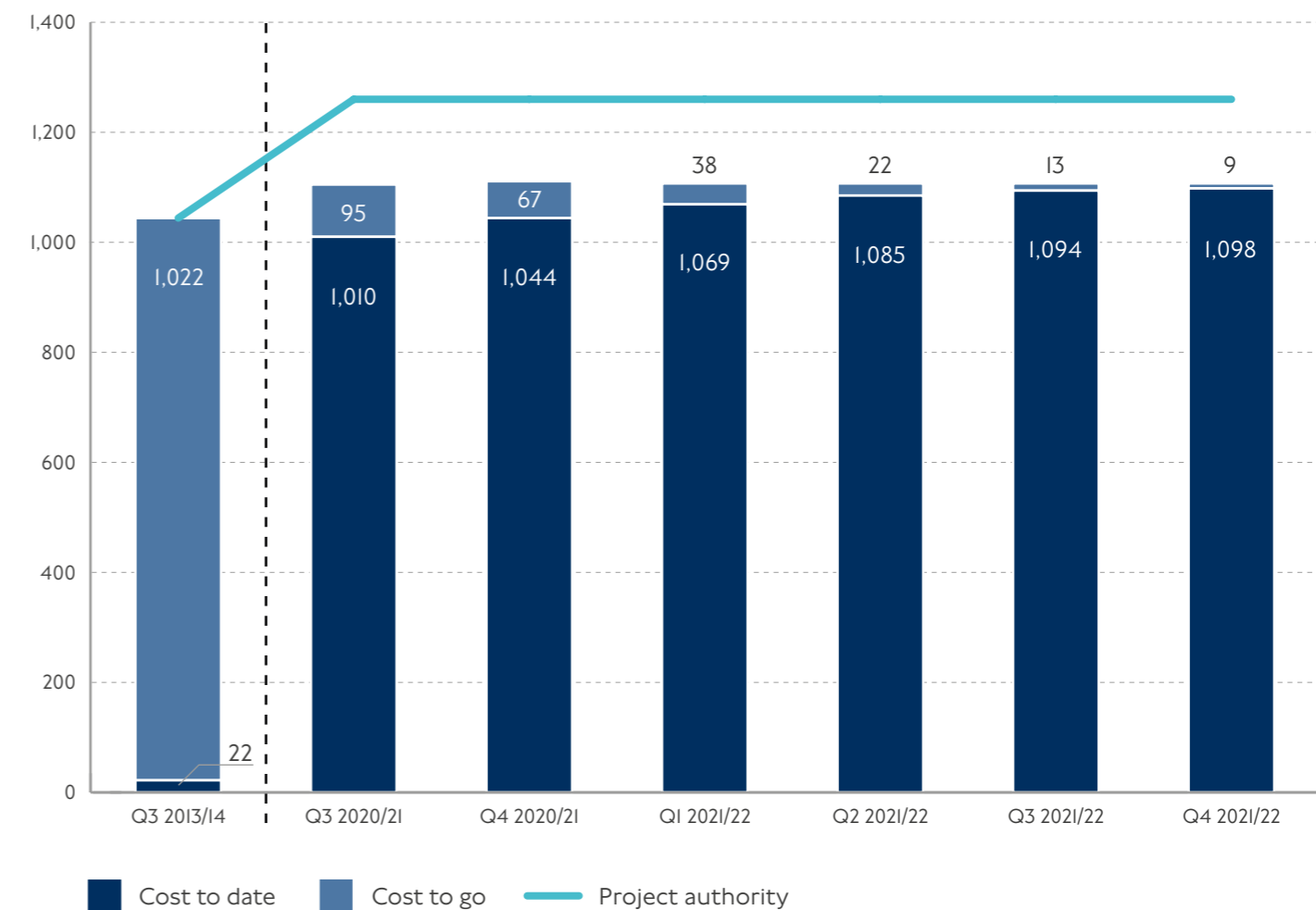
Programme update

The extension has operated successfully since it opened in September 2021. Up to 12 March 2022, approximately 2.14 million trips have been recorded, with an average of 30,000 passengers per week at Nine Elms and 60,000 passengers per week at Battersea Power Station.

The team is now focused on closing out snagging items, completing assurance documentation and achieving commercial closure.

Estimated final cost performance over time (£m)

Forecast completion date



Network extensions

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)
Spring 2025	69	111	180	173	(7)
Change since last Investment programme report					
I quarter later	4	(4)	No change	No change	

Financial commentary

The EFC is currently £7m 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 our risk exposure, which we are looking to mitigate, and an increase in group finance inflation assumptions.

Performance over time

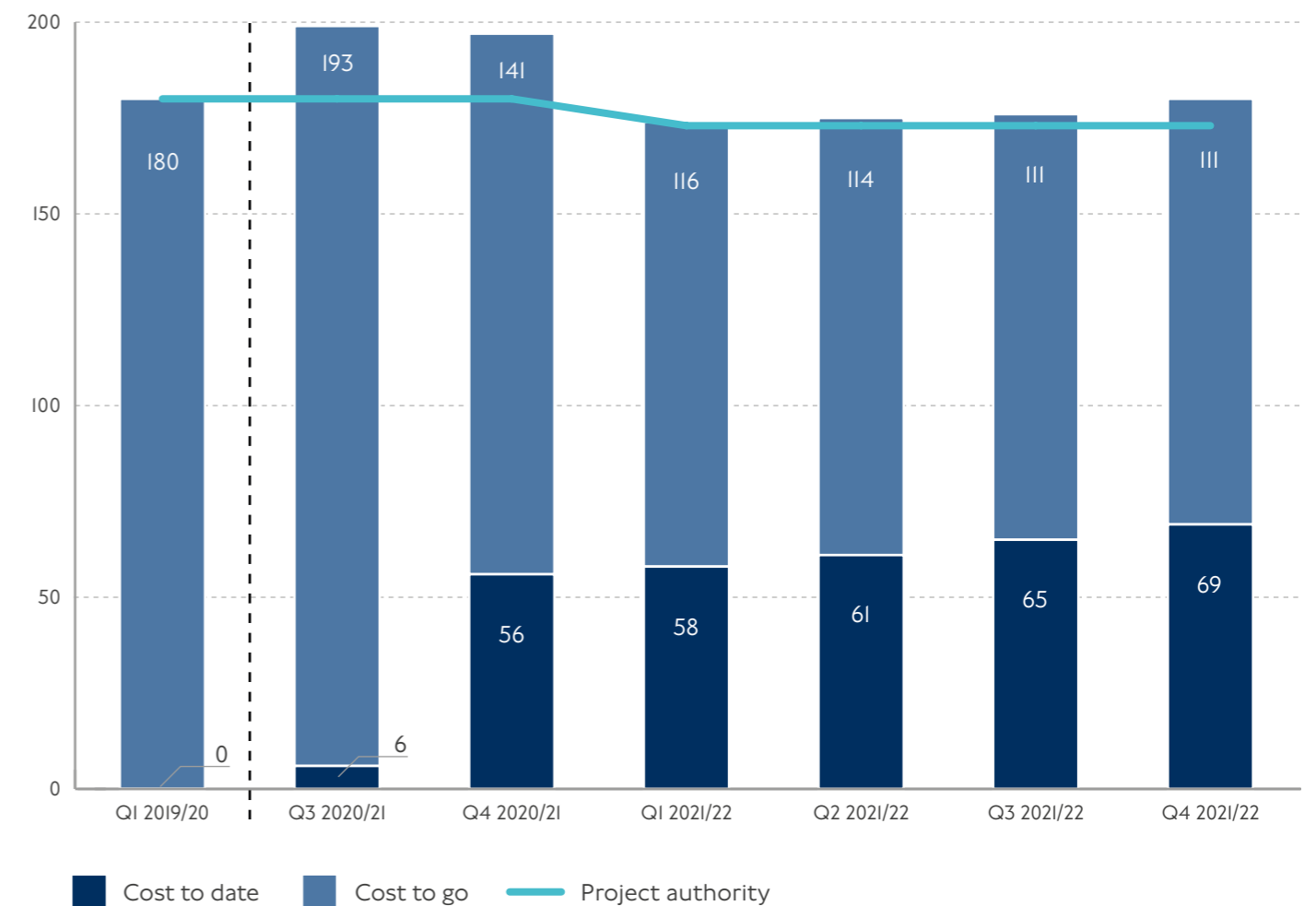
The forecast end date is when we obtain the permit to use the new Silvertown Tunnel from an independent assessor.

Our forecast end date has been relatively stable since the programme and project authority was approved in May 2019. Since the last report, however, we have seen a movement of 19 days in the permit to use date, moving from mid-March to the beginning of April 2025.

Our EFC increased to include additional costs for implementation of Road User Charging infrastructure. It was reduced in Quarter I 2021/22 after this scope and budget was transferred to the Road User Charging portfolio within surface programme and project delivery to achieve synergies with our other Road User Charging schemes.

Estimated final cost performance over time (£m)

Forecast completion date



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

Programme update

We have now taken temporary possession of much of the required land from existing tenants to enable handover of 59 out of 71 sites to our contractor Riverlinx.

Good progress continued on site, including significant piling operations and excavation works to construct the tunnel boring machine launch, rotation and retrieval chambers. The main components of the tunnel boring machine have arrived on site and are currently being assembled in advance of being used in summer 2022.

Other significant works include the completion of the replacement river wall on the north bank of the Thames to ensure its stability during our tunnelling works. This will also provide additional habitat and future-proofed flood defences to support wider development plans in the area.

Our contracts for further transport and traffic, as well as socio-economic and environmental monitoring are progressing well, with significant further modelling and analysis work now under way. This will support us in setting the initial user charges at the Silvertown and Blackwall tunnels, developing the new cross-river bus services, and allow a refreshed assessment of the scheme's environmental effects in advance of opening in 2025.



Construction work on the Silvertown Tunnel is progressing well

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)
Summer 2022	318	8	326	329	3
Change since last Investment programme report					
1 quarter later	7	(12)	(5)	No change	

Financial commentary

The EFC has reduced by approximately £5m since the last report and is the result of several savings. These include the transfer of the remaining urban realm works to the Barking Riverside developer (to fulfil our planning obligations), the closure of construction risks as the project enters the testing and commission phase, and a reassessment of the ranges of the remaining commercial issues. While the project EFC currently remains below authority, an emerging issue around signal positioning and the remedial option may impact the current EFC.

Service operation between Gospel Oak and Barking Riverside is expected to begin in summer 2022, which is an improvement from autumn, as previously reported.

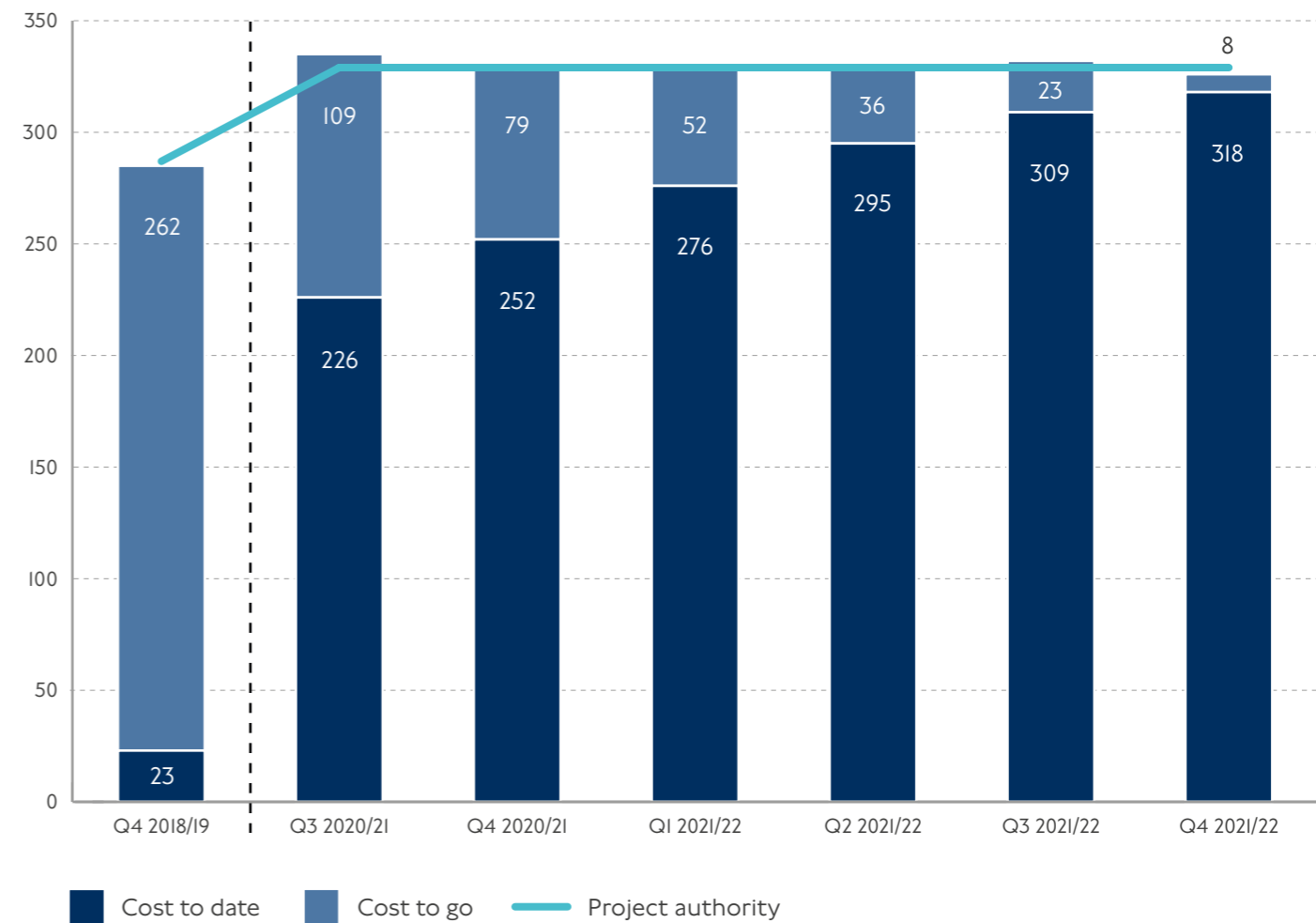
The revised date is based on our latest programme assessments, which includes more detailed information around the station urban realm works, assurance requirements and alignment with London Overground timetable changes.

Performance over time

Our forecast end date, when service will run between Gospel Oak and Barking Riverside, has been delayed since the programme and project authority was approved in 2018, following the discovery of uncharted utilities and the Safe Stop, because of the pandemic. The Safe Stop resulted in the rail systems works being replanned and Network Rail possessions rebooked, with only two opportunities in a year for a four-day possession. These events have also increased our EFC.

Estimated final cost performance over time (£m)

Forecast completion date





Programme update

Delivery of the physical works is now substantially complete with testing and commissioning of the station entering its final stages. The final signal commissioning was completed in early April, and during the final track possession at the end of April, we commissioned the overhead line electrification. The public areas around the station are on track to be completed before service begins.

As the station and rail systems testing comes to an end, the focus is on preparing the assurance documentation which will be submitted to Network Rail and Office of Rail and Road to obtain authorisation to operate the service. Quality documentation and operation and maintenance manuals required to support the submission are being progressed with the main contractor. Our most likely date to begin passenger service operations is summer 2022.

In January, Network Rail notified us of a reporting signal sighting issue with two signals that we installed, and we have been working closely with Network Rail and the train and freight operators to find a solution. On 13 April, a temporary solution was agreed to enable trial operations and passenger trains to run, enabling revenue service to start in the coming months.

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	637	65	702	702	0
Change since last Investment programme report					
No change	23	(23)	No change	No change	

Financial commentary

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

Performance over time

The forecast end date represents the opening of the new ticket hall at Bank station.

Our estimated final cost has increased since the authority award in 2016, owing to site works being disrupted by the impact of the terrorist attack at London Bridge, the need for additional scope following the discovery of asbestos, and the impact of the pandemic. Despite these challenges, our forecast end date has remained consistent.

Programme update

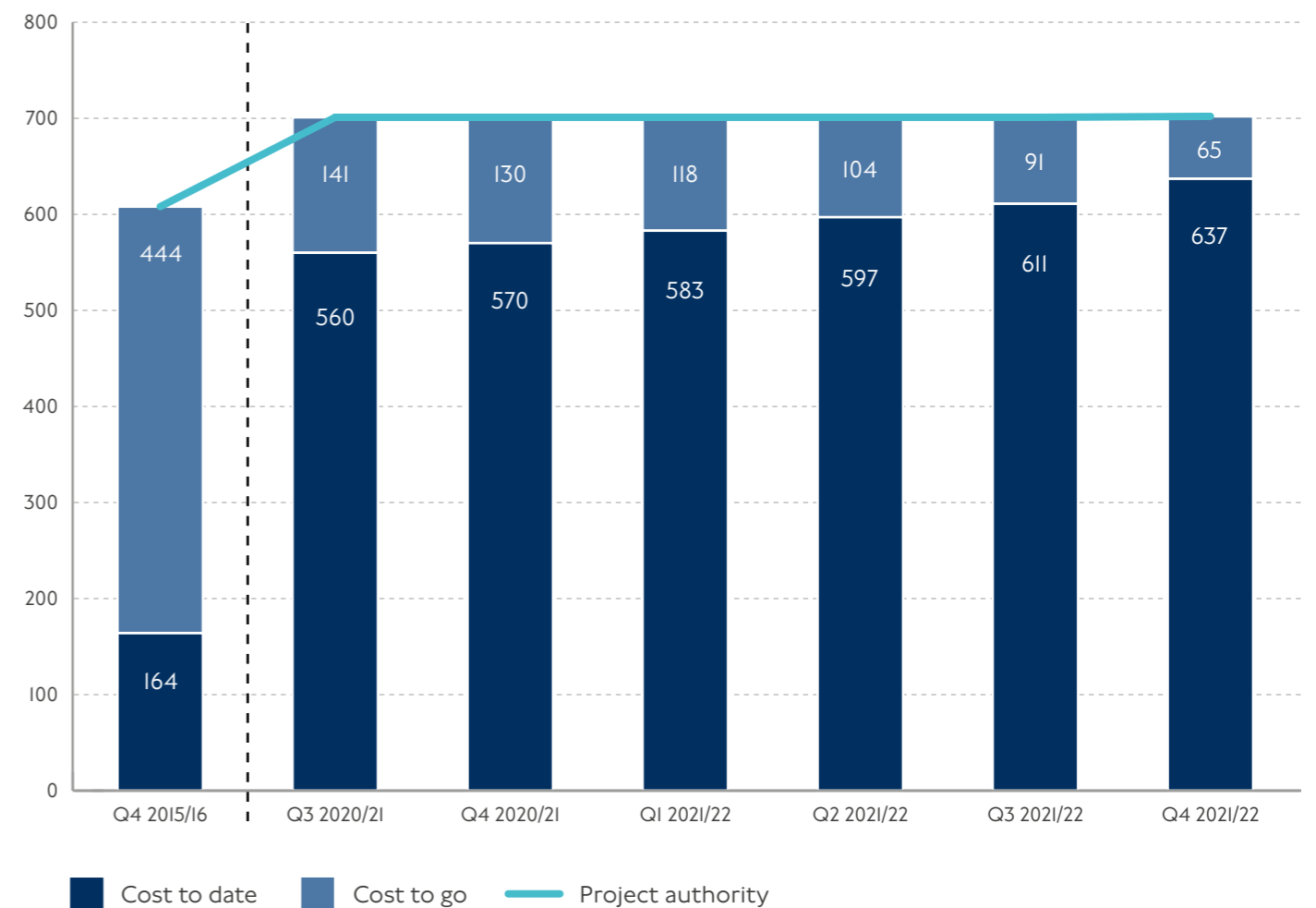
The Bank branch of the Northern line reopened to schedule on 16 May, following a 17-week planned closure. During the closure, we constructed a new, wider southbound Northern line platform and spacious new customer concourse. There are three new passageways, which will make moving around the station quicker and easier for customers.

The next phase of works is on the key interchange connections, including the new escalators linking the Northern line to the DLR, and the two new moving walkways and three new escalators connecting the Central and Northern lines. The works will culminate in a new station entrance at Cannon Street.

These improvements are all part of the wider Bank station capacity upgrade programme which is due to complete later this year.

Estimated final cost performance over time (£m)

Forecast completion 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)
Winter 2028	9	72	81	81	(0)
Change since last Investment programme report					
No change	2	(2)	No change	No change	

Financial commentary

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

Performance over time

The progress made by the forecast completion date has been revised since the last report, and now includes completing the station tunnelling works.

Completion dates and cost forecasts have remained stable since authority for tunnelling works and station box construction was approved by the Programmes and Investment Committee in December 2021.

Programme update

Since the development agreement in December 2021, a complex package of stage one early enabling works has been successfully delivered and allowed us to take advantage of the Northern line Bank closure to minimise costs and the risk of disruption. These works included relocating

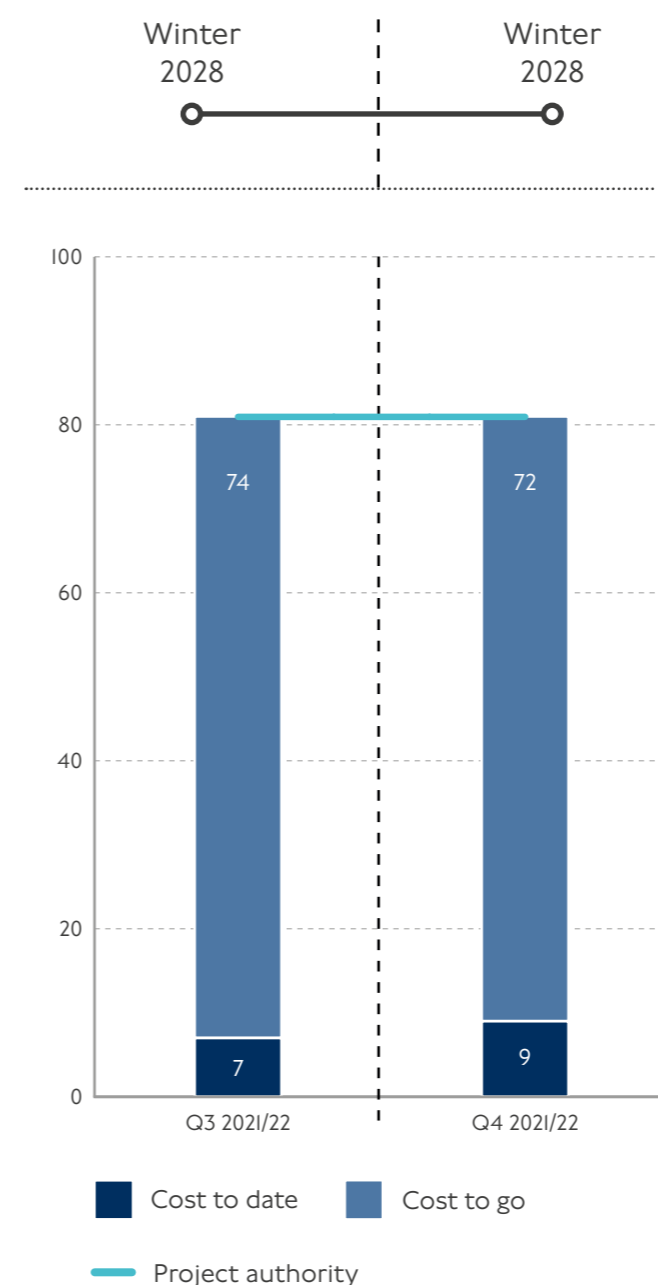
assets stored in platform rooms on both Northern line platforms, repurposing the disused pedestrian subway on the station peninsula, the installation of ducting to carry new utilities connections for the upgraded station, surveys of the tunnels at future breakthrough locations, as well as the removal of hazardous materials.

We have significantly removed this complex activity from the tunnelling contract by carrying out these works early, and this has also enabled the team to improve their safety routine. The works have notably had no incidents.

We are now moving ahead in our preparations to secure our procurement strategy, and have issued a prior information notice for the tunnelling works. This was supported by an industry day which took place on 27 May 2022. It was very well received by the suppliers and approximately 70 people attended. A press release accompanied the prior information notice, which was also positively received.

Estimated final cost performance over time (£m)

Forecast completion date



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)
Summer 2035	23	40	63	28	(35)
Change since last Investment programme report					
No change	3	(2)	1	No change	

Financial commentary

Programme and project authority is £35m lower than EFC, as it is granted on an annual basis for the following year's spend. All costs are fully reimbursable from the third-party High Speed 2 (HS2) project.

Performance over time

The reported forecast end date has been changed since the last report and now reflects completion of works at Euston.

This programme comprises new TfL assets, infrastructure and operational facilities at Euston and Old Oak Common to interface with the new railway.

Since this programme was included in our Major projects portfolio in 2019, forecast costs have increased due to increased scope instructed by HS2. Note that, currently, the forecast completion date for the works is under review as part of the Oakervee Review and the associated baseline review. Programme and project authority has been granted on an annual basis for the spend in the following year.

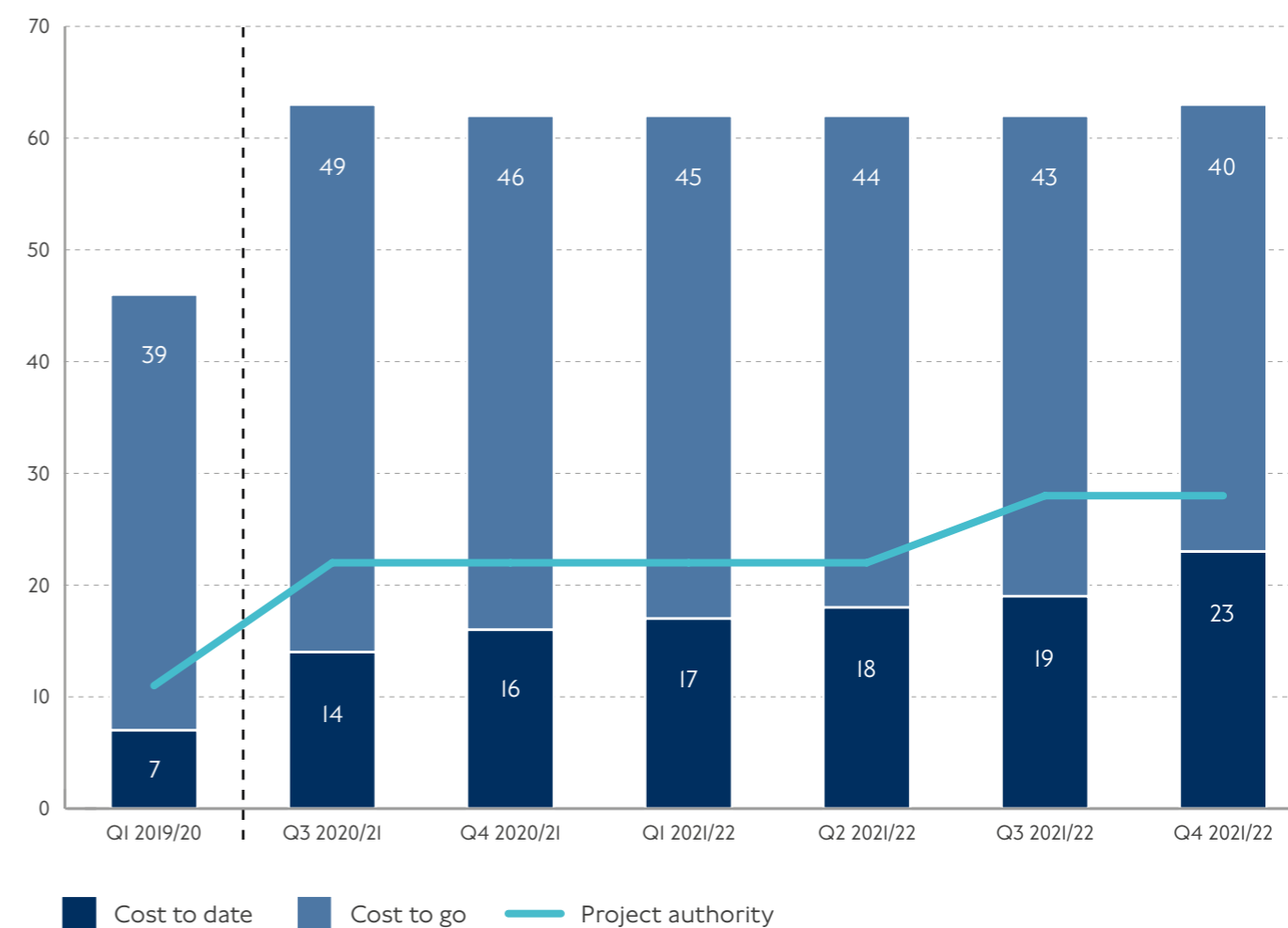
Programme update

At Euston, construction work continues across the campus and to the north of the Hampstead Road for the tunnelling portals and approach tracks. A milestone was reached last year when HS2 achieved a breakthrough at each end of the tunnels connecting the site of the new Northern line substation with the existing substation. HS2 construction is ongoing at this location, and the new traction substation will be handed over to us when complete.

The design of our new infrastructure at Euston continues together with the campus master planning, integrating with the new design for the upgrade of the existing Network Rail station at Euston. We are working with all stakeholders to ensure our services, including any required interim relocation of the bus station, are adequately provided to meet the needs of the travelling public. At Old Oak Common, HS2 works continue at pace on the construction of the new station box.

Estimated final cost performance over time (£m)

Forecast completion date



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)
2018/19 to 2028/29	143	20	163	171	8
Change since last Investment programme report					
No change	1	0	1	No change	

Financial commentary

The forecast cost and the programme and project authority have 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.

Performance over time

For the reporting period from 2018/19 to 2028/29.

Our costs and authority both reduced in Quarter 4 2021/22 driven by the decision to defer the enhanced signalling for the Jubilee line and fleet improvements due to funding challenges in the wake of the pandemic.

Programme update

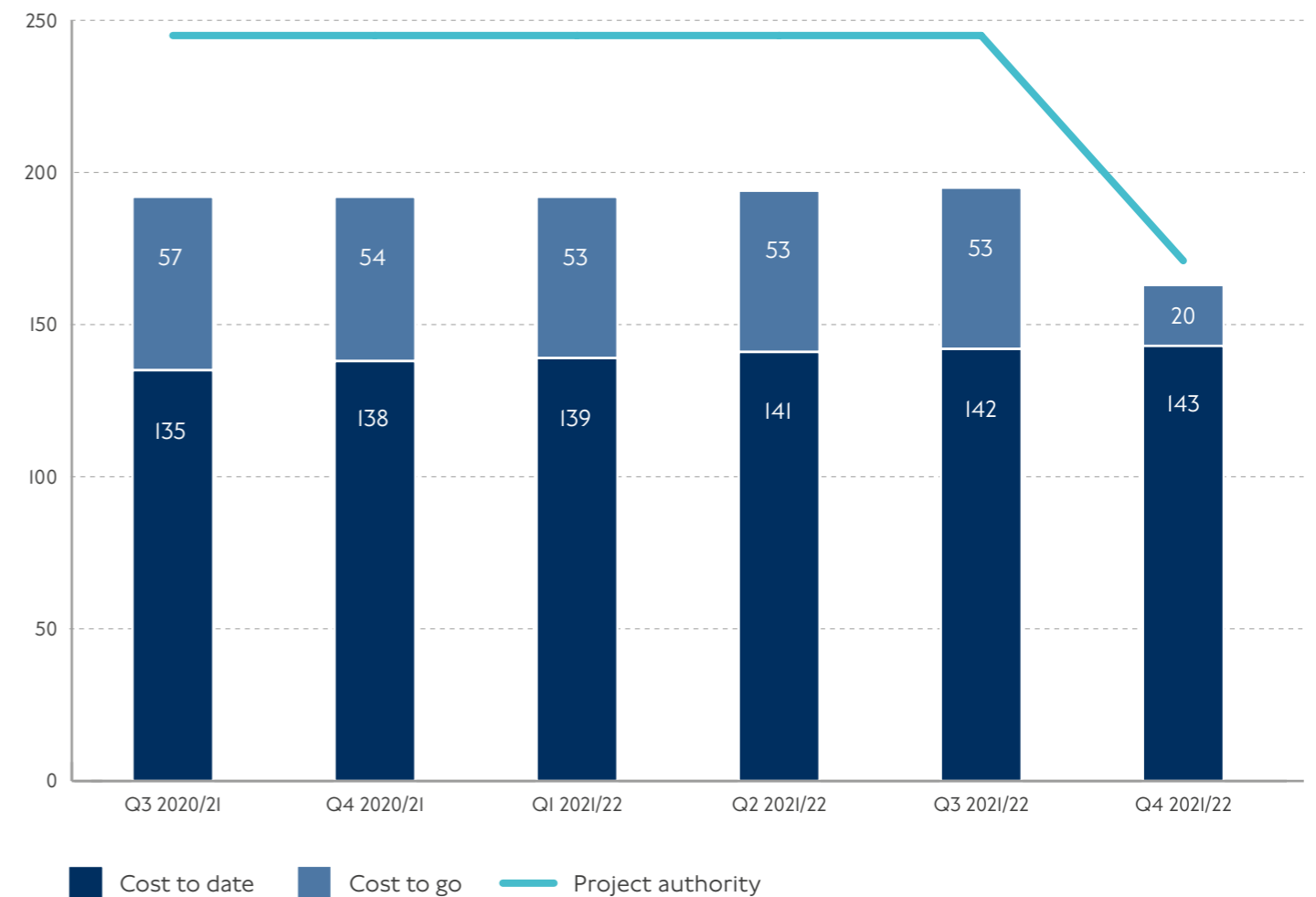
Planning continues for the delivery of Northern line signalling software updates targeted for commissioning on the railway in late 2022. This includes the software changes required at the end of the Bank closure in May 2022.

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.

Estimated final cost performance over time (£m)



London Underground

Our programmes ensure safety and reliability, while also delivering accessibility enhancements and increasing station capacity. This portfolio is made up of stations, track, accessibility, rolling stock and systems renewals, signalling, buildings and technology investments



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)
2016/17 to 2022/23	416	122	538	532	(6)
Change since last Investment programme report					
No change	4	(4)	No change	No change	

Financial commentary

Our forecast cost remains under review in light of funding constraints and will be updated to reflect the managed decline scenario in the new financial year.

Performance over time

Spend in the quarter continued at a steady pace as some projects reached completion, including the new ticket hall and interchange at Tottenham Hale, and work continued on the new entrance and step-free access at Knightsbridge.

Programme update

The enhancements programme covers a range of improvement projects, mainly on stations and depots. We improve stations primarily through enhancing accessibility, relieving congestion, and carrying out large scale capacity upgrades.

Tottenham Hale

The major redevelopment works at Tottenham Hale, which include a new landmark building housing an integrated ticket hall providing seamless step-free

interchange with National Rail, were successfully brought into customer service on 13 December 2021. All remaining snagging work is scheduled to be completed this summer.

Paddington

At Paddington, the successful completion of the main tunnelling drive to create a new cross-passage and changes to the evacuation routing in the station has enabled good progress on surface and ticket hall-level works on a co-funded scheme with Great Western Developments. The project is on target for delivery of the enhanced station in early 2023.

Colindale

We have completed the detailed design and early contractor involvement phase for an enlarged ticket hall at Colindale, with increased gateline capacity and step-free access. This has provided greater confidence in costs, schedule and construction readiness ahead of a future decision on contractual commitment to progress into construction delivery.

Discussions are ongoing with the London Borough of Barnet on potential ways forward if sufficient funding is not available to implement the current scheme.

King's Cross St Pancras

Negotiations continue 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. The delivery timescales for the project are still to be confirmed.

Knightsbridge

Following the delay caused by a supply chain insolvency in the past two quarters, programme-critical works related to providing step-free access at Knightsbridge have now been awarded to a new supplier, meaning works can be re-programmed. Completion of the Hooper's Court step-free entrance is now scheduled for summer 2023. The resultant costs from the delay, and the engagement of a new supplier have been offset by successful risk mitigation.

Leyton

We continue to work closely with our key stakeholder, the London Borough of Waltham Forest, to develop 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 later this year. The timing of this depends on wider discussions about our financial position, as we are currently not able to commit to this project beyond the current design stage.

London Bridge

We are working with a third-party developer, who is proposing to open a new Borough High Street entrance to London Bridge Tube station. This would result in reduced journey times and congestion at street level, especially on Borough High Street itself. Discussions are ongoing with key internal and external stakeholders with the draft heads of terms for a future development agreement progressing well with the developer.

Notting Hill Gate

We are working with a third-party developer with planning consent to redevelop land next to Notting Hill Gate station and will be installing lifts from street to ticket hall level as well as 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 to formalise the contractual and property arrangements have been suspended following a recent announcement that the site has been sold to another developer.

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 South Kensington station and surrounding streets, which includes providing step-free access to the Circle and District line platforms. We are currently reviewing all our options and continuing discussions with the Royal Borough of Kensington and Chelsea.

West Ham

We are working with the developer Berkeley Homes on a new ticket hall to serve the TwelveTrees Park housing development at West Ham. The main construction works associated with the new station entrance have begun on site and are progressing well, following the completion of the detailed design and successful enabling works, that were completed last year.

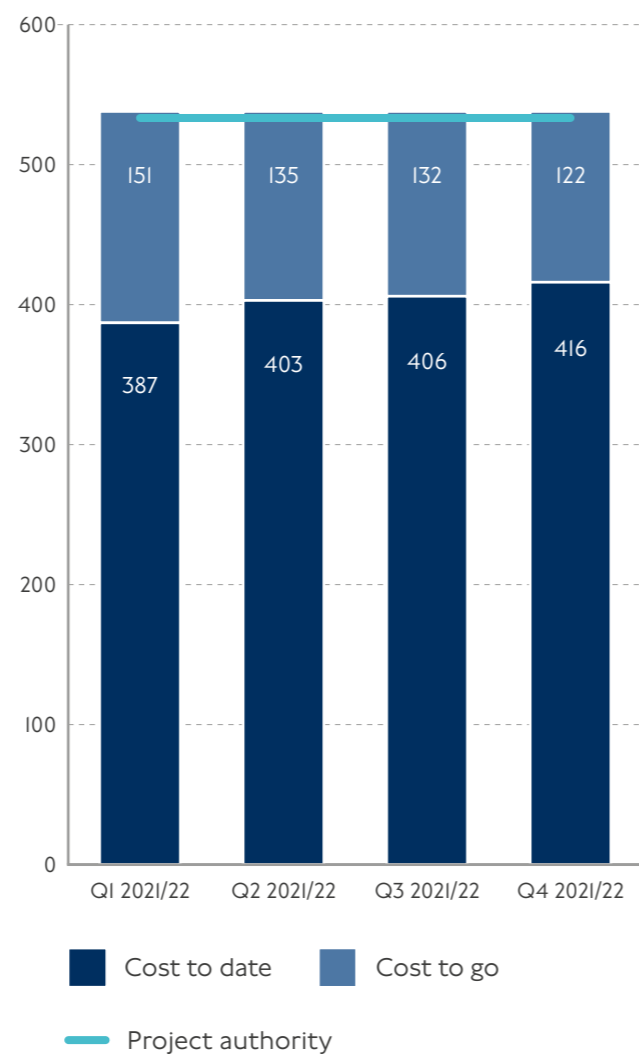
Waterloo

As part of a wider redevelopment at Waterloo that will see Elizabeth House demolished, we are developing a project to provide step-free access to the Northern line platforms. Discussions with the developer are ongoing and the programme is yet to be confirmed. The lift shaft would be constructed by the developer, however, the fit out 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 early 2024. It is a collaborative venture with the London Legacy Development Corporation, London Borough of Newham and the Greater London Authority (GLA), who are fully funding the capital works. Concept design is now complete and subject to release of third-party funding. The detailed design and early contractor involvement phase of the project will begin in the spring.

Estimated final cost performance over time (£m)



Our plans for improvements at Stratford station are progressing

Enhancements

Depot construction

The project team is continuing to work closely with maintenance and operational teams in the delivery of these important strategic projects.

Acton train modification unit

The new state-of-the-art facility at Acton that enables the heavy overhauls and modernisation of Central line trains as part of the Central Line Improvement Programme has been in operation since handover last year. The project's close down phase concluded in the spring. This valued asset in our estate will support future London Underground fleet renewal programmes for many years to come.

Acton warehouse

Works at the Acton warehouse are progressing well with most of the essential clearance works completed. This has been a complex and challenging operation to decontaminate and safely remove the existing warehouse contents and then make the building safe to enable the essential surveys to progress ahead of full demolition. The completion of the surveys will inform and facilitate the next phase of detailed design, which will focus on the 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

Work continues on upgrading substations to modernise the Circle, District, Hammersmith & City and Metropolitan lines.

Works at Acton have now been completed and brought into use. Works at Embankment are complete and were commissioned and brought into use in May. Progress is being made across the remaining seven sites, with preparations being made to tender the remaining two sites, Barons Court and Bouverie Place.

Waste heat and private wire

Continuing uncertainty over our funding deal with Government has resulted in both the waste heat and solar private wire projects being paused. It is hoped that if funding is made available, then both projects will restart. The projects were paused at the end of the financial year.

The successful delivery of the waste heat project will see the reuse of heat from London Underground vent shafts. The Tube produces 500 gigawatt hours of waste heat per year, of which 10 per cent or 50 gigawatt hours is available for reuse. Six ventilation shafts are under consideration, with a view to serving thousands of residential and commercial premises and public buildings such as schools. The aim is to reduce the need for gas combustion and improve air quality by decreasing carbon emissions.

The solar private wire project focuses 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. Over a 15 to 25-year contract, by purchasing the energy and importing it onto the network, approximately 62,000 tonnes of carbon saving could be achieved.

Enhancements: 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)
Spring 2023	109	11	120	120	0
Change since last Investment programme report					
No change	4	(4)	No change	No change	

Financial commentary

Spend to date includes completing 12 step-free stations including the latest one, Harrow-on-the-Hill. The forecast EFC includes the last three remaining stations which are currently paused in light of funding constraints and will be updated in the new financial year.

Performance over time

Since authority award in June 2017, our forecast cost and authority have reduced to reflect reprioritisation due to affordability, from 28 stations to 15 stations. The forecast end date has been delayed by ongoing funding challenges and the Safe Stop of works during the coronavirus pandemic.

Programme update

Since 2018, we have introduced step-free access at Newbury Park, Buckhurst Hill, South Woodford, Mill Hill East, Cockfosters, Amersham, Debden, Ickenham, Wimbledon Park, Osterley, Sudbury Hill, and, most recently, Harrow-on-the-Hill, which became the 91st step-free Tube station on 8 March.

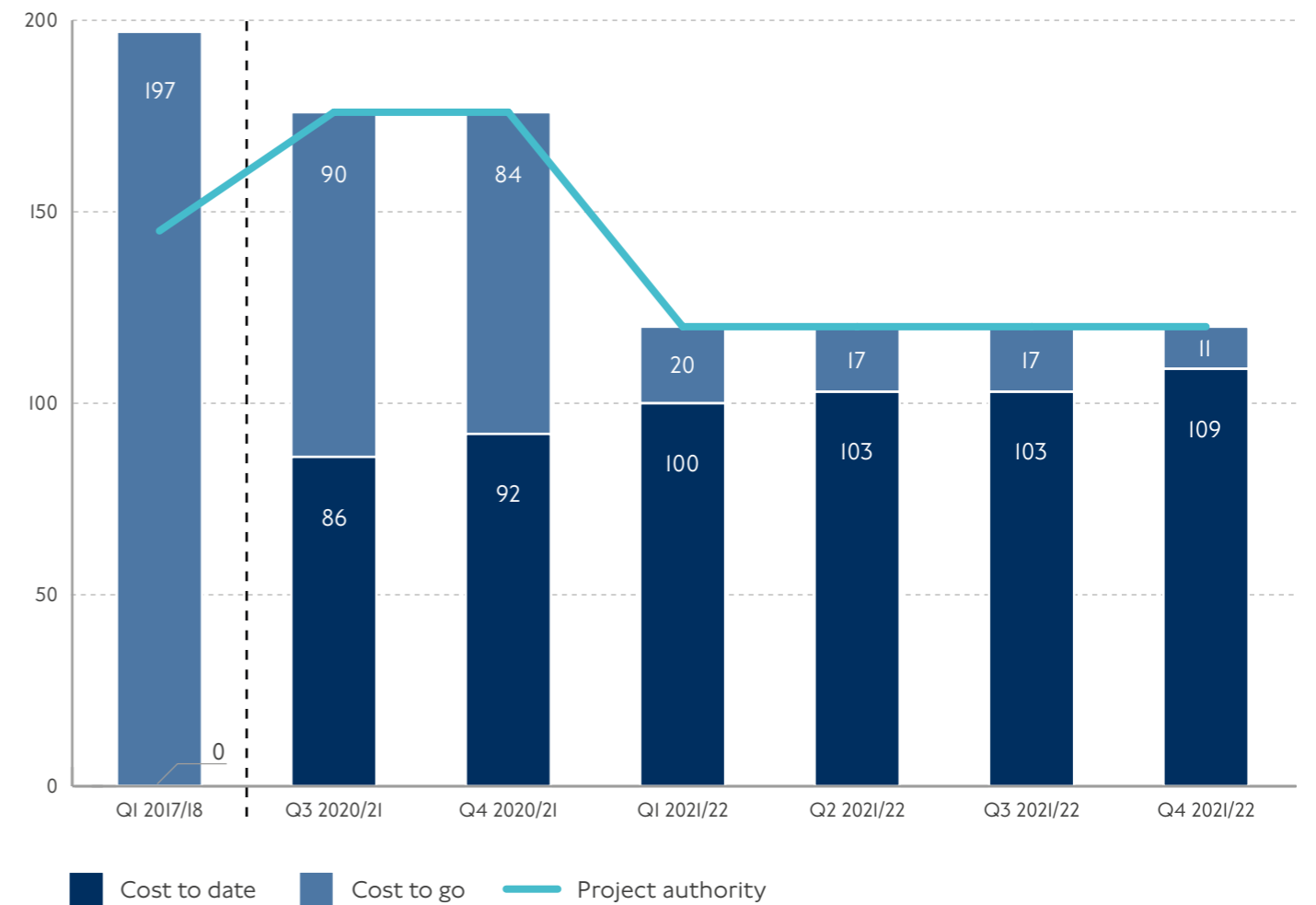
The lifts at Harrow-on-the-Hill were opened by the Mayor on 8 March. It was the 12th and final station to be delivered by the accessibility programme and means that 33.5 per cent of Tube stations are now step-free.

Without a long-term funding deal from the Government, it is not possible for us to progress any further schemes under the step-free access programme. Only contractually committed and third-party schemes are still being taken forward.

From 2 November 2021 to 10 February 2022, we held a public consultation on our future step-free access priorities and improvements online. We are reviewing the results and will share them with internal stakeholders shortly. We will begin work on prioritising stations and a public response to the survey will be published in summer.

Estimated final cost performance over time (£m)

Forecast completion date



Infrastructure renewals

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)
2005/06 to 2022/23	480	46	526	904	378
Change since last Investment programme report					
No change	8	(73)	(65)	No change	

Financial commentary

The programme authority exceeds forecast cost as it was granted for a 25-year period in line with our supplier contracts. Future spend has been aligned to the December Programmes and Investment Committee paper and reflects the impact of the coronavirus pandemic and funding uncertainty. Our forecast cost remains under review and will be updated to reflect the managed decline scenario in the new financial year.

Performance over time

Investment in renewing our lifts and escalators has continued at a steady pace with work at key stations such as Marylebone, South Kensington and the Jubilee line stations.

Programme update

There are 447 escalators, 259 lifts and four passenger conveyors on the London Underground network, which are essential to ensuring customers have safe, reliable and quick access to our services. 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 work 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 would need to replace around 2.5 per cent of our escalator assets and four per cent of our lift assets each year to maintain our assets at the current level for state of good repair. This rate will need to increase as the number of assets grow. The interventions carried out are informed by the condition and performance of each asset. Our funding constraints mean we will not be able to meet this level of intervention and we are developing a plan that will limit the impact as much as possible.

Replacing an escalator or lift is a complex process. 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

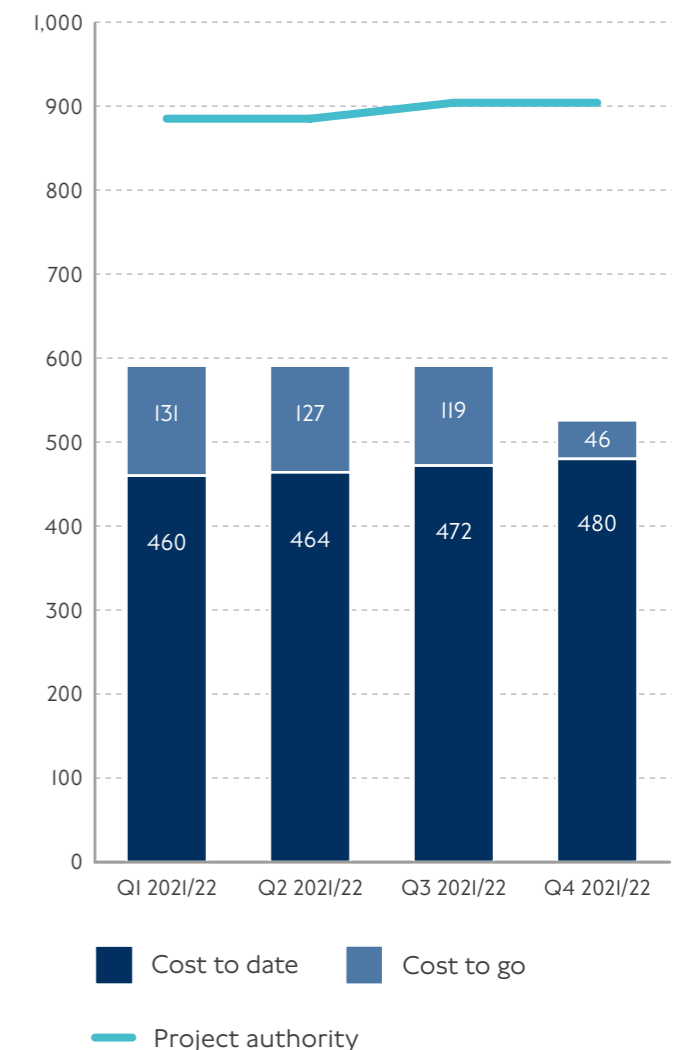
We completed works to replace the five life-expired escalators at the station at the end of May, and restarted Piccadilly line services.

As part of the work, we repainted the arcade stairways through to the ticket hall and down to the museum subway in a lighter, more welcoming colour scheme. We also replaced the tiles at the top and bottom of the new more reliable escalators and are restoring the heritage paving slabs in the arcade.

Marylebone

We have completed works to install a new escalator replacing the previous staircase and increasing escalator capacity and resilience at the station. We have also removed one of the two original life-expired existing escalators. We modified the civils structure of the station to accommodate the new escalator, which was delivered as planned in March, and have started to install it. All works are due to complete in 2023.

Estimated final cost performance over time (£m)



Oxford Circus

Refurbishment to improve the condition and reliability of the escalators at Oxford Circus station began in May 2021 and the fifth escalator was completed in April. Following prioritisation of funding, this will now conclude with works on a final, sixth escalator that will be completed in July.

Jubilee line

The rolling escalator refurbishment programme has delivered 11 refurbishments in the 2021/22 financial year as planned. Works have begun on the first three refurbishments planned for 2022/23.

Tottenham Hale

Works to replace the obsolete lift at Tottenham Hale station were successful and the new lift was bought into use on 22 December 2021. The team has completed the snagging works and is working to close out the project.

Borough

At Borough, the first lift was successfully replaced in April this year, and work has started on the second lift. This is due to be completed in August. Works were planned to coincide with the temporary Bank branch Northern line closure to help minimise disruption.



We regularly assess and update our lifts and escalators

Infrastructure renewals

Renewals: Civils, buildings and systems

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2018/19 to 2024/25	173	168	341	285	(56)
Change since last Investment programme report					
No change	19	(19)	No change	No change	

Financial commentary

The full impact of the move to a managed decline scenario on our future costs remains under review and will be updated in the financial year 2022/23.

Performance over time

Investment in the quarter accelerated as a result of civils works at the Grange Hill to Chigwell cutting, plus increased power and building asset renewals and the rapid rollout of the LED replacement programme, which will contribute to reducing our operating cost in future. Previous quarters' spend has been updated to correct a transposition error.

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 have now started works on site 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 and detailed designs 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.

Works have now started on site at London Bridge and North Greenwich.

Concept design at Liverpool Street and Charing Cross stations to address water ingress is progressing. Renewal works at Acton Town station entrance to flooring and wall tiling are now completed, reducing the risk of falling objects and trip hazards.

Welfare facility renewals

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 awarded the main works contract and works are progressing on site.

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 on site to stabilise the cutting between Grange Hill and Chigwell stations on the Central line to ensure the continued safe running of the railway. We have begun feasibility work for future interventions to embankments and cuttings at priority locations.

Rail Vehicle Accessibility Regulations

Works have begun on site at Paddington Bakerloo line station for the construction of a platform hump, including fabrication of new, bespoke fire and interlocking machine room doors. Similarly, installation of manual boarding ramps is under way at a number of stations.

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. 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. The first seven sites are commissioned into service, supply chain delays have hampered progress, but the remainder have now been delivered to site for commissioning by end of summer.

The procurement we began to replace 20 life-expired offline battery power inverter units supplying station emergency lighting systems has been temporarily paused due to market responses and reassessment of the strategy to address increasing obsolescence risks.

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 is in progress for the next series to be replaced in 2022/23 at Ruislip depot.

A replacement high-voltage switchboard has been installed at Greenford substation and has undergone site acceptance testing ahead of commissioning due in Quarter 2.

We have completed procurement activities in readiness for a contract award planned in Quarter 2 for the replacement of the DC traction switchboard at Holborn station. These works will address existing operational restrictions and safety risks at this key Central line site.

Power control

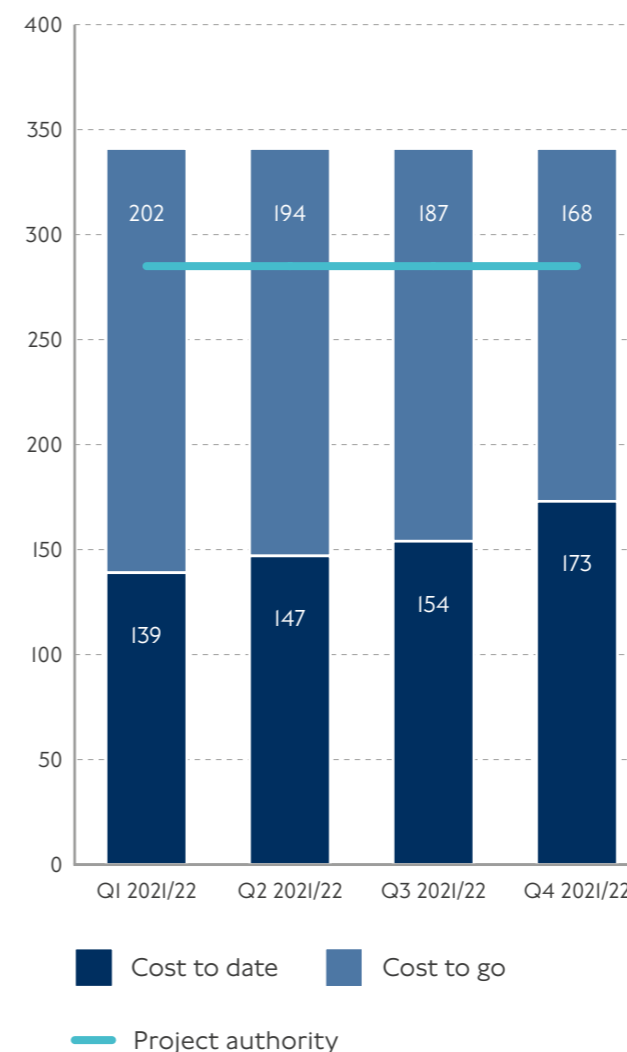
We have nearly completed the replacement of the network-wide power control system. This comprises control centres linking to circuit breakers across the network, which enable train traction control. Initial operator and maintainer training has started, with planned migration to the new system expected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

The first of the control system upgrades on the electricity generators at Greenwich Power Station was completed in October. The second unit is currently in progress. 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. We completed 24 stations and high priority areas with three depots in 2021/22. Progression of these works will be temporarily paused due to the current funding constraints.

Estimated final cost performance over time (£m)



Train systems

Track renewals

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2020/21 to 2022/23	211	139	350	402	52
Change since last Investment programme report					
No change	57	(57)	No change	No change	

Financial commentary

The forecast cost to go to the end of 2023 is aligned to the December 2021 Programmes and Investment Committee paper, however the full impact of the move to a managed decline scenario remains under review and will be updated in the new financial year.

Performance over time

Despite a challenging start to delivery in 2021/22, we finished the year strongly in Quarter 4, including successful significant points and crossings works at Northfields over Christmas. Due to uncertainty around available funding in 2022/23, our planning has ensured that impact on asset condition, commercial and planning of the various possible levels of funding is understood at each key decision point. Since Quarter 3, we are focusing on delivering a reduced level of core scope in 2022/23, while continuing to plan additional high priority works if more funding becomes available.

Programme update

Our track assets are an essential component of a safe and reliable railway. Track is continually degrading and needs rolling maintenance and renewals to maintain it. Each section of track may have a residual life of between 40-60 years, meaning we must renew two to three per cent of our track every year, as well as making ongoing component replacements.

We aim to progressively install high integrity, low-maintenance, flat-bottomed track on concrete sleepers, replacing bullhead rail on timber sleepers, some of which has been in service since the early 1900s. This new, modern track is more stable and reliable.

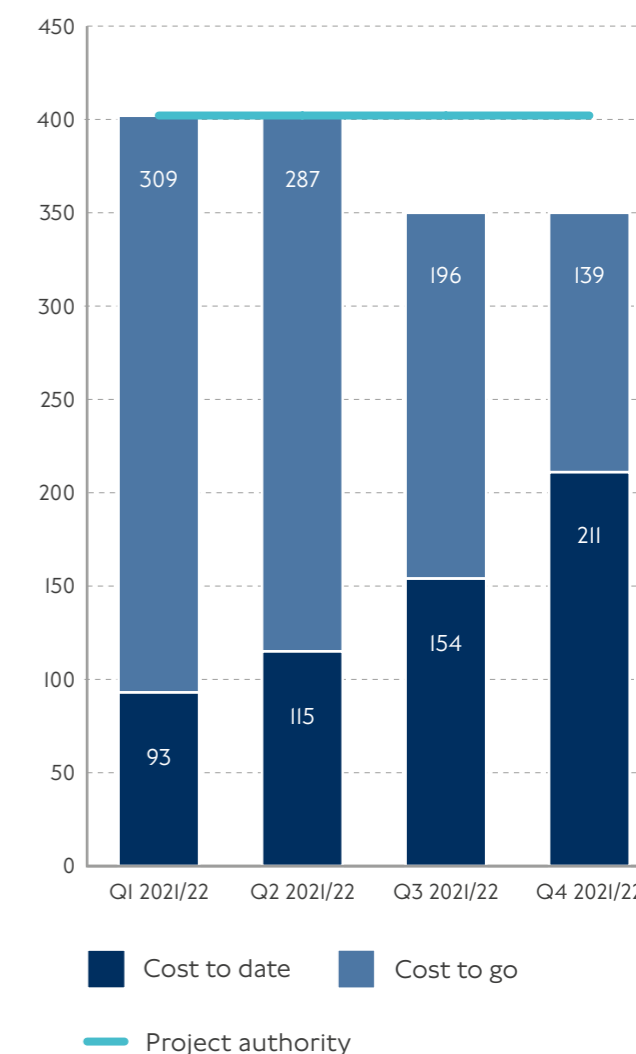
We completed our second packages of work at Ruislip depot, which will enable the future requirements and operations of the depot. This included 1,600 metres of ballasted track renewal and installing seven points and crossing units. One further work package is planned to complete the redevelopment of Ruislip depot.

Between January and March, we installed 930 metres of new ballasted track on the Central, District, Metropolitan and Piccadilly lines and achieved our key programme milestone by installing eight kilometres of new track in the 2022/23 financial year.

Other track renewals continued during Quarter 4, with our track delivery unit completing 560 metres of new concreted track in the deep Tube areas, as well as replacing 1,300 metres of bullhead rail with the more modern flat-bottom form.

On the open sections of the sub-surface rail, we renewed 300 metres of drainage channels.

Estimated final cost performance over time (£m)



Train systems

Rolling stock

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2016/17 to 2027/28	260	840	1,100	722	(378)
Change since last Investment programme report					
No change	5	(5)	No change	No change	

Performance over time

An increase in both forecast cost and programme and project authority was driven by improving information on the Central line fleet renewals following the completion of the prototype, and increased understanding of the engineering vehicles locomotive works.

The full impact of the move to a managed decline scenario on our forecast cost remains under review.

Programme update

We have more than 600 Tube trains operating across 11 lines, with the oldest trains entering service in the 1970s. We must ensure all 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 from 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 has 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 for the Piccadilly line. There are no other confirmed fleet replacements.

The engineering vehicle fleet supports the track renewal programme and comprises battery locomotives, wagons for different activities and plant equipment such as cranes and tampers. 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.

Accessibility

On the Bakerloo and Central line fleets we have a programme of works critical to improving accessibility. We are installing and testing prototype systems.

We have completed initial changes on the first Bakerloo line train, including wheelchair bays, grab poles and flooring. We have also installed LED lighting. We are progressing designs and prototype installation for the passenger information system and have begun static testing of the prototype system.

On the Central Line Improvement Programme, we continue to conduct full mainline (all stations) dynamic testing. We have negotiated approvals to replace manual boarding ramps at stations including Marble Arch, Leytonstone, Loughton and Mile End. 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 have successfully conducted multiple full London Underground mainline (all stations) dynamic tests. In the meantime, we have procured all materials 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 is under way.

Safety

We are working to improve customer safety on the Bakerloo and Central line fleets. The first Bakerloo line train with new LED lighting was returned to service in Quarter 1. We have successfully completed eight four-car units, and three three-car units and put them in service with no issues. 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 during the summer.

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 static train testing has been completed. This prototype train has successfully undertaken mainline dynamic testing on all Central line stations. This has identified some minor integration issues which the team are working with our suppliers to resolve.

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. Multiple trials were completed at Ruislip depot with final approval being sought ready to support upcoming deep Tube 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 Tube network. The remaining 66 wagons will enter production in China before they are shipped to the UK in early 2023.

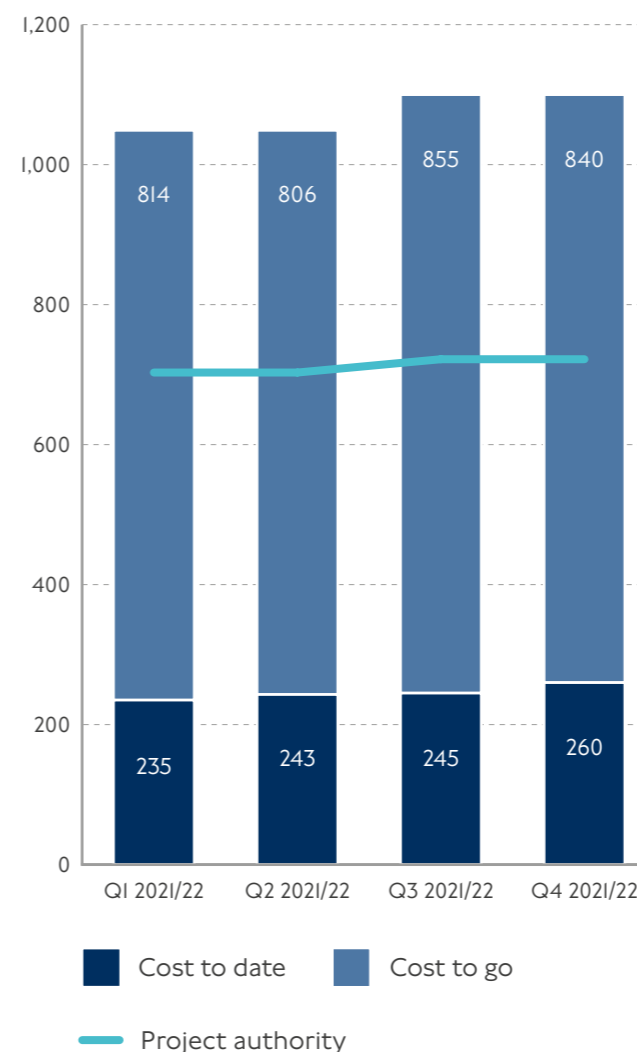
We purchased two rail-mounted cranes and eight tilting wagons from Kirow in Germany for modular points and crossings renewals. The cranes have been successfully operated within the Ruislip depot to support local track renewals works. The cranes are undergoing the final stages of approval before being granted a consent to operate for use in open sections of the Underground network. Once this is achieved, we will seek sub-surface and

tunnel environment approvals. 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.

The Remote Track Monitoring project has drafted a contract award recommendation for the design and build of new track geometry recording equipment. The project will mount this equipment on 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.

Estimated final cost performance over time (£m)



Train systems

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)
2016/17 to 2026/27	115	487	602	361	(241)
Change since last Investment programme report					
No change	22	(22)	No change	No change	

Performance over time

There has been steady progress for most of the year with a ramp up towards the latter part as the Metropolitan line and the Victoria line go into delivery.

The full impact of the move to a managed decline scenario on our forecast cost remains under review and will be updated in the new financial year.

Programme update

To ensure train fleets remain safe and reliable, we conduct a planned programme of essential heavy maintenance. This ensures all core systems meet the required standards. The programme delivers large-scale heavy maintenance activities on our existing fleet of passenger rolling stock and rail adhesion trains.

The work requires each train to be removed from service for several days or weeks and includes overhauling suspension, wheelsets, motors, brake systems and auxiliary equipment.

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

Victoria line

We continued to upgrade the pressurised ventilation fan systems completing work on the fourteenth train, which provides air in place of air conditioning and reduces maintenance. Delivery of the first five coupler overhauls was completed. The doors overhaul is due to begin in early July.

Metropolitan line

Physical work is substantially complete on the first six Metropolitan line trains, with the exception of train equipment used to transfer electric current from the third rail, which was completed in April. This will enable the programme to start ramping up.

Piccadilly line

On the Piccadilly line life extension works, 85 per cent of the floor scope is now complete. Over the financial year, 150 overhauled motors were delivered, which was 16 ahead of plan. We have completed 25 per cent of the second lift cycle to take the fleet to end of life.

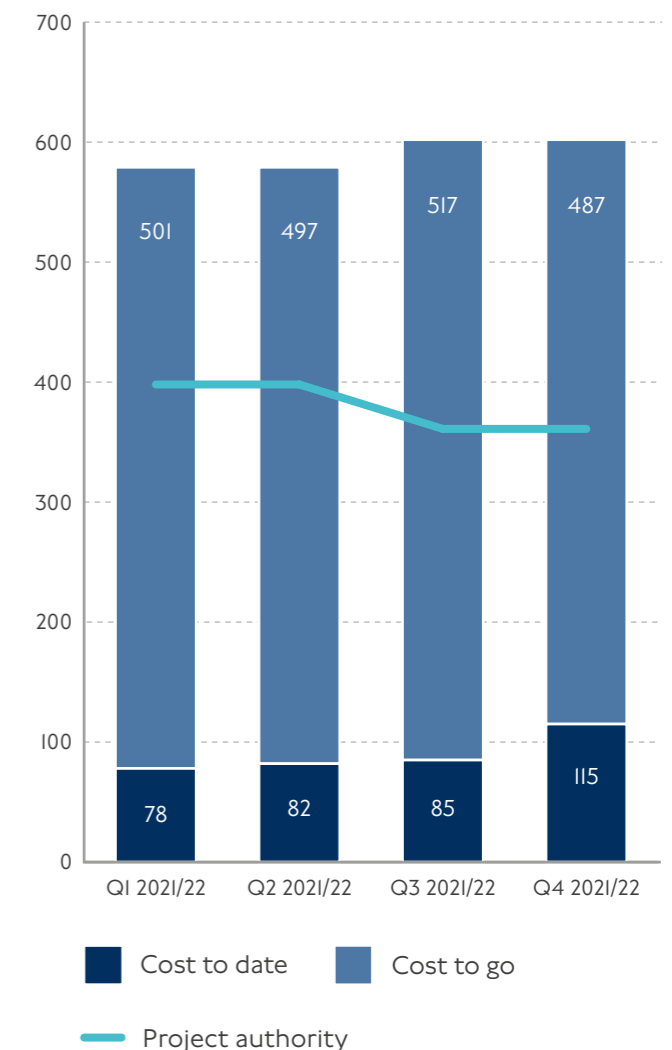
Jubilee line

Mobilisation continues at Stratford Market depot, with further recruitment and validation of work instructions. Procurement activities progressed, and the first phase of delivery started in April. We mobilised a team to support 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. The first train has had this year's work completed at Acton and we moved the second train to Acton in April to start work on it.

Estimated final cost performance over time (£m)



Train systems

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)
2018/19 to 2027/28	104	320	424	307	(117)
Change since last Investment programme report					
No change	7	(7)	No change	No change	

Performance over time

The performance over time baseline has been reset following the December 2021 Programmes and Investment Committee paper, which extended our authority to 2028 (previously 2025). In the quarter, work has started on the Central line signalling and control life extension following contract signature with our partner in Quarter 3, and we have ramped up our programme to remove hazardous materials from our signalling estate.

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 upgrading and life extension.

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

Signalling renewals

The Bakerloo line control system life extension project has completed all works on site, with control of the line now being managed by the replacement computers. The decommissioned equipment dating from the 1980s is of historical significance and has been shipped to Cambridge Computer Museum to become part of the permanent display.

In our project to remove track circuit capacitors that potentially contain hazardous polychlorinated biphenyls, we have awarded a contract for supply of new capacitors. This now includes further capacitors that will remain in service longer because of the descoping of the modernisation of the Circle, District, Hammersmith & City and Metropolitan lines.

Following award of contracts to Siemens for the life extension of the Central line signalling and control systems last quarter, works have begun to ramp up on the projects. This is critical to maintaining the safety and reliability of the line in advance of future upgrades. The projects are in the early stages of detailed design and delivery. In parallel, supporting works for fibre communication systems and cable route management systems are being designed.

Two new obsolescence projects are in the option selection stage and will start this year. These are the midlife overhaul of the platform edge doors on the Jubilee line and re-wiring the interlocking machine room at Acton Town.

Incremental signalling upgrade

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

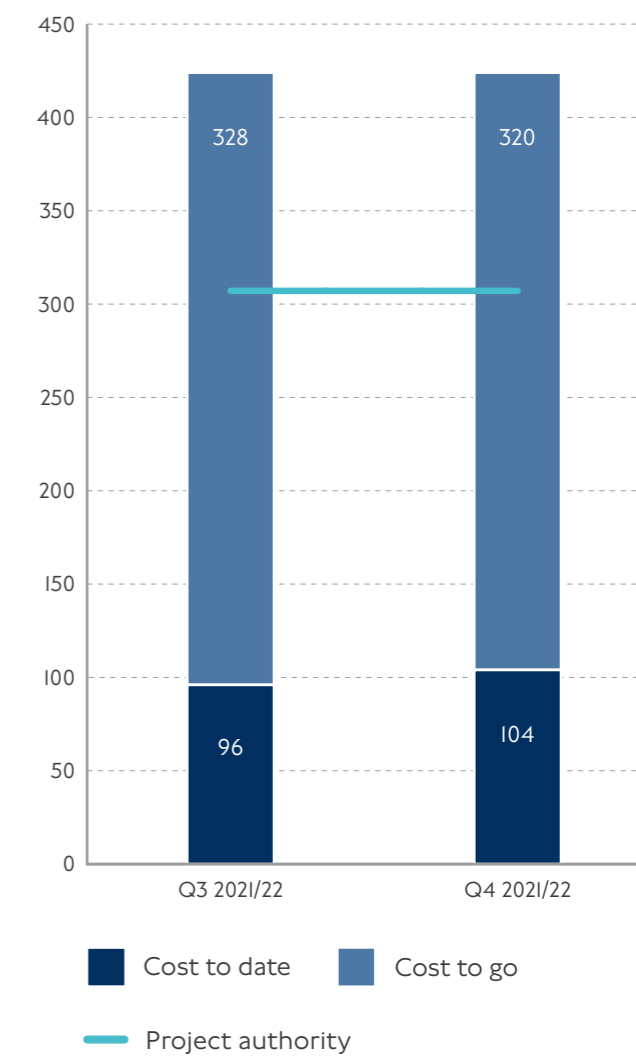
The Northern line vehicle control centre (central computing platform running the signalling) replacement project is in the tendering stage, approaching contract award. This investment will support the reliability of the signalling system, and it is expected that a contract will be awarded in Quarter 2 this year. The Northern and Jubilee line train operator display replacement project is preparing tender documents and it is expected that a contract will be awarded in Quarter 4 this year.

Regarding the Central line incremental upgrade programme, we have completed early market engagement with suppliers and the supplier feedback report was issued to the 13 respondents of the market questionnaire. Technical evaluation of the findings is under way.



We continue to move towards more modern signalling systems

Estimated final cost performance over time (£m)



Technology

Forecast completion	Cost to date (£m)	Cost to go (£m)	EFC (£m)	Programme and project authority (£m)	Variance: EFC versus authority (£m)
2019/20 to 2024/25	103	102	205	163	(42)
Change since last Investment programme report					
No change	8	(8)	No change	68	

Financial commentary

Authority has been reconciled to include £67.9m of authority granted to the Connect project (as part of the London Underground Technology Programme) by the Programmes and Investment Committee in December 2020. While Connect costs have been included separately in previous reports, we are now consolidating these figures to reflect the latest Programmes and Investment Committee approvals and ensure accuracy and consistency moving forward.

Performance over time

Last quarter we delivered new radio base-stations and rolled out critical incident management at several stations.

Programme update

Our technology assets include a network-wide radio system and data network as well as all the software to manage our assets and deliver customer service. The fast-evolving IT market necessitates

a programme to keep software in manufacturer support as well as taking advantage of new technology to improve the way we deliver service.

Networks and connectivity

We are continuing to upgrade key components of our Connect radio system and are now focusing on rolling out new radio hardware base-stations. We have replaced key hardware at more than 80 of the required 293 locations. This work will enable the Connect system to function into the 2030s.

We have delivered Critical Incident Management (CIM) functionality at 62 stations, enabling us to remotely control and evacuate a station in the event of a critical incident, such as a terrorist attack. We have also upgraded our CCTV at 75 stations, enabling the British Transport Police to remotely view our camera footage.

Assets and staff tools

To improve our approach to asset management and long-term planning, we are consolidating our asset management information systems into a single tool for London Underground and London Trams. We are migrating London Underground assets onto this new single platform. This is anticipated to complete in early 2023.

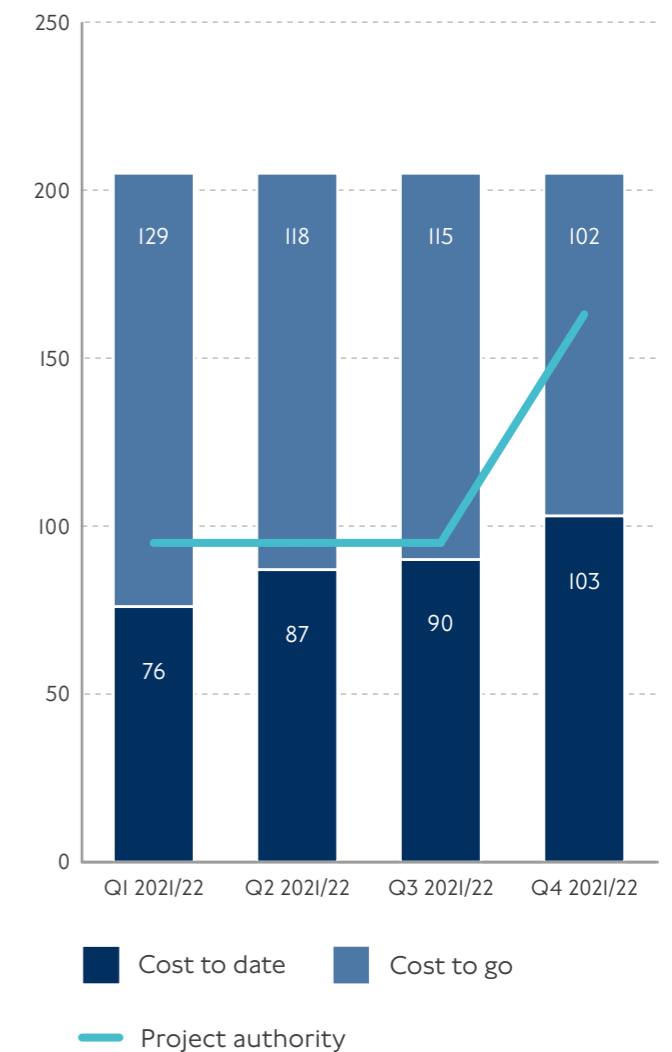
We have delivered more than 7,000 new tablets and mobile phones to our front-line staff (replacing obsolete models), allowing us to continue to provide excellent customer service and respond quickly to incidents on our networks. We have continued to deliver new body-worn cameras to improve the safety of both our staff and our customers.

We have also completed works to improve the quality of our condition data by undertaking surveys on a wide range of assets on our network. This work has helped us to improve the planning and co-ordination of essential maintenance works over the coming years.

Data, digital and revenue

To tackle fare evasion, we have continued work on the development of our irregular travel analysis platform. This tool enables us to target fare evasion more effectively and has directly contributed to the identification and prosecution of fare evaders. We have also made changes to our back-office systems to reduce the number of card clash refunds given in error.

Estimated final cost performance over time (£m)



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	262	86	348	319	(29)
Change since last Investment programme report					
No change	16	(20)	(4)	10	

Financial commentary

The five-year forecast from 2020/21 to 2024/25 has reduced by £4m since the last report.

The movement in spend primarily relates to boroughs overestimating the value of work delivered and claims being received for amounts lower than anticipated. We are working with the boroughs to improve the timeliness of periodic updates to ensure minimal movement between estimates and actual figures submitted.

The forecast cost reduction reported 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, active travel and key safety-related schemes across the network. Continued investment in active

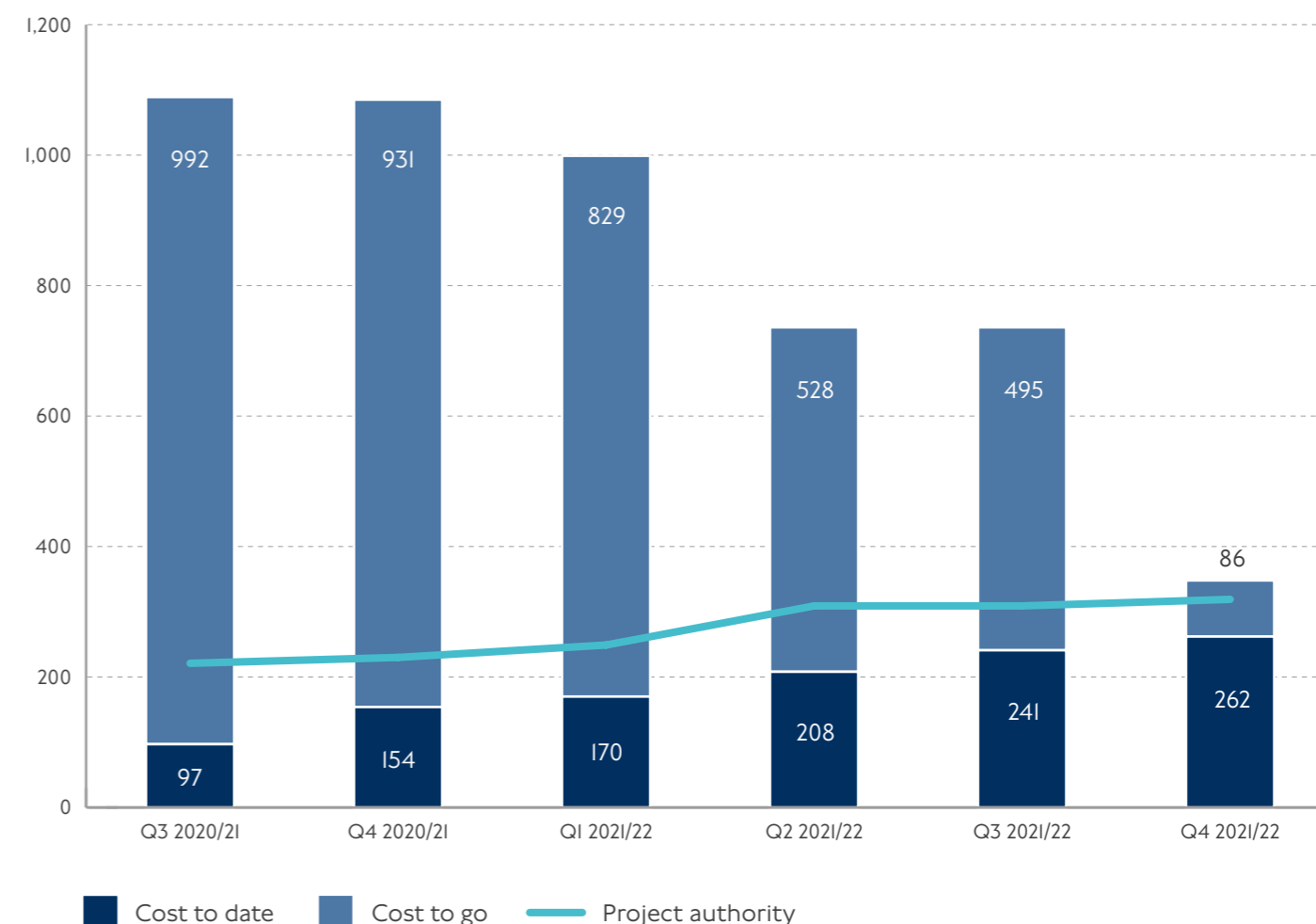
travel will need to form part of a longer-term, sustainable capital funding deal with the Government. The cost forecasted to 2024/25 in this report reflects the managed decline scenario and is in line with our assumptions made in the recent GLA budget.

Performance over time

Our forecast cost over the last six financial quarters has reduced due to funding challenges driven by the recent pandemic. This has resulted in several projects put on hold as we moved to a managed decline scenario.

Our programme and project authority has increased following Programmes and Investment Committee approval in March 2022 to cover Old Street Roundabout, active travel and safety-related projects across the network.

Estimated final cost performance over time (£m)



Programme update

The Healthy Streets programme continues to reduce road danger in line with the 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 complements our other initiatives such as Crossrail, the electrification of the bus fleet and future Road User Charging programmes, as well as helping to power London's wider recovery. Funding is provided to London's boroughs to achieve these outcomes on their highway networks.

Old Street Roundabout

Construction is progressing at Old Street Roundabout. The new design 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. Works are also continuing with the infilling of the northeast entrance to the station, Subway 1 and the surrounding paving works, including the water connections required from Thames Water to service the station. The south west entrance to the station, Subway 3, remains open for public use until late June once the final traffic management phase has been implemented. Similarly, works are continuing with the infilling of the northwest entrance ramp, Subway 4, and construction of the new passenger lift.

The passenger lift pit has been completed and works started on the lift shaft on 22 February. Construction of the concrete shaft for the new goods lift was completed on 8 February in readiness for installation of the new lift car from July.

Construction of the new main station entrance is continuing with the superstructure works. Temporary supports and propping were installed to receive the four precast concrete arms and ring beams which hold up the green roof structure. These works were completed on 25 March and were followed with installation of the roof deck in April and the glazing will begin from August 2022. The new station entrance stairs are scheduled to open for public use in late June while work continues on the above roof structure and glazing.

Refurbishment of the clerestory roof structure above the station began on 1 February following installation of a temporary crash desk in the subsurface area to help facilitate these works and provide a safety protection to the public using the subways to and from the station. These works will tie into the construction of the new bin store and UK Power Networks (UKPN) substation at surface level on the western side of the peninsula area, which continues to progress well. UKPN has completed all their works on site and the substation is now energised to provide the required power supply 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. Works on the east side retail units began on 3 February and will be followed with the west side retail units in the summer.

Completion of the project is scheduled for spring 2023 with the highway works substantially completed by winter 2022.

Cycleway 4

Construction work along Evelyn Street is progressing well and the project is now 80 per cent through with completion planned for summer 2022. The Royal Borough of Greenwich's works to Creek Road bridge has been reprogrammed for autumn 2022 and plans are now being developed to open the cycle track on the Creek Road section of the route for June 2022.

Cycleway 9

Work to transform Hammersmith Gyrotory is progressing well and expected to be completed by mid-July 2022. Work along Chiswick High Road from Chiswick Lane to Goldhawk Road, which is being delivered by the London Borough of Hounslow, is also progressing well and is planned to be completed in June 2022.

Responding to the coronavirus pandemic

Borough delivery continues, with more than 20km of cycling routes under construction. Westminster have completed their section of Cycleway 27 between Great Portland Street and Talbot Road. Barking and Dagenham have now substantially completed Cycleway 42; a 4km cycle route between Barking Town Centre and Barking Riverside.

Work is ongoing with the Future of Temporary Schemes Programme, to determine the next steps for each scheme delivered through the Streetspace for London programme. To date, several schemes have transitioned from temporary to experimental schemes, including making some improvements on site.

The A21 Lewisham to Catford and the London Bridge and Borough High Street schemes have recently made this transition in March 2022. Works continue on changes to the experimental Cycleway 8 upgrades on Grosvenor Road, and works started on a new experimental scheme at Mansell Street in January 2022, which will provide an important cycling connection between Cycleway 2 and Cycleway 3 and were completed in late April 2022. Following the local elections in May, several public consultations were launched as part of the experimental schemes process, which requires a six-month objection period and public engagement to inform any future decision about the experiment.

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. Some examples include the London Borough of Hackney, which made 300 school streets permanent in March 2022; the London Borough of Islington, which agreed to retain Cycleway 38 connecting Holloway and Pentonville Roads; and Westminster City Council, which will retain 11 cycle lanes across the borough following positive public support.



Lowering speed limits is a crucial way to reduce collisions

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 progress report, seeks to reduce speeds by 10mph on more than 140km of our roads. In 2021/22, we reduced the speed limit on almost 30km of our road network, surpassing our strategic milestone of 25km including: A13 Commercial Road; A10/A503 corridors in Haringey; A107 corridor and A23 London Road. Additionally, the whole of Westminster is now 20mph, with the exception of the Westway flyover where speeds have been reduced to 30mph.

Raised pedestrian crossings will soon be introduced in six locations, to further reduce danger to people walking and increase compliance with the new speed limit, as well as introducing accessibility benefits for mobility-impaired customers.

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. 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 (respectively delivering motorcycle and pedestrian safety measures).

On 26 November 2021 a new pedestrian crossing was introduced over Battersea Bridge, where a pedestrian was tragically killed at the beginning of 2021, with the second phase now in design. Subject to funding, we propose to engage on 10 further Safer Junctions by 2024.

Air quality

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	223	178	401	319	(82)
Change since last Investment programme report					
No change	11	(26)	(15)	64	

Financial commentary

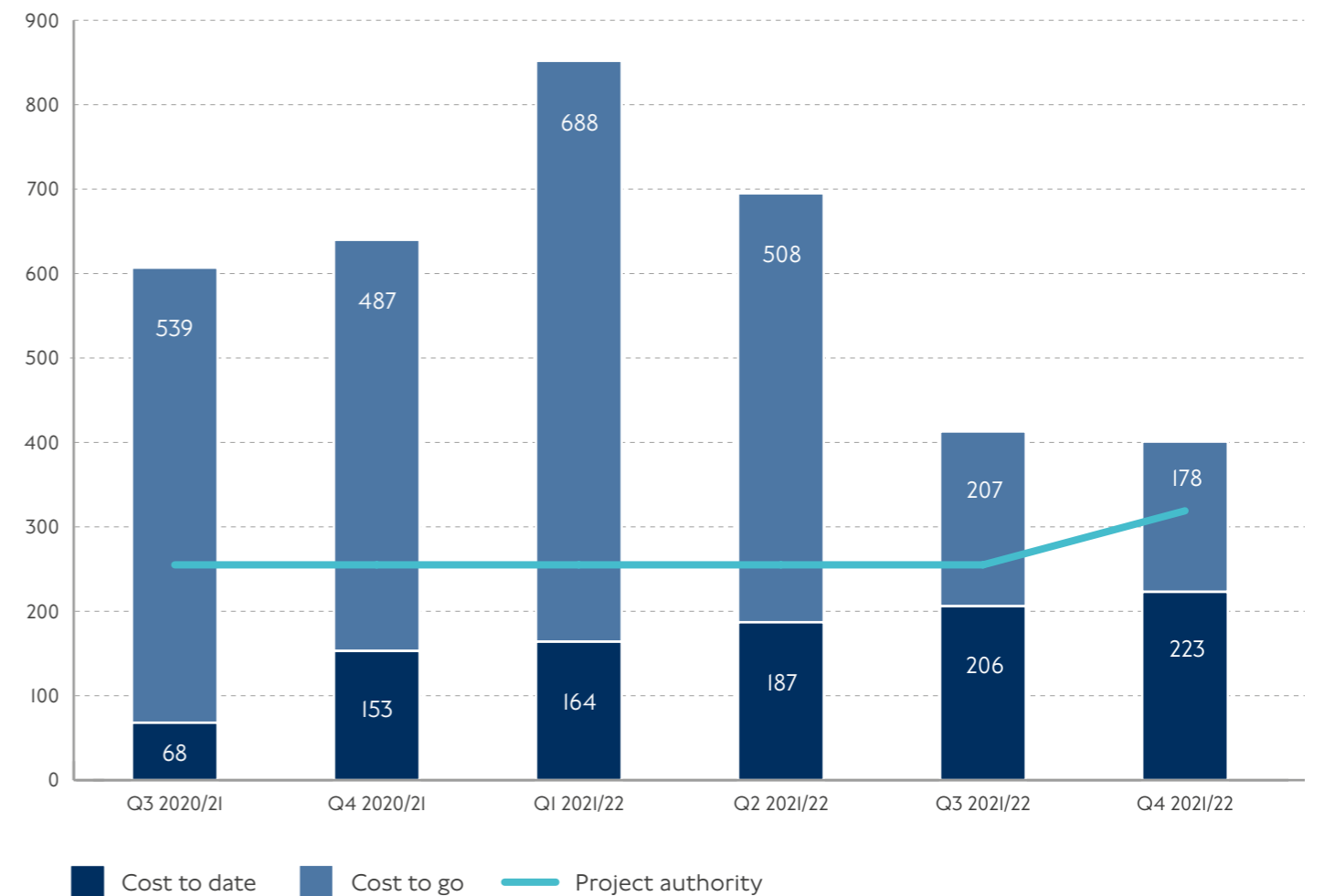
The five-year forecast cost from 2020/21 to 2024/25 has reduced by £15m since the publication of the last report. This reduction is mainly driven by the reduction in estimate for the Silvertown Tunnel Road User Charging infrastructure by £20m due to more certainty around costs from Capita reducing both risk and base. The programme and project authority was uplifted in March 2022 at the Programmes and Investment Committee.

Performance over time

Over the last six financial quarters, our forecast cost has fluctuated, driven by funding challenges brought about by the pandemic, which has meant several projects have been put on hold as we moved to a managed decline scenario. Pipeline programmes will remain under review, subject to available funding. The potential 2023 Road User Charging scheme forecast is not considered part of the Air Quality forecast while funding is reviewed.

Our programme and project authority has increased following Programmes Investment Committee approval in March 2022 to cover the Road User Charging Programme Projects to either P8 2022/23 or P13 2022/23, subject to project development and Mayoral decision.

Estimated final cost performance over time (£m)



Programme update

Electric vehicle strategy

We published our electric vehicle infrastructure strategy at the end of 2021, setting out what is needed for London to have the required level of EV infrastructure by 2030 and how this will be achieved.

Following the electric vehicle infrastructure strategy publication, an assessment has been made of the delivery status against each of its 21 commitments. The commitments set out how we will fulfil our role across land access, facilitation, strategic oversight, and financing. Two priority commitments have been classified as a risk to delivery in the absence of Government funding. Firstly, the development of a real-time and open Application Programming Interface (a software platform which shows when and how electric vehicle charging points are being used) of all charge points and secondly, establishing a commercial fleet database to support a switch to electric vehicles. These commitments are looking to address barriers and/or issues that have been raised by users, with the Application Programming Interface looking to improve the user experience in finding and using charge points and the database to help improve the understanding of the charging needs and demand hotspots for commercial vehicles. Mitigations to address the risks to these commitments are being investigated.

The Office for Zero Emission Vehicles published a UK electric vehicle infrastructure strategy on 25 March 2022. We are exploring funding opportunities available and implications for London's electric vehicle infrastructure strategy.

In mid-May, we confirmed in a press release that we have reached a significant electric vehicle milestone with more than 10,000 charging points now available for public use across the capital. This is about a third of the UK's total and an 85 per cent increase since 2019. London continues to lead the way with 111 electric charging points per 100,000 people, which is more than double the UK average of 45.

Electric vehicle infrastructure delivery

The electric vehicle infrastructure delivery project is a key commitment within the recently published electric vehicles infrastructure strategy, and it's designed to use GLA member organisations' land to accommodate charge point infrastructure.

Following some detailed market engagement, including interviews with key electric vehicle industry suppliers and charge point operators, we have presented a single preferred option for a delivery model to the Electric vehicle infrastructure delivery steering group. The recommended model will negate any capital investment from us or GLA member organisations, while leasing out sites to charge point

operators and negotiating a revenue sharing arrangement. Some additional cost and revenue modelling has been conducted, with sensitivity tests applied to examine assumptions and confirm the contractual relationship us and the GLA as landowners could have with private operators. In addition, we have achieved initial approval for using the Crown Commercial Services 'Dynamic Purchasing System', as a preferred procurement mechanism. This will, however, be subject to a procurement strategy being finalised in late summer. A further contribution from the GLA Collaboration Board of £520,000 was secured on 10 March, to enable the project to proceed to a point of tender. We have also now assessed more than 550 potential charge point locations across the GLA estate, with approximately 70 per cent passing the initial stage of site evaluation.

Zero-emission bus fleet

We continue to add zero-emission buses to the London fleet as quickly and affordably as possible, with an aim to make the entire fleet zero-emission by 2034, plus options for bringing this forward to 2030 if funding for vehicles and infrastructure can be provided by the Government. At the end of March 2022, there were 800 zero-emission buses in the fleet, including 20 hydrogen fuel cell buses, operating across multiple bus routes, helping to reduce CO₂ emissions and tackle air pollution across the capital.

We are aiming for around 10 per cent of our 9,000-strong fleet to be zero-emission by spring 2023, subject to manufacturing supply chains and vehicle delivery, and the essential upgrade of power at multiple bus garage sites around London. The timing and quantity of further orders are still dependent on reaching a long-term funding settlement with the Government.

Zero-emission buses will help meet the Mayor's overall target for London to have net-zero emissions by 2030. They will not only support the Government's wider plans to cut CO₂ emissions in the UK by 68 per cent compared to 1990 levels by 2030, but support British manufacturing, innovation and jobs – and reduce reliance on vehicles powered by fossil fuels such as diesel.

Asset investment

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	217	575	792	494	(298)
Change since last Investment programme report					
No change	43	(54)	(11)	No change	

Financial commentary

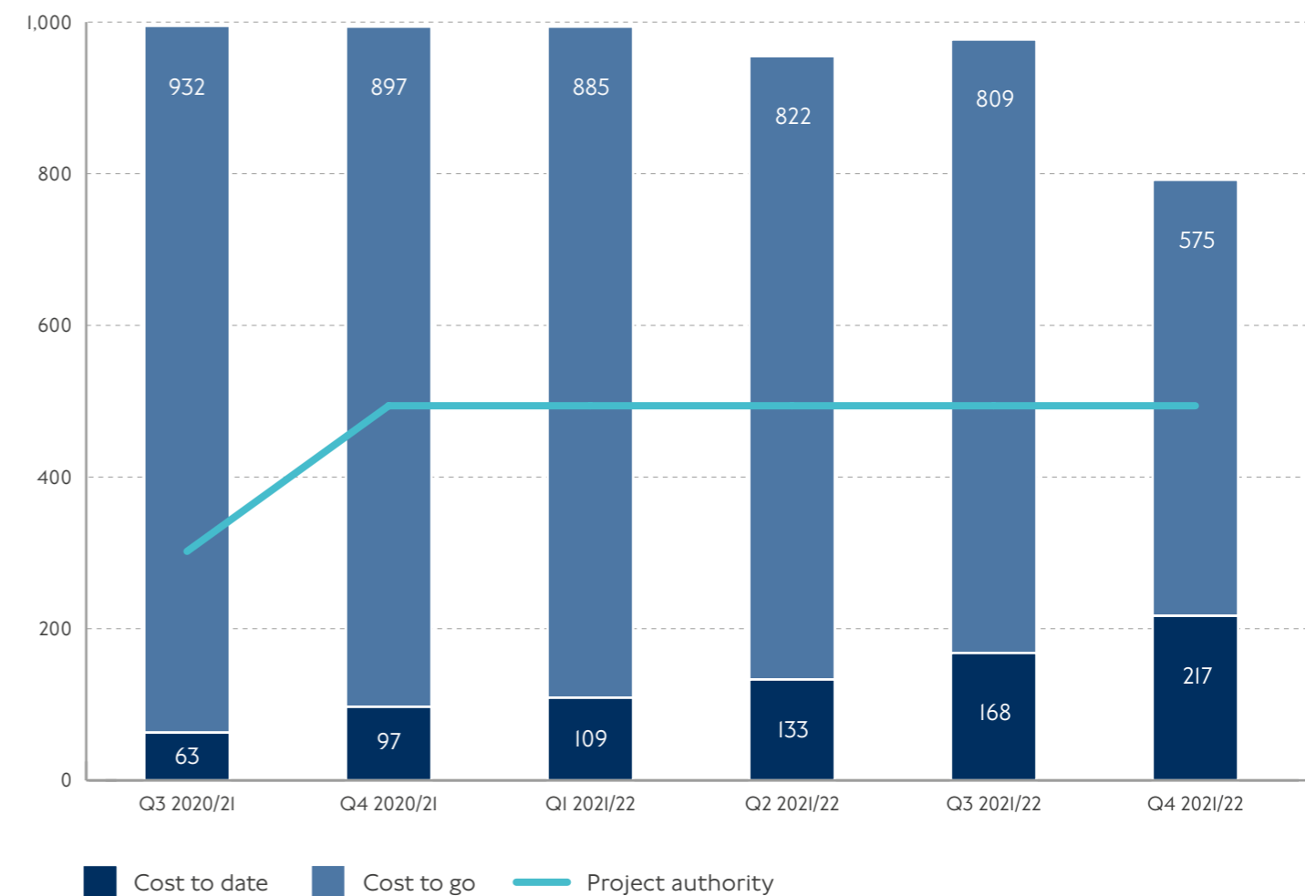
The five-year cost forecast from 2020/21 to 2024/25 has reduced by £11m since the publication of the last report. The reduction is mainly a result of us rephrasing some of our major renewals projects, where we deferred activities under a number of larger schemes to ensure that an affordable programme can align with our critical asset priorities. Also, the asset investment portfolio has delivered more than £6m of cost reductions in the 2021/22 financial year, where project teams found more efficient ways of working and had more value for money from suppliers.

Performance over time

Over the last six financial quarters, our forecast cost has fluctuated, driven by funding challenges following the recent pandemic which have resulted in several projects being put on hold as we moved to a managed decline scenario.

Our programme and project authority was increased at the December 2020 Programmes and Investment Committee meeting. This includes all spend up to the end of 2022/23.

Estimated final cost performance over time (£m)





We are renewing the systems that support Blackwall Tunnel

Programme update

Work is under way to ensure the safety and operability of our highest priority assets that need urgent renewals, including critical tunnels and structures.

Blackwall Tunnel Southbound

We have completed the concept design for the major renewal of Blackwall Tunnel Southbound. The project aims to renew critical systems that support the tunnel operation including lighting systems, concrete repairs and CCTV systems. We have identified potential options for how the construction can be undertaken. We will select a preferred construction option, based on detailed modelling assessments, before issuing a tender for the detailed design stage of the project by late summer 2022.

Gallows Corner

The Gallows Corner flyover is one of our highest priority assets to renew due to its age, condition and the current restrictions that are in place. We have completed the design and feasibility work for options to renew or replace the flyover. We are finalising our option selection before submitting a business case to the Department for Transport seeking a funding contribution through the Major Road Network programme. We plan to submit the business case in the summer and anticipate a decision from the Department for Transport by the autumn.

A40 Westway

The A40 Westway is a key strategic route and one of the busiest on our road network. Since the last report, we have successfully completed a number of full weekend closures both eastbound and westbound between 11 February and 3 April 2022. The weekend of 25-27 March was reduced to 30 hours from 55 hours, due to the provision made for the Ukraine Solidarity march at Hyde Park.

We are also working on the structure using single-lane closures to minimise disruption during the working week. The replacement of the safety and operationally critical roller shutter joint is planned to continue until the summer.

Westminster Bridge

Hostile vehicle mitigation works began on 15 November 2021. The installation of a new segregated cycle lane, installation of bollards and carriageway resurfacing were completed on both sides of the bridge on 3 February 2022.

With 95 per cent of the works now complete, the remaining works are to install footway bollards on three corners of the bridge. These works were delayed because of shallow utilities in the footways requiring bespoke design and engagement with the owners of the services to agree the design. Designs are now complete, bollards and foundation plates have been ordered and the works are planned to be completed by July 2022.

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 remains 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 installation of an over-height barrier to improve compliance of vehicles with the current temporary safety restrictions (that limit vehicles to no more than two metres in height and width) was completed by 12 April 2022.

Hammersmith Bridge

The stabilisation works, which involve replacing the seized bearings and repairing the fractures in the bridge pedestals, began on 22 March 2022 and are expected to be completed later this year in October. These works will make the bridge safe and ensure its continued use by pedestrians and cyclists. The stabilisation works are being delivered by the London Borough of Hammersmith & Fulham as the bridge owner, with the cost of £8.8m being shared equally between us, the borough and the Department of Transport (DfT). The subsequent stage of works, known as strengthening, will be required to enable the bridge to be re-opened to buses and general traffic. The London Borough of

Hammersmith & Fulham have appointed Foster COWI to develop a concept design for the strengthening works, which are expected to be finished in the autumn. A Memorandum of Understanding between the borough, the DfT and us is expected from the DfT, setting out the arrangements for how the strengthening works will be funded.

Carriageway renewal

We delivered more than 350,000 metres squared of essential carriageway renewal works by the end of 2021/22. These were locations where the current poor condition of the carriageway had the potential to impact on safety of users, reliability, performance and increased whole life costs if not treated. Over the course of the year, 27 schemes were delivered, with substantial schemes taking place on the A4 Great West Road, A21 Bromley Road and A24 London Road. This output represents tremendous performance and teamwork across TfL and our supply chain.

Public transport

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	130	343	473	249	(224)
Change since last Investment programme report					
No change	15	6	21	No change	

Financial commentary

The public transport portfolio is forecasting an increase in gross expenditure of £21m this quarter.

The latest forecast reflects a prioritisation review of the renewals assets programme, following the impacts of the managed decline scenario. This has driven an increase of £23m to ensure essential investment to meet operational requirements within the funding constraints. This is increased by higher cost estimates for East London Line Housing Infrastructure Fund, which is funded by the Department for Levelling up, Housing and Communities and offset by slippage across additional programmes into future years.

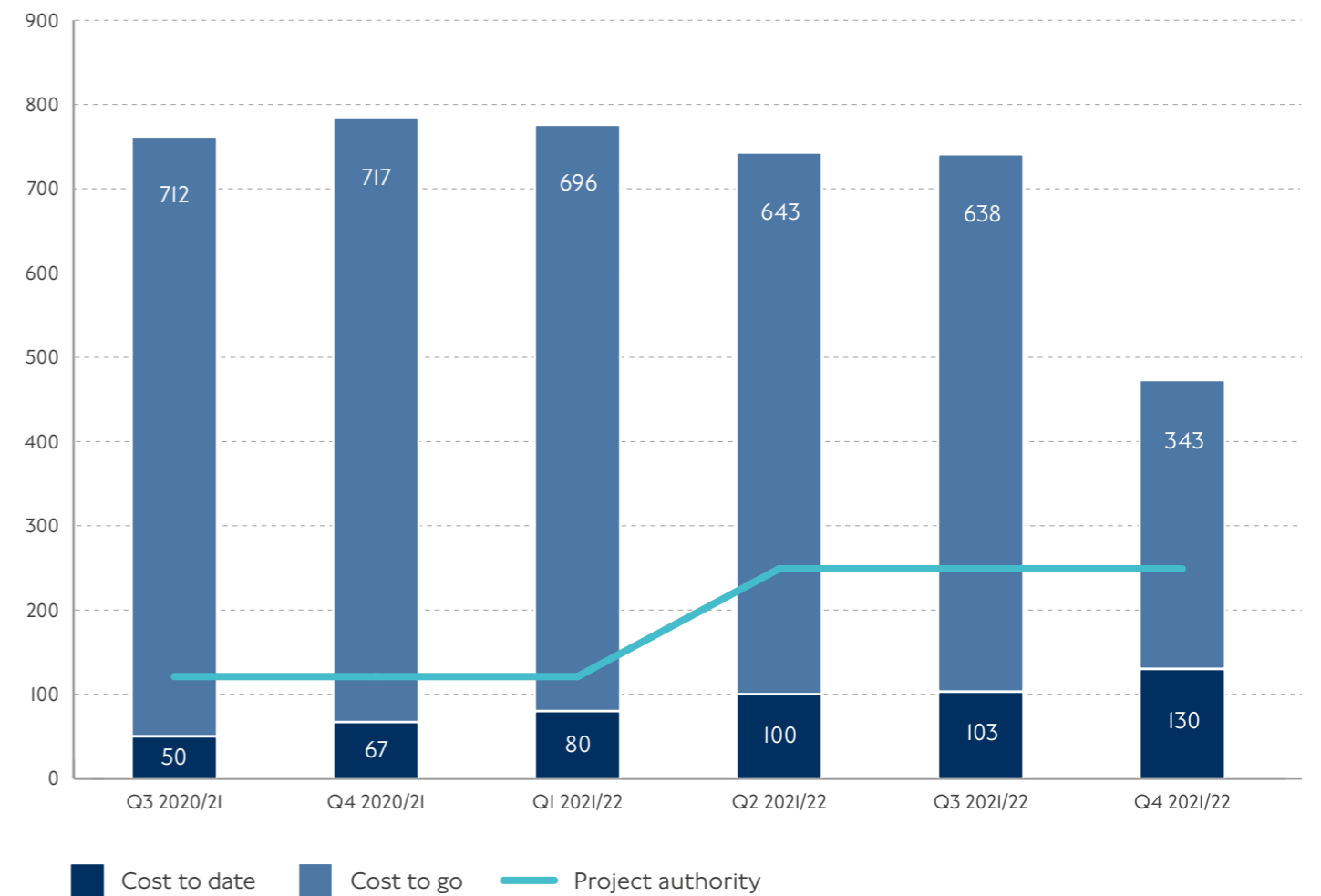
The five-year view also reflects an increased funding request for completion and handover of London Overground projects to Network Rail and Trams project, Sandilands.

Performance over time

Over the last six financial quarters, our forecast cost has fluctuated, driven by funding challenges following the recent pandemic which have resulted in a number of pipeline enhancement projects that have been put on hold as we moved to a managed decline scenario.

Our programme and project authority was increased at the July 2021 Programmes and Investment Committee meeting. This includes all spend up to the end of 2022/23.

Estimated final cost performance over time (£m)





We are working on infrastructure projects in East London

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 were completed in spring 2022. The programme is working with the Department for Levelling Up, Homes and Communities to agree a two-phase approach to the delivery of the programme.

Class 710 trains

50 of the 54 Class 710 trains have 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 price rises and availability of materials and resources.

The replacement bogie frame project for the B92 train type is progressing well, with the majority of frames delivered.

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 all planned stations, as well as intrusive lighting and power surveys, which has been completed at several stations, with technical documentation complete and ready for tender.

The lift system upgrade project continued to make good progress, with all planned lifts completed for the financial year. 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, and works have started on site to refurbish London City Airport and Cutty Sark escalators.

Coper, tactile and paving installation has been completed at London City Airport, as well as Bank and Shadwell stations, completing our DfT obligation for Rail Vehicle Access Regulations compliance. The third phase of works have begun at Limehouse Arches, and early engagement with the Canal & River Trust has meant we have secured our licence to work.

We have completed 800 metres of rail at Royal Mint Street and Stratford, and track fixings mean that we have continued to upgrade the baseplates through critical sites during engineering hours.

The GLA-funded Royal Docks stations programme has had its next phase of development approved by the GLA for Royal Victoria, Pontoon Dock and the proposed new station at Thames Wharf.

London Trams

Our rolling stock replacement programme will replace the life-expired 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 to complete the wayside installation works, which is now expected in September 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 was completed as planned during a nine-day part closure of the tramway from 12 to 20 February 2022. Detailed delivery planning was also concluded for the first phase of the Mitcham-to-Mitcham Junction ballasted track renewal works, scheduled to be delivered during a ten-day part closure of the tramway from 4 to 13 April 2022.

Following contract award in December 2021, the contractor started mobilising to replace the retaining wall and step-free access ramp at Birkbeck tram stop, and site works started on 11 April 2022.

The first phase (condition assessment and underframe crack investigations) for Tram 2547 (Bombardier type tram) was completed by Alstom. The recommendation to proceed with the second phase (replace underframe and return tram to service) was accepted and authorisation granted for Alstom to begin.

Approval was also granted to start the planned works in May 2022 to replace fire doors at the London Trams depot and ensure compliance with current fire safety standards. The tender process to refurbish key components of the CR4000 Bombardier tram fleet (flooring, doors and rooftop) was initiated in March 2022, with the contract award scheduled for summer 2022.

Santander Cycles

Our Santander Cycles scheme continues to go from strength to strength and has seen seven months of record usage. From September 2021 to March 2022 we saw a record number of hires per month compared to any previous equivalent month. The financial year 2021/22 saw 11.8m hires, an eight per cent increase on the previous best from 2018/19.

Since March 2020, we offered free cycle-hire access codes to NHS staff and other key workers. The free key worker promotional code ended in March 2022 following more than 25,000 redemptions. We continue to offer a free code to NHS staff, and it has been redeemed almost 150,000 times since March 2020.

The programme to modernise and electrify the Santander Cycles scheme continues as planned and aims to broaden and increase the usage of Santander Cycles bikes. It will also help support our financial sustainability plan and will improve the customer offering with the rollout of 500 e-bikes, and enhanced app functionality. Delivery is on track, with the launch of the 500 e-bikes planned for summer 2022 and further phases of improvements to follow.

The London Borough of Southwark has provided third-party funding to expand cycle hire within the borough, with design work and planning applications under way for the potential sites identified. We also continue to explore options to further expand the geographical footprint of Santander Cycles in London.

Woolwich Ferry (London River Services)

The Woolwich Ferry resilience and renewals programme falls under London River Services as part of the public transport portfolio. The current programme is made up of schemes across varied disciplines which are currently across various stages of the project delivery life cycle. The key aim of these schemes is to reduce operating expenses, maximising the use of the assets and exploiting opportunities to generate additional revenue where possible. Projects in the resilience and renewals work bank will support the delivery of the overall project objectives, in particular reducing cost, improving safety and making services more reliable.

Currently the key focus is to establish a clear prioritisation across the numerous schemes and agree an effective delivery strategy for each with all team members.

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	50	191	241	158	(83)
Change since last Investment programme report					
No change	8	(8)	No change	No change	

Financial commentary

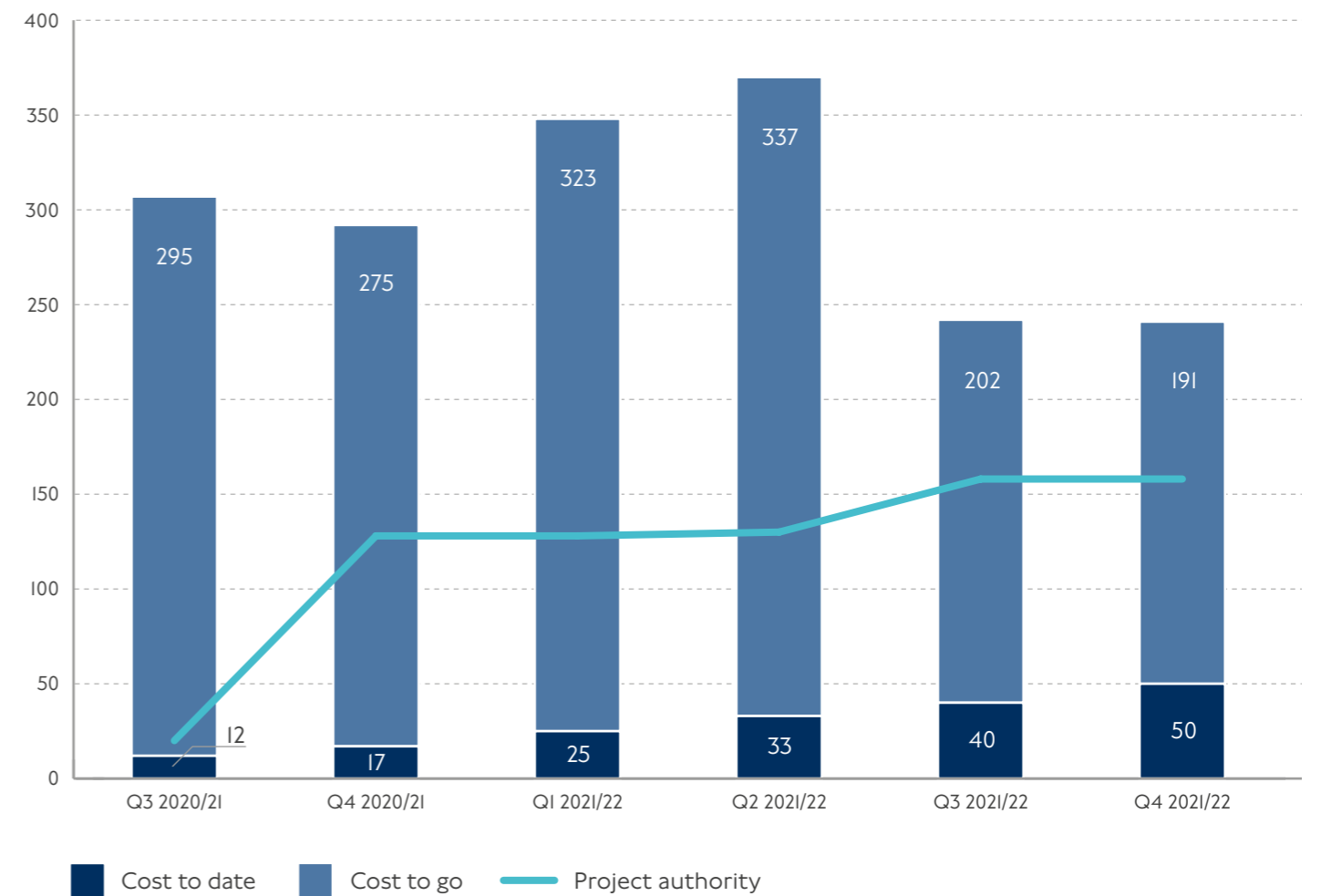
The five-year forecast cost for 2020/21 to 2024/25 remains unchanged since the last report.

Performance over time

The managed decline scenario accounts for a £96m reduction, 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.

The next submission to the Programmes and Investment Committee will be made this July and will cover the requirements for 2022/23 and the future year's commitments, which we'll be making this year.

Estimated final cost performance over time (£m)



Programme update

Compliance, enforcement and safety technology

We are continuing to progress the roll-out of deployable enforcement cameras, which will play a vital part in helping us meet our Vision Zero goal of eliminating death and serious injury on the road network by 2041. A trial of cameras carried out in 2020 saw an improvement in compliance of up to 60 per cent in six months. Following the installation of 24 cameras on the network by 31 March, a further 21 were installed by 28 April.

After completion of the subsequent testing and final camera installations at the end of May, 50 of the installations are now operational. We will be closely monitoring how successful they are at reducing road danger and congestion, and improving bus journey reliability. Any money we recover from penalty charge notices will be reinvested into maintaining a safe and efficient road network for everyone travelling in the capital. The cameras are used for enforcement of civil traffic rules only and are fully compliant with data protection legislation. Subject to a review of the success of these cameras in improving safety and compliance on London's roads, we will be looking at the feasibility of further extending the use of these cameras across London.

We are continuing to develop and refresh enforcement and compliance back-office systems using in-house teams for a variety of projects. These projects will enable us to replace and improve digital capability, which underpins operations in our Compliance, Policing, Operations and Security directorate, enabling

officers to record contraventions through mobile devices on the street, replacement data storage and reporting solutions, and delivering a case management solution to enforce regulations through prosecutions and advisory notices. These projects are at various levels of mobilisation and delivery.

We began a surface workforce management project in April 2021 to renew our existing systems for managing our operational staff and ensuring we are deploying them in the most effective way. We are working closely on a similar project, focusing on workforce management of London Underground staff to deliver benefits, opportunities and savings across TfL and align with our wider enterprise resource planning improvements.

Road technology

Many 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 part of emergency services. The programme remains on track to deliver several vital systems.

Work continues on the predictive element of the SITS programme. This aims to revolutionise our approach to managing small to medium-impact incidents.

It 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 provide a baseline for the scope, assuring the business case, benefits and proposed route to market. This enhancement is not funded in our budget, which would reduce value for money from the funded renewals elements of the SITS programme. Review of funding and prioritisation of enhancements is ongoing. This project will be paused in 2022/23 pending funding decisions.

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 Common Operational View Incident Management System will replace the legacy Traffic Incident Management System and provide a real-time common view to operators in the Network Management Control Centre of how the road network is operating. The fifth release took place on 27 April, to add roadwork information across London and additional mapping layers, further increasing the situational awareness for our control centre to better assess the impacts of an incident across different modes and deploy effective management strategies.

The London Driver Information Service was finally retired on 31 March. It was the control system for the 134 variable messaging signs on the London network, and used a bespoke system language that was created by our engineers. This project has successfully migrated these signs onto a new control system that uses 4G, which provides a more reliable service and enables the Network Management Control Centre to provide the services needed to

Keep London Moving and relay safety-critical messages to our customers.

Public transport technology

We are maintaining and developing technology to operate our public transport networks and improve the 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 have carried out an evaluation of the responses. Shortlisting has been carried out and the preferred bidders have progressed through to the competitive dialogue phase, which started on 31 May 2022. This phase will enable the project team to 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 were invited to submit final tender on 13 April, with contracts expected to be awarded in September 2022.

Professional services

This comprises Technology and data as well as 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	210	108	318	320	2
Change since last Investment programme report					
No change	25	(33)	(8)	No change	

Financial commentary

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

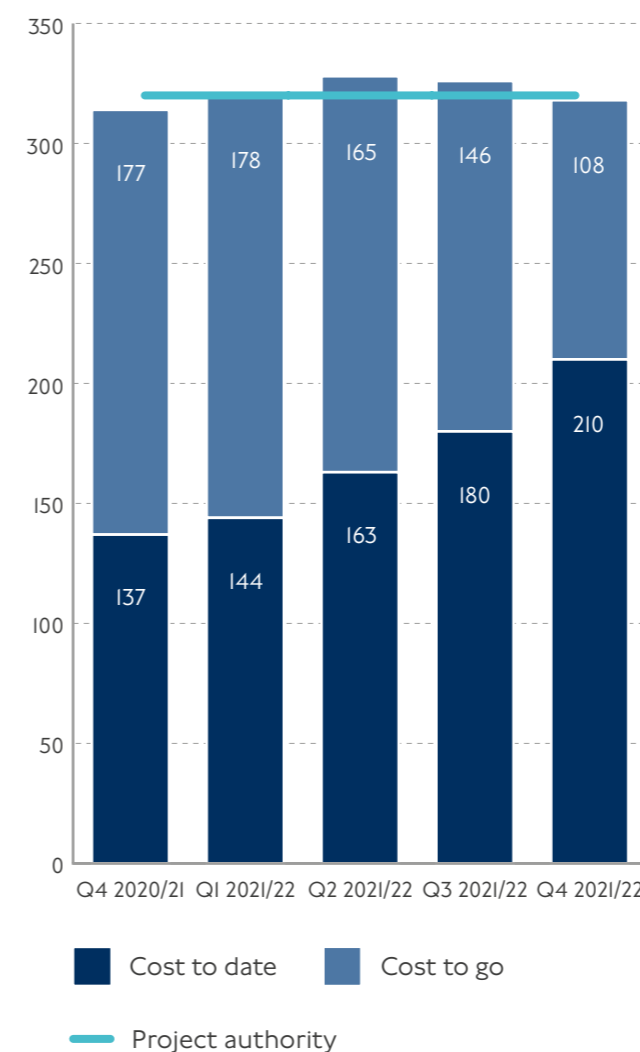
The values are for Technology and data funded projects only and exclude the Emergency Services Network, the public cellular network and telecoms commercialisation projects. Other telecoms spend is included from 2021/22 as it was included within the latest Programmes and Investment Committee approval.

The movement in EFC since the last report is due to savings and deferrals out of the period on projects related to payments, cyber, network, hosting and the digital workplace.

Performance over time

Over the last five quarters, forecast spend increased due to income for telecoms being transferred out of this portfolio. Reductions in recent quarters reflect savings and deferrals out of the period on the projects outlined in this section.

Estimated final cost performance over time (£m)



Progress update

Payments

We have signed an agreement with the DfT to begin the delivery of Project Oval. This will expand contactless payments to more than 200 stations across South East England.

The final payments systems (contactless back office and website, and cycle hire) were upgraded to handle the new stronger customer authentication standards required by the payments industry by 14 March.

Digital workplace

The consolidation of all legacy versions of Microsoft SharePoint sites into SharePoint online has now been completed. This addresses the security, compliance and obsolescence issues associated with this legacy infrastructure. It also ensures that we can maximise our investment in Microsoft Office365 technology with an improved security, accessibility and information governance position.

We have successfully migrated our fixed-line telephony services from legacy ISDN technology to a new SIP-based solution. This work, which included the transfer of more than 30,000 telephone numbers, is a significant milestone in the ongoing upgrade of our core telephony systems and removes our reliance on legacy technology (ISDN), that will be obsolete in 2025.

We have completed the third phase of our meeting room upgrade project, which has provided 50 operational locations with Microsoft Teams-based video conferencing equipment. This will further enable and support hybrid and collaborative working across TfL and follows on from the successful deployment of the same technology in the meeting rooms across our three hub buildings.

Hosting

Our programme to refresh end-of-life infrastructure in order to ensure the ongoing availability and security of our systems continues to progress well. A total of 5,743 out of 6,313 (91 per cent) servers hosting line of business application services have now been rehosted on a modern hardware platform.

A total of 75 out of 375 (20 per cent) mission and business critical application services which were operating on legacy end-of-life operating systems and database platforms have been re-platformed on a modern supportable platform.

Networks

The first milestone of the telecoms commercialisation project has been achieved, with the Jubilee line public cellular network pilot smoothly transferring to BAI, our telecoms concessionaire over the weekend of 12 to 13 March.

Achievement of this milestone completes the first of our planned commercial mobile service deliveries on the Underground and will enable all mobile network customers to continue to check the latest travel information, keep on top of their emails,

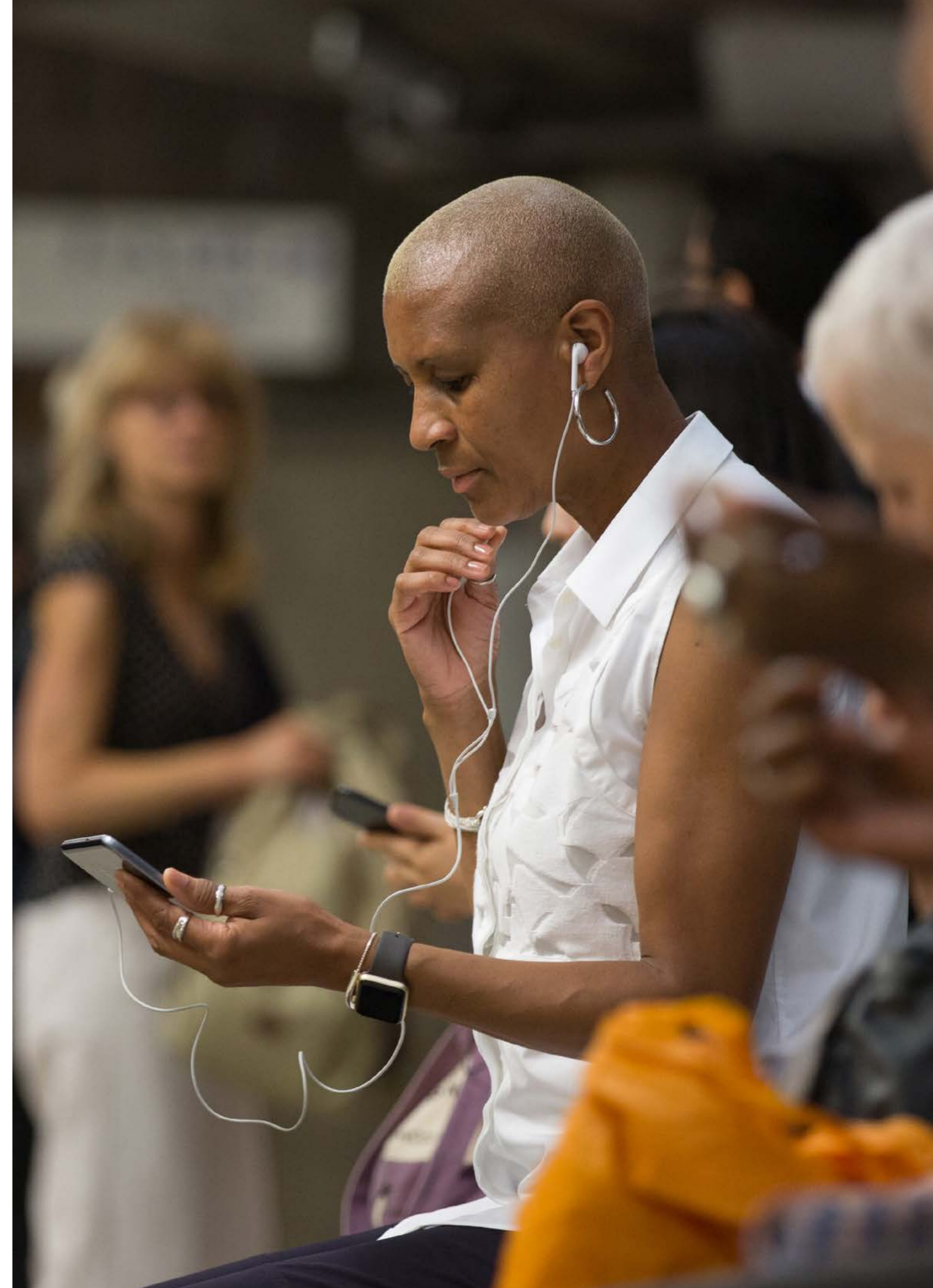
catch up on social media and live stream videos wherever they are on this section of the Jubilee line.

Looking ahead to the delivery of mobile services elsewhere on the Underground, Technology and data continue to work collaboratively with BAI and other internal TfL functions such as engineering, Safety, Health and Environment and Major projects construction in the rollout of station and tunnel infrastructure. Equipment has been purchased ready for installation to avoid supply chain and logistics issues, designs are being delivered and station works are under way in 17 stations.

Our project to install infrastructure within the Underground in support of the Home Office's emergency services network project is complete. We have now handed this infrastructure (approximately 470km of leaky feeder and 410km of fibre optic) over to BAI to complete the build of the service.

The Connect programme continues to replace London Underground's operational radio base stations. This two-year project has now replaced more than 100 of 293 (34 per cent) base stations. Our planned update to the core radio software was successfully completed in February 2022, bringing this operationally critical system in line with currently supported software versions.

Our project to replace the end-of-life data network services that underpin virtually all Surface services continues to progress according to plan. To date, we have migrated 1,207 of 4,496 (27 per cent) sites on to the new network delivered by Capita.



The Jubilee line provides 4G mobile service for our customers

Technical service operation

We are progressing with several projects to assess suitability of on-premise and cloud network infrastructure, and where necessary replace it. This will support and protect our business-critical services.

Other key projects relate to software license management. For the setup of a software asset management provider service, we have decided to revisit our requirements to ensure we secure the service we need. We intend to go out to market once that activity is complete. The initiative to optimise Java license usage is nearing completion, which will also put processes in place that enable this to continue long term.

Following approval by the GLA Collaboration Board, we are also progressing with the implementation phase of the GLA IT Shared Service project, which will see us take on responsibility for agreed GLA IT services over the next two years.

Enterprise resource planning

Preparation for a new core HR solution extending the myJourney SAP SuccessFactors platform continues. A market engagement prior information notice has been issued to potential implementation partners with a view to contracting a partner by Quarter 2 2022. Also, the new procurement and supply chain system is entering the testing phases for the Sourcing and Contracting

functions used by our Procurement and Commercial team and testing for the new digital catalogue and purchasing system (SAP Ariba) starts in July. We aim to have the new purchasing system live by the end of 2022. Communication and change management activities are ramping up now to promote this.

The Elizabeth line is now on TrackerNet

On 15 March, we took another step towards opening the Elizabeth line, with the release of an update to TrackerNet.

TrackerNet is London Underground's system for visualising train movement in real-time and is a key tool in control centres and for front-line staff, both for managing train operations and providing good customer information. Following the release, you'll now be able to see train movement across the Elizabeth line Central Operating Section, with a further release planned for the whole line in the autumn. It means that our frontline staff will continue to provide a seamless customer experience across the network, with a plan for it to be available to both London Underground and MTR (our station operator) staff. The development and delivery were the result of much hard work across Technology and data, with strong collaboration during the project with our colleagues in London Underground and MTR. The release has been well received by stakeholders across the business.

Contact Centre operations

We continue to focus on maintaining the quality and efficiency of our Contact Centre services. Following the retender, transition and go live of our new consolidated Oyster customer support contracts in July, we've successfully navigated our cycle hire services through the same processes to ensure we continue to provide a seamless transition to a new, continued cost-effective contract. This went live at the beginning of May.

In addition to ensuring a continuation of these business critical and cost-efficient contract services, we've also been introducing new automated rules to quickly and more efficiently manage our contactless payment card contact handling. Following a proof of concept we developed within Technology and data in 2019, we've fine-tuned and implemented rules that identify customers' journey information and what refund they're due when they contact us, so that the system automatically processes the contact handling and refund. Customers will receive quicker responses to their requests and refunds, which also decreases our cost by more than £800,000 per annum as we no longer need to pay our contact centre suppliers to manually complete the refunds.

Data analytics

During this period, our primary area of focus has been the critical asset refresh of our key data platform, which is known as CLEO. This legacy data platform requires a refresh to meet the size and performance demands of our data products that we provide to colleagues across the organisation. Our 'CLEO to the Cloud' project has been structured with an initial proof of concept stage to ensure that the development of our new solution is fit for purpose. This stage has now finished, confirming that we will indeed plan to migrate our Enterprise Data Warehouse from the ageing on-premises infrastructure to cloud architecture. We are now in the evaluation phase, which will lead into solution design and the definition of our implementation roadmap.

A key risk to the data analytics portfolio of work is resource retention in key roles across our delivery teams. This will likely impact us from a delivery capacity perspective, but also the loss of retained knowledge in the team and the time it will take to hire and train replacement staff.

Digital

More than 1.1 million customers have downloaded the TfL Go app since it was launched in 2020.

In April, we added widgets to the app so that customers can easily see when there is disruption to Tube, DLR, tram and TfL Rail lines. We continue to develop account, journey history and payment card functionality with a first phase beta release now planned for July 2022. We ensured that the app was ready for the recent successful launch of the Elizabeth line to customers on 24 May.



The popular TfL Go app provides real-time service information

Growth Fund

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

Financial commentary

The forecast has been rounded up to £2m, however, there has been a decrease of £0.6m due to a reduction in the requirement for funding for the project at Tolworth roundabout, which is owing to a reduction in costs.

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.

The changes at Tolworth roundabout in the Royal Borough of Kingston will mitigate the predicted increase in bus journey times resulting from increased traffic from the adjacent developments in the area. One of the two key changes includes a new shared area for walking and cycling in the centre of Kingston Road by extending the existing 'Greenway' in Tolworth Broadway. People walking and cycling will be able to access the path from an upgraded pedestrian crossing connecting through to Tolworth Roundabout. Other key changes include a new left turn to access the A3, new developments from the Kingston Road, and remarking of traffic lanes on the approach and around the junction to allow for better lane discipline and improved traffic flow. Over the last two quarters the project has secured the required land and started detailed design, which means that our spend forecast has been reduced by £0.6m to reflect that we have more certainty on the estimated final cost.

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.

About Transport for London (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, Elizabeth line, London Trams, London River Services, London Dial-a-Ride, Victoria Coach Station, Santander Cycles and the London Cable Car. The experience, reliability and accessibility of these services is fundamental to Londoners' quality of life.

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, our expanded Ultra Low Emission Zone and fleets of increasingly environmentally friendly and zero-emission buses are helping to tackle London's toxic air.

During the pandemic, we took a huge range of measures to ensure people were safe while traveling. This included extensive cleaning regimes across the public transport network and working with London's boroughs to introduce the Streetspace for London programme, which provides wider pavements and cycle lanes so people can walk and cycle safely and maintain social distancing. London's recovery is vital to the UK's recovery as life returns to normal. We want to ensure London avoids a car-led recovery and we continue to reassure people the capital and our transport network is safe and ready for them.

We have constructed many of London's most significant infrastructure projects in recent years, using transport to unlock much needed economic growth. This includes major projects like the extension of the Northern line to Battersea Power Station and Nine Elms in south London, as well as our work at Barking Riverside and the Bank station upgrade.

Working with Government, we completed the Elizabeth line in time for Her Majesty the Queen's Jubilee. This transformational new railway adds 10 per cent to central London's rail capacity and supports the delivery of high-density, mixed-use developments, which are planned around active and sustainable travel to ensure 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 intel, 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's recovery from the pandemic continues.

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