

Agenda

Meeting: Programmes and Investment Committee

Date: Wednesday 2 March 2022

Time: 10:00am

Place: Conference Rooms 1 and 2,
Ground Floor, Palestra, 197
Blackfriars Road, London, SE1
8NJ

Members

Ben Story (Chair)

Dr Nelson Ogunshakin OBE (Vice-Chair)

Seb Dance

Cllr Julian Bell

Dr Lynn Sloman MBE

Peter Strachan

Copies of the papers and any attachments are available on [tfl.gov.uk How We Are Governed](https://tfl.gov.uk/How-We-Are-Governed).

This meeting will be open to the public and webcast live on [TfL YouTube channel](#), except for where exempt information is being discussed as noted on the agenda.

There is access for disabled people and induction loops are available. A guide for the press and public on attending and reporting meetings of local government bodies, including the use of film, photography, social media and other means is available on www.london.gov.uk/sites/default/files/Openness-in-Meetings.pdf.

Further Information

If you have questions, would like further information about the meeting or require special facilities please contact: Jamie Mordue, Senior Committee Officer; Email: Secretariat02@tfl.gov.uk.

For media enquiries please contact the TfL Press Office; telephone: 0343 222 4141; email: PressOffice@tfl.gov.uk

Howard Carter, General Counsel
Tuesday 22 February 2022

**Agenda
Programmes and Investment Committee
Wednesday 2 March 2022**

1 Apologies for Absence and Chair's Announcements

2 Declarations of Interests

General Counsel

Members are reminded that any interests in a matter under discussion must be declared at the start of the meeting, or at the commencement of the item of business.

Members must not take part in any discussion or decision on such a matter and, depending on the nature of the interest, may be asked to leave the room during the discussion.

**3 Minutes of the Meeting of the Committee held on 15 December 2021
(Pages 1 - 14)**

General Counsel

The Committee is asked to approve the minutes of the meeting of the Committee held on 15 December 2021 and authorise the Chair to sign them.

4 Matters Arising and Actions List (Pages 15 - 18)

General Counsel

The Committee is asked to note the updated actions list.

5 Use of Delegated Authority (Pages 19 - 22)

General Counsel

The Committee is asked to note the paper.

6 Investment Programme Report - Periods 8, 9 and 10, 2021/22
(Pages 23 - 86)

Chief Customer and Strategy Officer, Chief Capital Officer and Chief Operating Officer

The Committee is asked to note the paper and exempt supplementary information on Part 2 of the agenda.

7 Independent Investment Programme Advisory Group Quarterly Report (Pages 87 - 90)

General Counsel

The Committee is asked to note the report and exempt supplementary information on Part 2 of the agenda.

8 TfL Project Assurance Update (Pages 91 - 96)

General Counsel

The Committee is asked to note the paper and exempt supplementary information on Part 2 of the agenda.

9 Asset Renewals (Pages 97 - 136)

Chief Capital Officer and Director of Investment Delivery Planning

The Committee is asked to note the paper.

10 Air Quality and Environment - To Follow

Chief Customer and Strategy Officer

The Committee is asked to note and approve the paper and exempt supplementary information on Part 2 of the agenda and approve authorities.

11 Technology and Data 2022/23 and 2023/24 (Pages 137 - 160)

Chief Customer and Strategy Officer and Director Strategy and Chief Technology Officer

The Committee is asked to note and approve the paper and exempt supplementary information on Part 2 of the agenda and approve additional Programme and Project Authority.

12 Enterprise Risk Update - Delivery of Key Projects and Programmes (ER8) (Pages 161 - 164)

Chief Capital Officer

The Committee is asked to note the paper and exempt supplemental information on Part 2 of the agenda.

13 Members' Suggestions for Future Discussion Items (Pages 165 - 168)

General Counsel

The Committee is asked to note the forward plan and is invited to raise any suggestions for future discussion items for the forward plan and for informal briefings.

14 Any Other Business the Chair Considers Urgent

The Chair will state the reason for urgency of any item taken.

15 Date of Next Meeting

Wednesday 18 May 2022 at 10.00am.

16 Exclusion of the Press and Public

The Committee is recommended to agree to exclude the press and public from the meeting, in accordance with paragraphs 3 and 5 of Schedule 12A to the Local Government Act 1972 (as amended), in order to consider the following items of business.

Agenda Part 2

17 Investment Programme Report - Periods 8, 9 and 10, 2021/22 (Pages 169 - 182)

Exempt supplementary information relating to the item on Part 1 of the agenda.

18 Independent Investment Advisory Group Quarterly Report

(Pages 183 - 238)

Exempt supplementary information relating to the item on Part 1 of the agenda.

19 TfL Project Assurance Update (Pages 239 - 242)

Exempt supplementary information relating to the item on Part 1 of the agenda.

20 Air Quality and Environment - To Follow

Exempt supplementary information relating to the item on Part 1 of the agenda

21 Technology and Data 2022/23 and 2023/24 (Pages 243 - 244)

Exempt supplementary information relating to the item on Part 1 of the agenda.

22 Enterprise Risk Update - Delivery of Key Projects and Programmes (ER8) (Pages 245 - 250)

Exempt supplementary information relating to the item on Part 1 of the agenda.

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Transport for London

Minutes of the Programmes and Investment Committee

Teams Virtual Meeting

10.00am, Wednesday 15 December 2021

Members of the Committee

Professor Greg Clark CBE (Chair)
Dr Nelson Ogunshakin OBE (Vice Chair)
Mark Phillips
Dr Nina Skorupska CBE
Dr Lynn Sloman MBE
Ben Story

Government Special Representative

Becky Wood

Board Members also in attendance

Cllr Julian Bell
Peter Strachan

Executive Committee

Andy Byford	Commissioner
Howard Carter	General Counsel
Stuart Harvey	Director Major Projects

Staff

Alexandra Batey	Director of Investment Delivery Planning
Bruno Carr	Head of Investment Delivery Planning – London Underground and Elizabeth Line
Andrea Clarke	Director of Legal
Justine Curry	Head of Commercial Law, Legal
Patrick Doig	Finance Director, Surface Transport and Major Projects and statutory Chief Finance Officer
Jackie Gavigan	Secretariat Manager
Joanna Hawkes	Corporate Finance and Strategy Director
Sean Horkan	Director, TfL Engineering Asset Strategy
Lorraine Humphrey	Interim Director of Risk and Assurance
Shamus Kenny	Head of Secretariat
Rachel McLean	Chief Finance Officer Crossrail, and Finance Director London Underground and TfL Engineering
Jamie Mordue	Secretariat Officer
Kumaran Nagiah	Chief of Staff, Major Projects
Robert Niven	Head of Investment Delivery Planning, Major Projects (for Minute 77/12/21)
James Norris	Interim Head of Project Assurance
Jonathan Patrick	Chief Procurement Officer
David Rowe	Head of IDP, Major Projects

Independent Investment Programme Advisory Group (IIPAG)

Alison Munro	Chair, IIPAG
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67/12/21 Apologies for Absence and Chair's Announcements

Apologies for absence had been received from Heidi Alexander. Simon Kilonback, Chief Finance Officer, Andy Lord, Managing Director London Underground and TfL Engineering, and Gareth Powell, Managing Director Surface Transport, were also unable to attend the meeting.

The flexibility of meetings regulations, which applied to TfL from August 2020 and enabled it to take decisions via videoconference, expired on 6 May 2021. As the Committee was unable to meet in person, any decisions required would be taken by Chair's Action, following the discussion of the item with Members at this meeting.

Owing to technical issues, the meeting was unable to be broadcast live. A video was uploaded to TfL's YouTube channel after the meeting, to ensure the public and press could observe the proceedings and decision-making.

Financial Authority was currently provided through the two-year Budget for 2021/2022 and 2022/23, approved by the Board on 28 July 2021. The current funding agreement with Government expired on 17 December 2021 (having been extended one week from 11 December) and additional Government funding would need to be agreed beyond this period, therefore a subsequent prioritisation of the TfL Investment Programme would be required to ensure that all projects were affordable within the funding envelope provided and as such revised authority may need to be sought.

Any Authority granted through Chair's Action, following consideration by the Committee, which related to both the current funding period up to the 17 December 2021 and commitments outside of this period, may need to be revised as part of future budgets to be considered by the Board. Provision would also need to be made in future Budgets and Business Plans in respect to commitments made. If additional funding was not available, a prioritisation of the TfL Investment Programme would be required and some programmes and projects would not be taken forward and revised authority would be sought as appropriate.

All financial commitments related to the requests would be overseen in accordance with TfL Business controls in respect of draw down.

The Chair reminded those present that safety was paramount at TfL and encouraged Members to raise any safety issues during discussions on a relevant item or with TfL staff after the meeting. No matters were raised.

68/12/21 Declarations of Interests

Members confirmed that their declarations of interests, as published on tfl.gov.uk, were up to date and there were no interests to declare that related specifically to items on the agenda.

69/12/21 Minutes of the Meeting of the Committee held on 13 October 2021

The Committee approved the minutes of the meeting held on 13 October 2021 as a correct record. The minutes would be provided to the Chair for signature at a future date.

70/12/21 Matters Arising and Actions List

Howard Carter introduced the paper, which set out progress against actions agreed at previous meetings of the Committee.

The Committee noted the actions list.

71/12/21 Use of Delegated Authority

Howard Carter introduced the paper, which provided an update on the use of delegated authority by the Committee, through the use of Chair's Action or of Procurement Authority and Programme and Project Authority, in respect of matters within the Committee's remit, granted by the Commissioner and the Chief Finance Officer.

Since the meeting on 13 October 2021, there had been two uses of Chair's Action in relation to approval of authority requests at the meeting of the Committee on 13 October 2021 and the Congestion Charge Changes Review.

The Chief Finance Officer had approved one Programme and Project Authority request relating to the Digital Safety, Health and Environmental Management Systems.

The Commissioner had approved one Procurement Authority request relating to the Central Line Signalling Life Extension – Signalling Call-Off 003 Detail Design and Installation.

The Chief Finance Officer had also approved five Procurement Authority requests relating to 1973 Piccadilly Line Life Extension Supply of Rubber to Metal Components; Immigration Enforcement's Checking and Advice Service; Extension of District line Wimbledon Branch Track Access Agreement; Fire Maintenance Contract Extension Variation Recommendation; and Thales Establishment Works – Bank Station Capacity Upgrade Signalling Variation.

There were no Mayoral Directions to TfL within the Committee's remit.

The Committee noted the paper.

72/12/21 Investment Programme Report – Quarter 3, 2021/22

Stuart Harvey introduced the report, which updated the Committee on the progress and performance of programmes and projects in Quarter 3, 2021/22.

On safety, there had been seven reports of safety issues during the period. Issues had been reported at the Barking Riverside Extension site and the Docklands Light Railway (DLR) Beckton Depot site. In both instances, the contractor had taken immediate action, demonstrating a good onsite safety culture. TfL was confident that lessons had been learnt. Overall, there was a sustained decrease in the number of injuries on sites. There had been three instances reported in London Underground (LU) and one in Surface Transport. Members noted the good work with Tier 1 contractors on Crossrail. A similar approach was taken across TfL but further conversations would be held with colleagues in Crossrail to see if there was any knowledge to share.

With regard to the Four Lines Modernisation Programme, a new timetable had been introduced for the northern section of the Circle line. Signalling Migration Area SMA05 had been deferred until spring 2022, to ensure that TfL could build on the strong reliability levels seen with the new signalling system. There were significant software challenges and TfL was working in strong collaboration with Thales to ensure the risks were understood and mitigated.

The first trains for the DLR Rolling Stock Programme and Piccadilly Line Upgrade Programme had been manufactured. On the DLR, static testing had commenced two months early. Good progress was being made on sidings and depot upgrades. On the Piccadilly line, some works had been deferred until spring 2025.

Since the opening of the Northern Line Extension (NLE) on 20 September 2021, the NLE had performed well and demand continued to grow. Good progress was being made on snagging and the project was on target to close out in the first quarter of 2022.

Physical works at the Barking Riverside Extension were advancing well and all the track on the viaduct had been laid. The station was at an advanced stage and the rail systems were planned to be commissioned in April 2022, and go live the following autumn.

At Bank station, good progress was being made on the planned blockade in January 2022, to connect the new tunnel to the existing Northern line infrastructure.

Alexandra Batey told the Committee that there were two milestones with a RAG rating of amber relating to the LU Central Line Improvement Programme and the Rotherhithe Tunnel.

Step-free access had been introduced at Osterly station, which became the 89th step-free station. Work continued at Harrow-on-the-Hill and Sudbury Hill stations, which were expected to be complete in early 2022.

Four planned weekend closures to complete track renewal works were successfully delivered on the District, Circle, Northern and Piccadilly lines; 1.1km of renewed track was delivered and the mid-financial year target of 34km had been achieved.

Work progressed on the LU Renewals Programme to deliver targeted renewals of safety and welfare facilities at prioritised locations, which would improve the condition of the facilities and environment for staff. On the Central line, works were also progressing to stabilise the cuttings between Grange Hill and Chigwell, to ensure continued safe running. At Greenwich Power Station upgrade works would continue into 2022/23 to remove obsolescence and improve the long-term reliability of the essential emergency electricity generation plant.

TfL continued with the planned conversion of traditional fluorescent lights to low energy LED lighting, which would improve efficiency and reduce ongoing maintenance costs. A new delivery programme for a further 26 stations and at prioritised train depot locations was planned to be completed during 2022/23.

On the Healthy Streets Programme, the sub-structure work for a new station entrance at Old Street station had been completed and work had started on the above ground super-structure. Work on Cycleway 9 to transform the Hammersmith Gyrotory had started in November 2021, which would install a protected two-way cycle track and cycle specific signals.

Through the Air Quality and Environment Programme, the central Ultra Low Emission Zone (ULEZ) expansion had been successfully delivered on time and under budget. The area now covered by ULEZ is 18 times larger than the central London Low Emission Zone. The migration to a cloud-based platform allowed TfL to deal with significant increases in volumes of data.

The Electric Vehicle Infrastructure strategy was delivered on 15 October 2021, which set out TfL's vision and key principles, captured recent trends and policy changes, forecasted the infrastructure needs to 2030 and set out TfL's role and that of the wider public sector.

Work was underway on the safety and operability of the highest priority assets in the Assets Programme. The schemes included critical tunnels, such as the Rotherhithe and Blackwall tunnels, and structures, such as the A40 Westway, Brent Cross, Croydon Flyover and Gallows Corner. The detailed design for protective security measures at Westminster Bridge had received consent and works began on 15 November 2021.

On the Public Transport Programme, DLR switches and crossovers had been installed at Canary Wharf and Canning Town stations. Over 800m of new rail had been installed, including eight new expansion switches. The third phase of the Reeves Corner embedded track renewal was completed during a 16-day part closure of the tramway in August 2021. Highway resurfacing work in the centre of Croydon and further repair works to the Addiscombe Road bridge were also completed during the possession. The final phase was planned for completion during a nine-day closure in February 2022.

Deployable enforcement cameras continued to be flexibly deployed at road junctions not covered by existing CCTV cameras. More than 4,000 people were killed or

seriously injured in collisions on London's roads, 76 per cent of which happened at junctions. During a trial, the junctions where these cameras were deployed saw at least a 40 per cent improvement in compliance.

Members welcomed the updates to the format of the report. The Committee asked that, where available, the value for money (VfM) calculations be included in future reports and, in instances where a project has been descope, it be shown how that impacted on VfM. Work on the monthly reporting of the Benefit Cost Ratio had already begun in Major Projects and projects in other areas, such as LU and Surface Transport, were being updated when a decision point was reached.

[Action: Stuart Harvey/Alexandra Batey]

It was noted that, for some schemes, the VfM would depend on future population projections. The Investment Delivery Planning team was working closely with City Planning to get updated base scenarios on capacity, passenger demand and growth demand scenarios in London, and would look at modelling assumptions and the impact on VfM.

The Committee noted that there were emerging risks around materials and resources. Specifically, on the Four Lines Modernisation Programme it was difficult to retain resource within TfL and Thales in the current software jobs market.

Members asked what contingency TfL had against inflationary pressures in materials and resource. It was noted that deep dives on the risks were discussed at portfolio boards and in periodic meetings, and several quantitative risk assessments had been carried out, including but not exclusively related to the risks around increased costs seen across the industry. TfL was also looking at opportunities to drive efficiencies.

TfL would focus on prioritisation of investment, to ensure that assets remained safe and in a state of good repair, and seek to proactively renew assets where possible. When prioritising investment, TfL would look at the risks and commitments of projects, followed by a full look at the renewals portfolio and critical works to maintain safety. Work around risks, opportunities and investment prioritisation would be brought to a future meeting.

On HS2, Members asked if TfL was working at risk or was invoicing on a monthly basis. It was noted that all costs were recoverable and TfL had been successful in getting costs covered to date. TfL was reimbursed on a periodic basis and had also agreed payments in relation to the impact of HS2 on the bus network.

A background note on Tottenham Hale station would be circulated to Members in early 2022, to set out how the project was delivered against the original estimated final cost and delivery date. A visit would be scheduled for February 2022.

[Action: Alexandra Batey]

The Committee noted the report and the exempt supplementary information on Part 2 of the agenda.

73/12/21 Independent Investment Programme Advisory Group Quarterly Report

James Norris and Alison Munro introduced the paper and supplementary information on Part 2 of the agenda, which provided an update on the work undertaken by the Independent Investment Programme Advisory Group (IIPAG) since the last meeting of the Committee.

IIPAG had undertaken relatively few reviews in the previous quarter. No new cross cutting or systemic themes had emerged; IIPAG had identified many of the issues and was checking on progress made on previously identified issues, such as the reporting of value for money and asset condition in papers submitted to the Committee.

Work had progressed on cross cutting work, particularly in relation to commercial matters, such as procurement challenges and contract form. The outcomes of this work and the lessons learnt from the Tottenham Hale station project would be reported to the next meeting of the Committee.

The availability of commercial resource, especially given the likelihood of increased commercial activities due to the current working environment, was a recurring issue. IIPAG would follow up on issues around commercial resource as part of its follow up review on the procurement and supply chain transformation.

Stuart Harvey outlined the procurement supply chain improvement initiative, which was designed to get the right leadership of the right resources. It was important that the project management community had commercial awareness, which would limit the exposure of the commercial resource issue.

Challenges around talent attraction and retention was also a recurring theme that teams felt could impact delivery of projects. IIPAG had seen management action on the recommendations that it had made and reprioritisation of resource. The situation was likely to continue and so TfL might need to look at different ways of doing things or reassess what could be delivered. Further information would be included on this approach in future updates on the Capital Efficiencies Plan.

Members stated that it was essential that TfL did all it could to retain key staff and capabilities. The Commissioner noted that, when he was appointed, he set two primary priorities: to lead TfL through the Coronavirus pandemic and to open the Elizabeth line. In order to help TfL through the pandemic, it was essential to rebuild its finances and rebuild its ridership. The Commissioner had since added the need to address capability and morale of TfL as a third requirement. To that end, he recorded fortnightly update messages to TfL staff and had recently published a vision and values document, which was developed from the bottom up, to address long standing grips and create a compelling vision for TfL.

With regard to talent retention, efforts to address talent leaving TfL had been misinterpreted as 'bonuses'. It was noted that some key TfL staff had been subject to a pay freeze for at least five years, were subject to high levels of pressure and, for some, did not have complete certainty on their tenure. As such, it was proposed that performance awards should still be earnable but deferred until TfL was in a position of self-sustainability (i.e. not in receipt of government funding for operational costs),

and only payable if colleagues stayed with TfL until that time. Rather than a bonus, it was more accurate to describe performance awards as a 'retention mechanism'. Ben Story said that the Remuneration Committee had reviewed the process and agreed that it was thorough and transparent and was the minimum that TfL should be doing to retain key staff.

The Committee noted the paper and the exempt supplementary information on Part 2 of the agenda.

74/12/21 TfL Project Assurance Update

James Norris introduced the paper, which provided an update on the project assurance work undertaken between 19 September and 8 November 2021.

Two programme reviews were undertaken during this period, with the Independent Investment Programme Advisory Group (IIPAG) involved in both. In the same timeframe five project assurance reviews were undertaken, with IIPAG involved in two of these.

Twenty-seven recommendations had been made, of which four were considered to be critical issues. There were three overdue critical issues relating to: GDPR cost estimates, which was expected to be closed in early 2022; Barking Riverside Extension commercial resource availability, which was expected to close shortly; and on the Central line signalling business case, which was expected to close out by early 2022 following resource being made available.

There were 44 overdue recommendations made by Project Assurance. This figure was fairly static and it was recognised that additional focus was needed.

Members asked that overdue recommendations be grouped by quarter, to give a greater sense of whether certain recommendations were taking longer to close out.

[Action: James Norris]

The Committee noted the paper and the exempt supplementary information on Part 2 of the agenda.

75/12/21 Barking Riverside Extension

Stuart Harvey introduced the paper, which provided an update on the progress for the Barking Riverside Extension project following the post-coronavirus Safe Stop and confirmation of revised Network Rail possession plans. The project had also completed the viaduct structure and an agreed strategy of construction responsibilities to complete the project.

The project would deliver a 4.5km extension of the London Overground to the Barking Riverside housing development, which had planning permission for up to 10,800 new homes.

There had been some issues previously, relating to the Coronavirus pandemic, design coordination issues and unforeseen ground conditions, but the project was now making good progress. The product was of a high quality and TfL was looking to finish the project as soon as possible.

The estimated final cost (EFC) was slightly above the approved Programme and Project Authority (PPA), largely because Authority was previously sought at the lowest possible ask. The project team would seek further efficiencies to bring the EFC back in line with PPA but a small amount of Finance Authority and Procurement Authority would be required.

The Chair, following consultation with Members, noted the paper and the exempt supplementary information contained in the paper on Part 2 of the agenda, and:

- 1 approved unbudgeted Financial Authority of an additional £0.9m for the Barking Riverside Extension project;**
- 2 approved additional Procurement Authority for the Main Works Contract of the amount set out in the paper on Part 2 of the agenda; and**
- 3 noted that the matters for which Authorities are sought include commitments that extend beyond the period of the Business Plan and Budget approved by TfL Board on 28 July 2021 and provision will need to be made in future business plans and budgets.**

76/12/21 London Underground Fleet Heavy Overhaul, Fleet and Engineering Vehicles Programmes

Alexandra Batey introduced the paper, which provided an update on the Fleet Heavy Overhauls (FHO), Asset Performance & Capital Delivery (APCD) Fleet and Engineering Vehicles (EV) Programmes.

The three elements combined was one of the most significant programmes. The FHO Programme delivered essential, large scale maintenance of the passenger train fleets and rail adhesion trains as part of the train maintenance regime, to preserve a safe and reliable service. The APCD Fleet Programme delivered projects that renewed life expired or degraded components on passenger trains beyond the scope of FHO, or reconfigure trains to comply with legislation. The EV Programme delivered projects related to the EV fleet that served and supported the track renewal programme.

Most of the activity within the programmes were mandatory, to maintain asset condition, and were prioritised on a safety critical basis. The activity also aligned with the do minimum scenario in the Long Term Capital Plan.

Bruno Carr told the Committee that the metric for asset condition was not purely state of good repair but also looked at the performance and condition of the asset. On the whole, the older the asset the worse it performed.

The Central line was a notable exception, as it performed poorly for its age than might be expected, as a result of being one of the first generation of computer controlled trains and more susceptible to mechanical failure.

A permanent fix was being designed and developed to address the fatigue cracking that had been identified in 2019 and had temporarily caused a full fleet stoppage.

The works identified in the paper were essential to prolonging the life of the fleets and delayed the need for replacements. There would likely be some performance issues over time but these could be proactively managed.

Additional authority sought for the EV Programme would allow TfL to operate more efficiently on its track programme and reduce costs.

Alison Munro noted that good progress had been made in the reporting of asset condition and against the recommendations made in the last Independent Investment Programme Advisory Group review, but there was an issue around the availability of resource.

The Chair, following consultation with Members, noted the paper and:

- 1 approved additional Programme and Project Authority of £14.72m (outturn including risk) to progress mandatory overhaul works within the Fleet Heavy Overhaul (FHO) Programme. This was the minimum additional authority required to continue this multi-year, in-flight essential maintenance programme and brought the total FHO Programme and Project Authority to £360.95m;**
- 2 approved additional Programme and Project Authority of £8.72m (outturn including risk) for Central line train improvements and progress rectification of the underframe fatigue cracking issue on the Jubilee line fleet within the Fleet Programme, bringing the total Programme and Project Authority to £634.59m; and**
- 3 approved additional Programme and Project Authority of £11.11m (outturn including risk) to design a replacement fleet of locomotives, enhance the Mechanical Renewals Vehicle prototype into an on-track machine, and continue the Engineering Vehicles overhauls within the Engineering Vehicles Programme, bringing the total Programme and Project Authority to £86.76m.**

77/12/21 London Underground Railway Systems Enhancements Programme

Stuart Harvey introduced the paper, which provided an update for the Committee on progress with delivery of the London Underground (LU) Railway Systems Enhancements (RSE) Programme and sought a reduction in Programme and Project Authority.

The Programme sought to exploit new technology on the Jubilee, Victoria and Central lines to enable improvements in capacity, through the new signalling systems.

In 2017, 36 trains per hour (tph) peak service capability on the Victoria line was delivered and, in 2018, 30tph peak services on the Jubilee line was delivered between Willesden and North Greenwich. The new working timetable would also deliver 31tph on the northern branch of the Northern line. Improvements had been made to the rolling stock maintenance facilities to enable the trains to perform with higher frequency of service.

The paper proposed to remove the requirement for the Jubilee line optimisation (JLO) to deliver 32tph between West Hampstead and North Greenwich stations in the peak periods, and to remove an enhancement scheme originally included as part of the Northern line capacity optimisation to provide a new 'scissors' crossover at East Finchley.

Alexandra Batey noted that the scope for the programme had been analysed and it had been determined that including certain elements of the scope did not represent good value for money.

Robert Niven shared that there was a business case for the JLO, pre-Coronavirus pandemic, and was financially positive (i.e. would generate more in fare revenue than it would cost to deliver). At current ridership levels, the JLO still had a good benefit:cost ratio and business case but was financially negative.

The work on the projects that had been removed from the programme would be carefully archived. It was not possible to determine when the projects might be reintroduced, as it depended on how much demand there was post-Coronavirus pandemic; the most optimistic scenario suggested that demand would return to near normal levels in five years.

The Chair, following consultation with Members, noted the paper and approved a reduction in Programme and Project Authority of £73.8m for the Railway Systems Enhancements Programme, giving a total revised Programme and Project Authority of £171.3m.

78/12/21 London Underground Lifts and Escalators Renewals Programme

Alexandra Batey introduced the report, which provided an update on the London Underground (LU) Lifts and Escalators Renewals Programme and to request authority for essential renewals to existing Secondary Means of Vertical Transport lift assets providing step-free access. The assets had shown a decline in state of good repair and availability, and renewals were essential to maintaining asset conditions. Proposed renewals were aligned with the do minimum scenarios in the Long Term Capital Plan.

Bruno Carr noted that the assets were essential to TfL's accessibility commitments; failure of assets were not just inconvenience but, for those who required step-free access, was the difference between making a journey or not.

The works, which involved nine replacement and 36 smaller interventions, would require whole life contracts with the manufacturer to ensure full availability. The target was for 99 per cent availability because of the essential nature of the assets. Subject to the approval of authorities, asset availability would likely only reach 98 per cent. The programme was being reviewed to see what options were available to recover the shortfall, depending on funding.

The Chair, following consultation with Members, noted the paper and the exempt supplementary information contained in the paper on Part 2 of the agenda, and:

- 1 approved additional Programme and Project Authority of £19.11m for the London Underground Lifts and Escalator Programme, bringing the total Programme and Project Authority to £904.24m, comprising:**
 - (a) £14.51m to complete the replacement of nine life expired Secondary Means of Vertical Transport lift assets for design in 2022 and delivery between 2023 and 2024; and**
 - (b) £4.60m to carry out the necessary capital whole life maintenance interventions on the nine new lift assets in (a) above and a further 36 existing lift assets until 2034;**
- 2 approved additional Procurement Authority in the sum requested in the paper on Part 2 of the agenda to carry out the works identified in 1 above; and**
- 3 noted that the matters for which Authorities are sought include commitments that extend beyond the period of the Business Plan and Budget approved by Board on 28 July 2021 and provision will need to be made in future Business Plans and Budgets.**

79/12/21 Members' Suggestions for Future Discussion Items

Howard Carter introduced the current forward plan for the Committee.

The Committee noted the paper.

80/12/21 Any Other Business the Chair Considers Urgent

Following approval by the Board of the revised membership of Committees and Panels, Professor Greg Clark CBE (Chair) and Dr Nina Skorupska CBE would leave the Committee. Ben Story would take over as Chair of the Committee from 1 January 2022. Meetings would be arranged with Committee Members and key staff in the new year.

The Chair thanked Committee Members for their diligent and constructive work. On behalf of the Committee, the Chair thanked TfL staff, the Independent Investment Programme Advisory Group and the Secretariat.

On behalf of TfL, the Commissioner thanked Professor Greg Clark CBE and Dr Nina Skorupska CBE for their contributions to the Committee. The Commissioner thanked the Chair for his immaculate chairing of meetings and for the support shown to TfL colleagues.

81/12/21 Date of Next Meeting

The next scheduled meeting was due to be held on Wednesday 2 March 2022 at 10.00am.

82/12/21 Exclusion of the Press and Public

The Chair, following consultation with the Committee, agreed to exclude the press and public from the meeting, in accordance with paragraphs 3 and 5 of Schedule 12A to the Local Government Act 1972 (as amended), when it considered the exempt information in relation to the items on: Investment Programme Report – Quarter 3, 2021/22; Independent Investment Programme Advisory Group Quarterly Report; TfL Project Assurance Update; Barking Riverside Extension; and London Underground Lifts and Escalators Renewals Programme.

The meeting closed at 12.30pm.

Chair: _____

Date: _____

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Programmes and Investment Committee



Date: 2 March 2022

Item: Matters Arising and Actions List

This paper will be considered in public

1 Summary

1.1 This paper informs the Committee of progress against actions agreed at previous meetings.

2 Recommendation

2.1 **The Committee is asked to note the Actions List.**

List of appendices to this report:

Appendix 1: Actions List

List of Background Papers:

Minutes of previous meetings of the Programmes and Investment Committee.

Contact Officer: Howard Carter, General Counsel
Email: HowardCarter@tfl.gov.uk

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Programmes and Investment Committee Action List (reported to the meeting on 15 December 2021)

Actions from the meeting of the Programmes and Investment Committee held on 15 December 2021

Minute No.	Description	Action By	Target Date	Status note
72/12/21 (1)	<p>Investment Programme Report – Quarter 3, 2021/22: Value for money and Benefit-Cost Ratios</p> <p>The Committee asked that, where available, the value for money (VfM) calculations be included in future reports and, in instances where a project has been descoped, it be shown how that increased the VfM [and how the Benefit Cost Ratio has changed].</p>	Stuart Harvey / Alexandra Batey	Ongoing	Work is ongoing; the IPR report will continue to be refined as and when data is available.
72/12/21 (2)	<p>Investment Programme Report – Quarter 3, 2021/22: Tottenham Hale station</p> <p>A background note on Tottenham Hale station would be circulated to Members in early 2022, to set out how the project was delivered against the original estimated final cost and delivery date. A visit would be scheduled for February 2022.</p>	Alexandra Batey	March 2022	A note will be provided, with the offer of a site visit if requested.
74/12/21	<p>TfL Project Assurance Update: overdue recommendations</p> <p>Members asked that overdue recommendations be grouped by quarter, to give a greater sense of whether certain recommendations were taking longer to close out.</p>	James Norris	March 2022	Complete. This has been included in the meeting papers.

Actions from previous meetings of the Committee

Minute No.	Description	Action By	Target Date	Status note
56/10/21	<p>Independent Investment Programme Advisory Group Quarterly Report: Asset data</p> <p>Having a good knowledge of the SOGR was particularly important in relation to funding discussions. Members asked for a briefing on how TfL captured and used asset data.</p>	Andy Lord	February 2022	Complete. This is addressed in the Asset Renewals paper on the agenda.
58/10/21	<p>Silvertown Tunnel: Traffic modelling</p> <p>Traffic remodelling would be re-run in 2022. The results from which would indicate how different sets of charges achieved different outcomes, in terms of both overall traffic level and what proportion of the traffic was made up of different vehicles.</p>	David Rowe	2022	A briefing will be arranged once modelling work has been completed.
64/12/20	<p>IIPAG Quarterly Report: gateway and performance review functions</p> <p>Members requested information on how the gateway and performance review functions worked and best practice and the principles that guided this, including the work done to embed value for money within TfL.</p>	Stuart Harvey / Alexandra Batey	2022	A paper will be provided to coincide with IIPAG's updated report to a future meeting of the Committee.
72/12/20	<p>Healthy Streets Programme, H2 2020/21: monitoring</p> <p>Further monitoring results were expected to be available in the next 12-18 months. Members asked that longer term assessment of the impacts of the Programme be conducted, with the results shared with the Committee, when available.</p>	Alexandra Batey	Ongoing 2022	Updates on monitoring were provided in the Chair's Action paper to the Committee on 19 April 2021 and the paper on the Forward Plan. The long-term assessment will be included in the annual Health Streets update.

Programmes and Investment Committee



Date: 2 March 2022

Title: Use of Delegated Authority

This paper will be considered in public

1 Summary

- 1.1 This is a standing item on the agenda to inform the Committee of any use of delegated authority by the Committee, through Chair's Action, or of Procurement Authority and Programme and Project Authority (in respect of matters within the Committee's remit) granted by the Commissioner and the Chief Finance Officer in accordance with delegated authorities under TfL's Standing Orders since the last meeting of the Committee. The paper also provides information on Mayoral Directions to TfL within the Committee's remit.
- 1.2 Since the last meeting of the Committee, on 15 December 2021, there have been:
- (a) no uses of specific authority delegated by the Board;
 - (b) two uses of Chair's Action in relation to the approval of authority requests submitted to the meeting of the Committee on 15 December 2021 and the Elephant and Castle Station Capacity Upgrade project;
 - (c) no approval of Project and Procurement Authority by the Chief Finance Officer;
 - (d) one approval of Procurement Authority by the Commissioner, relating to Cycle Hire – Bike Maintenance and Supply Contract Extension;
 - (e) four approvals of Procurement Authority by the Chief Finance Officer, relating to: Stops and Shelters, Advertising Shelters Assets – Advertising Panel LED Replacement; Lot 1 of Media Planning and Buying Services from Wavemaker; Maintenance of Platform Edge Doors (PED) on the Jubilee line with Knorr-Bremse Rail Systems (UK) Limited; and Jubilee line Heavy Overhaul Programme Lifts Components – Alstom and the Overhaul of Jubilee line – Line Contactors; and
 - (f) no Mayoral Directions within the Committee's remit.
- 1.3 A similar report is submitted to the Finance Committee in respect of the use of Chair's Action and of Procurement Authority and Land Authority granted by the Commissioner and the Chief Finance Officer in respect of matters within the Finance Committee's remit, together with relevant Mayoral Directions.

2 Recommendation

2.1 The Committee is asked to note the paper.

3 Use of authority delegated by the Board

3.1 There have been no uses of authority delegated by the Board since the last meeting of the Committee.

4 Use of Chair's Action

4.1 Under Standing Order 113, in situations of urgency, the Board delegates to each of the Chair and the Chairs of any Committee or Panel the exercise of any functions of TfL on its behalf, including the appointment of Members to Committees and Panels. Any use of Chair's Action is reported to the next ordinary meeting.

4.2 There have been two uses of Chair's Action since the last meeting of the Committee:

Approval of Authority Requests at the Meeting of the Committee on 15 December 2021

4.3 Owing to changes in Government guidance to manage the coronavirus pandemic, Members of the Committee were not able to meet in person. The meeting was held entirely on Microsoft Teams, following which the Chair exercised Chair's Action to approve the recommendations in the papers, as published on the TfL website. The minutes of the meeting are elsewhere on the agenda.

Elephant and Castle Station Capacity Upgrade project

4.4 On 16 December 2021, the Committee was sent a paper that provided an update on the Elephant and Castle Station Capacity Upgrade project, which sought the use of Chair's Action to approve related authority requests. The use of Chair's Action was considered appropriate as the proposed Development Agreement had to be in place for the station project to commence in line with the wider development which formed part of the Elephant and Castle regeneration programme.

4.5 On 17 December 2021, the Chair of the Committee, following consultation with Members, approved additional Financial Authority for the project and approved TfL and London Underground entering into a Development Agreement relating to the design and construction of a new subterranean station box and associated interfaces at Elephant and Castle. He also granted Land Authority to enter into the land transactions pursuant to the Development Agreement. The paper has been published on the [TfL website](#) but the appendix remains exempt from publication.

5 Programme and Project Authority Approvals

- 5.1 To enable an appropriate level of governance, processes are in place for the authorisation, control and reporting of projects.
- 5.2 Programme and Project Authority will normally be granted by the Committee for all programmes and projects as part of the defined Programmes within the overall Investment Programme. Where individual programmes or projects have a value in excess of £50m and have not already received full approval as part of a Programme, requests will be submitted to the Committee for consideration. Those programmes and projects with an estimated final cost of £50m or below, which have been approved by the Commissioner or the Chief Finance Officer, will be reported to subsequent meetings of the Committee.
- 5.3 Where the main contract has not yet been awarded, the Financial Authority and Estimated Final Cost may not be stated because they are commercially confidential.

Approvals by the Commissioner

- 5.4 Since the last meeting of the Committee, the Commissioner has not approved any Programme and Project Authority requests within the Committee's remit.

Approvals by the Chief Finance Officer

- 5.5 Since the last meeting of the Committee, the Chief Finance Officer has not approved any Programme and Project Authority requests within the Committee's remit

6 Procurement Approvals

Approvals by the Commissioner

- 6.1 Since the last meeting of the Committee, the Commissioner has approved one Procurement Authority request in respect of matters within the Committee's remit, relating to the Cycle Hire – Bike Maintenance and Supply Contract Extension.

Approvals by the Chief Finance Officer

- 6.2 Since the last meeting of the Committee, the Chief Finance Officer has approved four Procurement Authority requests in respect of matters within the Committee's remit. These related to: Stops and Shelters, Advertising Shelters Assets – Advertising Panel LED Replacement; Lot 1 of Media Planning and Buying Services from Wavemaker; Maintenance of Platform Edge Doors on the Jubilee line with Knorr-Bremse Rail Systems (UK) Limited; and Jubilee line Heavy Overhaul Programme Lifts Components – Alstom and the Overhaul of Jubilee line – Line Contactors.

7 Mayoral Directions to TfL

- 7.1 The Greater London Authority Act 1999 (as amended), permits the Mayor to issue to TfL general directions as to the manner in which TfL is to exercise its functions or specific directions as to the exercise of its functions (or not to exercise a power

specified in the direction). Directions are also often made in relation to the implementation of matters in respect of which the Mayor delegates statutory powers to TfL.

- 7.2 The Mayor makes Mayoral Directions through Mayoral Decisions. Papers for Mayoral Directions set out the financial and other implications. If those implications change over time, that will be reported to the Greater London Authority (GLA).
- 7.3 All Mayoral Decisions are issued in writing, with the information that is not exempt from publication included on the GLA's Decisions Database on its website: <https://www.london.gov.uk/about-us/governance-and-spending/good-governance/decisions?order=DESC>.
- 7.4 Mayoral Directions fall into three broad categories: those addressing technical issues relating to statutory powers; those related to commercial development activities; and those related to projects and programmes. Mayoral Directions relating to TfL are reported to the Board's Committees for discussion as soon as possible after they are received by TfL or published. Regular reports will list the relevant Directions for as long as they are applicable.
- 7.5 Annually the Audit and Assurance Committee considers the list as part of its consideration of the annual audit plan to ensure that appropriate audit resource is applied to assurance on TfL's work in implementing Mayoral Directions. This will also be kept under review at each quarterly meeting of that Committee.
- 7.6 A summary of current Mayoral Directions to TfL is maintained on the [How we are governed](#) page on our website, with links to the relevant Mayoral Decisions. That page will be updated as and when further Directions are made.
- 7.7 Mayoral Directions to TfL related to projects and programmes are reported to this Committee. There have been no Mayoral Directions to TfL within the Committee's remit since the last meeting.

List of appendices to this report:

None

List of Background Papers:

None

Contact Officer: Howard Carter, General Counsel
Email: HowardCarter@TfL.gov.uk

Programmes and Investment Committee



Date: 2 March 2022

Item: Investment Programme Report – Periods 8, 9 and 10, 2021/22

This paper will be considered in public

1 Summary

- 1.1 The Investment Programme Report describes the progress and performance in Quarter 4, 2021/22 of a range of projects that will deliver world-class transport services to London.
- 1.2 A paper is included on Part 2 of the agenda which contains exempt supplementary information. The information is exempt by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

2 Recommendation

- 2.1 **The Committee is asked to note the report and the exempt supplementary information on Part 2 of the agenda.**

List of appendices to this report:

Appendix 1: Investment Programme Report Periods 8, 9 and 10, 2021/22

Exempt supplemental information is contained in a paper on Part 2 of the agenda

List of Background Papers:

None

Contact Officers: Gareth Powell, Chief Customer and Strategy Officer
Email: GarethPowell@tfl.gov.uk

Contact Officers: Andy Lord, Chief Operating Officer
Email: AndyLord@tfl.gov.uk

Contact Officers: Stuart Harvey, Chief Capital Officer
Email: StuartHarvey@tfl.gov.uk

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Investment programme report

17 October 2021 – 8 January 2022

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Introduction

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



Purpose and scope

Purpose

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

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

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

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

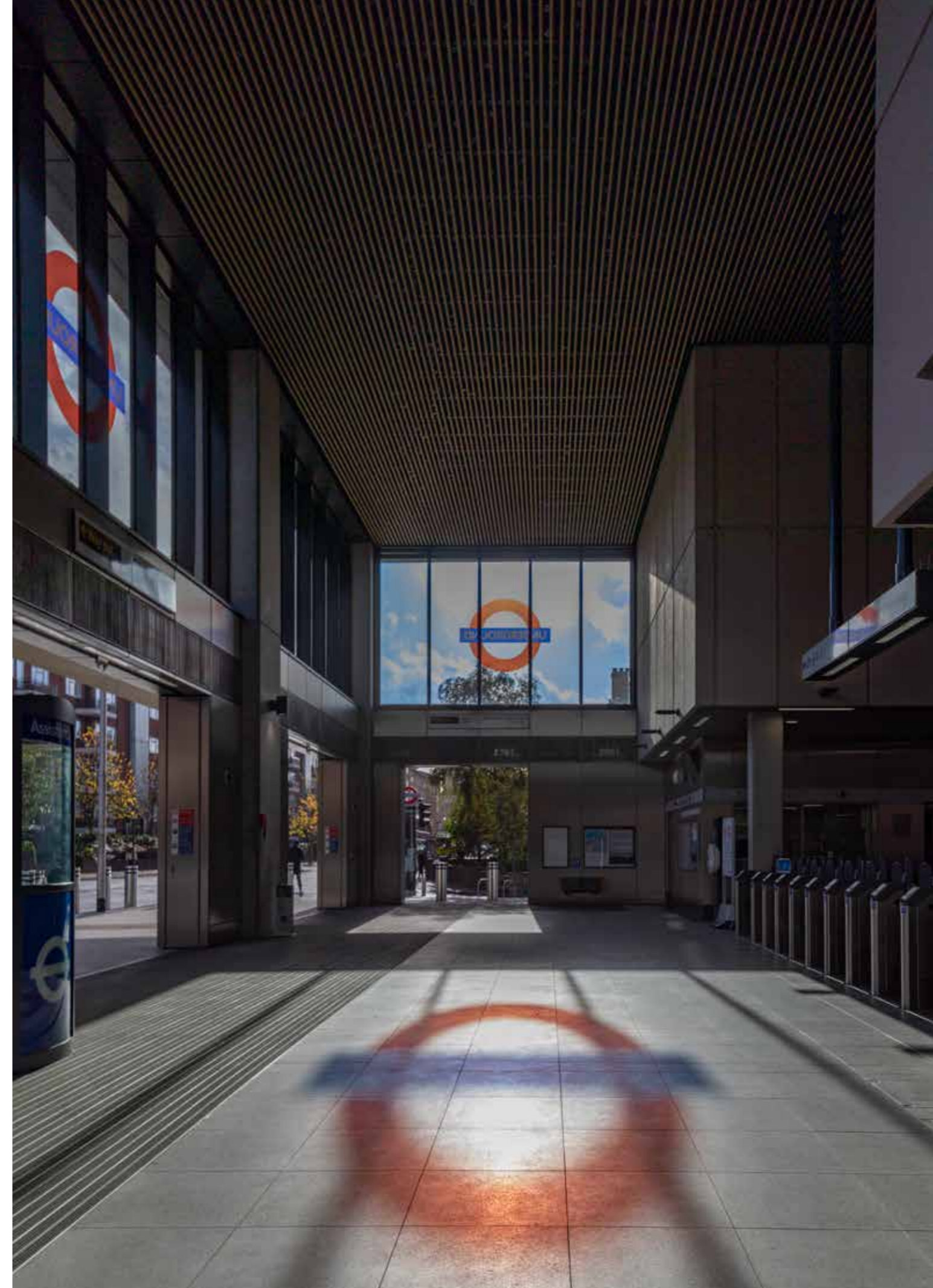
Scope

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

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

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

Some financial information is commercially sensitive and is redacted.



Our network can help support London's growth and recovery



Investment programme delivery structure

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

Major projects

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

London Underground

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

Surface transport

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

Professional services

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

Our performance

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



Safety performance

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

Capital delivery

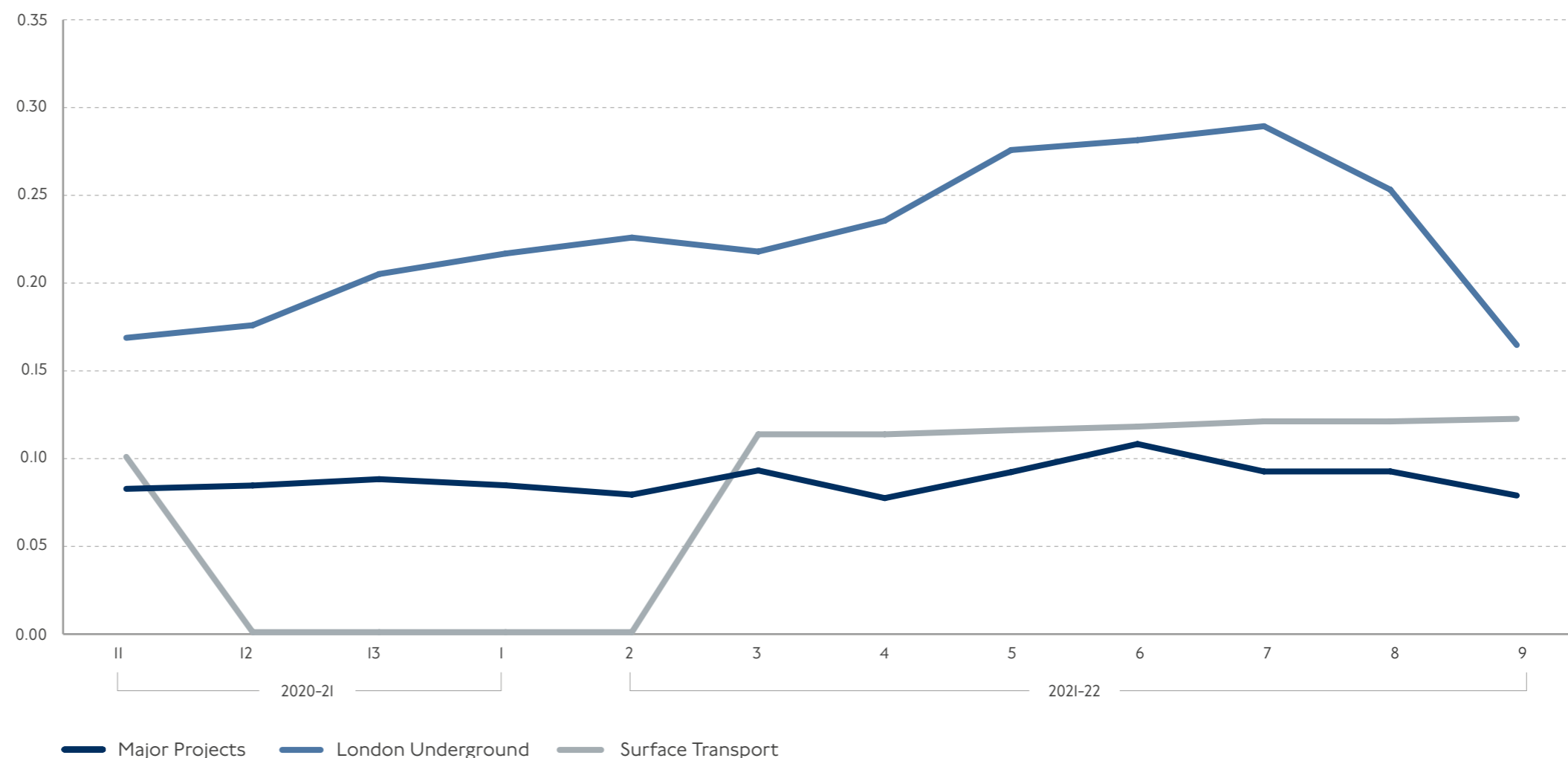
In line with our organisational structure, data reported in this section covers our Major Projects Directorate, Surface transport project and programme delivery and London Underground renewals and enhancements. Data from other areas where construction and maintenance work is done is reported separately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

Quarterly performance

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

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

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

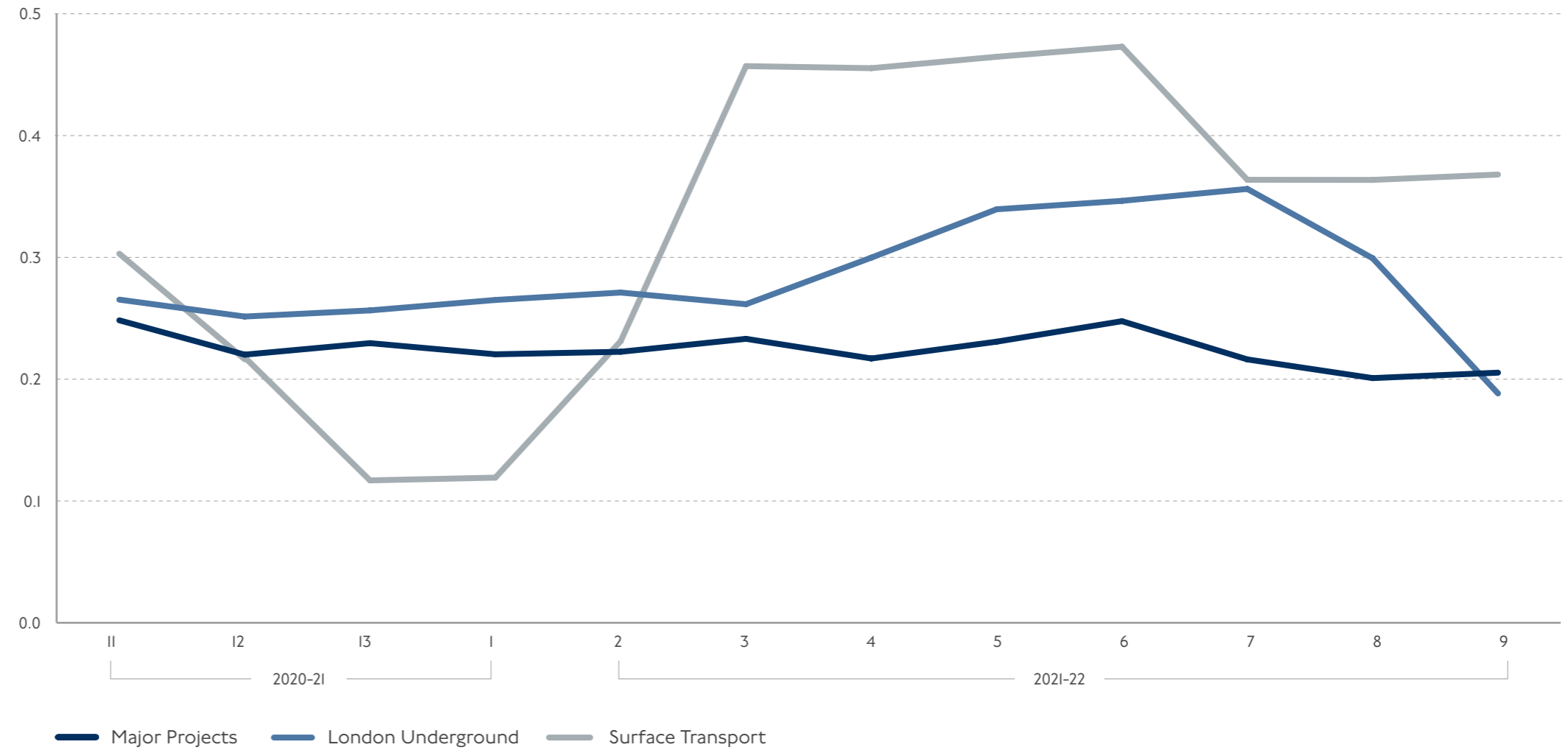


The significant reduction in RIDDOR reportable accidents is an improvement on previous quarters and also an improvement on last year's performance, where there were eight RIDDOR reportable accidents across our capital delivery teams. One highlight was the four million hours worked on the Four Lines Modernisation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

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

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

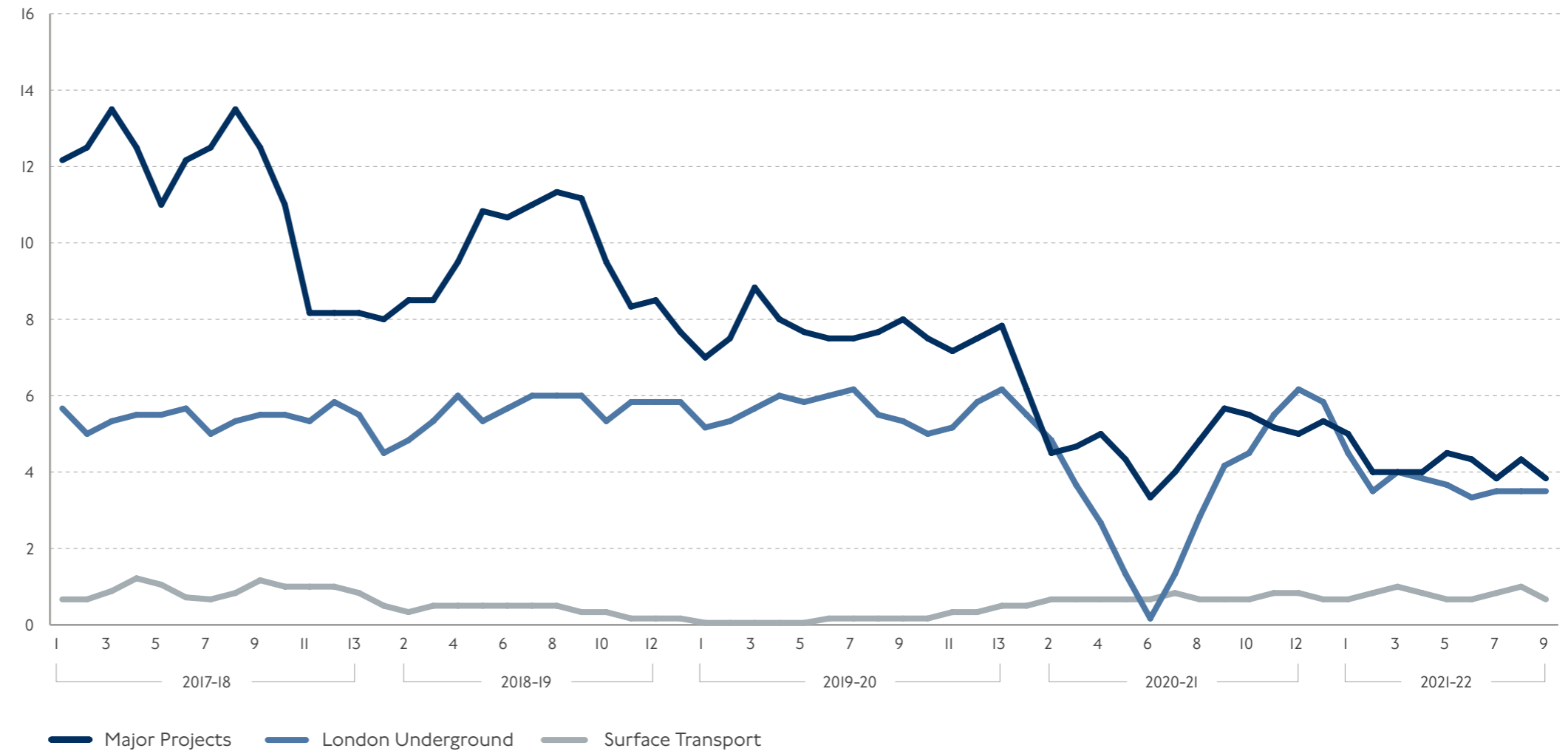
Lost time injury frequency rate
(per 100,000 hours worked)



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

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

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



Schedule performance

We have achieved a number of significant milestones throughout the year

Northern Line Extension

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

Piccadilly line upgrade

We have begun assembly of the new passenger trains.

DLR rolling stock replacement programme

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

Barking Riverside Extension

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

Four Lines Modernisation

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

London Underground

We have developed a decarbonisation strategy.

London Underground asset performance

We have completed the Victoria line train overhaul programme.

London Underground asset renewals

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

Surface technology

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

Surface assets

Construction work has started on site at the A40 Westway.

Surface air quality

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

Surface Healthy Streets

We have opened the station entrance on Cowper Street.

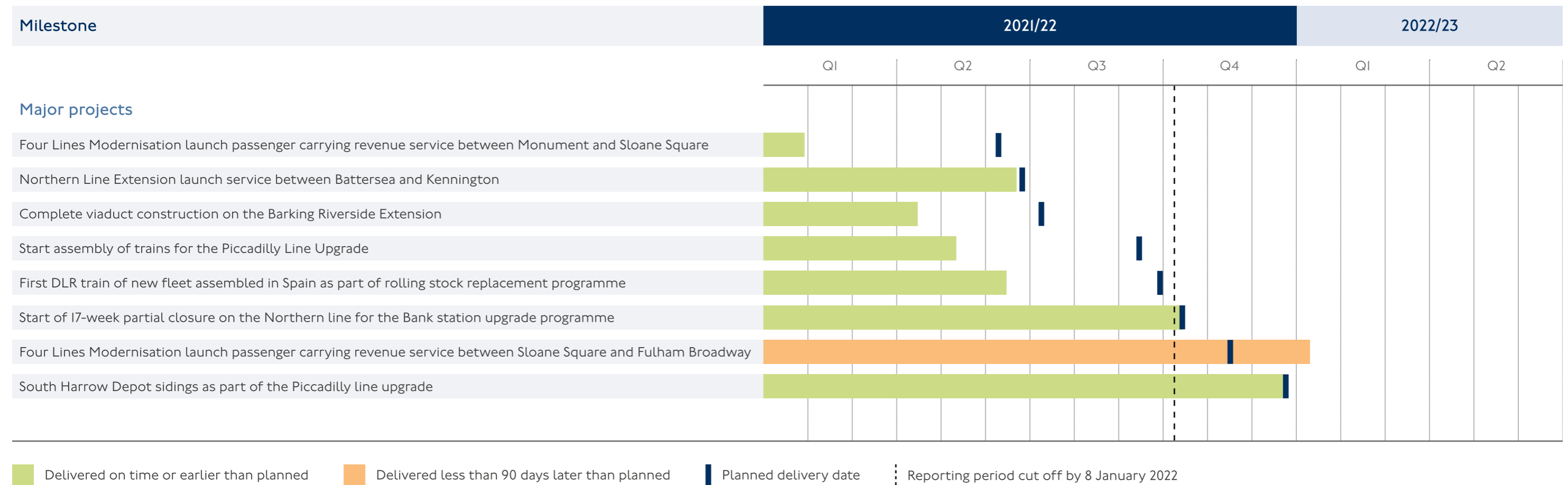


BATTERSEA POWER STATION

Strategic milestones

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

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



Strategic milestones 2021/22 (continued)



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

* Signed off by TfL Commissioner

Milestones forecast to be late

Rotherhithe Tunnel

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

Four Lines Modernisation

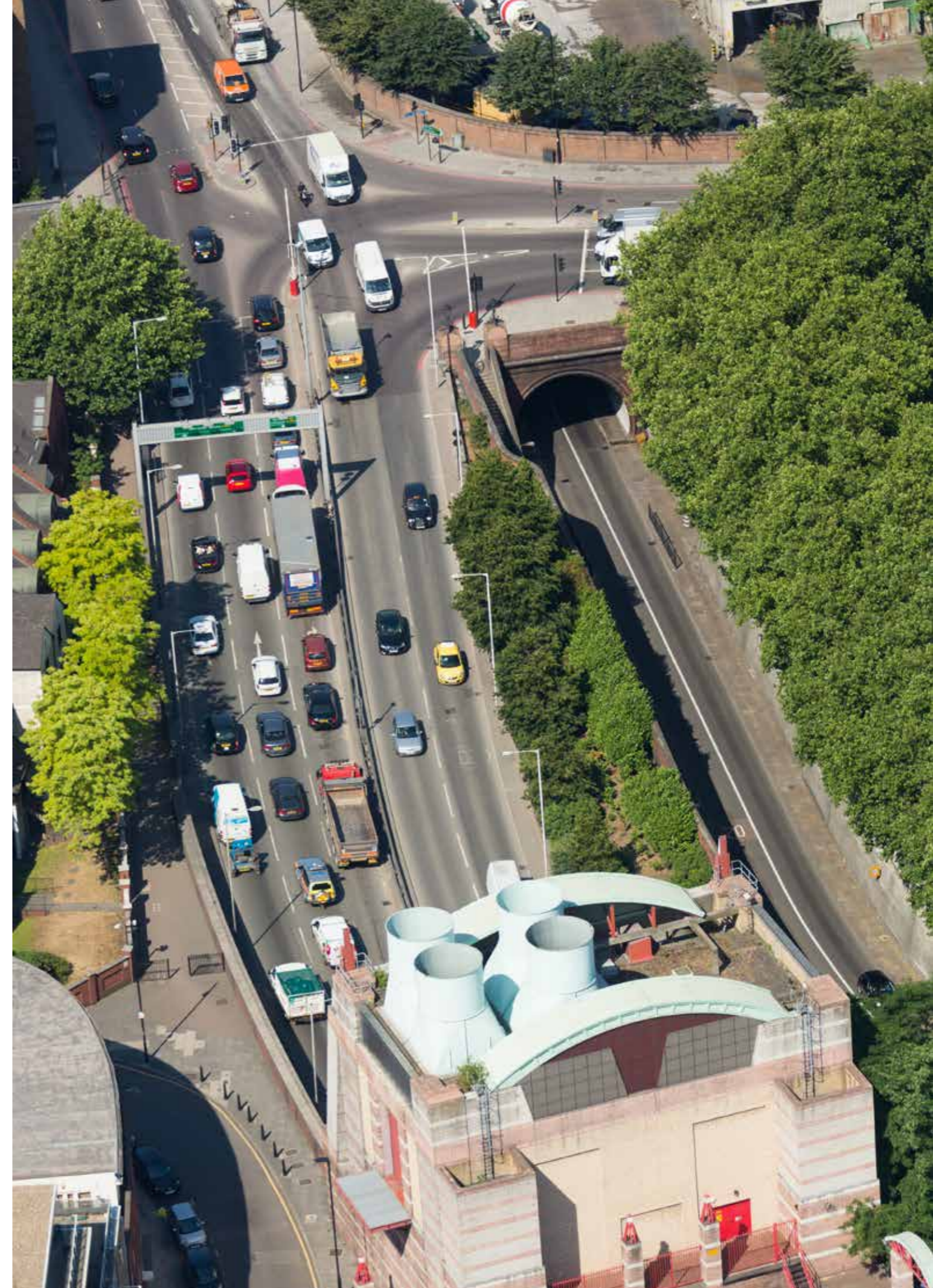
The milestone for signal migration area 5 is forecast to be 49 days later than planned. This is owing to ongoing software issues, which are being reviewed, and to incorporate all functionality for the safety and reliability of the migration area.

London Underground escalators

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

Central Line Improvement Programme

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



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

Major projects

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



On-network stations improvement programme

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

Programme update

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

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

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

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



We are refurbishing 22 of our Elizabeth line surface stations

Elizabeth line

Rolling stock

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

Programme update

Class 345 trains

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

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

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

Challenges

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



We are running trial operations of our Class 345 trains

Crossrail

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

Programme update

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

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

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

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

The railway is generally performing well following the completion of tunnel ventilation system works and commissioning of ELR110 signalling software. The central section is running at 12 trains per hour, which is the initial level of service on the Elizabeth line, with the new signalling software to test reliability and build mileage.

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



Nine central stations have been transferred to us from Crossrail

Four Lines Modernisation

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

Financial commentary

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

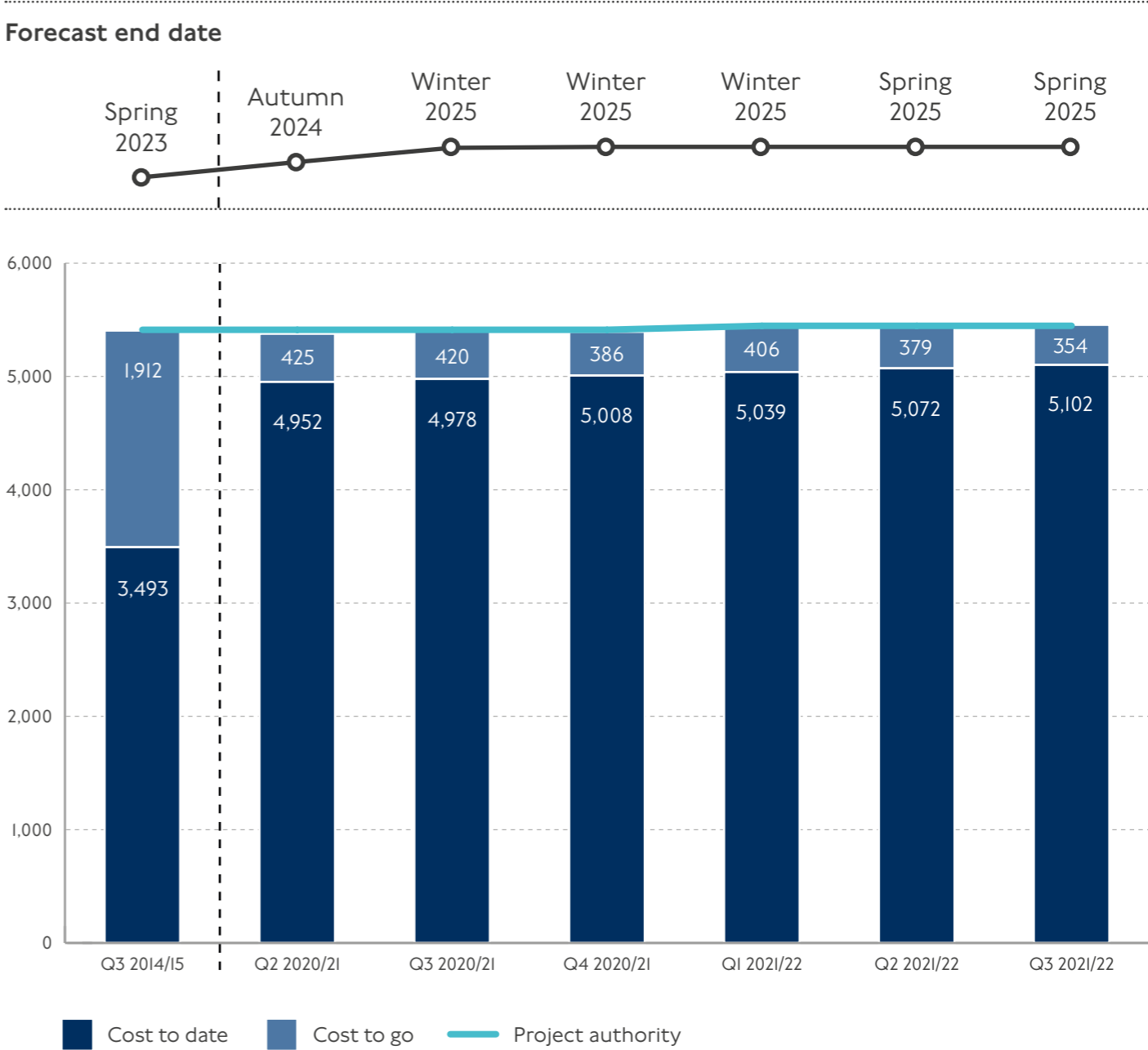
As part of the review, the software programme has been extensively analysed with our signalling contractor, Thales. This has focused on understanding the risks and the granular metrics, which are essential to improve performance. This review has been fed into the latest programme to help ensure it is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

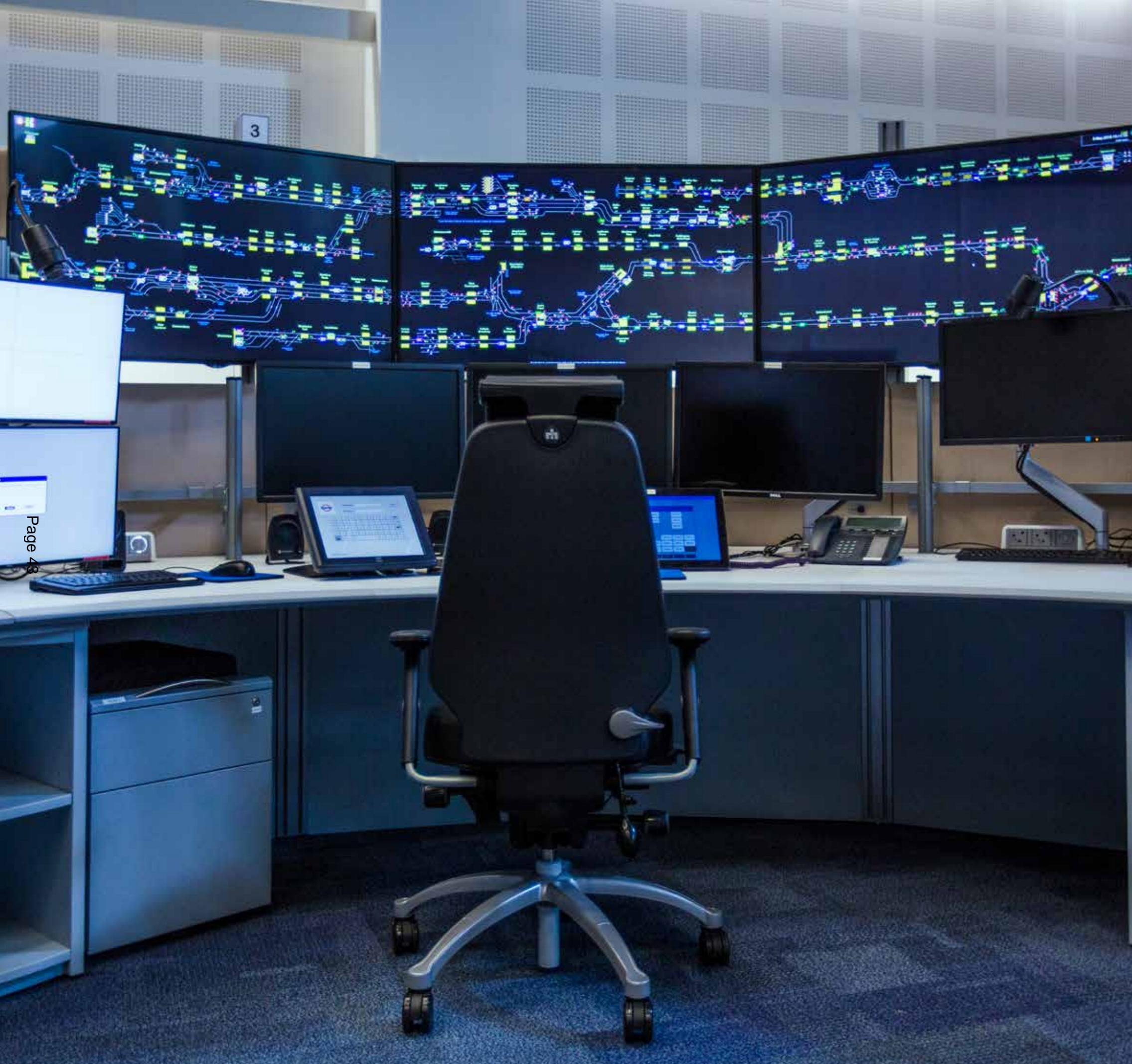
Performance over time

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

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

Estimated financial cost performance over time (£m)





Programme update

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

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

Line upgrades

DLR rolling stock and systems integration

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

Financial Commentary

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

Performance over time

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

Programme update

Rolling stock delivery

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

Beckton Depot and network infrastructure

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

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

Housing Infrastructure Funding

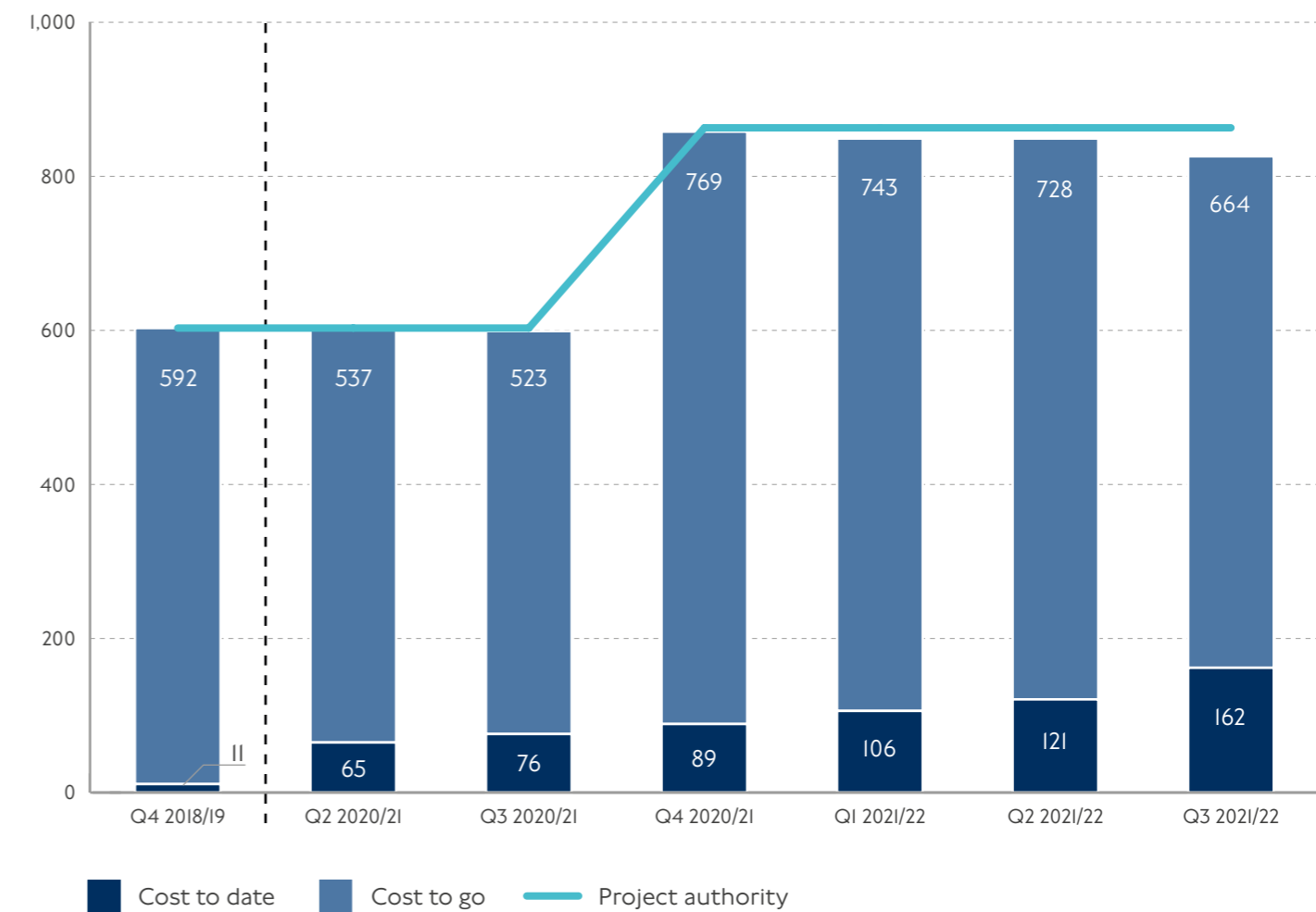
We have exchanged contracts for the acquisition of land at Beckton next to the depot, which is needed for the construction of the additional sidings funded by the Housing Infrastructure Fund. The date for completion is 28 February 2022.

Northern sidings works

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

Estimated financial cost performance over time (£m)

Forecast end date



Line upgrades

Piccadilly line upgrade

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

Financial commentary

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

Performance over time

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

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

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

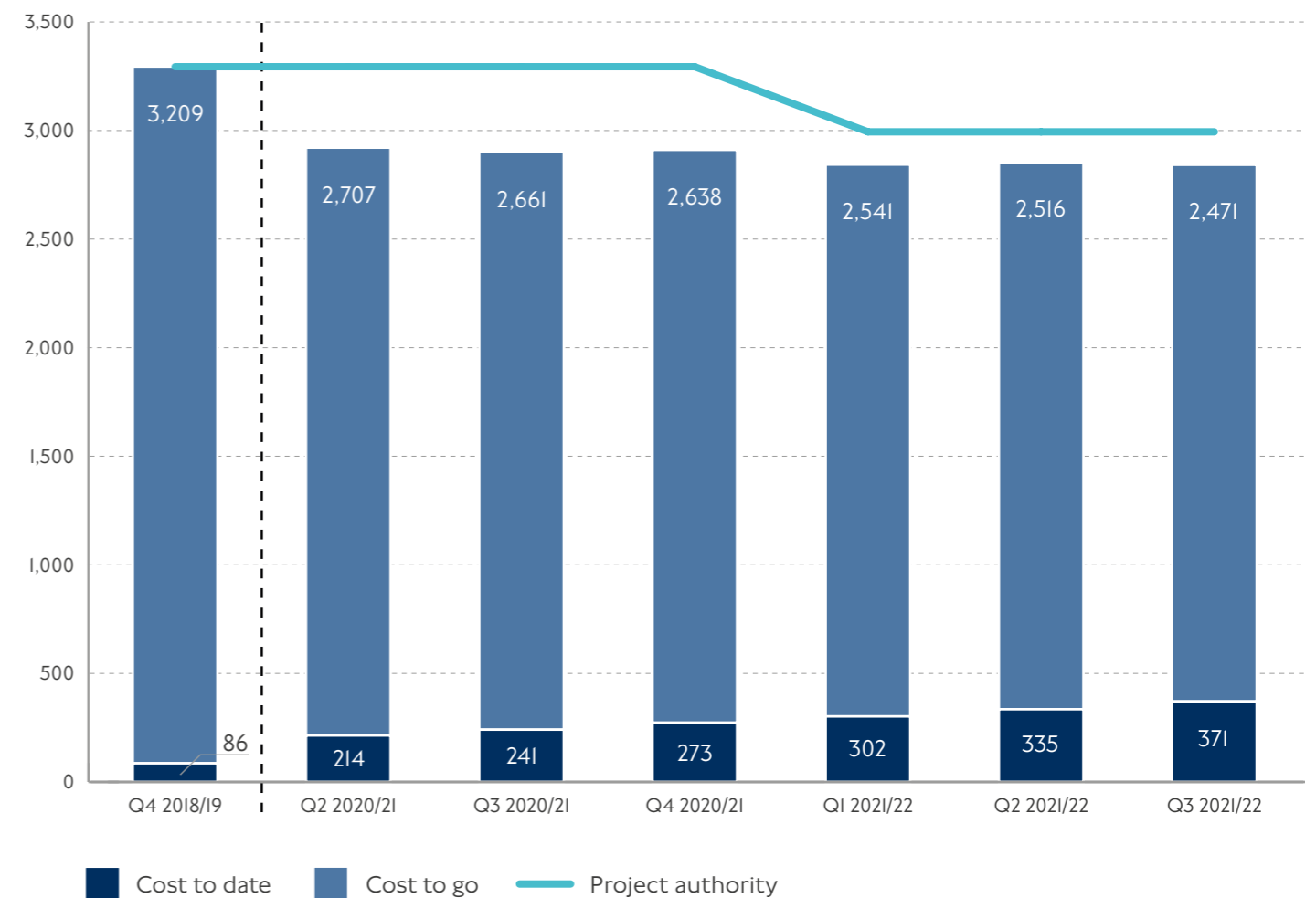
Programme update Power and signalling

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

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

Estimated financial cost performance over time (£m)

Forecast end date



Delivery fleet introduction

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

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

Depots and stabling

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

Northfield Depot

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



Our Piccadilly line upgrade project continues to progress

Network extensions

Northern Line Extension

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

Financial commentary

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

Performance over time

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

Programme update

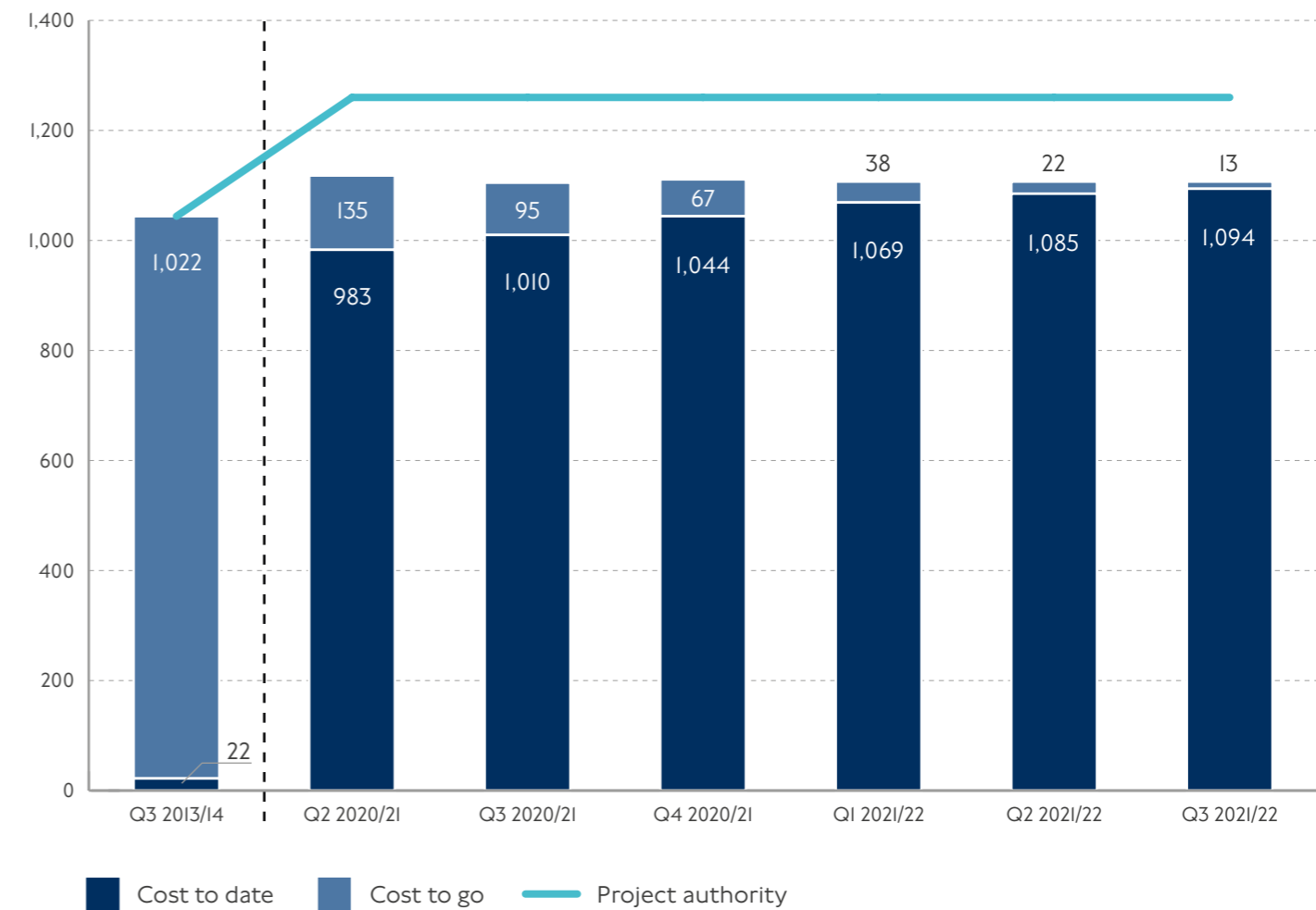
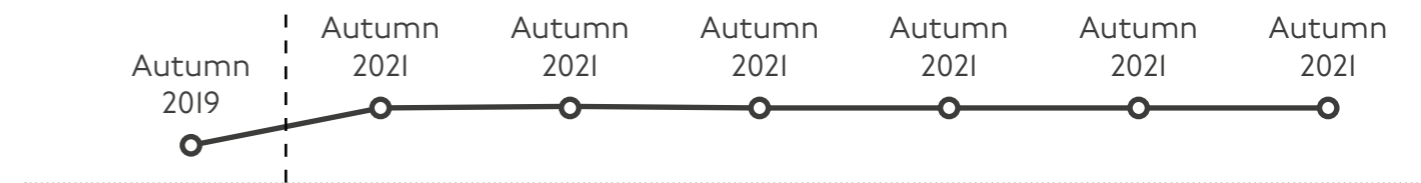
The revenue service launched on 20 September 2021, with the two new stations at Nine Elms and Battersea Power Station welcoming their first customers.

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

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

Estimated financial cost performance over time (£m)

Forecast end date



Silvertown Tunnel

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

Financial commentary

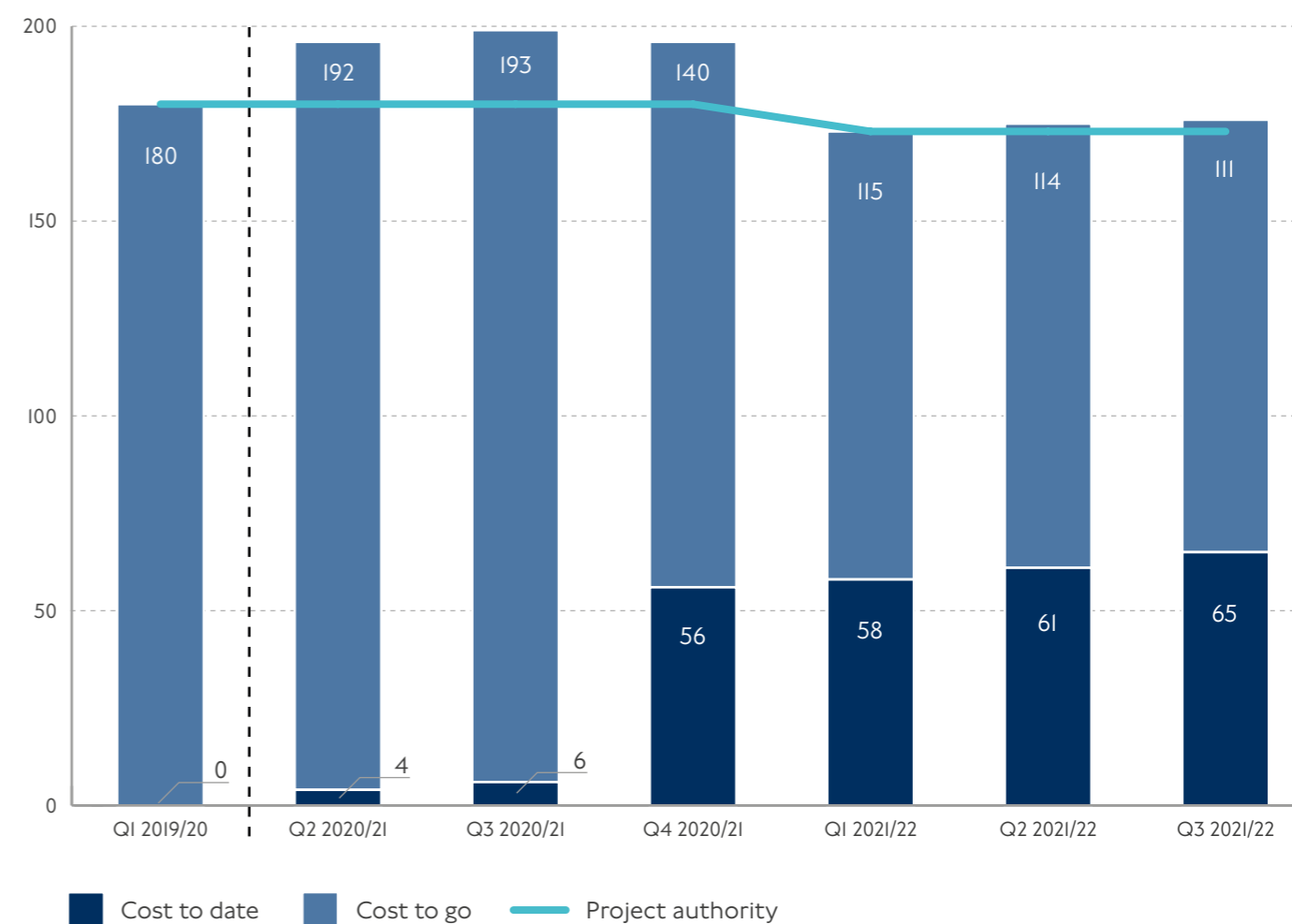
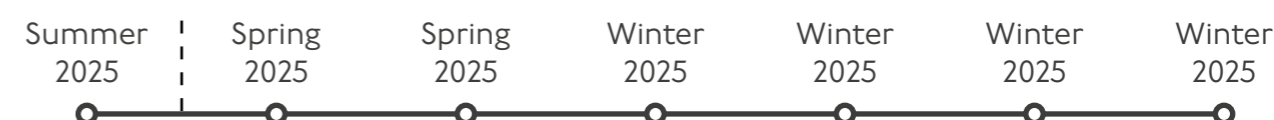
The EFC is currently £6m over the delegated Programme and Project Authority of £173m. The project team continues to seek opportunities to bring this back in line with authority. The main change in EFC since the last report is due to an increase in project risk, which we are looking to mitigate, and an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

Performance over time

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

Estimated financial cost performance over time (£m)

Forecast end date



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



Works on site are continuing at both Greenwich and Silvertown

Programme update

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

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

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

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

Network extensions

Barking Riverside Extension

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

Financial commentary

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

Performance over time

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

Programme update

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

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

Viaduct rail systems

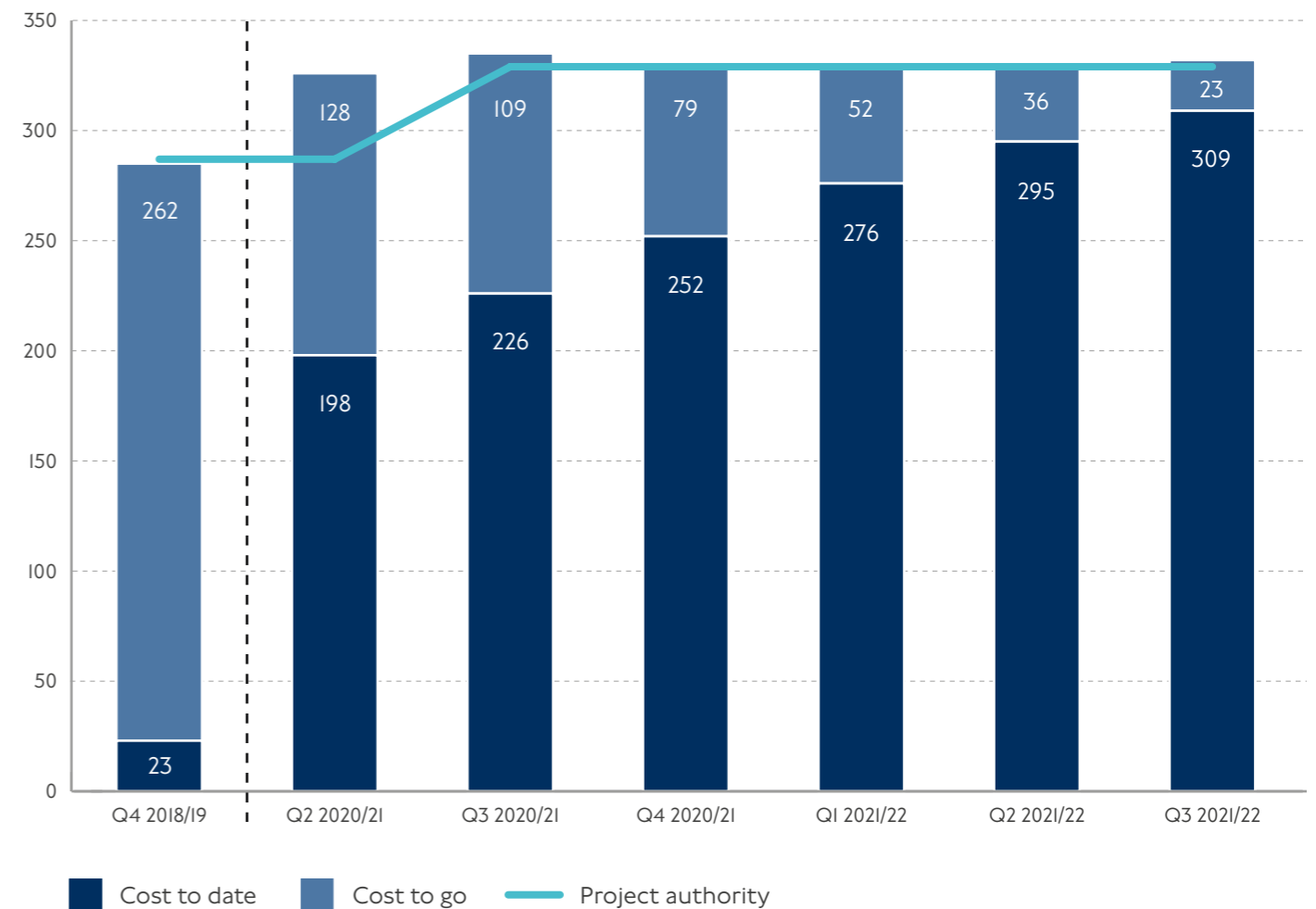
In October 2021, we completed the installation of the track running along the viaduct from the existing Network Rail lines to the new Barking Riverside station. We are now focused on installing telecoms, signalling and overhead line equipment and preparations for the final signalling stage commissioning,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

Station installation

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

Estimated financial cost performance over time (£m)

Forecast end date



Major station upgrades

Bank station capacity upgrade

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

Financial commentary

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

Performance over time

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

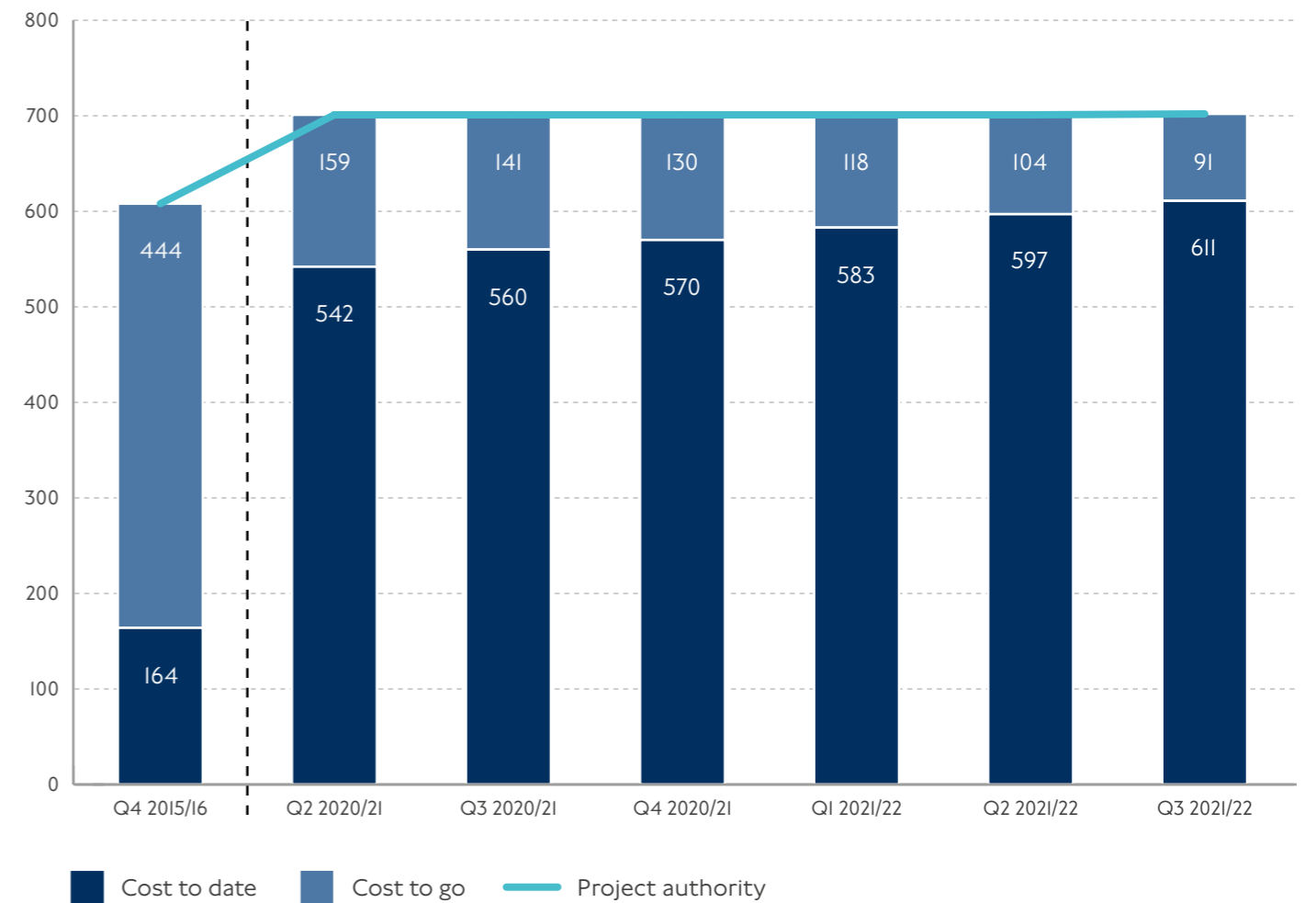
Programme update

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

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

Estimated financial cost performance over time (£m)

Forecast end date



Elephant & Castle

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

Financial commentary

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

Programme update

Developer negotiations

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

Funding

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

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



Our work will deliver improvements at Elephant & Castle

High Speed 2

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

Financial commentary

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

Programme update

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

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

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

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

Railway systems enhancements

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

Financial Commentary

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

Programme update

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

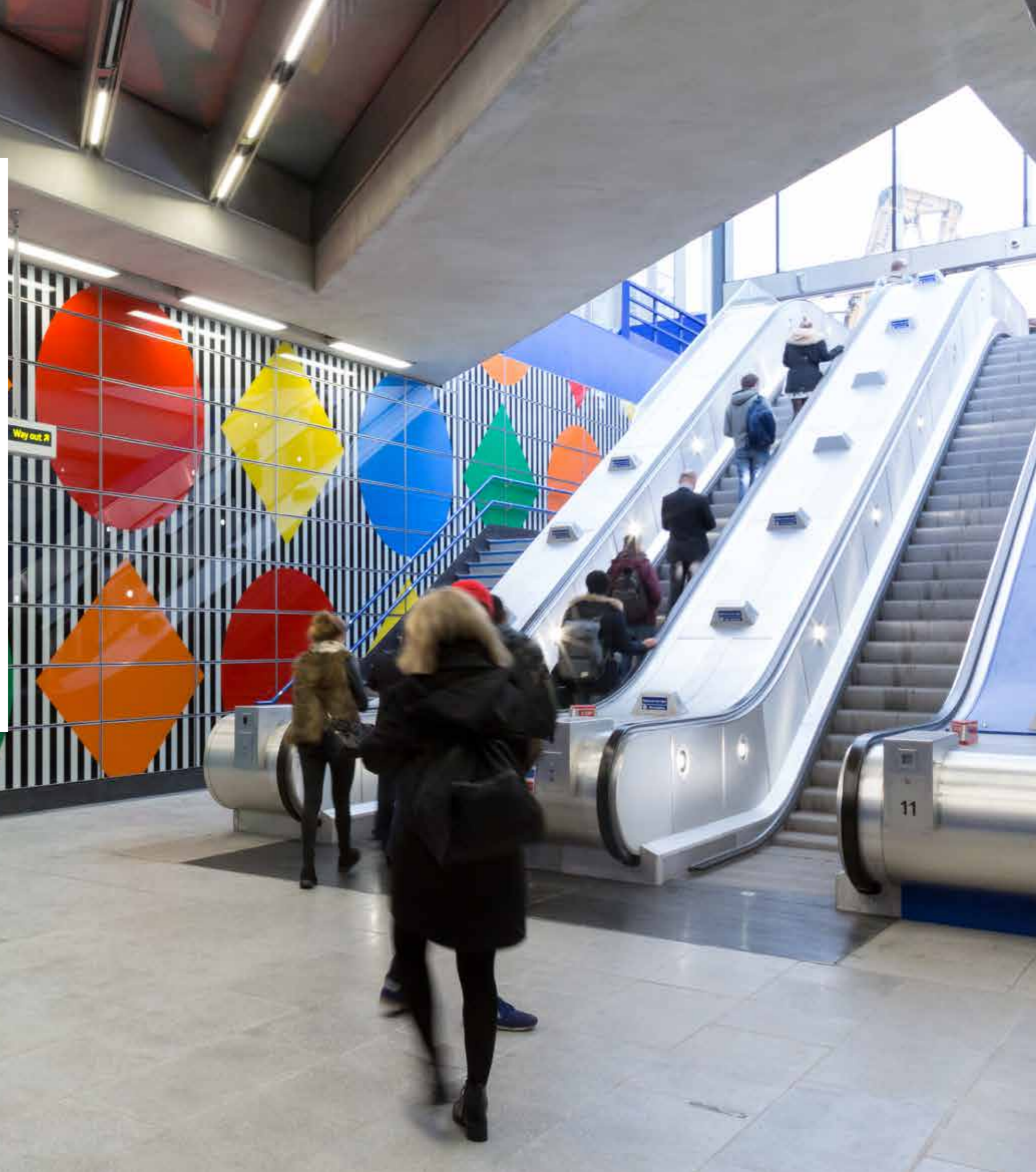
The enhancement work for the Northern line power supply continues and is due to be completed in early 2022. This will provide system capacity and resilience for reliable services during planned or unplanned outages.

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

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

London Underground

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



Enhancements

Station developments

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

Financial commentary

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

Programme update

Tottenham Hale

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

Paddington

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

Colindale

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



Our plans for improvements at Colindale station are progressing

King's Cross St Pancras

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

Knightsbridge

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

Ladbroke Grove

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

Leyton

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

London Bridge

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

Notting Hill Gate

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

South Kensington

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

West Ham

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

Walthamstow Central

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

Waterloo

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

Stratford

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

Enhancements

Depot construction

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

Acton train modification unit

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

Acton warehouse

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

Enhancements

Energy and cooling

Substation ventilation

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

Waste heat and private wire

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

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

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

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

Accessibility

Step-free access

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

Financial commentary

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

Programme update

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

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

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



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

Lifts and escalators

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

Financial Commentary

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

Programme update

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

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

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

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

South Kensington

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

Marylebone

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

Oxford Circus

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

Jubilee line

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

Borough and Tottenham Hale

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

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

Track renewals

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

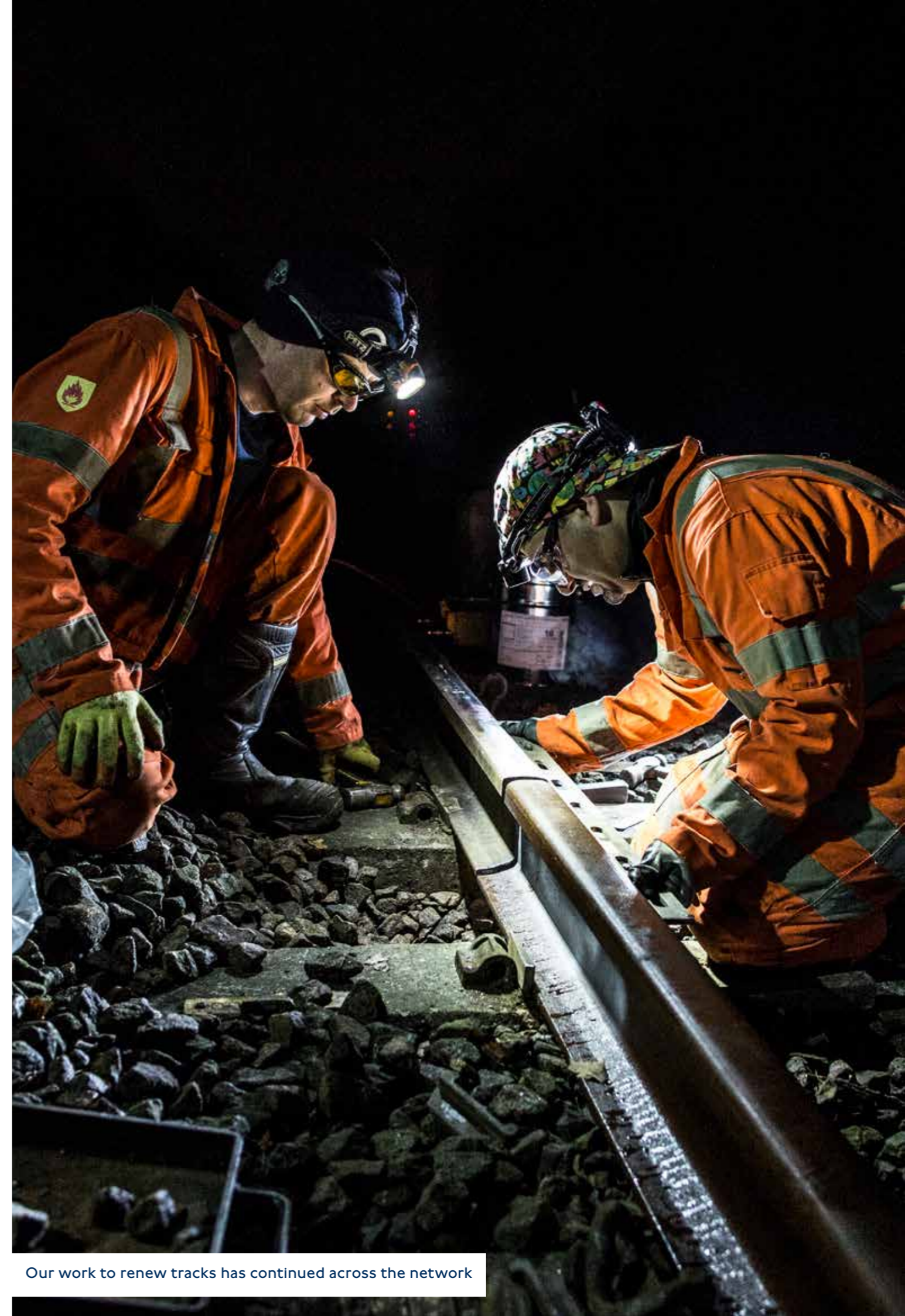
Programme update

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

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

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

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



Our work to renew tracks has continued across the network

Rolling stock

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

Financial Commentary

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

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

Programme update

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

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

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

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



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

Accessibility

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

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

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

Reliability

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

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

Safety

We are working to improve customer safety on the Central and Bakerloo line fleets. The first Bakerloo train with new LED lighting was returned to service in Quarter 1. The project has completed three more four-car units, rolling them out for service with no issues and completed a fourth four-car unit on 26 January. After prolonged periods with a technical support shortfall, the project has now secured engineering support to progress residual works designs. Additional facilities are also procured to enable full production early this year.

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

Engineering vehicles

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

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

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

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

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

Fleet heavy overhauls

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

Financial commentary

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

Programme update

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

Victoria line

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

Metropolitan line

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

Piccadilly line

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

Jubilee line

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

Adhesion train

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



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

Renewals

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

Financial commentary

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

Programme update

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

Buildings and stations

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

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

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

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

Staff facilities

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

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

Civils

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

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

Power and electrical

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

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

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

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

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

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

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

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

Power control

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

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

LED lighting

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

Civils and accessibility

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



Signalling and control

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

Financial commentary

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

Programme update

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

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

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

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

Signalling and control life extension

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

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

Incremental signalling upgrade

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

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

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

Technology

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

Financial commentary

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

Programme update

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

Networks and connectivity

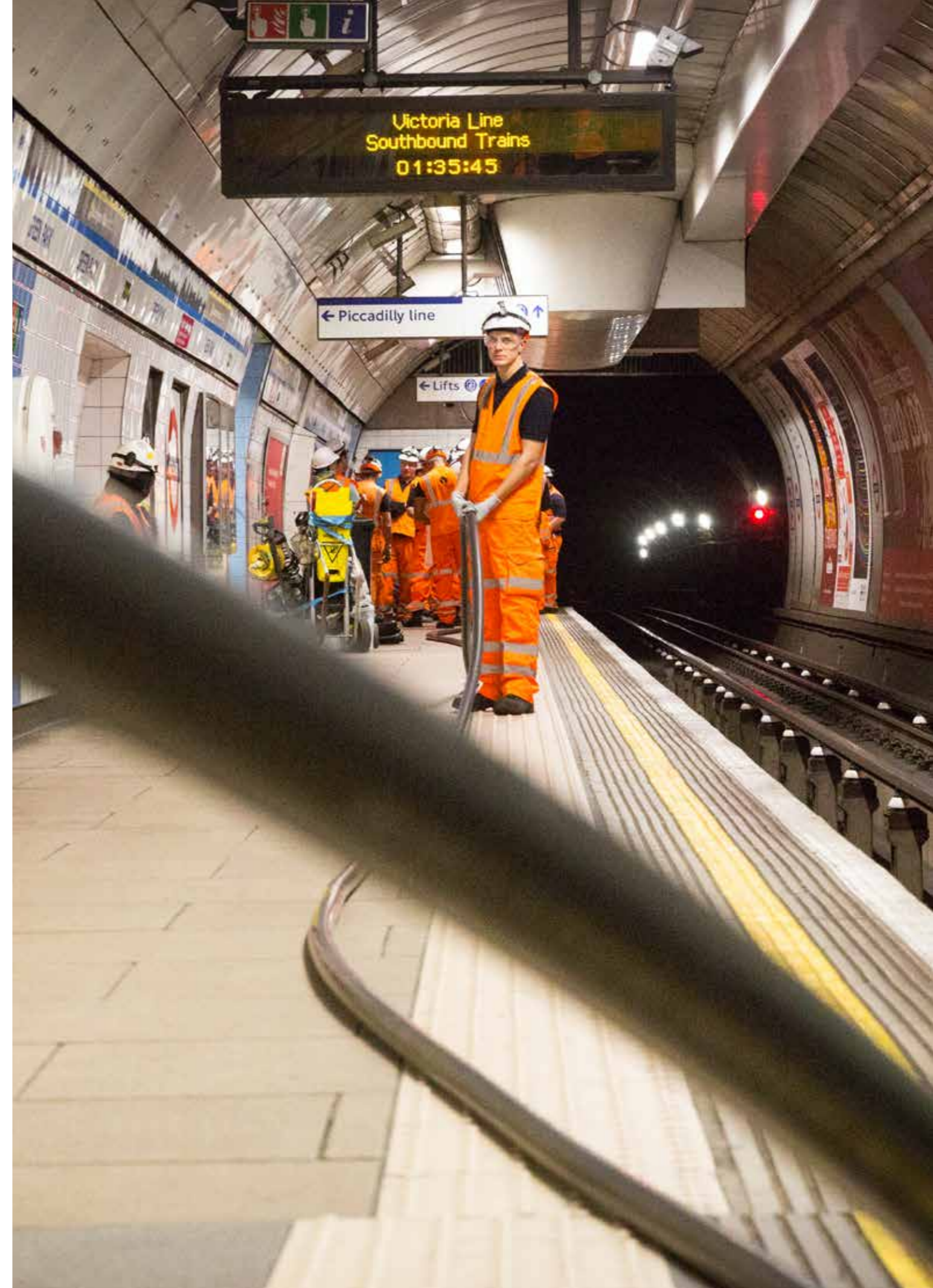
We continue to upgrade key components of our Connect radio system and are now focusing on rolling out new radio hardware base-stations. This second phase is expected to be complete in mid-2023. The Connect system will be able to function into the 2030s. We have installed new hardware at 58 of the required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

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

Asset management

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

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



We continue to upgrade technology assets across our network

Surface transport

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



Healthy Streets

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

Financial commentary

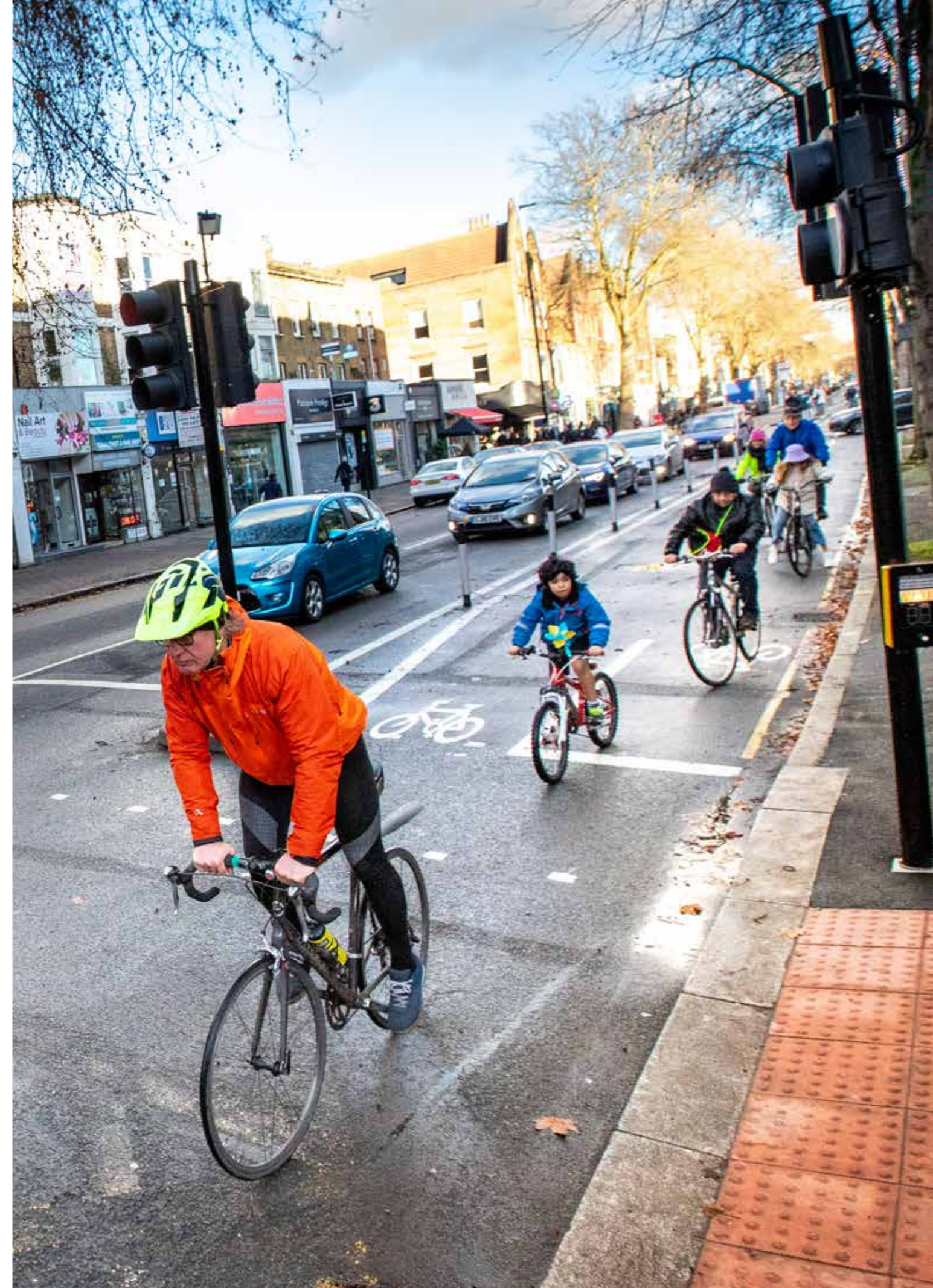
The five-year forecast from 2020/21 to 2024/25 has reduced by £385m since the publication of the last report.

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

Programme update

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

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



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

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

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

Old Street Roundabout

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

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

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

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

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

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

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

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

Cycleway 4

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

Cycleway 9

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

Responding to the pandemic

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

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

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



We are introducing lower speed limits to make our roads safer

Lowering speed limits

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

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

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

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

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

Safer Junctions

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

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

Air quality

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

Financial commentary

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

Programme update

ULEZ expansion

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

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

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



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

Congestion Charge changes

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

These changes included:

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

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

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

Electric vehicle strategy

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

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

Electric vehicle infrastructure delivery

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

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

Zero-emission bus fleet

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

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

Asset investment

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

Financial commentary

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

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

Programme update

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

A40 Westway

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

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

Westminster Bridge

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

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

Rotherhithe Tunnel

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

Hammersmith Bridge

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

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

Carriageway renewal

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

Public transport

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

Financial commentary

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

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

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

Programme Update

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



Our work continues to support the development of East London

Class 710 trains

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

DLR

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

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

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

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

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

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

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

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

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

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

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

London Trams

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

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

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

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

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

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



Santander Cycles are seeing record numbers of hires being made

Santander Cycles

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

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

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

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

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

Technology

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

Financial Commentary

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

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

Programme updates

Compliance, enforcement and safety

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

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

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

Roads technology

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

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

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

Public transport technology

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

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

Professional services

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



Technology and data

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

Financial commentary

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

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

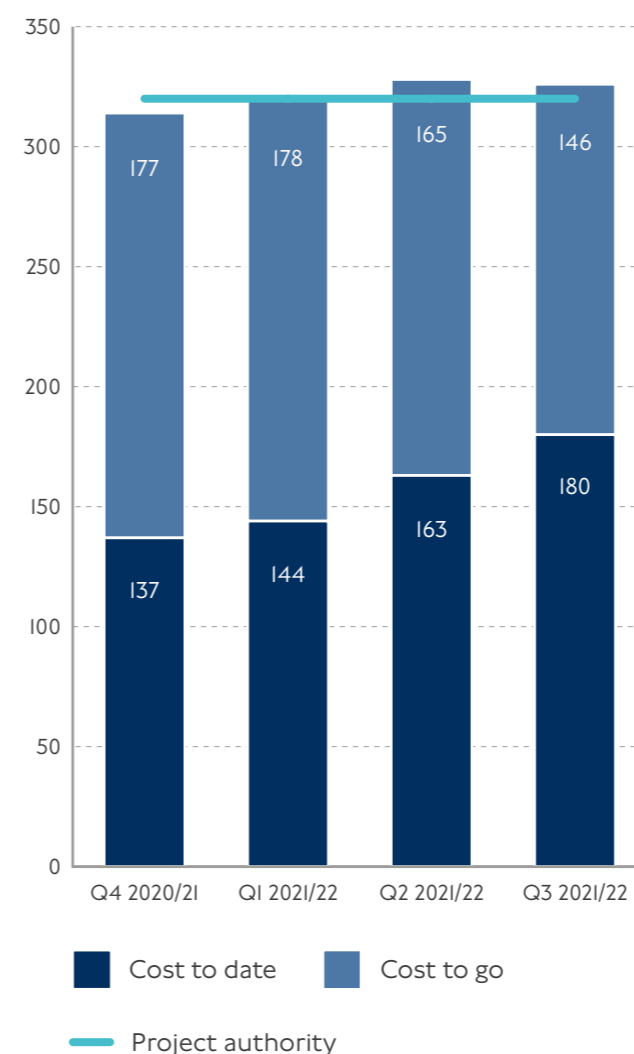
The values are for technology and data funded projects only and exclude the Emergency Services Network, the public cellular network and telecoms

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

Performance over time

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

Estimated final cost performance over time (£m)



Programme updates

Digital workplace

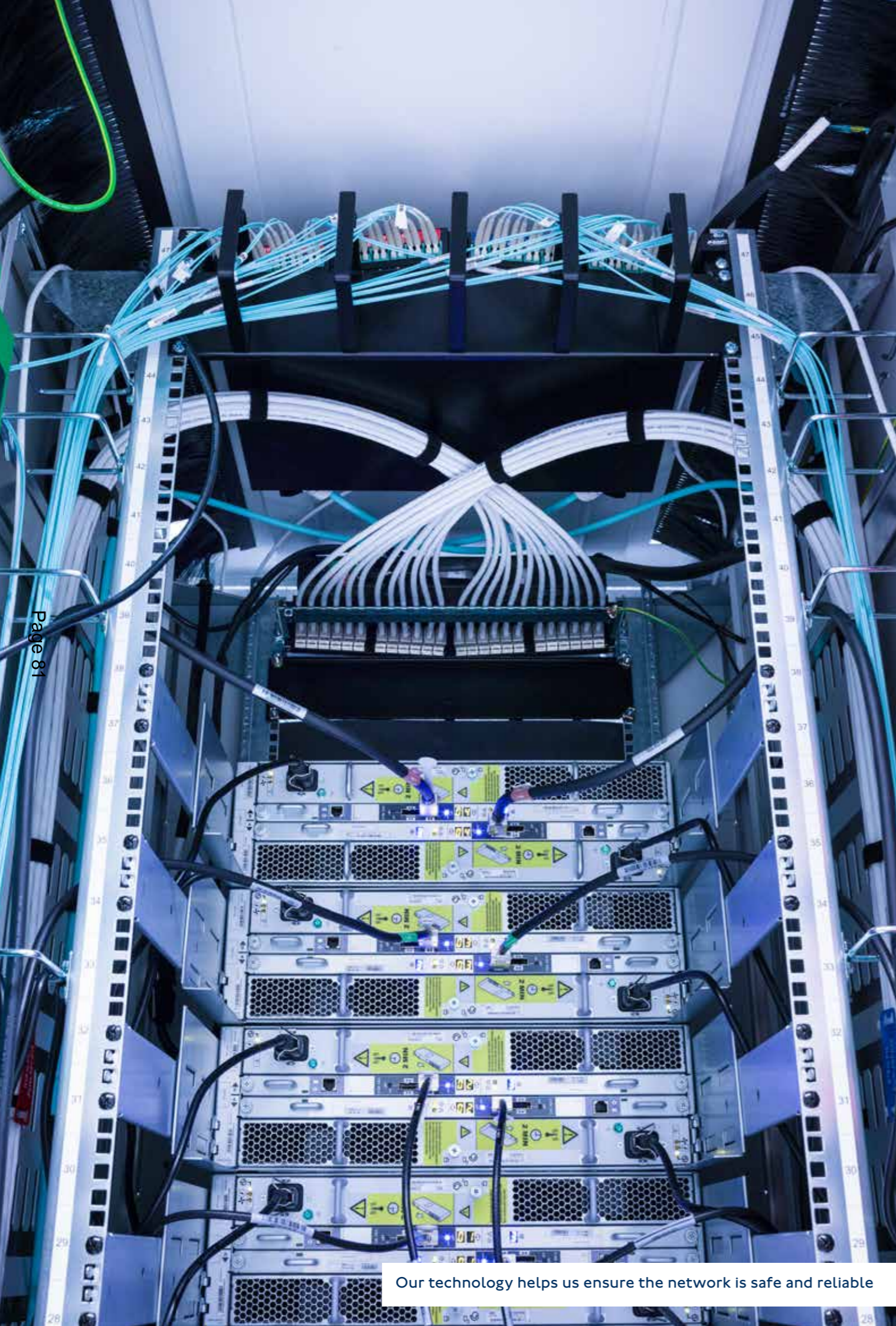
The consolidation of all legacy versions of Microsoft SharePoint sites onto SharePoint Online continues ahead of schedule, with 1,178 of 1,225 sites now completed. This project provides a common, online data platform for all our SharePoint sites, giving improved accessibility, security and eliminating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

Hosting

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

Networks

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



Our technology helps us ensure the network is safe and reliable

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

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

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

Technical service operation

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

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

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

Enterprise resource planning

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

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

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

Contact Centre operations

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

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

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

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

Data analytics

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

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

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

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

Digital

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

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

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

Growth Fund

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

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Programme update

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

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

Challenges

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

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



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

About TfL

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

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

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

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

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

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

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

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

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

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

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

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

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Programmes and Investment Committee



Date: 2 March 2022

Item: Independent Investment Programme Advisory Group
Quarterly Report

This paper will be considered in public

1 Summary

- 1.1. This paper presents the Independent Investment Programme Advisory Group (IIPAG) quarterly report for March 2022. It describes the work undertaken since the last report presented to the Committee in December 2021.
- 1.2. A paper is included on Part 2 of the agenda which contains exempt supplemental information that is exempt from publication by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

2 Recommendation

- 2.1 **The Committee is asked to note the Independent Investment Programme Advisory Group's quarterly report, the management response set out below and the exempt supplementary information on Part 2 of the agenda.**

3 IIPAG Quarterly Report

- 3.1 Under its Terms of Reference, IIPAG is required to produce quarterly reports of its advice on strategic and systemic issues, logs of progress on actions and recommendations and the effectiveness of the first and second lines of project and programme assurance. IIPAG's quarterly report for March 2022 is included as Appendix 1 to this paper.

4 Management Response to IIPAG Quarterly Report

- 4.1 In its quarterly report, IIPAG refer to the review of TfL Supply Chain Contracts. We welcome IIPAG's review and the recommendations made.
- 4.2 A significant proportion of TfL's portfolio is currently committed and in delivery. The future capital portfolio will be shaped by the outcome of current funding negotiations. An initial review and characterisation of the future portfolio will be undertaken to inform how best to target and address the recommendation to develop a business level contracting strategy, and the timescales for implementation.

- 4.3 The commercial strategy for a programme or project is heavily interconnected with the client, delivery and packaging strategies. TfL's current approach is based upon the Government's Project Initiation Routemap and involves a number of TfL's Pathway products including the Project Execution Plan and Procurement Strategy. The existing Pathway products will be reviewed to identify if a new product, or the enhancement of existing products, is needed with respect to the approval of commercial strategies at an early stage of project development, and subsequently during the project life.
- 4.4 Two additional gates have already been introduced into Pathway to assess market readiness and contract award. The effectiveness of these and other current pre-contract Pathway stage gates will be reviewed jointly with TfL's Programme Management Office.
- 4.5 TfL already engages regularly with other UK infrastructure clients to share common challenges and good practice and is an active member of the Transport Infrastructure Efficiency Group, Major Project Association and Infrastructure Client Group. Building on this existing engagement, a regularised series of meetings will be established with a focus on sharing of learning and best practice.
- 4.6 The Procurement and Supply Chain directorate is finalising its senior manager change programme, which has focussed on establishing the right capacity and capability to lead the function. This has included the appointment of a new Supply Chain Director for the capital investment programme. As part of the ongoing Improvement Programme we will review how stronger leadership of commercial strategy can be taken forward as part of the 2022/23 work plan.
- 4.7 All functions involved in capital projects have an impact on the commercial outcome of a contract. TfL already provides training in the New Engineering Contract for non-commercial disciplines. Opportunities to build broader cross-functional commercial acumen and experience will be reviewed within TfL's Capital Efficiencies Plan and a plan drawn up accordingly.

List of appendices to this report:

Appendix 1: Independent Investment Programme Advisory Group – Quarterly Report March 2022

Exempt supplementary information is included in a paper on Part 2 of the agenda.

List of Background Papers:

None

Contact Officer: Howard Carter, General Counsel
Email: HowardCarter@TfL.gov.uk

Independent Investment Programme Advisory Group – Quarterly Report March 2022

1. Introduction

- 1.1. This report to the Committee describes IIPAG's activities from December 2021 to January 2022. It contains no new strategic recommendations from the small number of Sub Programme reviews we have undertaken in this period, but contains some conclusions from our cross-cutting work.

2. IIPAG activity

- 2.1. We have undertaken the following reviews which will be considered at this meeting:
- Air Quality and Environment
 - Technology and Data
- 2.2. We are engaged in continuous assurance of the Four Lines Modernisation (4LM) programme. We also had an update briefing on the Healthy Streets programme, which was awaiting confirmation of its forward budget, and participated in a commercial review of the Old Street project.
- 2.3. The accompanying paper from TfL Project Assurance describes management progress in implementing IIPAG's recommendations from sub-programme and targeted reviews.

3. Progress with Cross-cutting Work

- 3.1. TfL Supply Chain Contracts. The purpose of this cross cutting review was to provide advice on whether the standard contract forms used on TfL infrastructure enhancement projects are appropriate for the type of work being delivered, whether they are effective in delivering value for money and certainty of out-turn cost and schedule, and whether they are being administered effectively.
- 3.2. Our conclusion is that the choice of contract form, including the standard use of the New Engineering Contract (NEC) suite, has no direct bearing on the cost and schedule delays and levels of commercial dispute experienced. Having said that, we also noted some cases in which the selection of NEC Options was inappropriate to the project circumstances and did contribute to delays and cost increases.
- 3.3. In our view the impact of these factors is dwarfed by that of a number of issues which are common on problem projects, including immaturity of scope at the point of contract award, immaturity of design, poor risk evaluation and management,

insufficiently detailed project information such as site investigation or asset condition, pressure to deliver to a deadline, and accrual of unresolved variations.

- 3.4. We think that these issues need to be addressed both at the project level and at the business level. We have made recommendations for improvements relating to: TfL's business level contracting strategy; the leadership of commercial strategy; sharing of learning and best practice with other major UK infrastructure owning clients; development of a more wide ranging project commercial strategy template; approval of commercial strategies at an early stage of project development and subsequently during the project life, as part of the five case Business Case; a review of the effectiveness of pre-contract Pathway gate reviews; and increasing the access of projects to capital delivery commercial expertise, both during development and delivery.
- 3.5. We have also undertaken a review of lessons learned from the recent legal challenges to two major TfL procurements. This will be reported to the TfL Finance Committee in March 2022. Other cross cutting reviews still in progress are detailed in the following items.
- 3.6. Risk. Despite the efforts of TfL risk managers as well as extensive guidance and process, our experience is that the risk associated with TfL projects is often underestimated, resulting in cost and schedule overruns. In this cross cutting review we are bringing together our experience of how TfL treats risk in the Investment Programme in order to provide advice on how it might be improved.
- 3.7. Programme Management Office (PMO) Progress Report. IIPAG reviewed the PMO some eighteen months ago. In the course of February 2022 we are revisiting the progress that has been made since then and asking whether the improvement efforts are delivering the desired results.
- 3.8. Asset Information Part 2. The second part of this review considers how asset data is generated. Interviews are complete, and the review is moving into the writing up phase.
- 3.9. Procurement and Supply Chain (P&SC) Improvement Programme. IIPAG reviewed the P&SC Improvement Programme 2 years ago. The current IIPAG review of progress with this programme started in mid-January and the interviews are currently under way.

4. Work Programme for 2022/23

- 4.1. We are currently putting together our work programme for the next year. We would welcome suggestions from the Committee on any topics we should include.

Contact Officer: Alison Munro, Chair of IIPAG
AlisonMunro1@tfl.gov.uk

Programmes and Investment Committee

Date: 2 March 2022

Item: TfL Project Assurance Update



This paper will be considered in public

1 Summary

- 1.1 This paper provides an update on the project assurance work undertaken between 9 November 2021 and 21 January 2022. Three programme reviews were undertaken during this time, with the Independent Investment Programme Advisory Group (IIPAG) involved in each of them. In the same timeframe five project assurance reviews were undertaken, with IIPAG involved in three of these.
- 1.2 These reviews gave rise to a total of 39 recommendations, of which two were considered to be critical issues. Critical issues are those that the TfL Project Assurance team or IIPAG believe should be addressed before projects proceed to the next stage.
- 1.3 A paper is included on Part 2 of the agenda which contains exempt supplemental information that is exempt from publication by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

2 Recommendation

- 2.1 **The Committee is asked to note the paper and the exempt supplementary information on Part 2 of the agenda.**

3 Background

- 3.1 The TfL Project Assurance update provides the Committee with a summary of the second line assurance, provided by TfL's Project Assurance team, and third line assurance, provided by IIPAG.

4 Summary of Project Assurance Activity

- 4.1 From the reviews undertaken, a total of 25 recommendations were made by TfL Project Assurance. These consisted of 24 general recommendations and one critical issue, with all these having been agreed with the respective project teams.
- 4.2 IIPAG made 14 recommendations, with all agreed with the respective project teams. These consisted of 13 general recommendations and one critical issue.
- 4.3 Appendix 1 shows the two critical issue that were raised.
- 4.4 The following graphs show the number of open recommendations, the number that are overdue, and the number closed in the last three quarters. The overdue recommendations include one overdue critical issue, this was raised by TfL Project

Assurance and relates to the Central line Signalling and Control Life Extension Project and the need to ensure that the business case demonstrates value for money for all elements of the scope. There are no overdue IIPAG critical issues.

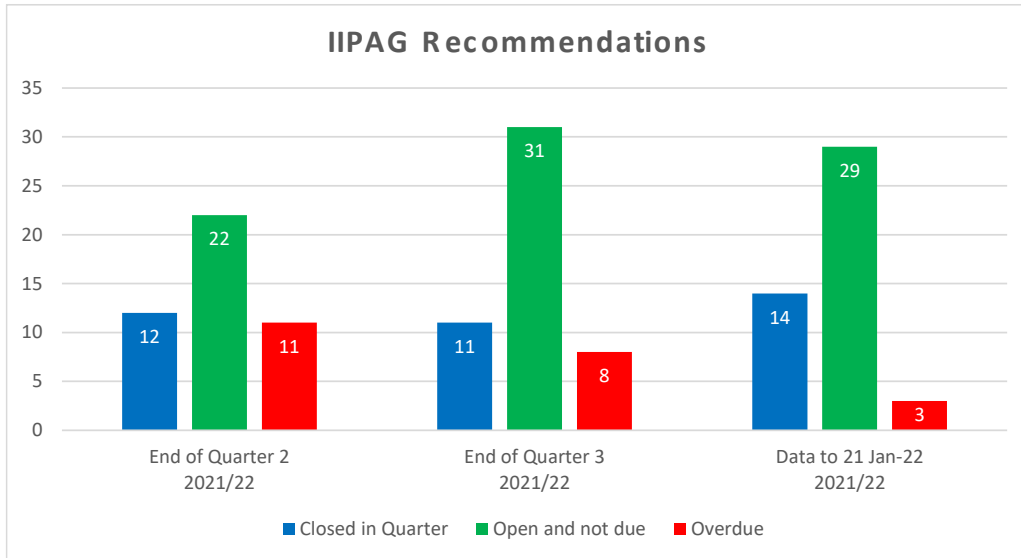


Figure 1: IIPAG Recommendations

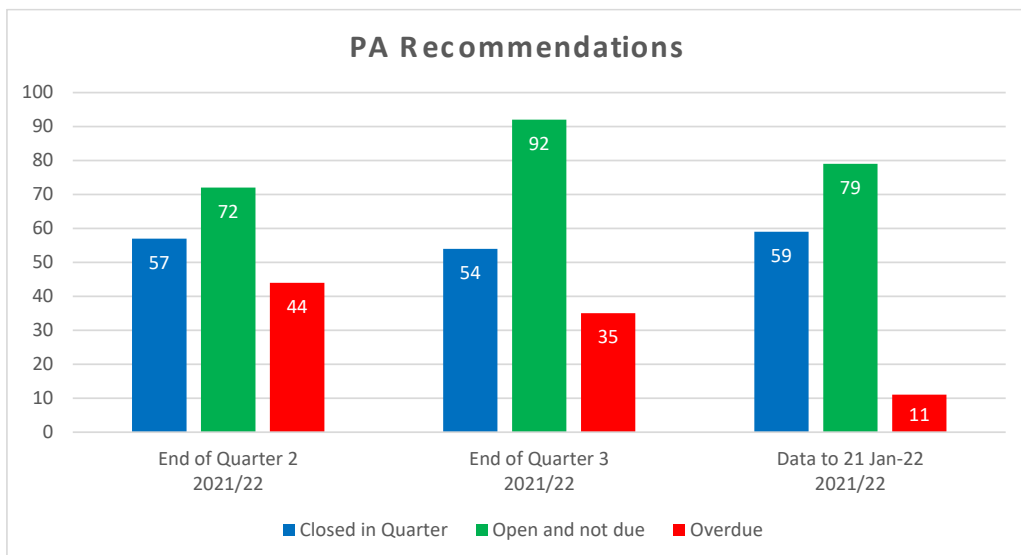


Figure 2: Project Assurance Recommendations

4.5 The following graph shows the length of time that the overdue recommendations have been overdue by. The information shows whether the recommendation is an IIPAG or TfL Project Assurance recommendation and the business area that the recommendation relates to (T&D being Technology and Data, LU being London Underground, ST being Surface Transport and MPD being Major Projects.)

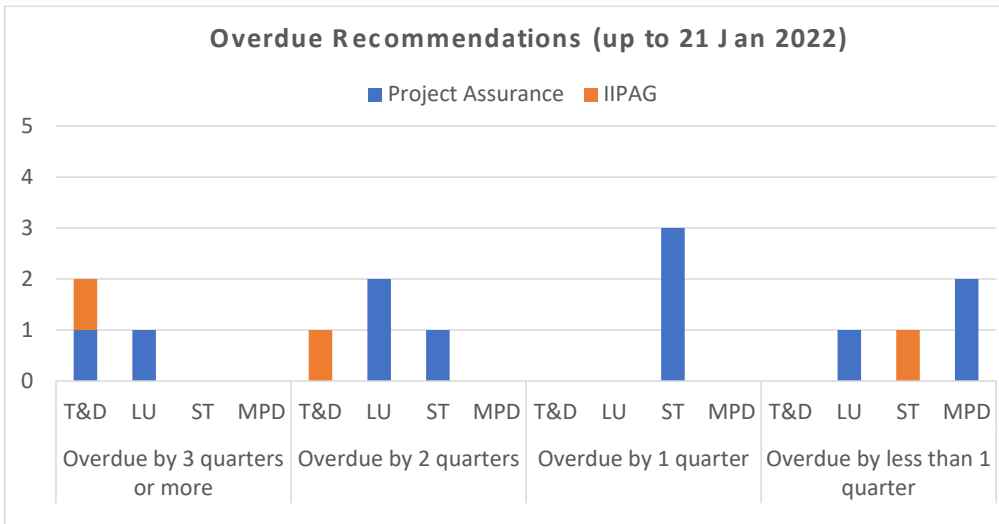


Figure 3: Breakdown of Overdue Recommendations

List of appendices to this paper:

Appendix 1: New Critical Recommendations

Exempt supplementary information is included in a paper on Part 2 of the agenda.

List of background papers:

None

Contact Officer: Howard Carter, General Counsel

Email: HowardCarter@tfl.gov.uk

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Appendix 1: New Critical Recommendations

Shown below are the critical issues raised and agreed with the respective project teams.

Project: Technology and Data (T&D) Programme		
Raised by	Critical Issue	Management Response
TfL Project Assurance	A clear resource forecast must be prepared. This should detail numbers of resources and their specialisms and when they are required in order to deliver the workbank and associated spend proposed by the Committee proposal. The support needed from the business in order to service this requirement needs to be detailed and tabled at the appropriate forums and the consequences of not obtaining the required resources made clear.	A resource forecast will be provided which will show the number of roles required, and when they are needed, across the Programme. This will be broken down by portfolios and specific roles, with the consequences for what will happen if these resources are not secured. Our current forecasting goes up until the end of financial year 2022/23 and this will be used for the information we collate. We propose sending this information in two stages, showing how we plan on delivering our Investment Plan. Firstly, providing the forecasts for each department and the support needs for T&D to support the recruitment profile. Secondly breaking this down further to show specific roles and consequences of not obtaining these at a portfolio level.

Project: Air Quality and Environment (AQE) Programme		
Raised by	Critical Issue	Management Response
IIPAG	A business strategy should be agreed which is sufficiently clear as to allow deliverable requirements to be defined; governance and approval processes should be streamlined; and the programme team (and the T&D delivery team) should be resourced at a level consistent with the delivery challenge.	It is acknowledged that a clear business strategy will aid delivery. We will work to produce a clear strategy and business case that sets direction for programme and delivery. It is acknowledged that such significant and critical projects to our outcomes need quality governance and clear decision making. While some areas of governance are already benefitting from the pragmatism and agility needed, we will review existing governance and seek opportunities to streamline where possible. Adequate resourcing is a significant challenge, consistent with the rest of the investment programme. We are reviewing the resource challenges and exploring opportunities to prioritise key projects.

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Programmes and Investment Committee

Date: 2 March 2022

Item: Asset Renewals



This paper will be considered in public

1 Summary

1.1 To provide the Committee with visibility of asset renewals material that has been shared with the Department for Transport (DfT) and Her Majesty's Treasury (HMT) as part of on-going discussions on TfL capital funding.

2 Recommendation

2.1 The Committee is asked to note the paper.

3 Background

3.1 TfL is in dialogue with DfT/HMT regarding capital funding requirements and priorities. One aspect of this dialogue is asset capital renewals, that is the capital investment required to maintain existing TfL assets.

3.2 This material was used in initial discussions with DfT/HMT to build a common understanding of the asset strategy language, data and techniques used by TfL. The opportunity was also used to explain how TfL is reviewing and assessing the level of funding required for asset renewals.

3.3 The review will focus on data, investment models and prioritisation over the next six to nine months and develop robust and credible information to support business planning and further DfT/HMT discussions.

List of Background Papers:

Appendix 1: TfL Asset Renewals presentation, February 2022

List of Background Papers:

None

Contact Officer: Garry Sterritt, Head of Asset Strategy
Email: GarrySterritt@tfl.gov.uk

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Appendix 1

TfL Asset Renewals

February 2022



Bond Street
Station

- Background
- State of Good Repair (SoGR): backward look
- Asset Management Objectives & Levels of Service
- Understanding TfL asset investment needs
 1. Past spend and delivery
 2. Run rate assessment
 3. Asset modelling
- Summary and next steps

Background












Asset Renewals Review

Purpose

- Strengthen our approach to strategy and planning of renewals investment
- Link asset health to TfL business outcomes
- Assess outcomes for different levels of spend level
- Challenge our ‘Do Minimum’ assumptions
- Improve the robustness of our asset models
- Align approaches pan-TfL where possible
- Calculate the renewals backlog

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		Aims	Where are we?
Organisational Objectives and Priorities		Prioritised business objectives and a policy steer on how to balance strategic requirements	Strategy steer provided on how to assess and compare network and asset priorities
			
Asset Management Objectives		A common set of pan-TfL asset objectives and measurement scale to inform Levels of Service	Objectives defined, developing Level of Service scales for networks and asset groups
			
Prioritisation & optimisation		Common approach for prioritising and/or optimising investment for the TfL portfolio of asset renewals	Different prioritisation approaches in LU, Roads & Rail – developed a common approach that was applied to all areas in Jan 2022
			
Analytics and asset models		Analysing condition data/trends, degradation and WLC modelling, linking condition to outcomes	Incomplete picture – some assets need to grow maturity – core area of focus for 2022
			
Asset data		Data by asset types, materials, location usage, age, condition, defects etc.	Varying levels of maturity, some gaps in asset and condition data that we are working to close

TfL Asset Strategy Consolidation

Year	Business Area							
Pre 2012	LU	Roads	Traffic	Buses	DLR	LO	Trams	Other
2014	LU	Roads & Buses			DLR	LO	Trams	Other
2016	LU	Roads and Buses			Rail & Sponsored Services			
2019	LU	Surface						
2021	Transport for London							

- TfL was formed in 2000 by bring together a variety of different transport networks
- It has taken time to consolidate Asset Strategy into one team
 - A single TfL Asset Strategy team was established in October 2021
- The objectives are:
 - To align practices to enable pan-TfL asset comparisons and trade-offs
 - Share and build upon existing good practices
 - Focus resources on areas where we need to accelerate development
 - Deliver a robust assessment of asset renewal needs in Autumn 2022



State of Good Repair (SoGR): backward look



State of Good Repair (SoGR): Definitions and Evaluation

State of Good Repair is based on an assessment of how well an asset, given its current “health”, is able to perform its required function

This requires the function, the appropriate standard (or level of function) and the current health to be understood and mapped to a SoGR scale

Term	Definition
State of Good Repair	An asset is considered to be in a State of Good Repair (SoGR) when it is able to perform its intended function without posing undue risk to services
Not in a State of Good Repair	An asset is no longer considered to be in a SoGR when it is unable to perform its intended function and poses an undue risk to services
Intended function	The primary purpose of the asset
Undue risk to services	Acceptable risks are those which are low to moderate risk to the delivery of organisational requirements and objectives (for example, safety, reliability and customer services) – these may be based on legislation, industry standards, good practice or TfL standards. Undue risks are those that pose a high or greater risk to delivery of organisational requirements and objectives.

SoGR categories: five categories are used to provide more granularity to the SoGR assessment. These allow detailed descriptions to be developed that aid the assessment of assets and the use of SoGR data for asset strategy activities. These categories are being developed at a pan-TfL, network and asset type level, and (where possible) will use and build upon existing asset health data and metrics

SoGR Category	Description
Very Good	Assets considered to be in A State of Good Repair
Good	
Fair	
Poor	Assets not in a State of Good Repair
Very Poor	

SoGR Population Formula

$$\text{State of Good Repair (\%)} = \left[\frac{\text{Assets in a State of Good Repair}}{\text{Total Asset Population}} \right] \times 100$$

Where the total asset population should be described in terms that are appropriate for that asset type, e.g. number, length, area, value.

Common SoGR measurement framework

All assets will be mapped to this common TfL SoGR framework, which has been built from and takes account of a variety of existing asset condition scales

We will be able to show the percentage of assets within each rating and use this to inform investment priorities

Modal and asset specific information will support this high level overview

Launched Dec 2020



State of Repair Rating	Description
Very Good	<ul style="list-style-type: none"> - No defects and in near new condition - Significant expected life remaining - Maintenance regime sustainable - No degradation in performance - No unplanned closures or restrictions
Good	<ul style="list-style-type: none"> - Minor defects - Good expected life remaining - Maintenance regime sustainable - No degradation in performance - No unplanned closures or restrictions
Fair	<ul style="list-style-type: none"> - Minor to moderate defects - Reasonable expected life remaining - Maintenance regime sustainable (includes obsolete with sufficient spares) - Minor degradation in performance, in line with expectations - Some unplanned closures or restrictions to mitigate safety or serviceability risks
Poor	<ul style="list-style-type: none"> - Moderate to major defects requiring substantial intervention - Nearing end of expected life - Imminent obsolescence (e.g. limited spares) - Trend of deteriorating performance - Unplanned closures or restrictions likely to mitigate safety or serviceability risks
Very Poor	<ul style="list-style-type: none"> - Major defects requiring immediate attention - Assets at or beyond expected life (Life Expired) - Obsolete (e.g. no or very limited spares, unsupported) - Significant degradation in performance - Interim measures in the form of closures or restrictions to manage safety

Decreasing probability of failure.
 Low priority for investment.

Increasing probability of failure.
 High priority for investment.

SoGR dashboard

Dashboard created for reporting State of Good Repair for a basket of 15 asset types across TfL

Established in February 2021



TfL Assets SOGR Scorecard

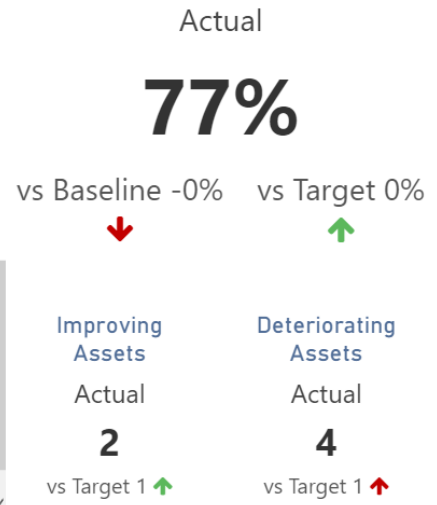
Reporting quarter

2022 (Year) + Q1 (Quarter)

Asset SOGR scores

Asset	Baseline	Actual	Target
LU Fleet	68%	→ 68%	68%
LU Signals	89%	↑ 91%	91%
LU Track	76%	→ 76%	76%
LU Escalators	84%	↓ 82%	82%
LU Lifts	73%	↓ 71%	71%
Rail DLR Track	96%	→ 96%	96%
Rail DLR High Voltage	78%	→ 78%	78%
Rail DLR L&E	31%	↑ 38%	31%
Rail Tram fleet	33%	→ 33%	33%
Rail Tram track	62%	→ 62%	62%
Rail Overground Civils	90%	→ 90%	90%
Roads Carriageway	88%	→ 88%	88%
Roads Structures	86%	↓ 83%	83%
Roads Lighting	89%	→ 89%	89%
Roads Bus shelters	96%	↓ 95%	96%
Weighted Percentage Score	77%	77%	77%

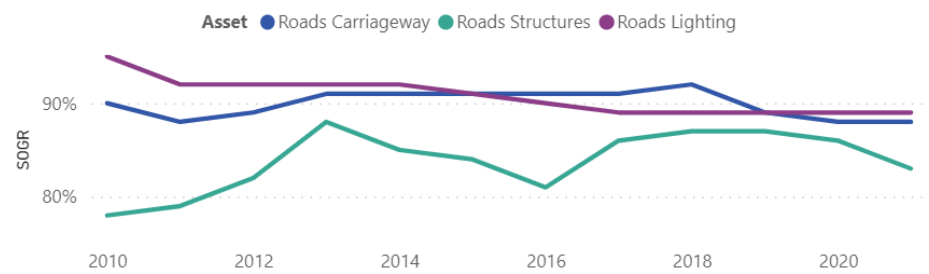
Weighted Percentage Score



Condition distribution



Historic SOGR trends



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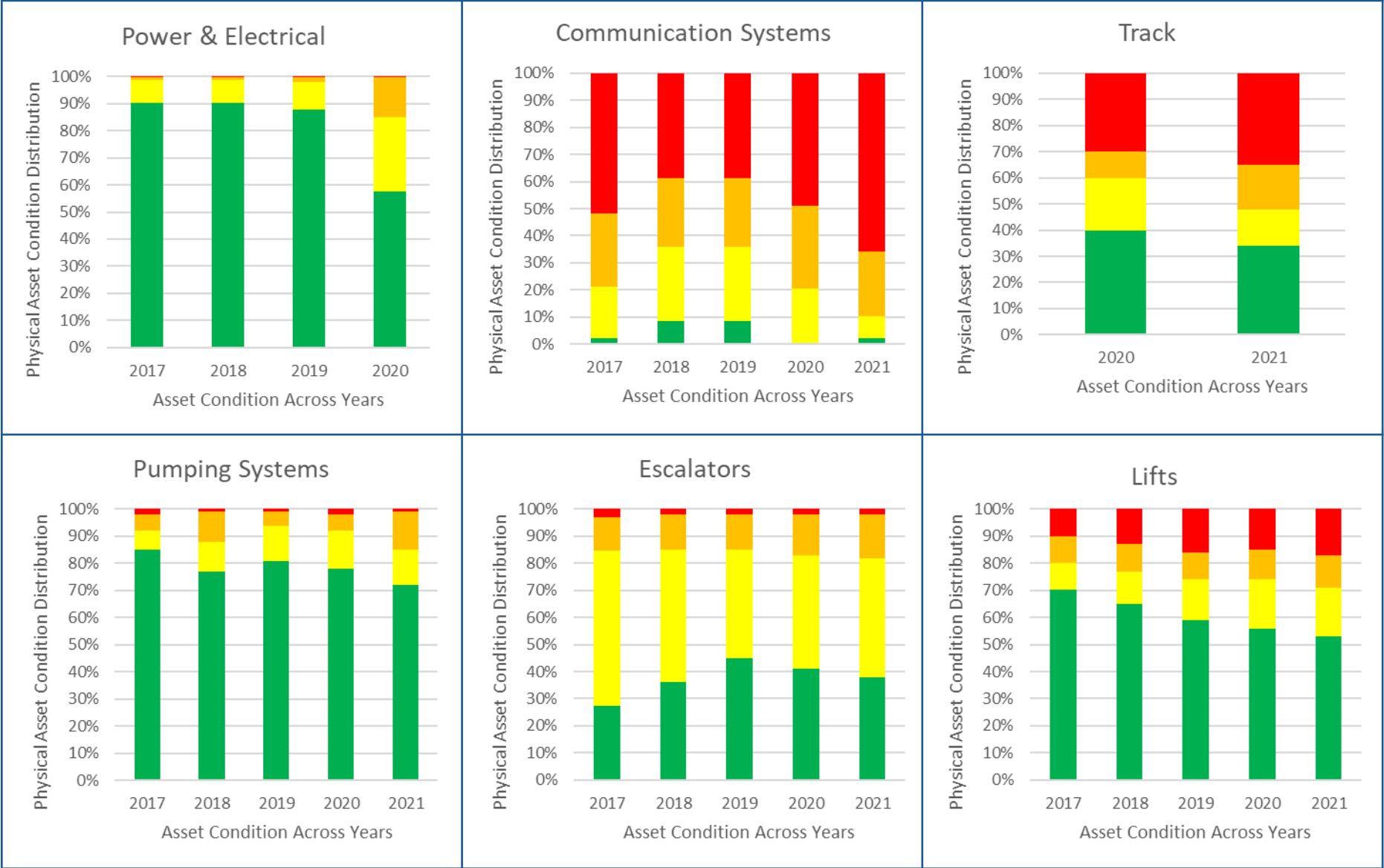
Surface Asset Strategy - Business Intelligence & Analytics

LU historical asset condition

We are progressing towards a consistent approach to measuring asset condition across TfL

These graphs show our initial application of the SoGR approach to some groups of LU assets

Important: this is an initial view of past trends and requires further refinement and calibration between assets and modes to ensure appropriate and consistent application of the SoGR approach



Key: ■ Good or very good condition ■ Fair condition ■ Poor condition ■ Very Poor

LU Fleet: age and performance

Asset Base: Overview



619 Passenger trains

4,316 Train cars

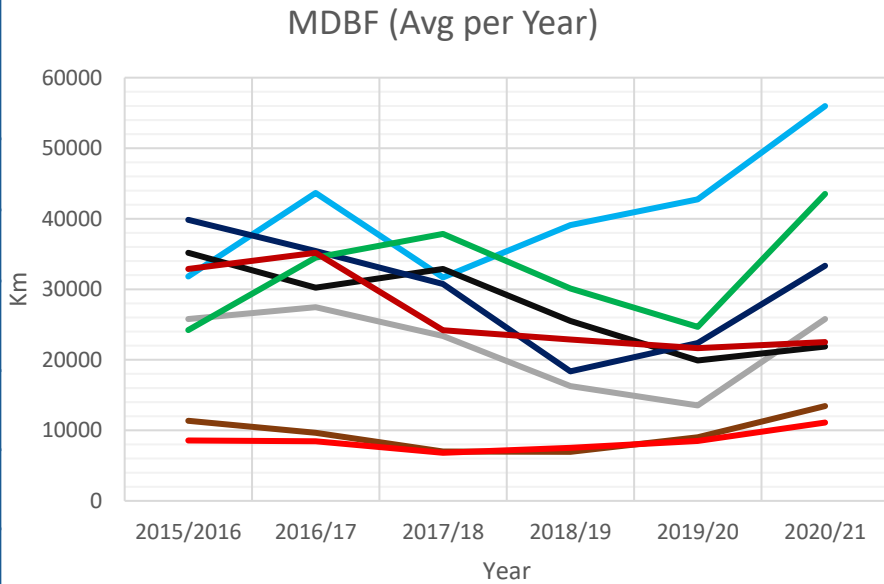
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- Old fleets cost more to maintain and deliver lower performance
- c.£20-25k more per car per annum to maintain the older fleet (£43k vs £69k)
 - 20-40k less MDBF in older fleets (10-20k vs 30-50k)
 - The older fleets require more and larger renewals interventions to keep them in operable condition
 - This in part is because they have been under higher duty than they were designed for

The older our Fleet the more prone they are to failure, causing increased maintenance to maintain safety and performance. We have high peak utilisation on some lines (>90%) meaning increasing maintenance quickly hits service.

- Ageing Fleets have increasing risks related to body structure problems (e.g. metal fatigue and corrosion). If inspections identify significant issues some, or whole, fleets can be taken out of services for further inspection or remediation works
- Fleets from the 1990s onwards, whilst having increased capability, have computerised sub-systems which consequentially have obsolescence challenges, requiring major renewals during their life
- Note: The improvement in MDBF seen from 2020-21 is due to the effects of COVID - reduction in footfall led to reduction in: train loading, doors being held open/jamming, train delays (service affecting failure (SAF) are delays above 2mins), etc.

	Fleet	Age	Utilisation in AM peak	Annual Opex per car (£k) Routine Maintenance	LCH per train (5yr avg) (k LCH)
Ageing	Bakerloo (72 TS)	47	86%	65	11.6
	Piccadilly (73 TS)	46	92%	69	12.0
	Central & W&C (92 TS)	27	92% / 100%	64	42.7
Mid life	Jubilee (96 TS)	24	92%	48	35.7
	Northern (95 TS)	23	91%	61 *1	10.3
Newer	Victoria (09 TS)	12	87%	47	12.2
	Met-S8 (S Stock)	11	83%	43	6.0
	SSR-S7 (S Stock)	9	82%	43	9.0



Legend for MDBF (Avg per Year) chart:

- Bakerloo 1972TS (Brown)
- Jubilee 1996TS (Grey)
- C&H + Dis S7 (Green)
- Central 1992TS (Red)
- Northern 1995TS (Black)
- Metropolitan S8 (Dark Red)
- Victoria 2009TS (Light Blue)
- Piccadilly 1973TS (Dark Blue)

Notes

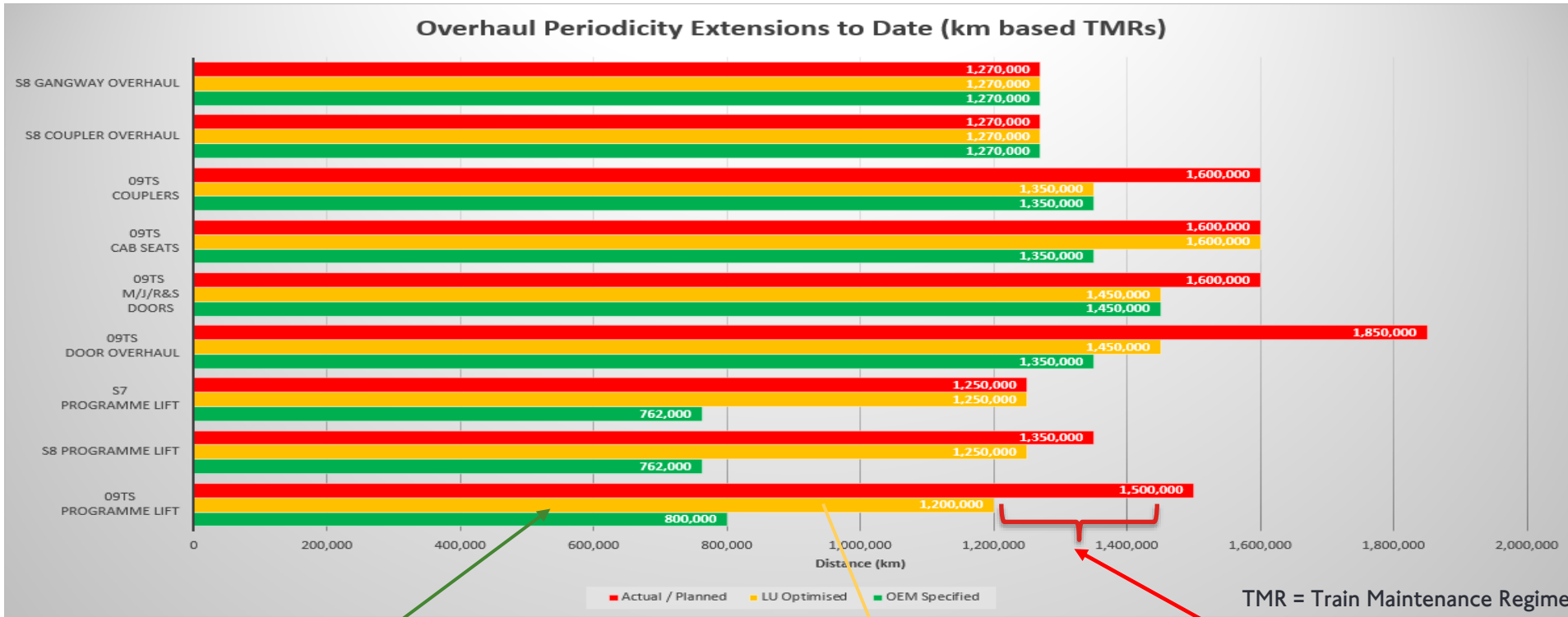
1 – Northern line Opex cost covers the whole Alstom contract prices including heavy works



Fleet Overhaul Programme

- Fleet Heavy Overhauls (FHO) have been deferred beyond the manufacturer specified regime
- Engineering concessions (Safety Cases) have been established to permit the deferral of the overhauls
- This is leading to a growing backlog of FHO due to increasing numbers of concessions
- Concessions are increasingly difficult to establish as the fleet degrades and FHO are deferred
- Any trains that cannot establish a concession will be taken out of service

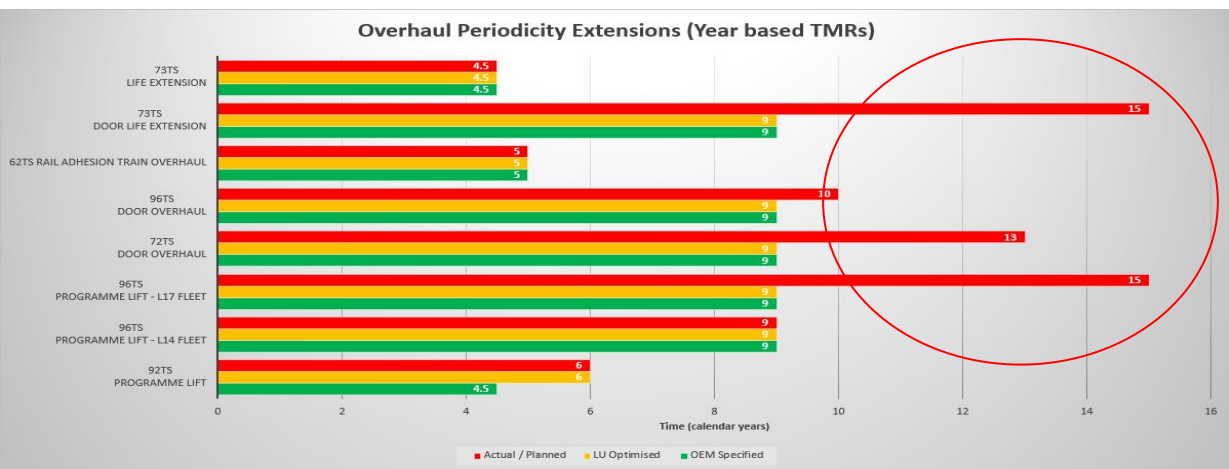
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Originally specified OEM (Original Equipment Manufacturer) Maintenance periodicity

Optimised periodicity from condition assessment (setting new limits of deferral)

Undesirable additional safety and cost risk already being mitigated and managed by the organisation.



Door overhauls beyond optimum for Piccadilly (73TS), Jubilee (96TS) and Bakerloo (72TS)

Central Line (92TS) overhaul extended 1.5 years beyond OEM maintenance regime

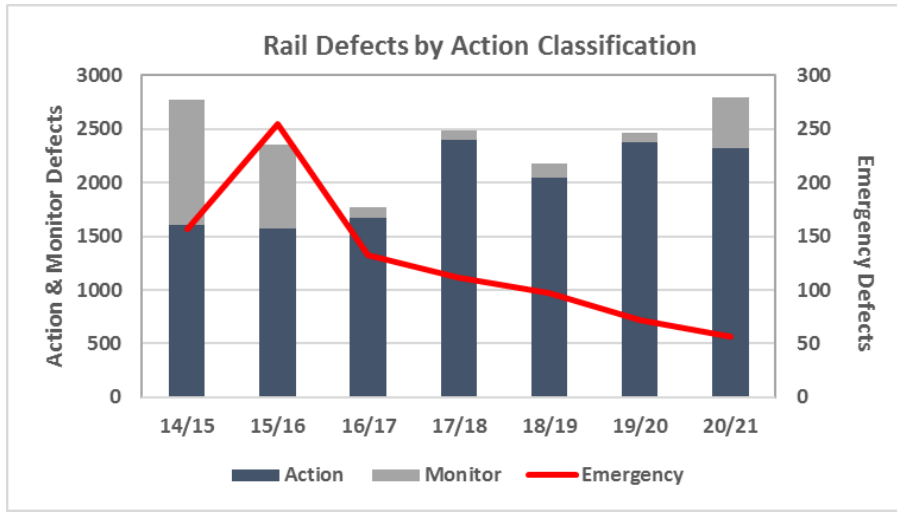
Case study: Track performance

Today's reliability is a result of strong investment in the mid-2010s, enabling the backlog of defects and poor condition to be reduced. This enabled investment to be reduced for a period. However, reduced investment due to the Covid pandemic is already starting to give up defects

Our experience is that reliability impacts tend to lag several years behind changes in investment level

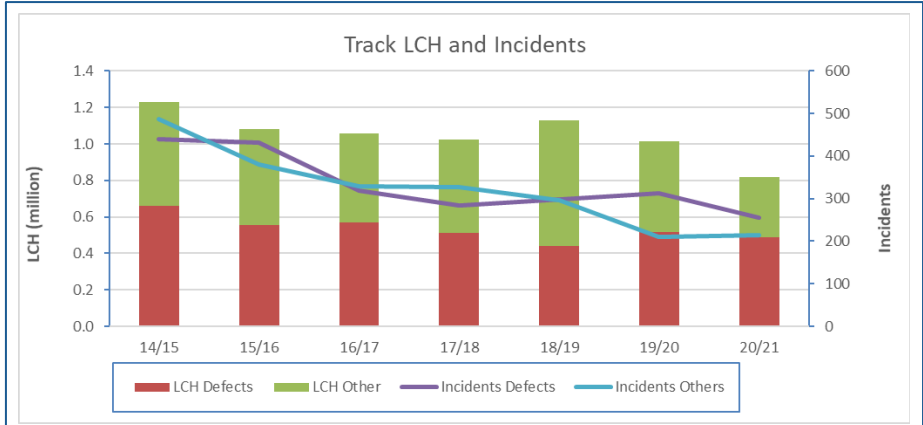
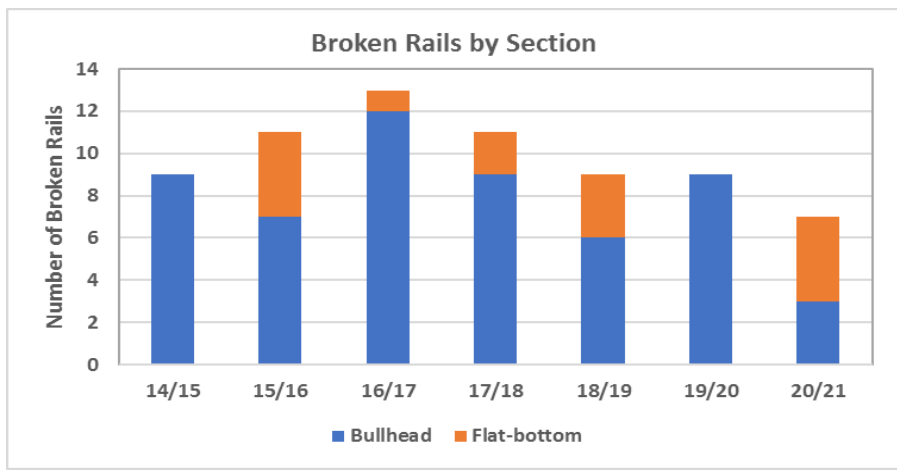
Continuing under-investment will lead to reductions in future reliability

LCH = Lost Customer Hours

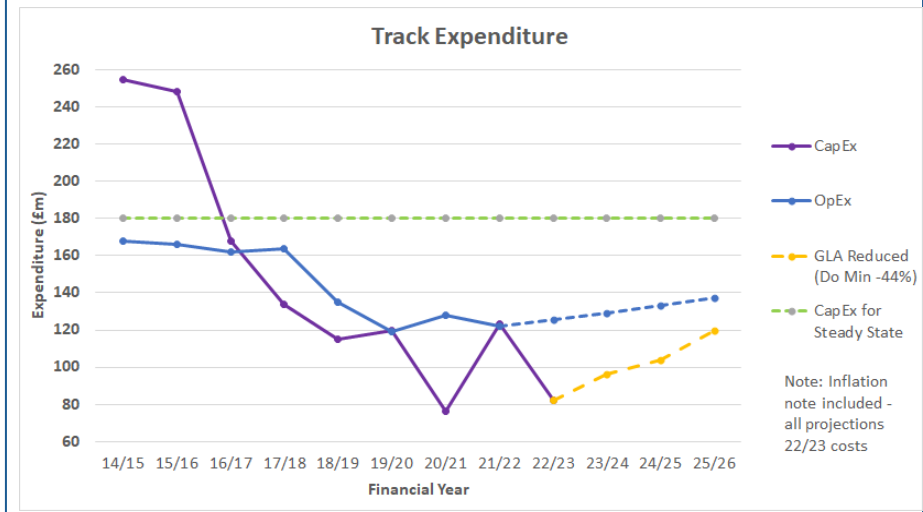


The total number of rail defects (shown above) on an upward trend, however the introduction of improved ultrasonic inspection technology has resulted in defects being detected and removed before they propagate to levels requiring emergency intervention. A growing portion of emergency defects are at aging junctions where renewals are high cost and require longer access windows.

Broken rails (shown below) are an unsafe failure mode and pose a risk of derailment and/or line suspension. A high proportion of renewals are prioritised to eliminate high fracture risk Bullhead rail. Recent flat-bottom breaks are due to delayed renewals.



Over the past decade track incidents and the resultant LCH impact initially fell. However, that improvement has levelled off as investment has reduced. The increasing number of rail defects, shown in the graph to the left, will lead to increasing LCH – however experience indicates there is normally a lag of several years.



The level of renewals required to maintain Track condition at a constant level is c£180m. Recent levels of investment mean there is already an accumulating backlog of renewals. If future investment continues to be below this level, operating expenditure will increase and reliability will drop.

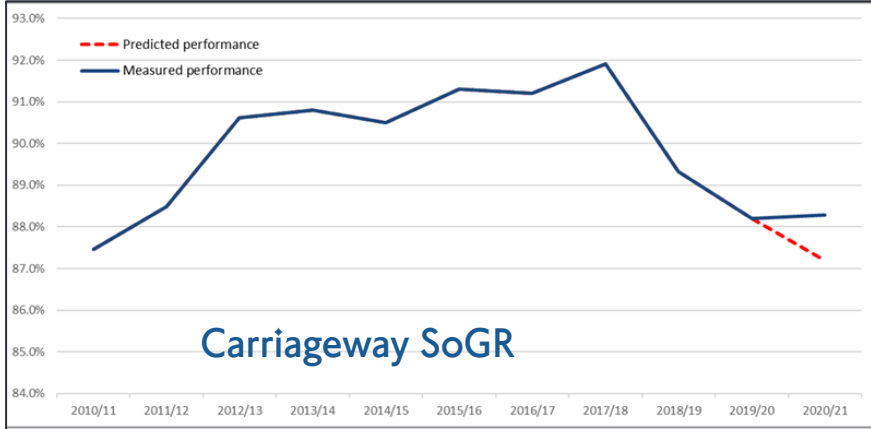
Road assets: Trends

In general, the State of Good Repair (SoGR) of road assets has been declining for the last five years. This is due to the ceasing of the Gov't revenue grant and Covid impacts.

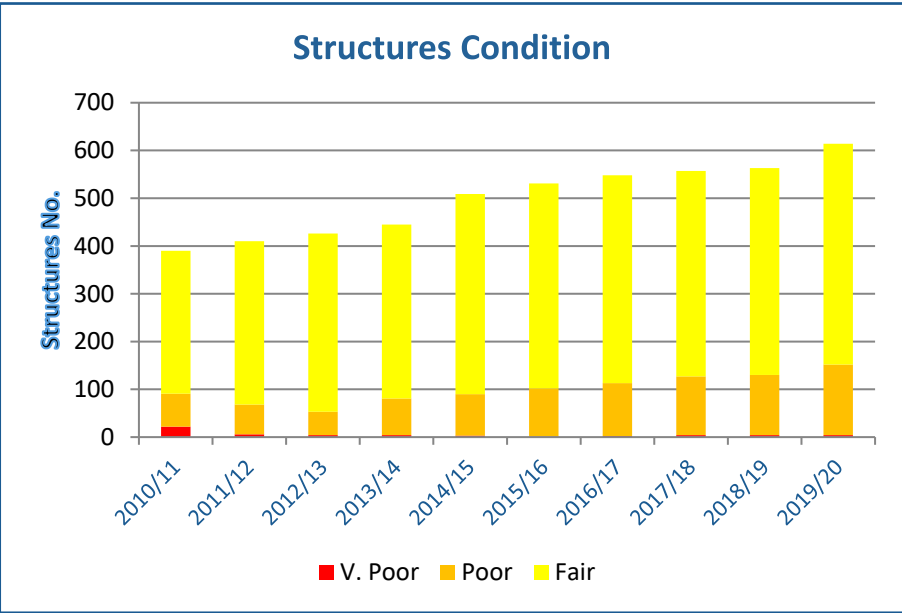
The rate of decline has been rapid and it is impacting TfL services due to restrictions, closures, increasing asset defects and falling reliability

Important: safety is paramount and asset restrictions and closures are used to ensure appropriate safety levels are maintained

- SoGR of carriageway has declined to 87% which is comparable to Local Authority B, C and Unclassified roads in the rest of England; rather than motorways (95%) and A-roads (94%)
- This means more defects (potholes, cracking, poor skid resistance) and a poor quality surface that leads to more accidents/liability claims and that acts as a barrier to active travel (cycling and e-scooters)
- c.100% increase in bridge and tunnel interim measures (including weight, height and speed) is causing traffic disruption and increasing pollution, while also placing considerable pressure on Asset Operation staff and budgets



- 2020/21 survey curtailed due to Covid and is primarily based on 2019/20 data, hence minimal change; the prediction of 87% is based on asset models
- The rate of deterioration over 3 years had previously required 8 years to rectify



Number and cost of interim measures on structures

Year	Assets with Interim Measures	Interim Measures Annual Cost (£000's)
2016/17	24	£566
2017/18	26	£966
2018/19	39	£2,071
2019/20	43	£3,936
2020/21	45	TBC

Asset Management Objectives & Levels of Service



Linking outcomes to asset condition

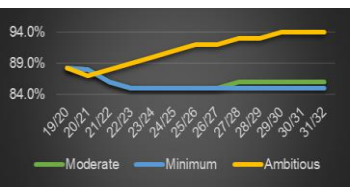
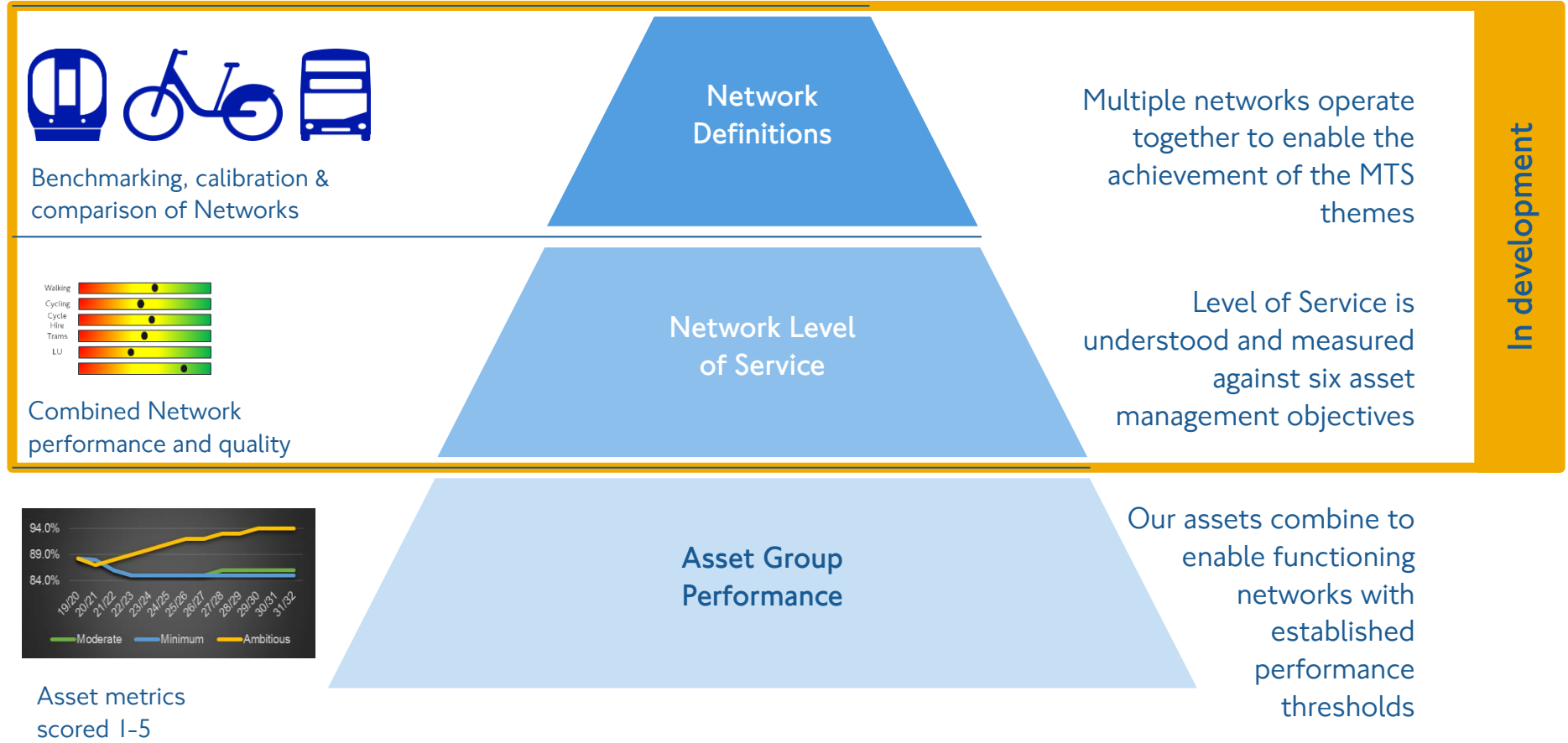
Our aim is to provide credible and robust asset investment strategies and plans that clearly demonstrate how they support strategic outcomes

To enable this we must create the 'line of sight' between asset condition and the MTS/Business outcomes in a meaningful and transparent manner

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- Healthy Streets and Healthy People
 - A good public transport experience
 - New homes and jobs
- Public Transport Experience and Quality supported by LoS scores

Three key themes underpin the Mayors Transport Strategy



Asset metrics scored 1-5

Asset Management Objectives & Levels of Service

Assets are assessed using six Asset Management Objectives

The level of performance against each Objective (on a 1 to 5 scale) is assessed using a range of data and information, including:

- State of Good Repair
- Customer Satisfaction Surveys
- Benchmarking
- Whole life assessment and deterioration models
- Industry guidance/standards
- Mayoral and TfL objectives

This is a developing approach and we are continuing to refine it

TfL Asset Management Objectives

Theme (Pan-TfL)	Description (Pan-TfL)
Safety	We will manage our assets so that they are safe to use and maintain
Service	Assets that directly support the movement of customers are able to perform their function to the required level of reliability
Customer	Assets contribute positively to the customer and staff experience and encourage the use of public transport and healthy forms of travel
Capacity & growth	Assets contribute to the growth of London and/or increased public transport capacity
Environment	We will minimise the impact of our assets on the environment and adapt our assets to cope with the impacts of climate change
Financial	Assets are managed cost effectively, they support income generation and revenue collection, and help reduce whole life costs

Asset Management Levels of Service scale



Levels of Service: Emerging definitions

Level of Service descriptions, for assets, are based on:

- How the “condition” of the assets are likely to impact the journey experience; and
- What form the asset management strategy will take, e.g. preventative, planned, reactive

These definitions provide the starting point for more granular Asset Management Objectives (e.g. Safety, Service & Customer) that are defined for networks, sub-networks and asset types

Excellent	5	<p>Journey Experience</p> <ul style="list-style-type: none"> • Customers know they will have a safe, reliable and easily accessible journey. The experience will be of a ‘world class’ transport environment with streets, trains, buses, stations and facilities which customers praise and promote to others. • A good/high-quality service, with the appropriate reliability and availability, that delivers the ambition of the Mayor’s Transport Strategy and caters for on-going passenger growth/demand. <p>Asset management strategy</p> <ul style="list-style-type: none"> • Optimised interventions, utilising preventative interventions to reduce whole life costs. • Well planned interventions that minimise network disruption, innovating materials and processes.
Good	4	<p>Journey Experience</p> <ul style="list-style-type: none"> • Customers receive an adequate and acceptable service that is safe and generally reliable, services can be inconsistent • Customer experience of TfL services is mixed; this is reflected in customer feedback with major complaints occasionally made and some negative media coverage <p>Asset management strategy</p> <ul style="list-style-type: none"> • A mix of planned and reactive renewals depending on risk exposure. • In control of State of Good Repair and asset risks.
<p>----- BASE POSITION -----</p>		
Poor	2	<p>Journey Experience</p> <ul style="list-style-type: none"> • The service remains safe, however reliability is reduced. Customers frequently experience disruptions and delays during their journey and modal shift is evident. • Customer satisfaction will decline and there will be frequent negative press coverage of London's transport network. <p>Asset management strategy</p> <ul style="list-style-type: none"> • Declining State of Good Repair and increasing asset defects/faults; majority of interventions are reactive. • Restrictions, closures and service reductions will be required to manage safety. • Increased pressure on operational and engineering teams to manage assets and safety, with a large renewals backlog which will take years to address and result in a prolonged period of service disruption (multiple years).
Unacceptable	1	<p>Journey Experience</p> <ul style="list-style-type: none"> • Customers have learned to expect significant unplanned service disruption as facilities and service will be reduced/closed to maintain safety; passenger numbers and revenue decline as a result and modal shift will be significant. • Substantial pressure on operational and engineering teams to maintain safety and services. Greater risk of more incidents/asset related accidents. <p>Asset management strategy</p> <ul style="list-style-type: none"> • Declining State of Good Repair and renewals are fully reactive (where affordable). • Increasing focus on managing restricted/closed assets and decommissioning assets/parts of networks. • A large renewals debt/backlog that is increasing and will result in service disruption of many years (5, 10 or more).

AMO Level of Service scores

Performance is assessed using a refined version of the five-category Level of Service (LoS) scale

This is based around a network/programme/asset's ability to meet the "requirements" of the definition

The refined scale gives a greater level of granularity to indicate movement within each category

LoS category	Priority score	Description of performance at network/programme/asset level, at a point in time	
5. Excellent	12	Fully aligns with AMO definition	↓
	11	Signs that alignment is weakening and moving to a lower level	
4. Good	10	Fully aligns and examples of moving to a higher level	↑
	9	Fully aligns with requirements	
	8	Signs that alignment is weakening and moving to a lower level	
3. Managed	7	Fully aligns and examples of moving to a higher level	↑
	6	Fully aligns with requirements	
	5	Signs that alignment is weakening and moving to a lower level	
2. Poor	4	Fully aligns and examples of moving to a higher level	↑
	3	Fully aligns with requirements	
	2	Signs that alignment is weakening and moving to a lower level	
1. Unacceptable	1	Fully aligns and examples of moving to a higher level	↑
	0	Fully aligns with requirements	

Setting our Asset Performance Expectations

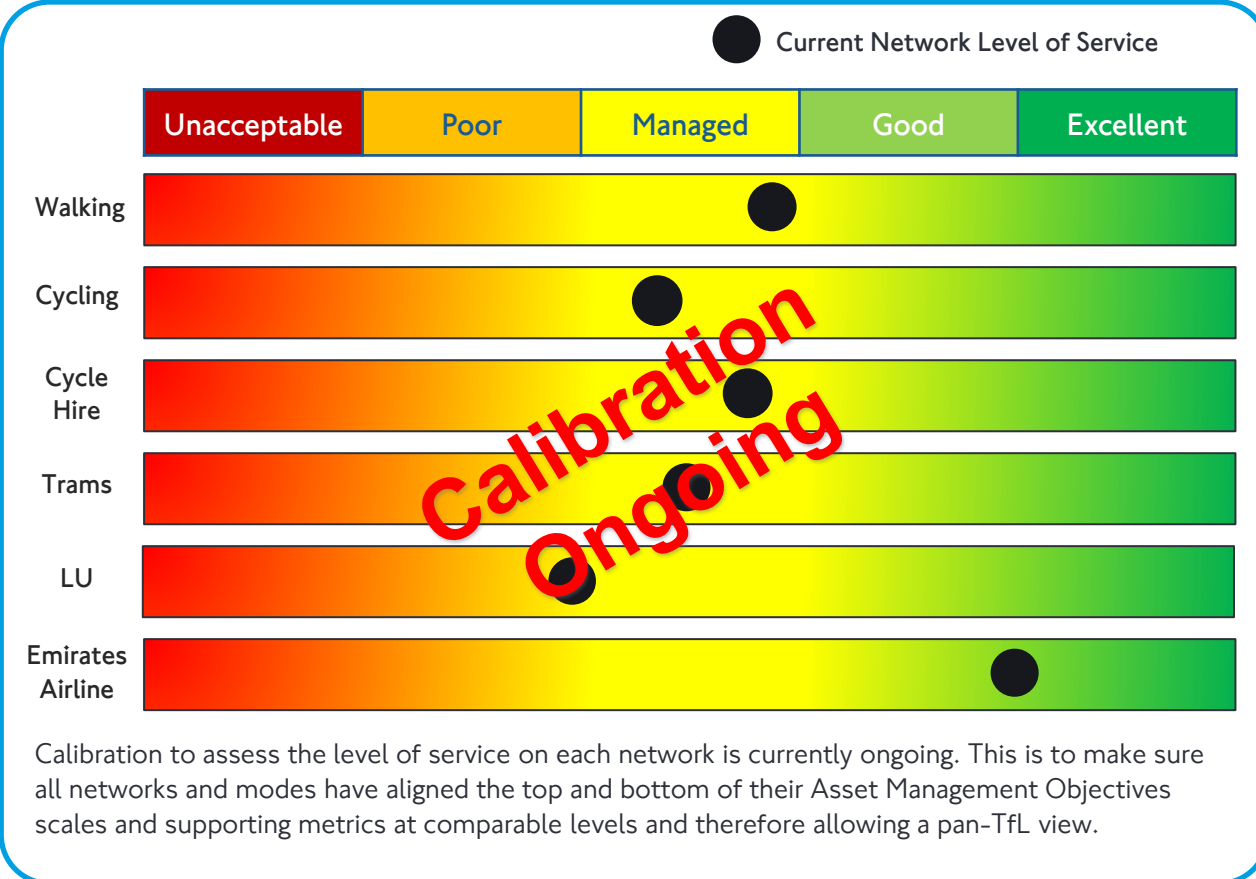
To help agree and prioritise our TfL level of service expectations, Asset Strategy are developing a supporting tool-kit

Using our AMOs and the Level of Service scale, we will define and benchmark asset condition and performance across every network and asset group

By refining and applying the Level of Service scale with specific AMO feeder metrics, we will be able to assess our networks and determine their ability, based on different levels of funding, to meet alternative Levels of Service

By taking a pan-TfL view we will be able to compare different networks and the overall impact on outcomes; helping support prioritisation of strategic decisions & investment

AMO Comparison by Network/Sub-network



Calibration to assess the level of service on each network is currently ongoing. This is to make sure all networks and modes have aligned the top and bottom of their Asset Management Objectives scales and supporting metrics at comparable levels and therefore allowing a pan-TfL view.

2022 Development

- Achieve consensus on our benchmarked asset and network conditions and their AMO impacts.
- Provide ExCo with the information to make an informed decision and agree the base level of service for the TfL networks and asset groups.

Visual Example: LU Assets Level of Service



*Note not all images are of the TfL LU network. Other networks and assets have been used to display extreme levels of service
Bottom right - Image shows high profile accident of an escalator pile up on the Rome metro in October 2018.

Understanding TfL asset investment needs

Three sections:

1. Past spend and delivery
2. Run rate assessment
3. Asset modelling

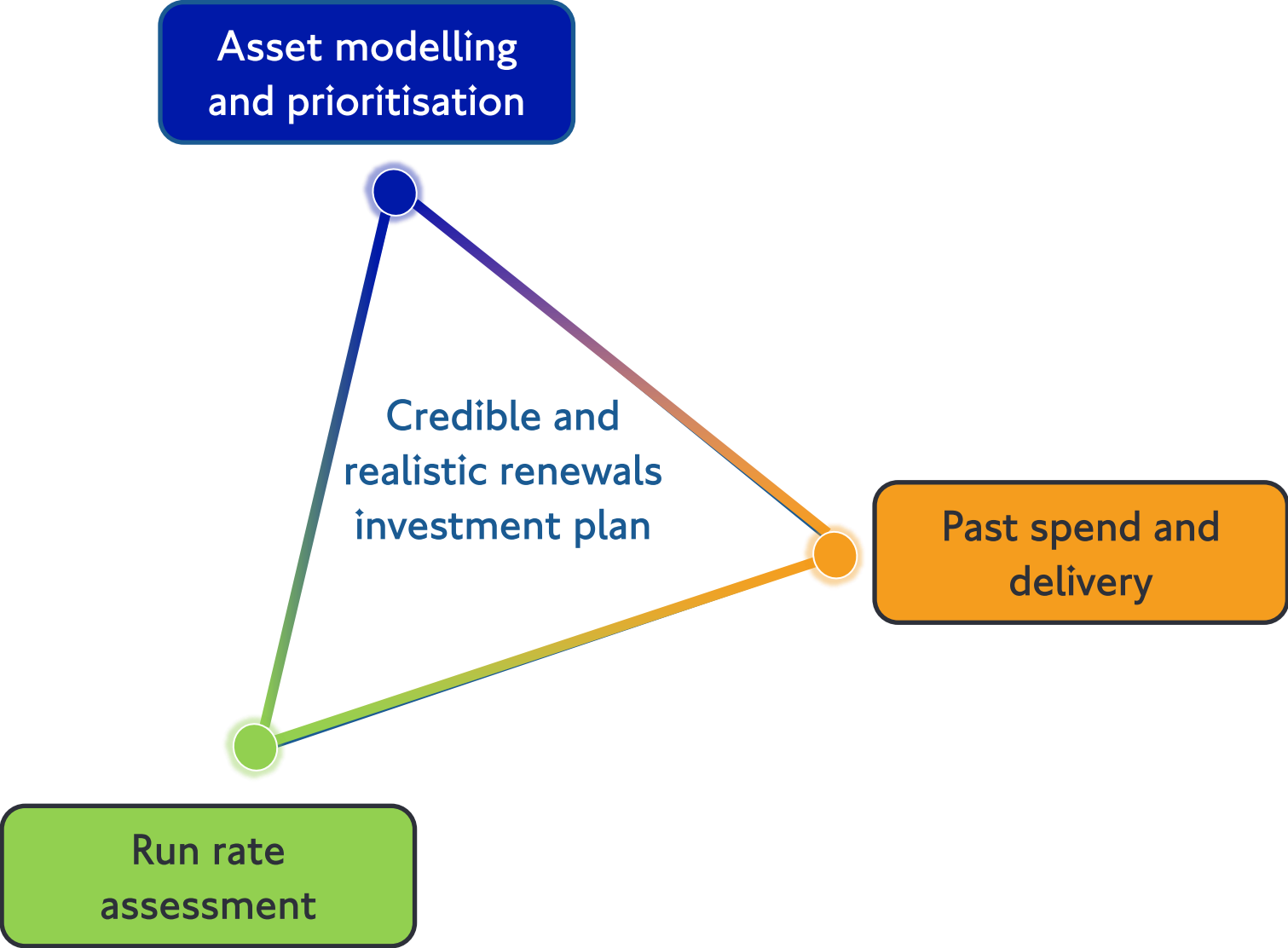


Establishing how much we need to invest in renewals

We will use three methods and sources of information to inform our renewals investment plan

1. Past spend and delivery
how much have we invested in renewals over the past 10 years (taking account of recent low investment)
2. Run rate assessment
a simple calculation of need based on asset quantities, expected lives/replacement rates and the average cost of replacement
3. Asset modelling and prioritisation
formal and validated asset models that assess degradation and investment options

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1. Past spend and delivery

Notes:

- The slides are based on the best available information
- Investment classifications (OpEx and CapEx) have changed over the last 10 years, e.g. after 2019/20 Fleet Heavy Overhaul moved from OpEx to CapEx
- Classification between historic Renewals and Enhancements is not always clear from financial records
- Under the Tube PPP some CapEx was “expensed” and we do not hold records of this
- Excludes historic CapEx renewals spend of circa £150m to £200m per annum covering (i) Rail and Sponsored Services; and (ii) Technology and Data because these portfolios have evolved and changed substantially over the last 10 years and meaningful data could not be collated



Renewals Investment: London Underground

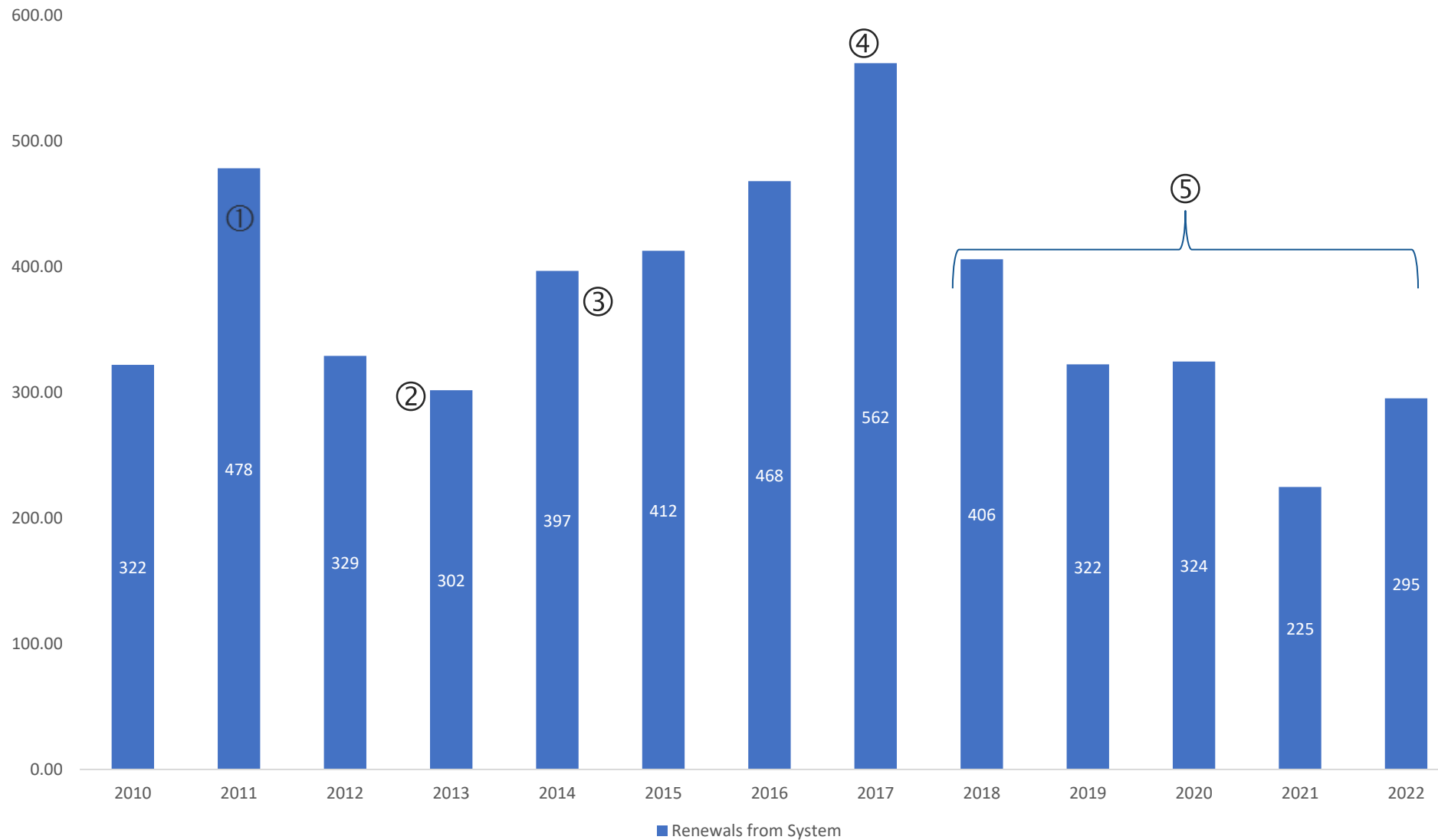
- ① Olympic Boom
- ② Post Olympic trough
- ③ Bringing in of Infraco's
 - Renewals portfolio coming into LU
 - Growth of investment

Renewals Peak

Reduced renewals investment due to:

- 2018 and 2019 - affordability constraints due to removal of Gov't grant;
- Renewal levels were planned to recover from 2020 onwards;
- 2020 onwards – Covid impact has meant renewals has been unable to return to 2016 and 2017 levels

LU Renewals History 2010 – 2022



- Classification between “R”&”E” commenced mid 2010’s, retrospective assumption on renewals made
- Historic renewals that were previously “expensed” as part of PPP contracts are not shown
- Pre 2019 figures exclude Fleet heavy Overhaul (c£100m to £200m per annum) as it was classed as OpEx
- Indicative renewals takes peak spend in 2017 and deflating at 3% back and inflating forward at 3%.

Surface: Roads investment From 2003 to 2020

Investment in roads renewals has fluctuated over the last 20 years.

Improvements in asset management from 2010 onwards improved data quality and asset modelling capabilities. This improved our understanding of the renewals backlog and the need for increased levels of investment to avoid major network impacts.

In 2012/13 the case was made to invest in road renewals to remove the backlog of work that had developed and move towards steady state investment

- The increased investment, as shown by the graph below, started in 2014/15

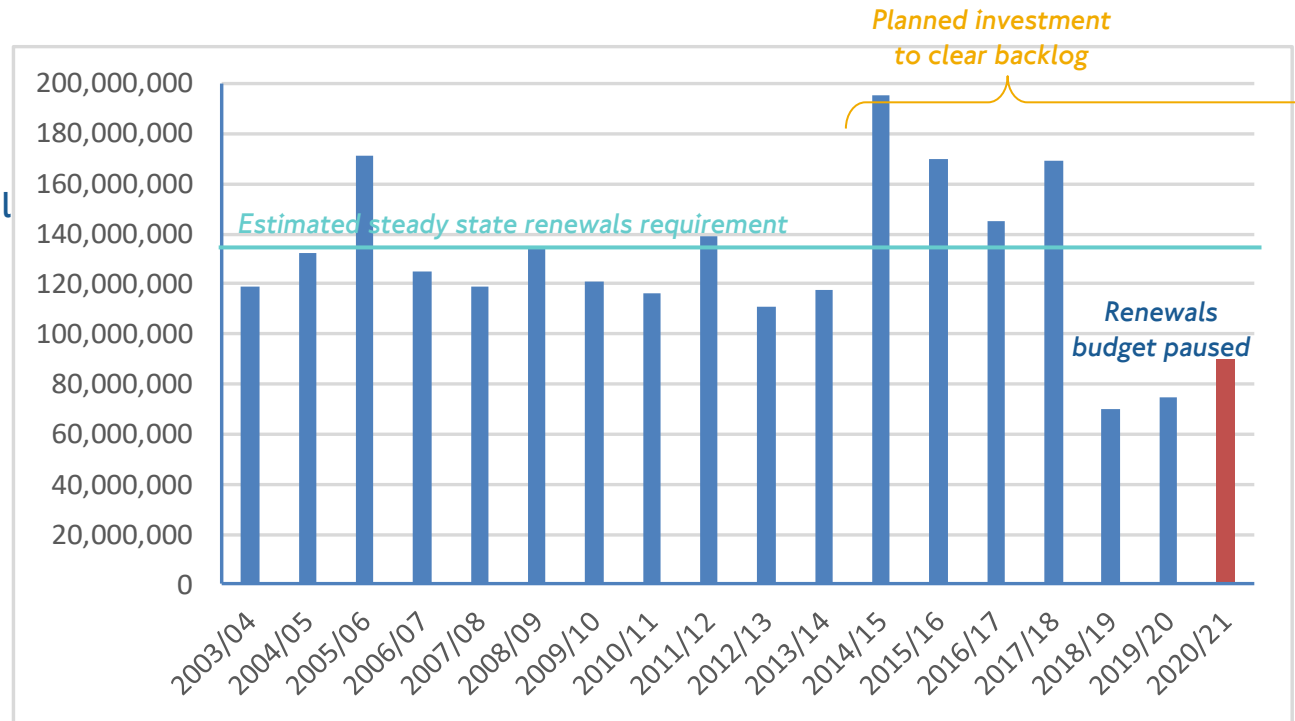
Investment of £150m to £200m per annum was planned until 2022/23 to remove the backlog

- Renewals would then move to a steady state of circa £130m to £140m per annum to maintain services and avoid another backlog developing

The removal of TfL's Government grant in 2017 required the budget to be 'paused' until a sustainable investment solution for roads was established

- Only contractually committed schemes and the highest priority renewals were progressed

Road renewal spend – not inflation adjusted



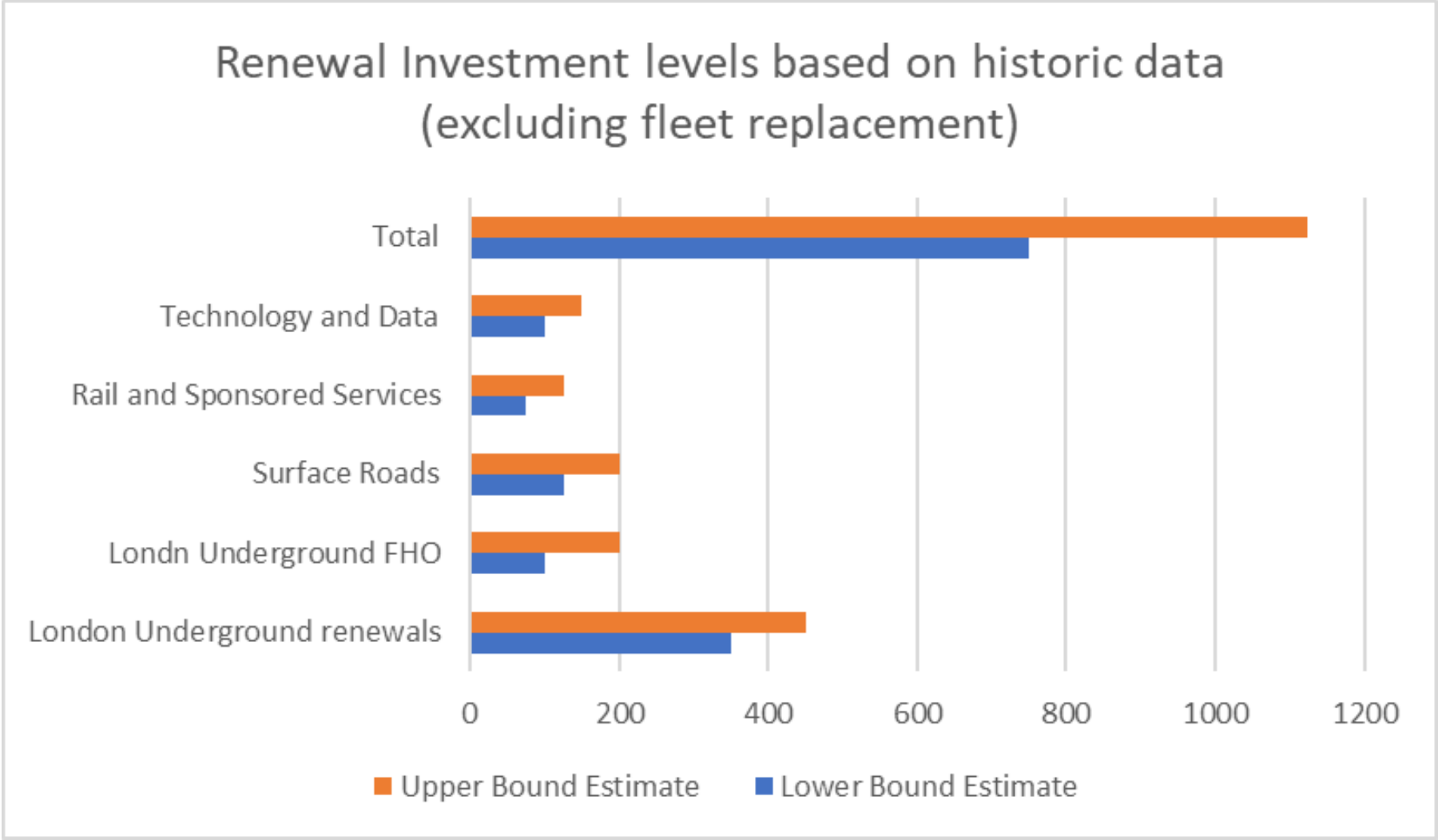
2019 Business Plan
The 2019 plan included a return to previous investment levels for road renewals of between £150m and £200m per annum from 2021/22

Annual renewal investment levels derived from historic data

To be used in conjunction with run rate analysis and asset model data

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- Note: this graph is based on past financial data and provides an indicative range of annual steady state renewals spend for TfL
- This is not based on detailed asset modelling or run rate assessment



2. Run rate assessment



Run rate calculations

- Simple assessment of asset life, renewal costs and steady state replacement rates
- Used as another data point alongside historic financial data and asset modelling work

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Note: LU renewal figure excludes Fleet replacement (estimated at an additional steady state need of £280m per annum)

- High level data and assumptions captured include:
 - Asset quantities; intervention cost assumptions; degradation and asset life assumptions; and explanation of simple steady state calculation

	Asset quantities	Cost assumptions (including any fixed costs)	Deterioration rate/service life	Known issues/concerns	Strategy Options (Asset Condition and work volumes)				Steady state Do Minimum range (£m per annum)		Explanation of Steady State calculation
					Do Min -20%	Do Minimum	Moderate	High Ambition	Lower Bound	Upper Bound	
Highway Infrastructure											
Carriageway	9,000,000m ² 2550 lane km	Average treatment is £40 to £45 per m ²	Varies by road type and usage: 10 to 12 years for inner London and high bus usage; 12 to 15 for outer London and lower bus usage; 15 to 20 for high speed roads	Condition of high volume cycle routes to be improved to avoid road conditions becoming a "barrier" to new cyclists or deterring existing cyclists.	SOGR of 85% for roads with a low volume of cyclists SOGR of 90% for roads with higher volume of cyclists	SOGR of 90% for roads with a low volume of cyclists SOGR of 92% for roads with higher volume of cyclists	SOGR of 92% for roads with a low volume of cyclists SOGR of 95% for roads with higher volume of cyclists	13	36	Lower bound - (9,000,000/20)*40 - £18m PA Upper bound - (9,000,000/10)*45 - £36m PA NOTE: £27m PA as per Moderate scenario in Mid term (yr23-11m23/24-45/46) - however this may be up to 20-30% higher due to new contractor	
Fantasy	3,000,000m ² 2400km length	Average treatment is £90 to £200 per m ² depending on material selection. £100 per m ² used for long term investment planning based on historic costs.	Deterioration of Fantasy is mostly driven by vehicle overruns and tree roots. The anticipated renewal frequency ranges from 12 years for high volume walking routes to 30 years for lower volume routes.	Condition of high volume walking routes to be maintained to avoid surface conditions becoming a "barrier" to walking.	SOGR 90% for high volume walking routes SOGR 88% for low volume walking routes	SOGR 92% for high volume walking routes SOGR 90% for low volume walking routes	SOGR 95% for high volume walking routes SOGR 93% for low volume walking routes	8	14	Lower bound - (3,000,000/30)*90 - £9m PA Upper bound - (3,000,000/12)*200 - £14m PA NOTE: £5m PA as per Moderate scenario in Mid-Lang term (yr23-25/24-45/46) - however this may be up to 20-30% higher due to new contractor	
Lighting	62000 lighting points 35,000 lighting columns	Average treatment cost is: Column & Luminaire combined replacement - £5k Luminaire only replacement £400 average of 1.2 luminaires per column. Inefficiency in do minimum from year 6 onward reduce output by 10%. Increased luminaire only output in moderate and high ambition for year 1 and 2	Varies by column material type, environment and luminaire lamp type: Steel (galvanneal) - 25 to 40 years Aluminium - 35 to 50 years LED luminaire - 15 to 20 years High energy lamp - 2 to 4 years	Column and cable deterioration affecting routes on TLRN, such as A2, A12. Wide scale replacement of flange mounting struts a location not feasible due to deterioration of concrete foundation structure and parapets, alternative solution required where permanent removal not appropriate (such as Graydan Flyover). Column attack has potential due to "move on" installation history, a higher annual replacement rate within 10 year period to accommodate large number of columns reaching end of typical service life.	SOGR 87% 850 Columns 1050 LED Luminaire	SOGR 90% 900 Columns 1650 LED Luminaire	SOGR 91% 1400 Columns 3400 LED Luminaire	5.6	7.6	Lower bound: (35k columns / 40yr avg)*5k + (62k luminaire / 20yr avg)*400 - £5.6m PA Upper bound: (35k columns / 20yr avg)*5k + (62k luminaire / 15yr avg)*400 - £7.5m PA NOTE: £5.33m PA as per Moderate scenario in 25yr investment (taken on average of annual investment between Mid-Lang term, since it periodically deteriorates slightly) - however this may be up to 20-30% higher due to new contractor	

Business Area	Do Min Lower Bound	Do Min Upper Bound	Comments
London Underground	549	686	One figure calculated, this is taken as Do Min upper bound; Lower bound is 20% less
Roads	121	199	Large bridge and tunnel refurbishments and assumptions generate significant range
Rail & Sponsored Services	80	105	Circa £5m per annum added to cover Cycle Hire, Woolwich Ferry and Emirates Airline
Tech and Data	90	130	Estimated figures based on current spend, more detailed analysis required
Total	840	1,120	Lower to Upper range of £280m

Case Study: Track run rate calculation

- The run rate for Track renewals is established by setting a rate of renewal that ensures the asset is replaced within its nominal life.
- The nominal life for each Track type is set by engineering judgement, based on asset data and experience and technical knowledge of the assets
- We are establishing a SoGR measure for Track and developing a Track asset model

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Activity	Quantity of asset type	Av. Nominal life (years)	% renewed p.a.	Annual Volume	Unit rate	Annual Cost (£m)
Ballasted Track Renewals – vol	507km	60-40*	1.7%	8.5km	£4.25m/km	36.1
Ballasted Track Life Extension – vol	507km	30-20	1.7%	8.5km	£2.20m/km	18.7
Deep Tube Renewals – vol	289km	60-28	3.0%	8.6km	£7.70 - £4.50m/km	48.9
Main P&C Renewals – vol	747	40-30	3.2%	24 units	£1.26m/unit	30.2
Depot P&C Renewals – vol	987	80-60	0.8%	8 units	£0.72m/unit	5.8
P&C Life Extension – vol	747	40-30	1.3%	10 units	£0.42m/unit	4.2
Track Drainage – vol	N/A	N/A	N/A	4.5km	£2.30m/unit	10.4
Additional Works (e.g. Depot Reliability, Safety Improvements)	N/A	N/A	N/A	N/A	N/A	5.5
Overheads (Programme Costs & Replacement Bus Services)	N/A	N/A	N/A	N/A	N/A	28.1
Efficiencies (3.6% delivery efficiency challenge)	N/A	N/A	N/A	N/A	N/A	-6.6
Total						181.3

* Within the categories of assets above, different components have different nominal lives

Current Track type	Quantity of asset type	Average nominal life (years)	Percentage renewed p.a.	Steady state rate of replacements required p.a.	Unit rate	Total cost p.a.
Ballasted Track Renewals - straight and curved	491 km	60	1.7%	8.2km	£4.3k/m	£35.2m
Deep Tube Renewals – tight curves	35km	34	2.9%	1.0km	£7.7k/m	£8.0m
Mainline P&C – bullhead rail	391 units	30	3.3%	13units	£1.6m/unit	£20.8m

$$Annual\ renewal\ cost(per\ track\ type) = \frac{1}{Average\ Nominal\ Life} \times Track\ type\ length \times Unit\ rate$$

3. Asset Modelling



Asset modelling

- Computerised models used to assess and predict how assets will degrade/behaviour under different intervention and investment scenarios
- The models vary in maturity and complexity and are a key focus area for the next 6 to 9 months
- The outputs will provide a pan-TfL view of alternative investment scenarios and their impact on outcomes and asset health

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Change Scenario selection

Selected Scenarios

Asset Level 2	Scenario	Description
Carriageway	Do Min -20%	Reduced level of ii
VRS	Do Min -20%	Reduced level of ii
Dial-a-Ride	Do Min -20%	Scenario Overview
River Piers	Do Min -20%	Under this scenari
Structures	Do Min -20%	Under this scenari
ITS - CCTV	Do Min -20%	Under this scenari
Building Systems	Lu Do Min	
Buildings	Lu Do Min	
Data	Lu Do Min	
FVs	Iu Do Min	

Total investment by Asset

Scenario ● Do Min -20% ● Lu Do Min

Asset	Do Min -20%	Lu Do Min
Fleet & Depots		10,389M
Track		5,297M
Buildings & Civils		
Signalling		
Bridges & Tunnels		
Highway Infrastructure		
DLR		
Tech & Networks		
Power		
Trams		
Traffic Infrastructure		
Bus, Coach & River Infrastructure		
London Overground		
Sponsored Services		

Select year range: 2022 - 2046

Total investment: 26.76bn

Scenario investment proportions: Do Min -20% (17%), Lu Do Min (83%)

Budget: Enhancements (5,077M), Enhancements - New Fleet (21,671M), Opex, Renewals Investment

Investment profile

Asset Level 1

- Bridges & Tunnels
- Buildings & Civils
- Bus, Coach & River Infrastructure
- DLR
- Fleet & Depots
- Highway Infrastructure
- London Overground
- Power
- Signalling
- Sponsored Services
- Tech & Networks
- Track
- Traffic Infrastructure
- Trams

Investment proportions

Do Min -20% ● Lu Do Min

83%

Year	2024	2025	2026	2027
Value 1	312,200	280,980	252,882	
Value 2	132,459	125,836	119,544	
Value 3	3,260	3,097	2,942	
Value 4	1,763	1,587	1,428	
Value 5	1,479	1,405	1,335	
Value 6	2,256	2,143	2,036	
Value 7	6,519	6,193	5,883	
Value 8	4,256	3,830	3,447	
Value 9	1,341	1,274	1,210	1,150
Value 10	1,092			

Go back Custom Scenari... < >

Long Term Capital Plan | Data updated 10/12/21

Number of ACR Concerns - Open Code 2's - Electrical: 5,254 (2022), 4,729 (2023), 4,256 (2024), 3,830 (2025), 3,447 (2026)

Number of ACR Concerns - Open Code 2's - Fire systems: 1,341 (2022), 1,274 (2023), 1,210 (2024), 1,150 (2025), 1,092 (2026)

State of Good Repair (%)

Asset

- Bus Stops and Shelters
- Carriageway
- Cycleways
- Drainage
- EVs
- Footways
- L&E
- Lighting

Go back Custom Scenari... < >

Long Term Capital Plan | Data updated 10/12/21

Investment scenarios

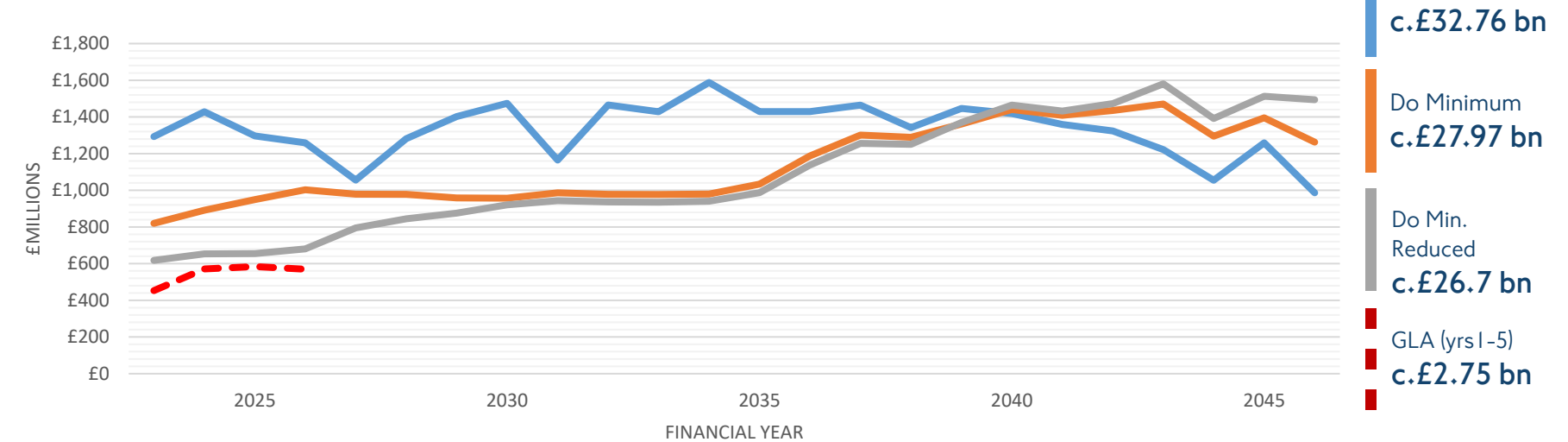
- The slide shows the scenarios that have been modelled to date by TfL
- The latest GLA submission is c.40% below Do Minimum; and c.20% below our lowest modelled scenario to date ('Do Min Reduced').
- This work, by necessity, has been rapid to provide additional data points for DfT discussions, further work is essential
- In 2022 work will continue to improve the robustness of models and validate impacts on outcomes

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	Objective	2021 LTCP?	Outcomes modelled	LU	Surface & Rail	22/23	23/24	24/25	25/26	26/27	Total
Mid / Moderate	Optimum renewals profile	✓	✓	Known as Mid	Known as Moderate	1,293	1,428	1,297	1,259	1,056	6,333
Do Minimum	Maintain 2019 Safety & Service	✓	✓	Re-profiled 2020 Do Min 'Asset Need' scenario (for deliverability)	Do Min historically linked to year 1 -5 deliverability	820	892	950	1,003	979	4,644
Do Min Reduced	Theoretical		✓	c.-20% below the Do Min.		618	654	655	680	795	3,402
GLA Budget	Actual			GLA is c.-20% below Do Min Reduced; c.-40% below the Do Min; and c.-57% below Mid.		453	571	584	570	571	2,749

Note: the above scenarios exclude professional services, Surface Technology and Elizabeth line ~ circa £100 to £150m per annum. GLA accounts for inflation, whilst other scenarios do not.

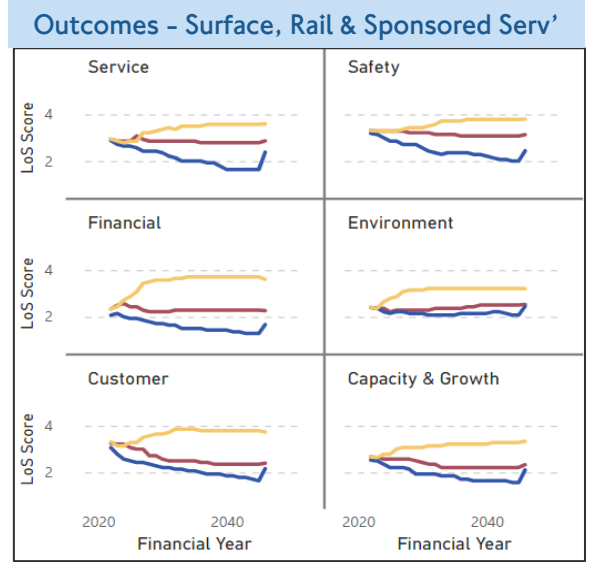
Pan-TfL renewals: Investment profiles (2022/23 to 2045/46)



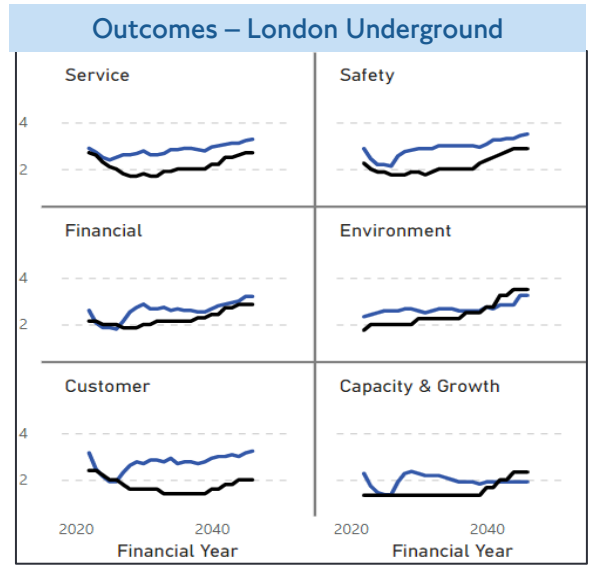
Examples of the detail the work is producing

- Models and outcomes are being validated by the 'Guiding Mind' groups
- All assets are providing long-term projections against the common Asset Management Objectives (AMO)
- All assets are providing facts and stats to support the AMOs to bring them to life, e.g. bridge restrictions, trains available for service etc.
- Started work to model latest GLA budget and outcomes
- We will challenge ourselves on the credibility of the outcomes and impacts

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Legend: Moderate (yellow), Do Min (red), Do Min Reduced (blue)

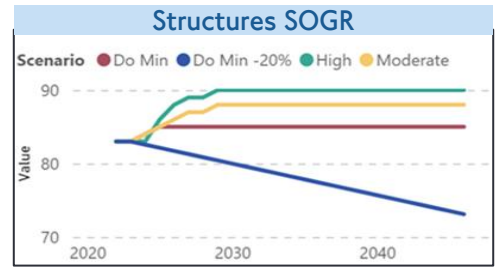


Legend: Do Min (blue), Do Min Reduced (black)

	Mid / Moderate	Do Min 2021	Do Min Reduced (examples of modelled impacts)
LU Fleet *		<ul style="list-style-type: none"> More modelling is required on fleet, in particular to understand the impact deferred heavy Overhauls may have on fleet availability; the assumptions made have a significant impact on spend/availability 	
LU Track			<ul style="list-style-type: none"> More safety risk and associated line restrictions – with +43% Asset Condition Safety Concerns by 2026 The estimated £1.7bn renewals 'backlog' will continue to grow and impact heavily on Opex. Contracts no longer provide value, due to fixed costs Improvements in condition (SOGR) delayed 10 years.
Trams	<ul style="list-style-type: none"> Optimum renewals profile; Targeted savings and core business objectives met 	<ul style="list-style-type: none"> Short-term condition and service impacts; However, overall we maintain or recover Service Levels to "base" levels 	<ul style="list-style-type: none"> Fleet life extension & non-RVAR compliance to 2037 Asset condition falls, with number of assets in a state of good repair (SOGR) down to just 2 in 10 by 2040s
Cycle-ways			<ul style="list-style-type: none"> Condition (SOGR) falls from 93% to 83% within this decade – pushing demand back onto private vehicles.
LU L&E			<ul style="list-style-type: none"> Sustained availability issues with Lifts and Escalators as 'good' condition assets fall to just 55% by 2027.
Carriage-ways			<ul style="list-style-type: none"> Increase in journey times due to speed restrictions, with +16% more carriageway 'Cat I' defects by 2026
Buildings			<ul style="list-style-type: none"> Customers 'will no longer want to use our stations' in the next 10-15 years; 50% of stations 'poor' condition
SHE			<ul style="list-style-type: none"> Stalled growth or decline in active and sustainable travel; increased pollution & KSI with modal shift Less mobile, vulnerable & low income groups isolated

Road Bridges & Tunnels under Do Min Reduced

- Tunnels** - Rotherhithe & Blackwall Tunnel (S) wouldn't be renewed – with further restrictions required in 2 to 5 yrs
- Bridges** - a continued decline in condition with around 1/3 in a poor condition by 2040s; only **Moderate** recovers backlog.



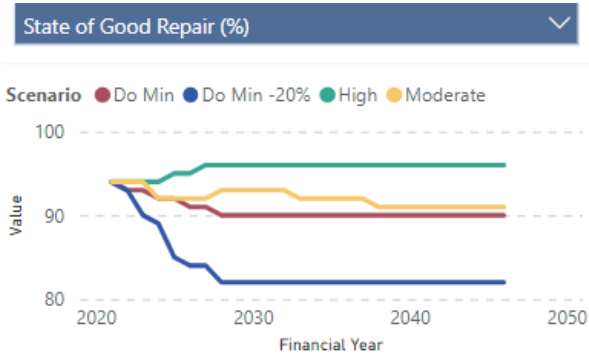
Road: SoGR Predictions

State of Good Repair (SoGR) comparison between four funding scenarios: High Ambition, Moderate, Do Minimum (also referred to as Managed Decline) and (Do Minimum minus 20%)

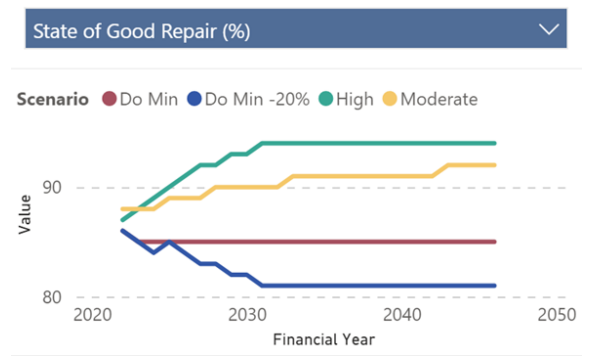
Cycleways, footways, bus stops and shelters and lighting all require the Moderate scenario to maintain SoGR. Under Do Minimum and (Do Minimum minus 20%) SoGR degrades over the 25 years

Carriageways and structures SoGR increase under the Moderate scenario. Under the Do Minimum and (Do Minimum minus 20%) scenarios the SoGR is predicted to degrade to previously unexperienced levels

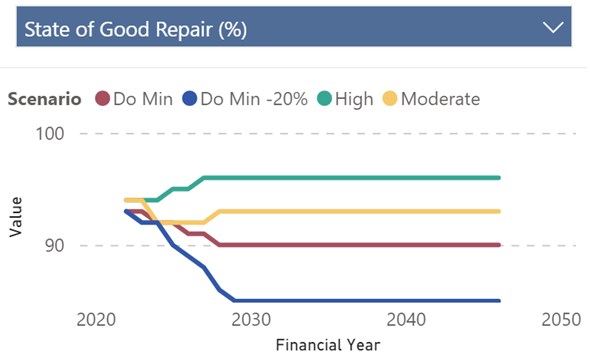
Cycleways



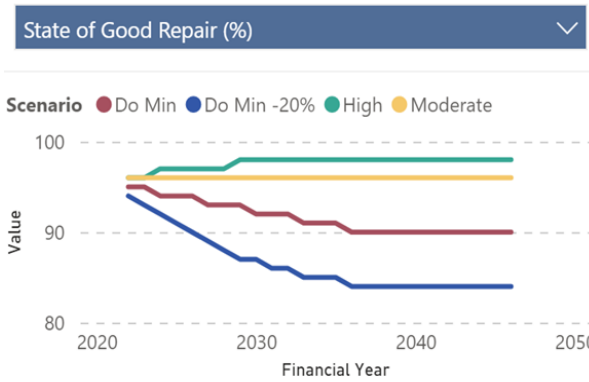
Carriageways



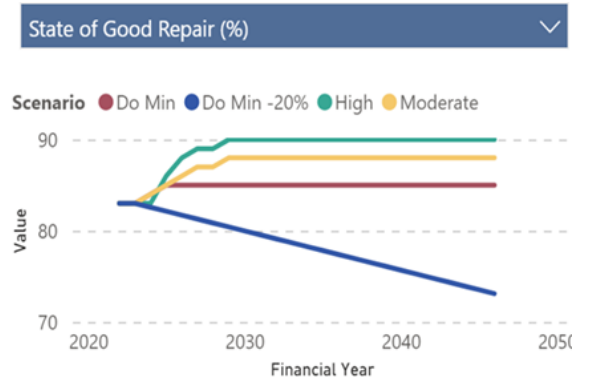
Footways



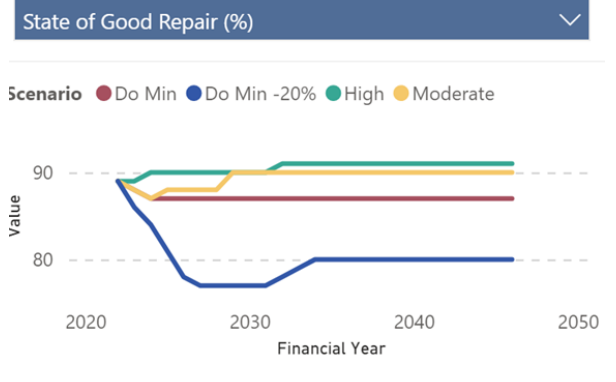
Bus stops and shelters



Structures



Lighting



Case Study: Track Heat Map

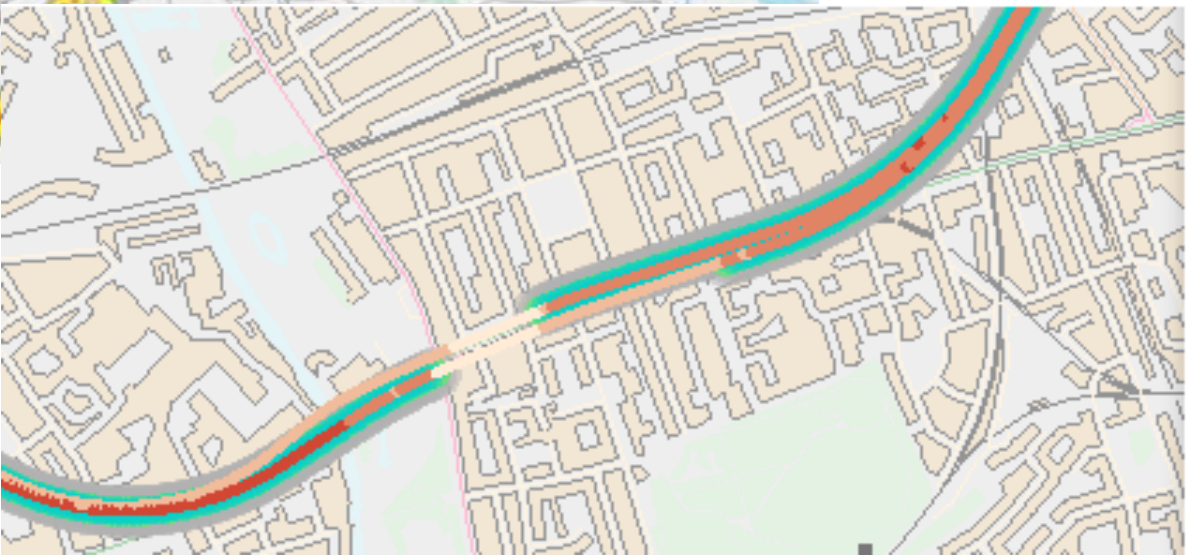
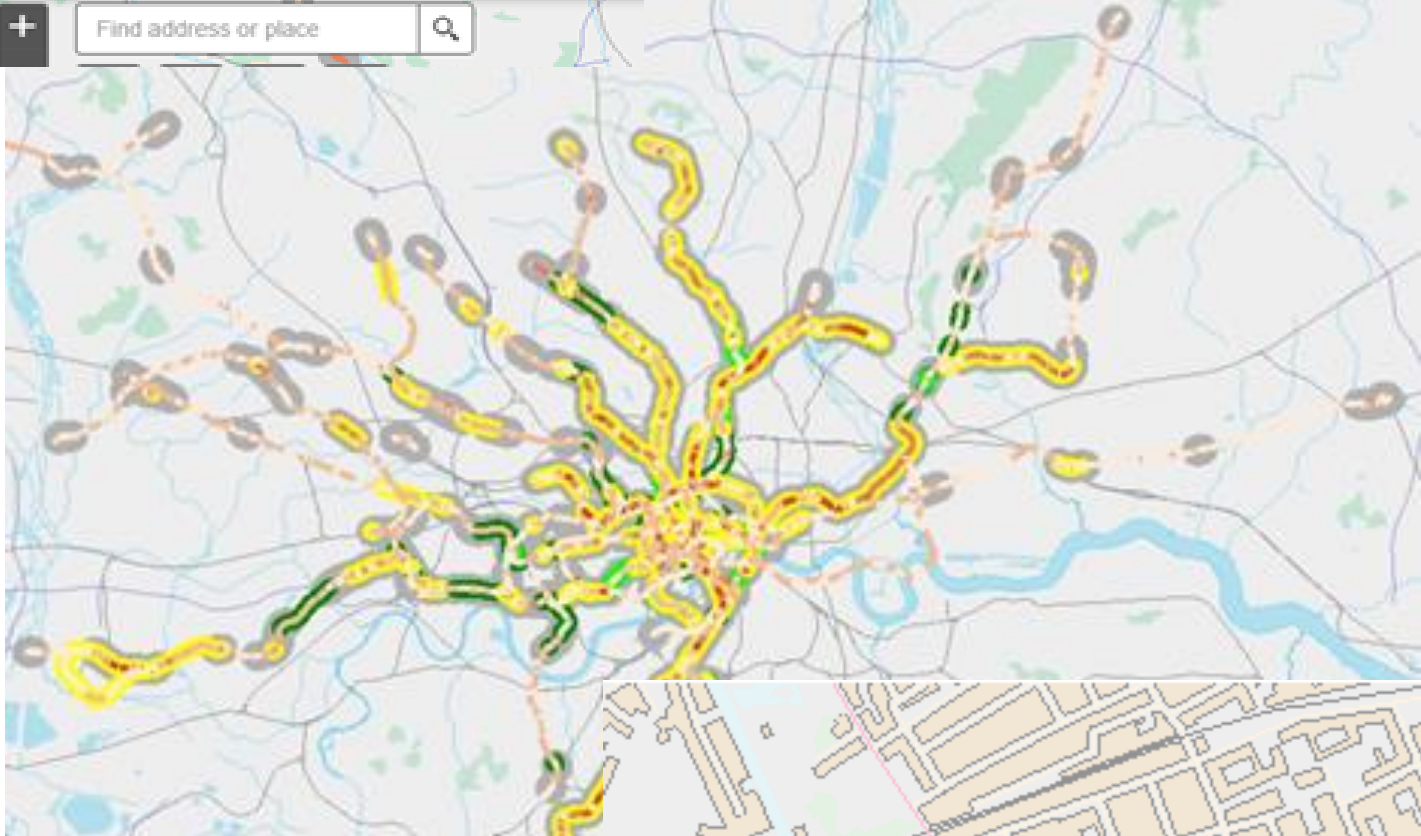
The Heat Map shows condition at any location, visualised as 10 metre cells

This aims to reflect how likely a given section of track is to require capital renewal, helping to validate existing decision-making

It was developed using existing data from mechanised track recording and the maintenance management system

Further development will create an asset management model / decision-support tool

LU GIS :: Geographical Map



Summary and next steps



Summary and next steps

- Considerable time and effort is required over the next 6 to 9 months to deliver the work described in this slide deck

We recognise this work is vital to enable us, and our stakeholders, to openly and transparently understand, and challenge, the investment needed in TfL assets

Summary

- We have brought together our Asset Strategy teams
- We are standardising Asset Strategy practices and approaches
- We are collating the data and developing the models to help us improve our understanding of short and long term asset needs and priorities
- We are developing the language and framework for describing the Level of Service we require from our assets

Next Steps (Feb to October 2022)

- Develop, refine and agree the Level of Service language and descriptions
- Close critical data gaps
- Mature our whole life asset degradation and risk models
- Develop robust investment strategies and plans that clearly explain the Levels of Service that will be delivered under different funding levels
- Continue to engage with stakeholders (internal and external) to ensure firm buy-in to the approach

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Programmes and Investment Committee



Date: 2 March 2022

Title: Technology and Data 2022/23 and 2023/24

This paper will be considered in public

1 Summary

Table 1: Authorities Requested					
Technology and Data Investment Programme for FY2022/23 and 2023/24					
Latest Estimated Final Cost (EFC) (Gross)	Previous EFC		Financial Authority	Programme and Project Authority	Procurement Authority
£360m	£258m	Existing (incl. transfers)	£258m	£249m	
		Requested	nil	£111m	
		Total	£258m	£360m	nil
		Future Submissions	£101m	£234m	

- 1.1 We are only seeking authority for activities that are directly funded within the Technology and Data (T&D) budget. We have excluded activities where T&D is accountable for delivery but where authorities are secured separately (London Underground and Surface Transport).
- 1.2 We have excluded the Home Office funded Emergency Services Network programme, which is due to be completed this financial year, and our Public Cellular Network project, which has been authorised separately. We have also received a request from the Department for Transport (DfT) for another project, which will be funded by the DfT and will be the subject of a separate request for authorities.
- 1.3 A paper is included on Part 2 of the agenda which contains exempt supplementary information. The information is exempt by paragraphs 3 and 5 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL and contractors and legally privileged advice. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

2 Recommendations

2.1 The Committee is asked to note the paper and exempt supplementary information on Part 2 of the agenda and:

- (a) approve in respect of the Technology and Data Investment Programme (the Programme) an increase in Programme and Project Authority of £7.7m in financial year 2022/23 (bringing the total up to £110.5m) and additional Programme and Project Authority of £102.9m in financial year 2023/24 resulting in total Programme and Project Authority to £110.6m;**
- (b) note that the matters for which Programme and Project Authority is sought above include commitments that extend beyond the period of the Business Plan and Budget noted by the Board on 8 December 2021 and provision will, therefore, need to be made for those commitments in future Business Plans and Budgets; and**
- (c) note that Procurement Authority for the various projects in the Programme described in this paper will be sought at officer level in accordance with Standing Orders.**

3 Background

3.1 T&D is charged with providing core IT services as well as operational systems, payments, contact centre and digital online services, under a single function.

3.2 The outputs that T&D provide are fundamental for TfL to operate and deliver services to its customers. A strong track record has been established of delivering significant benefits for TfL and its customers, that has been maintained throughout this year.

3.3 T&D continues to support TfL's and London's coronavirus response and recovery, being at the forefront of getting the business and the city back on its feet. Throughout the pandemic we have used data to provide actionable insight to guide our response, particularly about customer demand, movements, and behaviour. We continue to provide local and national Government, and organisations across London, with leading insights and high-quality information to guide decisions.

3.4 We continue to adapt to the new ways of working, building on the success of our Digital Workplace Transformation programme, enabling over 15,000 employees to work from home. We are supporting TfL's move to hybrid working and enabling all our colleagues to work effectively both in our offices and at home, using the full set of technology services they need. We have upgraded around 180 rooms to smart meeting rooms and improved wi-fi in our hub offices. We improved our on-site support at our hub buildings for the next few months of office returns. We delivered 1,150 laptops, 2,955 headsets and 465 monitors to colleagues' homes.

- 3.5 We have continued to experience rapidly growing demand for delivery of technology and data products and services, in an organisation that continues to operate with intense financial and resourcing challenges.
- 3.6 Despite these challenges, T&D has continued to deliver significant achievements. Including, introducing weekly capping on Oyster for rail customers, which gives customers the best price outcome for both Oyster and contactless payments over a seven-day period, and enabling the technical go live for the expansion of the Ultra-Low Emission Zone (ULEZ), which is helping to clean up London's air quality. Further details on our achievements are outlined in section 4.
- 3.7 We have worked with colleagues across TfL to deliver key business outcomes. For example, working with our Surface Transport colleagues, we delivered a new asset management system to manage the new Works for London (WfL) contracts. The Surface Asset Management Information System brought together several systems into one single solution, enabling TfL and its contractors to better manage the data and maintenance activities related to their assets. The internal T&D delivery and enhancement of the Maximo Surface asset management solution included 378 business requirements, over 60 enhancements as the WfL contracts were refined and the data migration of 1.3m assets, which has saved TfL over £5m, when compared to external delivery proposals.
- 3.8 Significant pieces of work continue to come in, T&D has been at the forefront of discussions regarding technical solutions for potential new Road User Charging (RUC) schemes. A further DfT funded project will be another substantial piece of work that T&D will be accountable for. An announcement on the project is expected shortly once all approvals have been confirmed.
- 3.9 Our new Chief Information Security Officer started in April 2021 and is driving forward our Cyber Security strategy. The strategy acknowledges that significant improvements are needed as cyber security threats across the globe are expanding and increasing amounts of interconnected technology pervades all aspects of TfL's business. Over the next two years, further investment will be made in this space, to improve our security posture and enable the major transformation which is underway.
- 3.10 While T&D has always demonstrated Value for Money (VfM), we continue to build on our governance processes with the Assurance team for projects over £2m and improving business case development across the department. In addition, we hold periodic deliverability reviews to support budget accuracy, and identify delivery issues which need intervention. This helped us to finish the 2020/21 financial year within 1.5 per cent of budget. Further details on our record of delivering VfM are outlined in section 5.

4 Review of delivery during 2021/22

- 4.1 In March 2021, the Committee granted authority for the current programme. For the 2021/22 financial year, the authority was for £79.5m. Overall, we expect to complete the year with a gross spend of £84.1m (£83m net of income). The difference of £4.6m is due to project spend carried forward from financial year 2020/21 and movement of some telecoms income and technology development spend transferred to business as usual (BAU) operating expense.

- 4.2 We are continuing to deal with the impact of the pandemic. We have delivered at pace across all our portfolios and are currently estimated to finish the year at £83m (net of income) against a revised budget of £83m.
- 4.3 Resourcing has been the greatest challenge to delivery this year and will continue to be a challenge over the course of the requested authority. We have an increasing workload against a background of resource attraction and retention issues. We need to recruit at volume, in a competitive job market, while delivering at pace, against a backdrop of pay freezes and job insecurity (based on media reports about funding discussions).
- 4.4 TfL's robust headcount control processes, 'pauses' in recruitment, and shortages in recruitment agents exacerbate this challenge. Approximate lead time to even start a campaign is around eight plus weeks (two-three weeks for headcount approval, then an average of six weeks for appointment of a recruitment agent). This additional pressure on our teams is decimating work life balance, and in a buoyant job market is making more people choose to leave TfL, some for up to 50 per cent more pay. Where traditionally slippage in technology projects is caused by technology failures or solution complexity, we are now finding resource availability is our biggest risk to delivery.
- 4.5 There are also resourcing challenges impacting our internal delivery partners, such as Procurement and Supply Chain, on whom we are dependent for authorising and placing contracts and have seen significant resignations, and our external supply chain, who are facing similar challenges in attracting staff.
- 4.6 It is important to note that these resourcing challenges not only impact T&D but also the wider business as we also deliver technology enabled outcomes for the rest of the organisation. There are frequent conversations with our colleagues across the business to determine prioritisation as necessary.
- 4.7 A substantial amount of time is consumed in governance activities. This includes those activities undertaken in preparation of papers, obtaining buy in from the relevant stakeholders informally before submission, presenting the paper through sequential meetings and reworking it following queries or challenges. The length of this process means we cannot react quickly in changing circumstances, such as acting to secure 'last buy at current price' warnings from the supply chain.
- 4.8 Throughout the year, TfL has continued to receive short term funding commitments from the Government. At a Programme level, the continual business planning work and prioritisation of our projects, draws attention away from project delivery. This is a TfL wide challenge however is worth highlighting here due to the demand it places on teams across T&D and the uncertainty it can cause to projects while trying to focus on delivery.
- 4.9 The global semiconductor (integrated circuit chips used in most technology hardware) shortage also remains a challenge to our projects as there are now extended lead times, sometimes more than 12 months, for many items of hardware that are critical to areas such as Networks and Hosting. The shortage in supply is causing costs to rise and we can struggle to react in time to 'last buy at this price' opportunities, primarily due to the protracted governance arrangements.

- 4.10 Milestone performance has not met target. TfL judges its performance against milestones, some of which are published externally (known as Strategic Tier 1s). These Strategic Tier 1 milestones are selected from a broader pool of “delivery Tier 1 milestones” which are nominated by each sub programme. These are supported by precursor milestones known as Tier 2s, which indicate our progress toward the Tier 1s. While T&D have no selected Strategic Tier 1 Milestones for 2021/22, we have 11 Tier 1 delivery milestones and 12 Tier 2 which we track locally. We have completed three Tier 1s on time, five cannot be delivered on time and three more are at risk. The three late Tier 1s impacted the customer benefit of weekly fares capping (22 days late), the benefit from a new network provider (15 days late) and the business benefit of new mapping data (101 days late). Other impacts include delays to cyber security improvements and delays to compliance works. Please see Appendix 1 for a detailed summary on the missed milestones and reasons for the delays. Note that only one of the Tier 1 milestones has slipped delivery into FY 2022/23 and mitigations are in place for that.
- 4.11 We are on track to deliver most of our T&D funded work, and we have secured efficiencies, notably in Hosting where savings of £47m are expected to be realised over the next seven years. Due to the challenges set out, some of our projects will deliver later than we hoped, which continues to impact our year end spend. To minimise the impact of this, we have brought in additional resources, notably in project management, to work in parallel. We have used alternative routes to market and different commercial approaches. We have reprioritised delivery, for example purchasing £1.4m of high specification virtual Desktop infrastructure to realise business benefit when other equipment was not available. Taken together, these initiatives have minimised the extent to which slippage of work in this year creates a cost pressure in subsequent financial years.
- 4.12 Across a range of projects, we have demonstrated our ability to unlock the potential of technology for our customers, our colleagues and for London. Examples of key deliverables this year include:
- (a) introducing weekly capping on Oyster for rail customers – this involved development work by our internal teams and our supplier, as well as lengthy, complex negotiations with the Rail Delivery Group to enable introduction on all rail services in London. This change brings significant benefits for customers, including giving the best price outcome for both Oyster and contactless users over a seven-day period;
 - (b) in October 2021, the central London ULEZ expanded to create a single, larger zone up to the North Circular Road and South Circular Road. T&D was central in enabling this milestone to be achieved. Our work included a technical upgrade of all Capita systems to a cloud-based platform – which was one of the largest IT projects in Europe this year;
 - (c) we have supported the readiness for the opening of the Elizabeth line by enabling the operation of new revenue collection assets (ticket machines, gates and supporting systems) at new entrances to Liverpool Street and Whitechapel stations, which have been opened as part of station rebuilding in advance of the Elizabeth line opening;

- (d) in June 2021, we signed a concession agreement with BAI Communications to help expand the delivery of 4G in Tube tunnels, with work starting in 2022. In addition to delivering key infrastructure for the Emergency Services Network, which has been delivered by TfL on behalf of the Home Office, once in operation TfL will be able to earn new revenue;
- (e) TfL Go's delivery focus in 2021/22 has been the integration of account and payment functionality so that customers can plan, pay and travel through one digital experience. The app has been downloaded over 750,000 times. The app has achieved an Apple App Store rating of 4.7 (out of 5) and a Google Play Store rating of 4.4. We are also continuing to add new features and functionality supporting operational priorities, from the Northern line closure to the introduction of the Elizabeth line; and
- (f) for our colleagues, we successfully launched myJourney, which is our new product for all career conversations. It is a key enabler of the culture we want to create for our people across TfL, with frequent conversations about wellbeing, progress, and development. myJourney has been delivered at rapid pace through a collaborative project team, involving HR, T&D, various teams across TfL and our SAP supplier. The initial delivery is the first step along a multi-year journey to upgrade our existing HR systems to support and enable our Colleague Roadmap.

4.13 A breakdown of our Programme structure can be found in Appendix 2.

5 Delivering value for money

- 5.1 We have continued to simplify and consolidate our services and core infrastructure. Operating cost has dropped from £362m in 2015/16 to £234m in 2020/21 to £232m in 2021/22, an overall reduction of 36 per cent. We continue to drive savings in other areas of the organisation through better processes and use of technology.
- 5.2 Following last year's submission, we initiated a Programme-wide approach to increasing the amount of business cases for our projects. Working with the Investment Appraisal team, we ran multiple training sessions on how to develop a business case, setting out the different levels of information required depending on the initiative. We published a specific business case area on our T&D SharePoint site, hosting our newly created guidance and tools. We also focused on the projects with estimated costs over £2m and have seen an increase in business cases for these projects from 22 to 56 per cent. We are running individual sessions with some of our largest projects to provide direct support in developing business cases. Overall, across T&D (business funded projects and projects under £2m as well), the number of projects with approved business cases has risen. This year we have been tracking business cases periodically across all initiatives in comparison to last year where we only tracked T&D projects above £2m. We have seen an increase in the number of business cases being completed, and while the percentage of business cases completed has stayed static, approximately 31 per cent, this is because the number of live initiatives has increased from 145 in Period 3 to 200 in Period 10.

- 5.3 We continued the Financial Acumen workstream, which mapped out the end-to-end process for initiatives, from business planning estimation through project lifecycle out to BAU operations. This was supported by training sessions, which have been delivered to over half of the portfolio and will continue in 2022.
- 5.4 During the Greater London Authority budget process, we carried out multiple deliverability reviews with all portfolios to review their delivery and forecasts. This provided an opportunity to challenge the spend, understand where potential delays could occur and drive consistency. Across all areas during the reviews, resourcing was the biggest risk to delivery and accurate forecasting for the remainder of the year.
- 5.5 In our periodic finance variance reviews, we ask our teams to report on spend against budget and identify where slippages or issues have occurred and the reasons for these, looking to putting in place remedial actions where possible.
- 5.6 After our last review by the Committee, we recognised our weaknesses in risks and engaged central Programme Management Office (PMO), securing a subject matter Expert to carry out a risk maturity assessment across the programme as well as to support best practice in high impact projects and create an improvement plan. Results from the assessment showed where we were falling short to the ideal standards and provided useful steps to increase our maturity. We are establishing guidance on both cost and schedule risk management. We are reviewing our capital investment risk strategy and are trialling the use of TfL standard risk management software (Active Risk Manager) supported by specialist colleagues in PMO.
- 5.7 We are working with our colleagues in Assurance, PMO and Finance on the best way of treating risk. In 2020 we collaborated with central PMO on a risk maturity assessment. We have started taking steps to improve in the areas identified by the Maturity Assessment. This includes the management of risk at programme level and the use of Active Risk Manager. Not all of these recommendations readily integrate with our other management and reporting provisions, so we are running trials to de-risk them. Unrelated to the trials, but related to risk management, there is an open item over the treatment of uncertain elements of scope, for example the appropriate way to record the potentially multiple million-pound cost of moving from a long-term incumbent supplier to a new supplier if the incumbent does not win the tender.
- 5.8 As part of our recommendations from last year's Programme review, it was identified that we had a gap in our assurance processes whereby we were missing Project Assurance Reviews (PARs) for our high value projects. In total 12 PARs were missed or late. We implemented changes to our project controls and as a result the three projects which required a PAR have completed one as required, with a further two projects under continual review.

6 Strategic case for new authority

- 6.1 T&D's Technology strategy is aligned with the Mayor's Transport Strategy and TfL's strategic priorities. We recognise the central role technology plays in any modern organisation. Our strategy lays out our commitments and our delivery principles.

6.2 The strategy includes T&D's commitments, which are:

- (a) technology enabled workforce – we provide the technology tools our people need to do their jobs at the front line, in head offices and from home;
- (b) informed customers – we deliver the digital experiences that help customers make informed and safe technology choices;
- (c) seamless payments – we manage day to day revenue collection processes and technologies and ensure they meet the needs of our customers and operations;
- (d) infrastructure that works – we provide our people and customers with infrastructure that is cost effective, secure, and works;
- (e) secure and resilient – we make sure technology is sufficiently secure and resilient to collapse, attack and quick changes in demand, and that our customers and operations are confident of that fact; and
- (f) data driven technology design – we adopt technology that is focused on making data available and accessible for decision making.

6.3 Our delivery principles are the rules we follow when making decisions about investing in, running, or maintaining technology:

- (a) focus on business outcomes – listen to business needs, taking colleagues on a journey to shape appropriate and cost-effective technology and data driven decisions;
- (b) consolidate and standardise – consolidation of multiple systems, decommission unused systems and avoid bespoke systems, following industry standard products where possible;
- (c) reuse – be resourceful with the technology we have already bought or built and challenge the need to buy new kit or software;
- (d) start small, plan big – start with a minimum viable product, gather user feedback to inform new requirements and build in an iterative manner;
- (e) safe, protective, resilient – protect our customers, staff and business integrity, keeping technologies up to date consistently;
- (f) protect our commercial position – proactively manage contracts to keep whole life costs down; and
- (g) risk managed – identify when our delivery principles, policies and standards are not met and ensure plans are adapted to address relevant threats.

6.4 Beneath the over-arching T&D strategy sit several supporting strategies which are refreshed annually. These include product strategies which guide how we invest in technology, service strategies which set out the day-to-day provision of our technology and contact centre services, and business strategies which guide our

ways of working. These strategies are shared with our colleagues in relevant areas of the business.

Risks of insufficient funding

- 6.5 T&D is responsible for delivering critical services that enable the business to meet its purpose and work towards its vision of being a strong, green heartbeat for London. These services are viewed as business as usual, and without them, our customers, staff, and London would not benefit from a world leading transport network. Our work includes providing the ability for customers to pay easily to travel across the city on all our services whilst the underpinning technology allows us to collect the revenue from customer journeys. We provide the phones and connect networks, without which our transport network would halt as well as providing the ability for service controllers to track their bus or train. For our staff, we provide the hardware, such as PCs, and software, such as Windows 10 and SAP, which are the bare minimum for their roles.
- 6.6 Over the last few years, TfL has been in a challenging financial position. As a result, T&D has deferred non-essential spend in order to help the business meet its financial targets. Much of the spend in T&D is focussed on supporting essential business functions, including collecting revenue and keeping our systems running, as well as upgrading systems and processes to be compliant with legislation (eg General Data Protection Regulation). Due to historical deferral of planned investment, T&D is now in a position where all Programme spend is considered essential.
- 6.7 We are continuing to go through prioritisation exercises, driven by the ongoing funding negotiations with the Government, and we are expecting the outcomes of these negotiations to result in further cuts to the programme. This will come with substantial risks, as we will no longer be able to carry out essential activities across our portfolios, including several necessary renewals works.
- 6.8 We asked all our portfolios to prioritise their projects from most to least critical. This provided a forced ranking which was then used to develop a narrative explaining the profile of risk that would occur should reductions to the T&D budget be made because of the funding deal outcome. These risks are detailed in our submission to Part 2 of the agenda.

Financial context

- 6.9 Once the latest Government funding agreement is finalised, we expect that the authority required for the coming financial year will be reduced in line with the agreed prioritisation, using a risk-based approach. Despite the expected outcomes of the funding settlement, and our delivery challenges, we have not reduced the value of this programme at this time. We will instead focus concerted effort on overcoming barriers to delivery, including recruitment and retention, taking all opportunities to increase the speed and consistency of decisions taken and flexibility of approach to ensure delivery of these essential projects.
- 6.10 Risks which may increase the required authority for FY 2022/23, include new technologies such as Windows 11 and new legislation, which are likely to drive costs up, plus projects like the Enterprise Resource Planning (ERP) transformation, which are in the early stages of development, so the forecast can

vary significantly. In addition, Project Proteus, which will deliver the retender of the Revenue Collection Contract (which collects £5bn of TfL's fares revenue annually), is responsible for a major risk to the overall programme as the potential supplier transition costs remain a multi-million-pound unknown.

- 6.11 In technology projects, almost by definition, any renewal will contain elements of enhancement. Eighty-four per cent of our spend is currently classified as renewals work which focusses on refreshing assets and infrastructure to address legacy technology issues and maintain the availability, security, and quality of service. The remaining 16 per cent is for non-discretionary enhancements work, which is focussed on creating new capabilities and functionality, however, all is considered essential.

Delivering capability

- 6.12 We have a clear understanding of our resourcing requirements for the full programme of work requested in this paper and have conducted regular bottom-up exercises during the past year to understand the resource profile required to deliver this work. This has been tested against our trends in recruitment to provide a realistic profile. This profile will be amended once we understand the funding agreement secured and which projects remain in scope of the programme.
- 6.13 We know that recruitment will remain a significant challenge going forward, however, it is important to note that we have managed to increase our number of fulltime equivalent employees (FTE) to 1,354 (an increase of 73 FTE) since Period one 2021/22. Based on our forecasting in Quarter one, we still require approximately 331 FTE to deliver against the full authority requested and business funded projects (excluding Contact Centre Operations and additional requirements for RUC and the DfT project outlined in section 3.8), with around 60 per cent of these resources directly delivering against capital investment programme.
- 6.14 We have put in place measures to help meet our demand for resources, including working with HR Pay and Reward to offer an allowance to help attract and retain 'hard to fill' roles within the team; engaging external agencies to source more specific skill sets; sponsoring overseas workers; utilising consultancy partners; and we will be looking to obtain bulk headcount approvals where appropriate.
- 6.15 We will also continue to seek support from HR colleagues to find quick, pragmatic, and realistic solutions to our short-term resourcing constraints, while also looking to the future to develop a more robust resource strategy for T&D. At this heart of this strategy will be upskilling our delivery teams and further investment and support is needed to allow us to do this. We need to develop our people so they can meet the demands from the business and stay updated on the latest developments in the technology sector. With the resourcing challenges limiting the skills we can recruit, being able to train our existing staff will be crucial in reducing the resourcing challenge.
- 6.16 The above interventions will not remove all delivery risks, but by keeping a diverse supply chain with rapid routes to market, e.g. frameworks and reacting swiftly and flexibly to challenges as they arise, we will be able to deliver on this

programme. Having said this, to account for the fact that there will always be elements that we are over optimistic about, a total over-programming amount of £44.9m has been included covering FY 2022/23 & FY 2023/24. This comprises £33.6m of general overprogramming and £11.3m specifically for Payments projects.

7 Authorities sought

- 7.1 A summary of the T&D Business Plan and Investment Programme from FY 2020/21 to FY 2025/26 is shown in Figure 1, and summary of breakdown of total Programme and Project Authority by portfolio in Figure 2.
- 7.2 Authority granted by the Committee which relates to both the current funding period to 2022/23 and commitments outside of this period, may need to be revised as part of future budgets to be considered by the Board. Provision will also need to be made in future Budgets and Business Plans in respect of commitments made which extend beyond the period of the current Business Plan and Budget. If additional funding is not available, a prioritisation of the TfL Investment Programme will be required, and some programmes and projects will not be taken forward and revised authority will be sought as appropriate.
- 7.3 All financial commitments related to this request will be overseen in accordance with TfL Business controls in respect of draw down.
- 7.4 Ongoing investment prioritisation exercises taking place across TfL and linked to the latest Government funding deal mean the figures and projects included in the programme are subject to change.
- 7.5 This submission presents the case for the overall T&D Investment Programme. This authority table covers project spend of £210.1m and an estimated income of £1.6m totalling £211.7m of authority requested for financial years 2022/23 and 2023/24. The Programme will return annually to the Committee to renew and validate a rolling two-year approval. This ensures that approvals are aligned to financial years to complement the nature of this Programme.

8 Assurance

- 8.1 TfL Project Assurance conducted a Programme Assurance Review on the Programme on 17 and 18 January 2022.
- 8.2 Through the Programme Assurance Review, and the Independent Investment Programme Advisory Group's (IIPAG) report, eight issues and recommendations were made, including one critical issue. We responded to these on 31 January 2022, and we have started working on the actions outlined in our Management Response.

Figure 1: Summary of the T&D Investment Programme Costs and Funding

	Portfolio		Business Plan Year						Total
	Rounded to £m		20/21	21/22	22/23	23/24	24/25	25/26	
Cost	Base Gross Draft Forecast values	(E)	65.3	86.2	124.5	119.3	113.1	124.0	632.3
	Management adjustment to account for schedule optimism		0.0	(2.1)	(17.3)	(16.3)	(1.7)	(1.5)	(39.0)
	Investment Programme Total Gross	(A)	65.3	84.1	107.2	102.9	111.4	122.5	593.4
Funding	Financial Authority	(B)	65.3	84.5	108.6	-	-	-	258.4
Authority	Existing Project Authority	(C)	70.4	79.5	102.8	-	-	-	252.7
	Transfers	(D)	(2.8)	(1.0)	-	-	-	-	(3.8)
	Project Authority less Transfers	= C + D	67.6	78.5	102.8	-	-	-	248.9
	This Project Authority request	= A - C	(2.3)	5.6	4.4	102.9			110.6
	Future Project Authority request	= A - C					111.4	122.5	233.9
	Income	Investment Programme Income	(E)	5.0	1.5	0.7	0.9	0.2	-
Income	Financial Authority Income	(F)	5.0	1.5	0.7	-	-	-	7.2

- A) Gross Costs net of the management adjustment for overprogramming
- (B) Financial Authority is based on the Revised Budget up until FY22/23
- (C) Based on the last committee Paper that was approved in March 2021
- (D) iBus2 project transferred to Surface in FY21/22
- (E) Income value which requires Programme & Project Authority plus Financial Authority
- (F) Financial Authority Income is based on the Revised Budget up until FY22/23

Figure 2: Summary of breakdown of Total Programme and Project Authority by T&D funded portfolios

Portfolio / Product Family	Estimated Final Cost (£k) (Note 1)		Valid Existing Authority (£k) (Note 2)		Additional Proposed Authority (£k) (Note 3)	
	2022/23	2023/24	2022/23 (incl prior year carryover)	2023/24	2022/23	2023/24
	Note 1		Note 2		Note 3	
Payments	40,578	43,011	33,014	-	7,565	43,011
Payments - Cubic Performance Assurance Fund (see Note 4)	2,516	4,950	9,046	-	(6,530)	4,950
Networks	15,546	1,793	7,192	-	8,354	1,793
Hosting	12,284	10,598	26,214	-	(13,930)	10,598
Cyber Security	10,016	10,000	9,594	-	421	10,000
ERP	9,984	6,925	11,394	-	(1,410)	6,925
Digital Workplace	7,797	8,833	2,777	-	5,020	8,833
T&D London Underground	5,930	10,075	4,887	-	1,043	10,075
Digital	4,708	5,493	4,838	-	(130)	5,493
Data & Analytics	4,557	4,424	9,158	-	(4,601)	4,424
T&D Surface	2,496	1,603	172	-	2,324	1,603
Technical Service Operation	1,977	1,223	(133)	-	2,110	1,223
Contact Centre Operations	624	813	778	-	(154)	813
Telecoms	-	-	265	-	(265)	-
Other T&D (inc Technology Development & Indexation)	5,443	9,522	-	1,622	-	7,065
Management adjustment	(17,303)	(16,332)	(18,119)	-	816	(16,332)
Total Authority Required	107,155	102,930	99,456	-	7,698	102,930

Note 1 – Estimated Final Cost for FY22/23 & FY23/24 are based on the Period 10 financials

Note 2 – Includes:

- £102.8m authority for FY22/23 approved at Programmes & Investment Committee in March 2021
- £3.3m of additional authority required from prior years carried over into FY22/23

Note 3 – Additional Proposed Authority requested for FY22/23 & 23/24

Note 4 – the fund is a mechanism in the Revenue Collection Contract which allows Cubic to draw-down on funds for refreshing life expired or obsolete components of the Revenue Collection system

List of appendices to this report:

Appendix 1: Milestones setting, Tech Programmes FY 2021/22

Appendix 2: Technology and Data Delivery Programme Summaries FY 2021/22

A paper containing exempt supplemental information is included on Part 2 of the agenda.

List of Background Papers:

T&D Technology Strategy (October 2021)

Independent Investment Programme Advisory Group Report

TfL Project Assurance Report

Management Response to IIPAG and TfL Project Assurance Reports

Contact Officer: Shashi Verma, Director of Strategy and Chief Technology Officer
Email: ShashiVerma@tfl.gov.uk

Milestone setting, Tech Programmes FY21/22

Project ID	Tier	Forecast Date	Baseline Target Date	Achieved Date	Portfolio	Project	Milestone	Description	Comments (if milestone is late or forecasting late and what the impact is)
Upcoming Milestones									
7250	2	28/02/2022	28/02/2022		ERP	Supply Chain Upgrade (SAP Ariba)	Contract management module ready for service	Implementation of the SAP Ariba solution to deliver Contract Repository.	
7383	2	31/03/2022	31/03/2022		EUC	TfL Telephony Strategy	Migration to new Session Initiation Protocol (SIP) for voice calls	Mitigate risk of reliance on legacy telecommunications connectivity to maintain our main inbound voice and outbound calling capability and allow the public to contact TfL.	On Track to be completed before 31.3.22 forecast date will move to Mid March next period
7246	1	28/04/2022	28/04/2022		Hosting	Compute Tech Refresh (Tech Refresh Compute Enterprise Platform)	Completion of Tranche 4	Completion of Tranche 3.1 migrations and the full Tranche 4 delivery, including HCI network switches which seeks to replace a further 20% of hardware in T&D's shared compute platform used to host application.	Tranche 3.1 migrations completed. HCI network switches completed. Tranche 4 hardware installation completed. Tranche 4 migrations continues – 47% completed as of P9. The project delivery is currently envisaging a delay related to Dell migration software which has been raised. If this issue does not get fixed, this may delay migration completion by declared Target Date. Note: The issue has only transpired as of P10 so its early days to declare a delay and RAG status to overall Amber. Due to uncertainty of issue resolution, unable to commit to a final completion forecast date.
Upcoming Late Milestones									
9999	1	31/03/2022	31/03/2022		Networks	Emergency Services Network (ESN)	Emergency Services Network (ESN) Enabling works completed	All enabling works in stations and tunnels completed	Some works may need to be de-scoped where there is a valid justification understood by all parties. However from From 1/4/22 this project transitions to TCP and their associated milestones.

SW375	2	12/02/2022	08/10/2021		TSO	GLA City Hall Office Move - Project Crystal	TfL networking infrastructure installations complete for GLA's use of Crystal Building	All TfL networking infrastructure installed and tested as working for GLA's use of Crystal Building as Head Office	<p>The infrastructure changes contributing to this milestone are provision of a primary network circuit and a secondary fallback circuit in to the Crystal Building, along with associated changes to the TfL Data Centres, in order to provide access to TfL IT services (SAP and CCTV).</p> <p>The TfL Data Centre and the primary circuit work is now complete, which allows for GLA to go-live with the move.</p> <p>Provision of the secondary circuit has been delayed by other factors outside of TfL's control. GLA has accepted to manage the risk associated with this delay, as there is a fallback solution in place in case the primary circuit fails.</p>
7273	1	30/06/2022	26/03/2022		Networks	Access Network & WAN Transformation	Completion of the Access Network & WAN Transformation	Completion of the installation works for the ANW Transformation project	<p>The external factors contributing to the overall delay in Milestone will be late by 3 months.</p> <p>At the most recent Project Forum (11 January 2022) Capita provided a revised forecast date of 30 June 2022 for the completion of installation works for the ANW Transformation. The impact of this delay will be a need for Capita to continue to support legacy infrastructure until the last site has been cutover to the new core network.</p>
7358	2	31/03/2022	08/02/2022		Surface 2c	Deployable Enforcement Cameras (DEC)	Implementation of First Camera	Operational of 1st Camera complete, blueprint created for implementation of other cameras	RAG is now red - recent supplier issues with regard to DEC cameras to the two PoC sites and a change to the agreed process for managing Evidence Packs has resulted in the agreed deployment dates not being met.
7383	2	31/03/2022	29/10/2021		EUC	TfL Telephony Strategy	Enhanced remote working capability for Contact Centre staff	Enhanced capabilities for Contact Centre Operations to respond to customer calls remotely.	Forecast date is an estimate and we are still replanning following unsuccessful deployment in October 21. Supplier failed to deliver working solution and we had to rollback on the night. Planning meetings continue to firm up on new forecast which will be no earlier than March 22 with possibility of April 22
7220	1	26/06/2022	26/11/2021		Payments	SSO Security (Single Sign On (SSO) Security (TfL Restricted))	Technical ready to deploy Multi Factor Authentication (MFA) across all agreed online services	Technically ready to deploy the upgraded Customer Account authentication (from the existing legacy SSO to the new B2C SSO) and Multi Factor Authentication (MFA) across agreed online services. All technical development for delivery of B2C SSO and MFA will be completed. The project will be ready to deploy once a suitable deployment date is available.	<p>The target dates for the 1 & 2 milestones cannot be met due to the slippage of the dependent milestones and the Go live date. The main reasons for missing these declared target dates are as follows:</p> <p>Initial reasons for slippage to the October 2021 Go Live Date:</p> <ol style="list-style-type: none"> 1.Impact of the SSO Migration Project and unexpected Business to Consumer (B2C) configuration complications continued to cause the teams challenges, requiring previously unplanned time to resolve. 2.Revised estimates from the development team showed significant additional time was required to deliver the refund microsite APIs; pushing back the expected go-live to mid-2022 3.Development team roadmap at risk of further work taking priority over SSO Security (e.g. SCA project with a hard deadline of 31st May which if not completed in time we would not have been able to continue taking card payments).

									<p>Reasons for further slippage:</p> <p>4. Bus Data project took priority – a mayoral commitment to the Government to make Live Bus location data publicly available. Required half a scrum team for over 12 sprints (resource previously assigned to SSO Security).</p> <p>5. Always encrypted SQL (part of SSO Migration) roll back has been prioritised due to significant performance issues, impact on problem resolution, and to remove risk to future go-lives – including MFA (if the code was not fully rolled back it could accidentally make it into production during a release).</p> <p>6. Legacy Adaptor – the detailed revision of scoping for the SSO work took place and the estimate had increased from 3 to 9 sprints, now the complexity was better understood. This estimate also reflected the nature of the work - building a new component to integrate with systems the assigned development team don't usually work on.</p>
									<p>7. Styling of B2C policies to TfL look and feel – build of six flows, and all have taken longer than estimated due to limited 'out the box' functionality of B2C, and greater than expected complexity the work to apply styling to B2C policies (only known once TfL teams were picking up the completed Microsoft work).</p> <p>8. Key resources such as SAs have other competing priorities which have impacted on the low-level solution design being developed throughout the project, and this was not just an upfront or one off activity.</p>
SW352	1	15/03/2022	12/11/2021		Cyber	Secure DMZ for Operational Services	DMZ Go Live	Live rollout of the full DMZ solution/service. This includes the current use cases in scope which are CTAC and Trams (TMS) – along with the ability to support other use cases going forward.	Still a heavy dependence on Capita to resolve some firewall issues raised before Christmas - Capita are actively working on issues at present. Still working towards a mid-March release for core solution and CTAC use case with Penetration Testing being organised for Feb'22. The Trams use case is also dependent on Capita completing work in Croydon - this is currently scheduled to complete around end Feb'22 - (based on update from the Trams project PM received on 11th Jan'22.).
Completed Milestones									
7345	2	30/09/2021	30/11/2021	01/11/2021	ERP	SAP Success Factors	Talent Management Ready for service	Implementation of the Performance & Goals and Succession & Development modules to enable and support our Performance & Development, Talent Management and Succession Planning processes.	

353	1	27/09/2021	05/09/2021	27/09/2021	Payments	Future Ticketing Programme Phase 4 (FTP)	Enable Rail/LU adult Oyster customers to benefit from a Weekly Fares Cap.	Launch of FTP4 Weekly Capping, allowing adult Oyster card holders travelling by Rail/LU to qualify for a Weekly Cap. Aligns adult Oyster fares with those charged when using contactless for travel.	Float based on delays in obtaining TOC agreement to launch. Therefore we have aligned the target with the Sept Fares Revision Update 06/08/2021 - The Oyster Weekly Capping / OCA launch date is now planned for 27th September 2021. Therefore, the Tier 1 milestone associated with the launch of Weekly Capping (5th September) will therefore be missed). The project has determined that it is not possible to bring the launch date forward to meet the milestone.
353	1	12/10/2021	18/01/2022	12/10/2021	Payments	Future Ticketing Programme Phase 4 (FTP)	Processing of discounted / concessionary Oyster cards in the FTP Back Office	Development and testing completed (prior to TfL Assurance processes) which will allow Oyster cards with Concessions or Discounts applied to be processed in the FTP4 Back Office. This will enable concessionary customers to have weekly caps and/or refunds, aligning Oyster fares with contactless.	Float is based on limitations of deploying in December due to the January Fares Revision moratorium
7347	2	13/08/2021	01/11/2021	27/08/2021	TSO	Introduction of Software Asset Management (SAM) Service Provider	Contract Award for the SAM Provider	Contract Award approved for the SAM Provider for Microsoft, IBM & SAP assetssoftware	Forecast date is based on when FCOG will review and hopefully approve the funding for the award.
7376	2	23/07/2021	22/08/2021	08/07/2021	Payments	Proteus	Proteus Gate 1	Gate 1 review complete with T&D Project Controls Analyst and the project is ready for Project Authority drawdown PAR to commence. Gate 1 certificate produced. Documentation for Gate 1 as agreed in the PPMP complete and approved including: 1) Outline Business Case 2) Project Requirements 3) Project Execution Plan	
7410	1	17/12/2021	15/01/2022	02/12/2021	Hosting	Payments Infrastructure Refresh	Completion of Phase 1 (Compute and Storage) Payments Infrastructure Refresh	The scope of the project is to refresh the components that support the Cubic managed Payment systems. Phase 1 covers off procurement activities across the compute and storage platform and installation into our datacentres.	The project delivered all components of the Compute and Storage with all hardware delivered, installed and migrated to the DC's (A & B). Completed as of 02/12/2021.

7374	2	23/11/2021	28/12/2021	08/11/2021	Networks	Hub Office Wi-Fi (TfL Hub Offices - Wi-Fi Upgrade)	Installation complete & Wi-Fi operational	All new and Improved Wi-Fi offering in place in our 3 head office buildings	
7259	2	28/05/2021	25/06/2021	13/05/2021	Data & Analytics	Origin Destination Interchange (ODX) modernisation	Origin Destination Interchange (ODX) Minimum Viable Product (MVP) Go Live	Release into production of the minimum viable product for ODX Origin Destination Interchange	Milestone Stage for Tier 1 D&A Milestone
7361	1	31/08/2021	29/09/2021	14/10/2021	Networks	Surface Transport Data Network Transformation	Commercial sign off to migrate the Surface Data Network into the Access Network and WAN Managed Service	The formal sign of Variation 33 which will migrate the Surface Data Network from GTT to the Capita Access Network & WAN managed service.	
7382	1	31/05/2021	16/07/2021	30/06/21	Payments	Strong Customer Authentication (SCA) for online T&D payments Channels	Delivery of Strong Customer Authentication for T&D Online channels	Enabling Strong Customer Authentication on 1) the TfL Oyster and contactless App and 2) Oyster Online. Secure protocols will be implemented for online purchases of Oyster top-ups and travel tickets, bringing T&D portals in line with the required legislation; improving TfL fraud management and customer transaction security.	The qualification testing required for Oyster Online is complex and lengthy , therefore it is prudent to include some float for any issues that are found during this activity.
7259	1	16/07/2021	30/08/2021	9/12/21	Data & Analytics	Origin Destination Interchange (ODX) modernisation	Origin Destination Interchange (ODX) full product Go Live	Origin Destination Interchange (ODX) moving into the Azure cloud and in production, with all historic data migration completed. Pan TfL access across all business areas.	Update 09/08- Miestone has slipped as a result of problems faced in production with data volumes. CR has been done to change dates. Dates Proposed 3-4 months Previous Update. Project is currently on schedule. Confidence for this is quite high. There is a relatively high level of confidence as the MVP is being released in the next 6 weeks. The MVP is very close to the final product.
SW352	2	20/05/2021	19/06/2021	20/05/2021	Cyber	Secure DMZ for Operational Services	Start of the new De-Militarised Zone (DMZ) solution/service	Implementation Start of the full DMZ solution/service. This includes the current use cases in scope which are CTAC and Trams (TMS) – along with the ability to support other use cases going forward.	Milestone Stage for Tier 1 Cyber Milestone
353	2	30/04/2021	30/05/2021	?	Payments	Future Ticketing Programme Phase 4 (FTP)	Verify Oyster Card Information Store (OCIS) data is in alignment with Central System.	The OCIS is a new component in the FTP4 Back Office and is fundamental to the processing of discounted / concessionary Oyster cards. Key to its operation is for it to be a complete replica of the Oyster Central System and for it to maintain data alignment during its operation.	Testing will be performed to verify (or not) that data is current and complete during the next stage of Back Office development. If not, remediation action will be performed.

6781	2	15/07/2021	01/10/2021	15/07/2021	TSO	JNP T&D Services Integration	Infrastructure decommissioning of Global Switch North Data Centre	Completion of decommissioning of all TfL infrastructure located in the Global Switch North data centre	Completing this milestone will mean TfL is no longer using the Global Switch North site and we will not need to renew the contract with Global Switch which expires in 2022.
7220	2	16/01/2022	15/02/2022	17/11/2021	Payments	SSO Security (Single Sign On (SSO) Security (TfL Restricted)	B2C Tenant Deployed in Production	EUC have deployed B2C tenant in production (with no integration with IRC systems).	<p>The target dates for the 1 & 2 milestones cannot be met due to the slippage of the dependent milestones and the Go live date. The main reasons for missing these declared target dates are as follows: Initial reasons for slippage to the October 2021 Go Live Date: 1.Impact of the SSO Migration Project and unexpected Business to Consumer (B2C) configuration complications continued to cause the teams challenges, requiring previously unplanned time to resolve. 2.Revised estimates from the development team showed significant additional time was required to deliver the refund microsite APIs; pushing back the expected go-live to mid-2022 3.Development team roadmap at risk of further work taking priority over SSO Security (e.g. SCA project with a hard deadline of 31st May which if not completed in time we would not have been able to continue taking card payments). Reasons for further slippage: 4.Bus Data project took priority – a mayoral commitment to the Government to make Live Bus location data publicly available. Required half a scrum team for over 12 sprints (resource previously assigned to SSO Security.</p>
									<p>5.Always encrypted SQL (part of SSO Migration) roll back has been prioritised due to significant performance issues, impact on problem resolution, and to remove risk to future go-lives – including MFA (if the code was not fully rolled back it could accidentally make it into production during a release). 6.Legacy Adaptor – the detailed revision of scoping for the SSO work took place and the estimate had increased from 3 to 9 sprints, now the complexity was better understood. This estimate also reflected the nature of the work - building a new component to integrate with systems the assigned development team don't usually work on.7.Styling of B2C policies to TfL look and feel – build of six flows, and all have taken longer than estimated due to limited 'out the box' functionality of B2C, and greater than expected complexity the work to apply styling to B2C policies</p>
									<p>(only known once TfL teams were picking up the completed Microsoft work). 8.Key resources such as SAs have other competing priorities which have impacted on the low-level solution design being developed throughout the project, and this was not just an upfront or one off activity.</p>

Appendix 2: Technology and Data Programme summaries

Programme	Summary
Programme 1 – Technology Service Operations	Technology Service Operations is responsible for the day-to-day provision of IT systems and services that enable TfL to deliver its required business services cost effectively: Service Performance, Customer Experience, People, Compliance, Efficiencies and Lifecycle Management. Projects in this programme include procurements to maintain our IT services, developing our IT service management systems, changes in IT service-sourcing solutions, and implementing licence compliance solutions and tactical IT infrastructure changes.
Programme 2 – Surface	The Surface programme covers the delivery of technology projects aligned to the Surface business plan. The Surface programme also contains management of some £50m of intellectual property from Surface portfolio sponsorship and delivers changes to the technology applications, systems, platforms and services that are utilised to manage the road network, public and private transport systems, safety, enforcement, compliance and licencing. These tech projects tend to be renewals or those where the operational costs are borne by T&D. Examples include incident management, data reporting and integration products.
Programme 3 – Networks	The Networks programme delivers projects to reduce the total cost of ownership of data network and telecommunications services which underpin our technology infrastructure. Projects include the refresh of the core network infrastructure provided via the Access and WAN Contract with Capita, and the Emergency Services Network, Connect, Public Cellular Network, Telecommunications Commercialisation Project and Wi-Fi upgrade project.
Programme 4 – Enterprise Resource Planning	Enterprise Resource Planning incorporates the processes we use to conduct our 'back office' activities. We will invest to retain and re-platform the existing system (mostly SAP) to support the ongoing improvement of our HR, Finance and Supply Chain business processes by delivering a more efficient supply chain capability to Procurement and Supply Chain; standardise how Finance plan, budget, forecast and report financial information across the business; provide greater access to user friendly HR technology for our people. We will exploit Cloud technology to enable this.

Programme 5 – London Underground & Rail	The London Underground and Rail programme is responsible for the delivery of technology projects that are aligned to the LU business plan. Examples are the Asset Management Information System, Station Security Technology Integration Programme, Safe Track Access and TrackerNet projects. The majority of the initiatives are London Underground and Safety, Health and Environment (SHE) funded but delivered by T&D.
Programme 6 – Major Rail Extensions & Installations	Major Rail Extensions and Installations delivers projects to install and/or change Fares & Ticketing devices and associated equipment across TfL and Train Operating Companies sites e.g. gate lines, ticket vending machines and Oyster readers. This is in support of new builds, modifications and expansions of Oyster and Contactless ticketing. Delivery of voice and data projects across TfL.
Programme 7 – End User Computing and Content & Collaboration (Digital Workplace)	The programme consists of projects to ensure that all TfL workers have access to digital workplace products and services that are a good fit for their roles, easy to use, affordable for TfL, and drive effective performance. We will ensure TfL staff are upskilled in adopting digital technologies, enabling them to be mobile and more productive, leading to an increase in the use of virtual meetings and therefore more efficient building utilisation.
Programme 8 – Payments and Ticketing	The Payments and Ticketing programme delivers a secure and compliant ticketing system, a better customer proposition and reduced revenue collection costs. Maintain and upgrade revenue collection assets to assure their service performance to minimise revenue loss for TfL.
Programme 9 – Road User Charging	Road User Charging supports the delivery of initiatives which involve the Road User Charging systems and schemes in London. These initiatives range from schemes to improve air quality, improve safety standards on heavy goods vehicles and encouraging cleaner modes of transport. Our products include maintaining and building the relevant TfL websites, building back-office systems and seeking new and more efficient ways to improve services to our customers while delivering on the Mayor’s Transport Strategy. Most of the initiatives in this programme are business funded but delivered by T&D.
Programme 10 – Hosting	Hosting is how we organise, process, store and disseminate large amounts of data. We aim to provide a flexible, scalable, and agile hosting model that allows us to adapt to changing business needs to deliver a cost efficient, flexible and secure hosting environment that keeps your data protected and your applications available with on-demand scalability.

<p>Programme 11 – Data & Analytics</p>	<p>Data and Analytics collect, manage and deploy data to drive evidence-based decision making. We will continue to exploit transport data that drives operational performance, supports future planning, and provides our customers with data services and information while complying with data regulations. Projects include Wi-Fi Insights, and Electronic Incident Reporting Form Improvements. The programme delivers projects funded by T&D, Surface, LU, SHE and Commercial Media teams.</p>
<p>Programme 12 – Contact Centre Operations</p>	<p>Contact Centre Operations provides service for TfL customers via their in-house contact centre teams, and their out-sourced service providers. This involves managing customer contacts and complaints relating to ticketing and travel on TfL's network via telephony, correspondence, and social media platforms. The Contact Centre Operations programme aims to reduce the ongoing cost of operation including by the utilisation of technology, while maintaining the current service level.</p>
<p>Programme 13 – Digital</p>	<p>The Digital programme ensures that TfL maintains a direct digital relationship with its customers so that it can deliver on the Mayor's Transport Strategy. Without that relationship we cannot nudge customers towards sustainable transport modes.</p>
<p>Programme 14 – Cyber Security</p>	<p>The Cyber Security programme delivers or enhances controls, including technical solutions and services, to directly support cyber risk management within T&D. The programme also delivers or enhances elements of our pan-TfL cyber security programme, including our policy framework and assurance and reporting capability, to coordinate and support the management of cyber security risk pan-TfL.</p>
<p>Programme 15 – Accommodation</p>	<p>The Accommodation programme ensures that all our staff and third parties are able to work across the TfL estate, with the necessary IT provisions (client hardware, telephony and Network). This includes supporting decommissioning of buildings, departmental moves, and new buildings.</p>
<p>Programme 16 – Mobile</p>	<p>The Mobile programme develops mobile solutions for TfL's internal team's that help to improve current ways for of working. For example, developing a paperless mobile solution for fault reporting of assets across London Underground – users can log faults anywhere using their mobile devices (rather than making notes of fault then coming back to office and record on a PC).</p>

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Programmes and Investment Committee



Date: 2 March 2022

Item: Enterprise Risk Update – Delivery of Key Projects and Programmes (ER8)

This paper will be considered in public

1 Summary

- 1.1 As part of TfL's risk management process, the Programme and Investment Committee oversees the "Delivery of TfL key investment programmes" (Enterprise Risk 8).
- 1.2 This paper provides an update on how TfL manages the risk across its capital delivery.
- 1.3 A paper is included on Part 2 of the agenda which contains supplementary information that is exempt from publication by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

2 Recommendation

- 2.1 **The Committee is asked to note the paper and the exempt supplementary information provided on Part 2 of the agenda.**

3 Background

- 3.1 A comprehensive review of ER8 introduced new causes, controls and mitigations resulting from the current short-term funding position, the prevailing market conditions and the requirement to deliver to a "managed decline" scenario.
- 3.2 The ongoing funding challenges and consequential short-term budgets severely impact the delivery of TfL projects and programmes, compromising effective internal decision-making, the ability to prioritise programmes and projects with certainty and make longer term commitments.
- 3.3 Brexit and the coronavirus pandemic continue to compound global supply chain concerns. In conjunction with TfL's current short-term funding settlements, suppliers continue to adopt a more cautious approach when dealing with TfL. The Procurement and Supply Chain department continues to identify, track and manage these risks proactively, details of which are available through the risk registers maintained for each major project.

4 Overall Control Effectiveness Rating

- 4.1 Although robust controls remain in force, the consequence of the factors outlined in section 2 have manifested in the Enterprise risk rating deteriorating from being "Adequately Controlled" to "Requires Improvement". There will be considerable pressure in the coming year for TfL to demonstrate our ability to "deliver more for less". To succeed, it will be fundamental to continuously review and, as required, revise our control measures, thereby implementing consistent, coherent and competitive processes to refocus our capital business.

5 Risk Assessment rationale

- 5.1 The probability assessment of the collective risk remains as "medium", reflecting the effectiveness of critical preventative controls. However, the financial impact remains "high" due to spending commitments on programmes and projects in TfL. More detailed information is reflected by Key Performance Indicators (KPI) in all the business scorecards.

6 Consequences, Controls and Actions

- 6.1 The current funding constraints have compromised TfL's capital delivery: major programmes and projects are at risk of further delay or require significant de-scoping or prolongation.
- 6.2 The TfL investment portfolio remains vulnerable to various internal and external factors. Most notably, the pandemic and uncertain market conditions creating further funding challenges, impacting TfL's financial position.
- 6.3 The fluctuating financial situation has placed additional pressure in terms of:
- (a) our ability to conduct financial forecasts with lasting accuracy;
 - (b) our ability to plan effectively which causes increased overheads, uncertainty in securing resources and inability to lock-in long term savings. This uncertainty also requires teams to reallocate and replan resources to align to changing scenarios;
 - (c) attracting and retaining competent resources is challenging when the resilience of the business is perceived as being eroded, the remuneration packages are seen as less attractive and the market is overheated; and
 - (d) suppliers are limiting their exposure, in part due to TfL's financial standing, and also in response to global market dynamics.
- 6.4 Existing controls from ER8 include:
- (a) the Project Management Office (PMO), which is an independent support function working collaboratively with the delivery teams to implement consistent, transparent and efficient controls processes across TfL's projects and programmes. The PMO also provides first line assurance;
 - (b) establishment of the Capital Improvement Group (CIG), which meets periodically to review short, medium and long-term organisational capital

improvement activities. The output is captured in the Capital Efficiencies Plan (CEP);

- (c) the CEP establishes targets and tracks the efficiency of all capital delivery projects and programmes including initiatives to help us deliver outcomes for less money;
- (d) project, programme and portfolio reviews are in place to monitor progress and escalate critical issues to CIG;
- (e) the Financial Commitment Oversight Group provides an additional level of control and governance by considering all matters exceeding a set threshold to manage cashflow; and
- (f) a Controlled Projects List (CPL) tracks budgets against the approved TfL Investment Programme baseline. The CPL is the central point of truth for business-level reporting.

6.5 Live and ongoing mitigations include:

- (a) cost efficiencies initiatives:
 - (i) “Pounds in the Ground” – introduction of a smarter approach in considering what needs to be done and how we are deploying resources;
 - (ii) “How Good can it get” – beyond the traditional risk management approach our delivery teams have explored what happens if ‘everything went their way’ and what that would mean to the business and when we would know. A view is then taken from what could reasonably happen (mitigated risks and realised opportunities); and
 - (iii) risk management activities to ensure reserve allocations are adequately assessed and released in line with the appropriate appetite; and
- (b) additionally, the newly appointed PMO Director and his Senior Management Team are assessing opportunities to simplify further and streamline the reporting functions, thereby optimising the deployment of available resources and enhancing the effectiveness of decision-making and governance procedures.

List of appendices to this report:

A paper containing exempt supplementary information is included on Part 2 of the agenda.

List of Background Papers:

None

Contact Officer: Stuart Harvey, Chief Capital Officer
Email: StuartHarvey@tfl.gov.uk

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Programmes and Investment Committee



Date: 2 March 2022

Item: Members' Suggestions for Future Discussion Items

This paper will be considered in public

1 Summary

- 1.1 This paper presents the current forward plan for the Committee and explains how this is put together. Members are invited to suggest additional future discussion items for the forward plan. Members are also invited to suggest items for future informal briefings.

2 Recommendations

- 2.1 **The Committee is asked to note the forward plan and is invited to raise any suggestions for future discussion items for the forward plan and for informal briefings.**

3 Forward Plan Development

- 3.1 The Board and its Committees and Panels have forward plans. The content of the plan arises from a number of sources:
- (a) Standing items for each meeting: Minutes; Matters Arising and Actions List; and any regular quarterly or periodic reports. For this Committee, these are the quarterly Investment Programme Report and the regular report on the Crossrail project.
 - (b) Programmes and Projects at a level requiring Committee approval. These include the annual review of the 20 sub-programmes in the Investment Programme and other approvals sought following advice from the operating businesses.
 - (c) Items requested by Members: The Deputy Chair of TfL and the Chair of this Committee will regularly review the forward plan and may suggest items. Other items will arise out of actions from previous meetings (including meetings of the Board or other Committees and Panels) and any issues suggested under this agenda item.

4 Current Plan

- 4.1 The current plan is attached as Appendix 1. Like all plans, it is a snapshot in time and items may be added, removed or deferred to a later date.

List of appendices to this report:

Appendix 1: Programmes and Investment Committee Forward Plan 2022/23

List of Background Papers:

None

Contact Officer: Howard Carter, General Counsel

Email: HowardCarter@tfl.gov.uk

Programmes and Investment Committee Forward Plan 2022/23

Membership: Ben Story (Chair), Dr Nelson Osgunshakin OBE (Vice Chair), Seb Dance, Cllr Julian Bell, Dr Lyn Sloman MBE and Peter Strachan.

Government Special Representative: Becky Wood

Abbreviations: CCO (Chief Capital Officer), CCSO (Chief Customer and Strategy Officer), CFO (Chief Finance Officer), COO (Chief Operating Officer, D IDP (Director Investment Delivery Planning)

Standing Items		
Use of Delegated Authority	General Counsel	Standing item
Quarterly Programmes and Investment Report	CCO, CCSO and COO	To note high-level progress updates of the Investment Programme and Major Project items and any specific approvals required in relation to programmes not on the deep-dive list for that meeting.
Independent Investment Programme Advisory Group Quarterly Report (appendix on Second line Assurance Activities)	General Counsel	Standing item
TfL Project Assurance	General Counsel	Standing item
Regular programme annual reviews		

18 May 2022		
London Underground Enhancements	D IDP	Update and approval
Surface Transport Assets	D IDP	Update and approval
Surface Transport Technology	D IDP	Update and approval
East London Line Housing Infrastructure Programme	D IDP	Update and approval
Dockland Light Railway (TBC)	D IDP	Update
London Underground Renewals Infrastructure Portfolio	D IDP	Update
Northern Line Extension	CCO	Update and approval (transfer of authorities)

20 July 2022		
London Underground Technology (TBC)	D IDP	Update and approval
Barking Riverside Extension	CCO	Update
Public Transport	D IDP	Update
Dockland Light Railway (TBC – if not on May agenda)	D IDP	Update

Items to be scheduled:

- London Overground future planning
- Rotherhithe Tunnel
- Fiveways Corner in Croydon
- Lessons Learnt from Complex Projects with Commercial Issues (CCO)
- Enterprise Risk Update - Delivery of key projects and programmes (ER3)
- Healthy Streets

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