high speed one

HS1 ASSET MANAGEMENT ANNUAL STATEMENT 2023/24

June 2024

Executive Summary

This Asset Management Annual Statement (AMAS) reviews the performance of HS1 in year 4 of Control Period 3 (CP3). We compare our performance and outputs to the plans that were recorded in our Five Year Asset Management Statement (5YAMS) at the start of CP3. A significant focus this year has been preparation of 5YAMS documents for the next Control Period, CP4. The focus for HS1 has been on assurance of the Specific Asset Strategies (SASs), totex models and renewals work bank through extensive review meetings, site visits and stakeholder engagement.

HS1 is committed to continuously improving asset management maturity. During 2023/24 the documents, people and processes in HS1's asset management system have been independently assessed against ISO55001. HS1 was successful in the Stage 1 and Stage 2 assessments and we await the issue of the ISO55001 certification in June 2024.

Safety performance has been good and our key safety measure, Fatalities and Weighted Injuries (FWI), is better than the thresholds agreed with Network Rail High Speed (NR(HS)) for both workforce and members of the public, demonstrating the positive impact of NR(HS)'s locally owned safety improvement plans giving delivery functions increased ownership of risk reduction. Regrettably in P9 a contractor was struck by a tamper in an engineering possession, fortunately with no serious injury. An investigation was completed and a number of improvement actions identified. HS1's assurance going forward will consider the effectiveness of NR(HS) processes around the tracking and close out of recommendations from incidents and investigations.

Overall, our operational performance has been good with an average of 11.8 seconds delay per train in the year. We are starting to see the performance benefits of NR(HS)'s Resilience Plans and in P8 we achieved zero delay minutes attributed to either trespass or infrastructure failures. However, our performance continues to be challenged with a small number of isolated incidents that have caused significant disruption. In particular, in December 2023 we had a significant flood incident in the Thames tunnels which caused extensive disruption to train operations. HS1 apologises for this. There are lessons to learn from this incident and we now have a comprehensive technical report, that details openly what happened, which will be used to improve systems and processes to prevent a similar incident in the future.

Stations have performed well and station cleaning has exceeded the target of 95% in every period of 2023/24. Lift, escalator and travelator (LET) performance has been good but continues to be challenged by emerging asset faults as reported last year; however, Schindler's performance improvement plan was implemented in P1 delivering an improved maintenance approach which resulted in the LET target being exceeded between P5 and P12.

HS1 focuses on understanding its station customers, we continually monitor customer feedback through our customer satisfaction programme Station Matters, to ensure we are getting the basics right and are responding to changing customer needs, behaviours, and profiles. As a

result of this we have delivered additional customer service training and launched a digital map of St Pancras International to improve customer navigation through the station.

Following the successful introduction of regenerative braking in October 2022, HS1 continues to actively identify and act upon opportunities to deliver cost savings and reductions in our environmental impacts. In January 2024, the N-1 electrical feeder power reduction scheme went live following a significant period of stakeholder discussions. This project is forecast to generate around £1.1m annual savings (at winter 2023 energy prices) to train operating companies.

Delivery of renewals is progressing well, during the year 120% of planned volume was delivered for route and 248% for stations. During years 2 and 3 of CP3, HS1 challenged NR(HS) on under delivery of renewals volumes and NR(HS) has responded with improved processes and governance, providing certainty in delivery and giving confidence that the increasing renewals volumes forecast for CP4 can be achieved. Route renewals have been delivered ahead of schedule for 2023/24 by utilising the opportunity granted by industrial action and maximising delivery during the Christmas 2023 blockade to accelerate renewals and delivering a number of year 5 renewals in year 4 through improved portfolio planning.

Despite the significant challenges in CP3, HS1 has worked hard to keep outturn costs within the CP3 efficient budget. This year HS1 has taken active steps to reduce costs, including enhancing internal systems and completing a structural review of our organisation. As a result of this, we forecast that HS1 costs will reduce to below the CP3 budget level in the final year of CP3. CP3 pass through costs are forecast to be 0.4% lower than budget, with all savings passed on to operators.

Contents

1 Purpose

The purpose of this AMAS is to provide assurance to the ORR and the Secretary of State that HS1 is fulfilling the Asset Stewardship obligations as defined in:

- Schedule 10, Section 6 of the Concession Agreement between HS1 and the Secretary of State for route; and
- Schedule 10, Sections 4.5 and 4.6 of the HS1 Lease between HS1 and the Secretary of State for stations.

We are committed to providing transparency and engagement with our customers on the efficiency and effectiveness of operations and maintenance expenditure and renewals funded from the escrow accounts. Therefore, while there are no specified reporting obligations for HS1 in the track or station access agreements between HS1 and the operators, this AMAS is shared with the Train Operating Companies (TOCs) and Freight Operating Companies (FOCs):

- Eurostar International Ltd (EIL);
- SE Trains Ltd (SETL);
- East Midlands Railway (EMR);
- DB Cargo;
- GB Railfreight; and
- Freightliner.

The key regulatory reporting dates for the AMAS are:

- HS1 submits the Draft AMAS to the ORR by 15 February 2024 (30 business days before year end); and
- HS1 submits the Final AMAS to the ORR by 5 June 2024 (45 business days after year end).

2 Safety and sustainability

Workforce FWI Moving Annual Average (MAA) of 0.055, better than threshold of 0.060
Reduction in lost time accidents, 11 in 2023/24 compared to 14 in 2022/23
Serious incident in P9 where a contractor was struck by a tamper in an engineering possession suffering minor injuries. Contractor investigation complete and actions identified. RAIB investigation is ongoing.
Public FWI MAA for NR(HS)-managed areas of stations better than threshold; FWI MAA was 0.010 against a threshold of 0.020
RM3 independent audit found significant maturity improvements since 2019
There has been a shift in the risk profile from workforce safety to the management of major incidents
Implementation of the N-1 energy saving scheme to reduce energy consumption and provide cost savings for train operators

2.1 Safety performance

We monitor a range of activity and outcome indicators to identify issues and challenge NR(HS) and other suppliers to make improvements. Outcome indicators include RIDDOR-reportable and lost time accidents for staff and contractors and accidents to passengers and members of the public. Activity indicators include RM3 improvement plan milestones and safety tours.

Our top-level safety metrics are:

- Workforce safety: FWI per million hours worked; and
- Public safety: FWI per 10 million footfall at stations.

2.1.1. Workforce safety

Figure 1 shows the workforce FWI per million hours worked for route and stations combined. The relatively small number of incidents on HS1 means that a single RIDDOR-reportable incident can have a significant impact on FWI. This was the case in P12 2022/23, when a member of

security staff was physically assaulted by a member of the public, sustaining a 'specified injury'; this incident affected the FWI MAA calculation through most of 2023/24 but dropped out of the MAA calculation in P12 2023/24. To reflect this, we worked with NR(HS) to create an FWI MAA threshold of 0.060 for 2023/24 and a glide path to monitor our progress towards achieving it by year end; this was a realistic but challenging threshold, based on analysis of recent safety performance.

FWI MAA remained below the glide path from P5 onwards; for the full year it was 0.055 compared with the threshold of 0.060. This demonstrates the positive impact of NR(HS)' locally owned safety improvement plans (SIP), discussed in Section 2.1.3 below, and wider safety culture initiatives within the NR(HS) infrastructure function.

Figure 1: Workforce safety - FWI per million hours worked

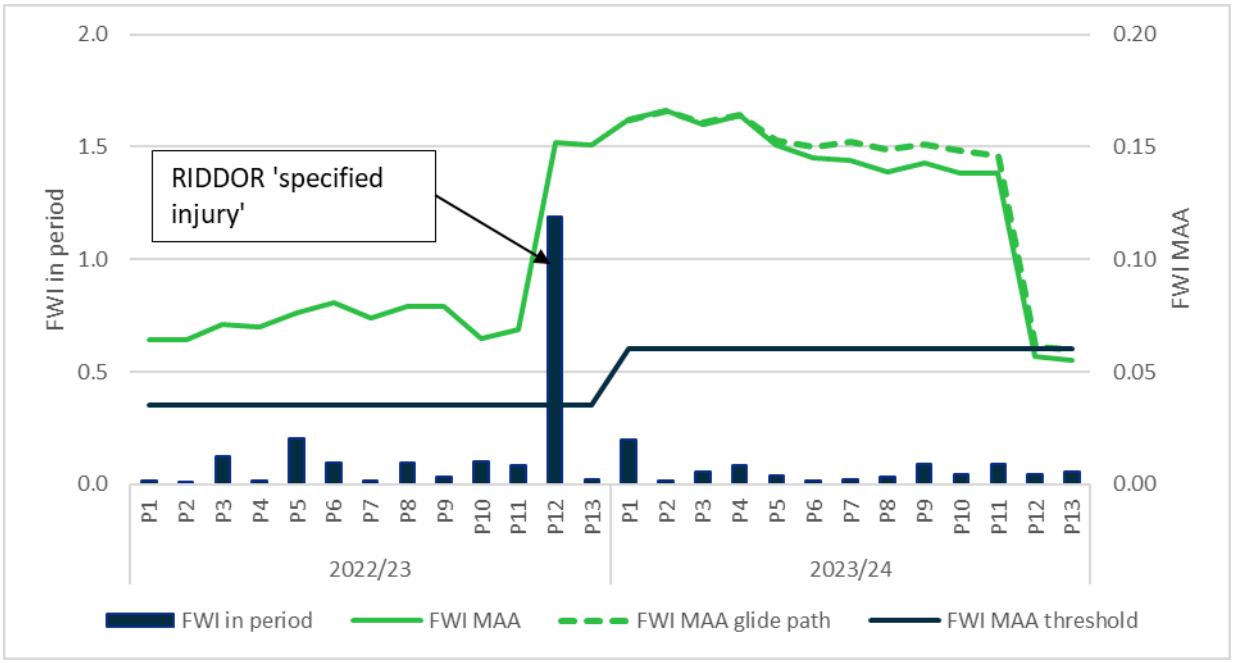
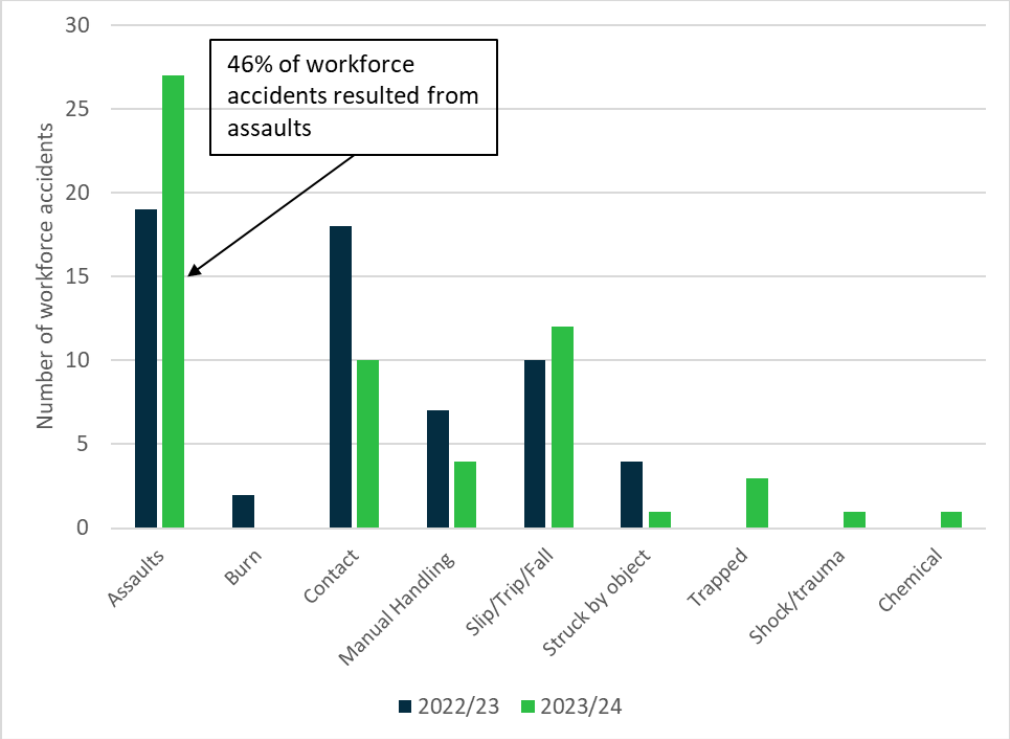


Figure 2 shows workforce accidents by category in 2023/24 compared with 2022/23.

Figure 2: Workforce accidents by category



In 2023/24 there were 59 accidents to the NR(HS) workforce and contractors, compared to 60 in 2022/23. 27 accidents (46%) resulted from assaults, this increase is not specific to HS1 and is reflected nationwide across the industry based on RSSB reports[1]. We developed plans to address this issue in 2022/23 and have continued to evolve these plans this year. This has led to an improvement during the year with no staff assaults recorded in P12 or P13, this is discussed in Section 2.1.3 below.

11 of the accidents were lost time accidents (a reduction from 14 in 2022/23), of which four were RIDDOR-reportable lost time accidents (compared with seven in 2022/23). There were no RIDDOR Specified Injuries reported in 2023/24 (compared with one in 2022/23). In addition, there was one reported RIDDOR Dangerous Occurrence as a result of the Thames tunnels flooding incident. The RIDDOR lost time accidents are summarised below:

- A contractor was struck by a tamper in an engineering possession. An MPV was moving towards a tamper to be coupled when there was a loss of communications; the MPV operator did not receive the instruction to stop, collided with the tamper and knocked it into the contractor. The contractor suffered minor injuries and was away from work for over seven days. NR(HS) took immediate steps to prevent recurrence. An investigation is now complete. Actions were identified around installing Duplex communication system in the MPVs, fitting emergency stop buttons and horns on the rear handrails and a review of driver and machine controller training to cover the newly installed equipment and to reflect the process for reversing and for coupling trains. The incident is also subject to investigation by RAIB. As part of HS1 assurance plans we will explore how we gain assurance of the effectiveness of

[1] workforce-related-violence-quarterly-update-q3-2023-24.pdf (rssb.co.uk)

NR(HS) processes around the tracking and close out of recommendations from incidents and investigations.

- A slip, trip, fall accident in Singlewell depot (28 days lost time). Actions were immediately taken to address the hazard.
- A contact injury while refitting a handrail to an access platform module (10 days lost time). Actions were taken to provide improved mitigation with the working technique.
- A track maintenance operative twisted their ankle while walking on ballast.

NR(HS) has conducted safety investigations for all accidents occurring on NR(HS)-managed infrastructure. Each investigation identified specific actions and recommendations, which have included changes to safe methods of working, briefings on expected behaviours and, in the case of assaults, implementation of body worn cameras for staff and contractors. These actions have also fed into safety improvement plans, particularly for NR(HS)'s contractors. NR(HS) has used its Infrastructure Directorate Safety Stand Down sessions with the workforce and Trade Union Safety Representatives to share learnings around accident reporting, good communications, 'Take 5' and challenging behaviours. NR(HS) is also updating its safe methods of working.

At Ashford International station there were no accidents recorded for the Mitie/ABM[2] workforce or contractors during 2023/24.

UKPNS workforce

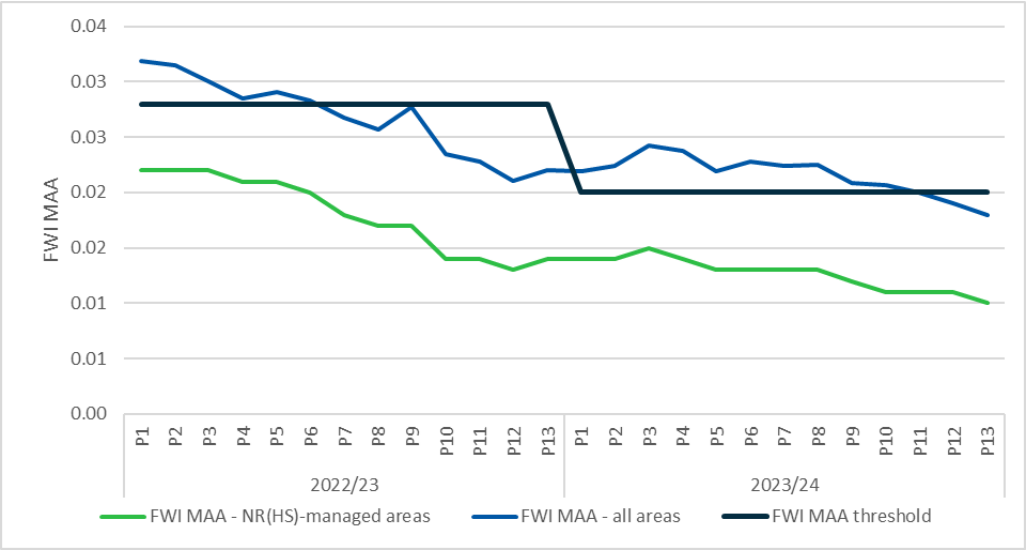
The UKPNS team working on HS1 had no lost time incidents in the year. This continues the team's excellent safety record, with no lost time incident for 12½ years. The UKPNS HS1 team complies with the UKPN safety strategy and NR(HS) safety requirements. In 2023/2024, staff have continued to take the rail safety team leader course. UKPNS hosted several site meetings with HS1 and worked closely with NR(HS) to share safety best practice.

2.1.2. Public safety

Figure 3 shows the FWI for passengers and members of the public for St Pancras International, Stratford International and Ebbsfleet International. FWI at P13 was 0.010 for NR(HS)-managed areas of the stations and 0.018 for all areas[3], against a threshold of 0.020. Both measures show an improving trend over the year as well as an improvement over 2022/23.

[2] ABM took over from Mitie as Station Operator on 1 October 2023
[3] NR(HS) reports passenger and public FWI for all areas of the stations. HS1 separately reports the passenger and public FWI for NR(HS)-managed areas of the stations.

Figure 3: Public safety - FWI per 10 million footfall at stations



At Ashford International station there were no accidents recorded for members of the public during 2023/24.

2.1.3. Safety improvement

NR(HS) has continued to develop locally owned safety improvement plans within the delivery functions to address function-specific risks. This promotes ownership as part of the drive to reduce safety related accidents and incidents in each business area, and has been effective in reducing the workforce FWI below threshold. The delivery functions identify and predict, through analysis of previous accidents, the top causes of harm to the workforce and members of the public. Workstreams to address these areas of concern have been identified and successfully delivered. Phase 1 was implemented in 2022/23; Phase 2, implemented in 2023/24, aims to take a more proactive approach to reducing FWI, by reviewing risks to prevent accidents happening. In Phase 3, NR(HS) will develop an assurance regime and business-wide safety plan. A number of workstreams have been successfully delivered including application of CDM in renewals works, training of manual handling champions, supplier training and assurance, depot walkway improvements, supplier control of works, risk assessment review, working around third rail, behavioural safety training and the use of small hand tools.

To drive down contractor and supplier accidents, which accounted for 54% of workforce lost time accidents in 2023/24, NR(HS) followed up the Supplier Safety Day held in P12 2022/23 with two further events in 2023/24, one of which included its Tier 1 contractors and HS1 which drove greater safety collaboration across the system as a whole. Supplier safety days will continue as part of the Phase 3 plan. They provide an opportunity for NR(HS) to set out safety expectations to suppliers and to discuss safety initiatives within their businesses. A number of NR(HS)'s Tier 1 suppliers have created their own safety improvement plans in 2023/24, which have supported the reduction in workforce FWI; progress is monitored in periodic meetings with contractors.

Assault related events account for the largest proportion of workforce safety incidents in stations. Body worn cameras (BWC) have been issued to station staff and cleaning contractors who

directly interface with members of the public, conflict avoidance training has been rolled out, along with a workstream to improve BTP presence and intervention on site. HS1 has challenged BTP to take a leading role in reducing workplace violence; a multi-stakeholder working group has been established to address this issue. These measures have had a positive effect on the number of assaults with only one being recorded in P11 to P13 compared with 13 over the same period in 2022/23. HS1 will continue to monitor the use of BWC and the number of assaults to gauge the effectiveness of these initiatives and, where needed, seek improvements through the Workplace Violence Reduction Group. This group meets periodically, is chaired by BTP and attended by TOCs, NR(HS) and HS1.

The stations locally owned safety plans target reducing passenger FWI, with a focus on escalators in St Pancras, where most passenger accidents occur. The NR(HS) stations team has continued with the project commenced in 2022/23 using artificial intelligence (AI) screens to recognise unsafe behaviours as people approach the escalator, such as carrying luggage. The screens warn them to stop and guide them to use the lift. NR(HS) is currently assessing the data from the trial to understand the benefits of a wider roll out; initial data is showing that around 250,000 passengers with at-risk characteristics, such as large luggage items, have diverted towards lifts and away from escalators. The trial showed a 38% compliance rate from passengers which was greater than the baseline of 16%; NR(HS) is investigating whether this led to a reduction of accidents reported on this asset and if there is a business case for further roll out across other escalator assets.

Locally owned safety plans and safety statistics are monitored every period at the NR(HS) Directorate Periodic Business Review (PBR) meetings and on a quarterly basis at the NR(HS) Safety Board. The success of improvement initiatives is measured and future strategies to improve safety performance are agreed. Progress against these plans is reported to HS1 in the periodic NR(HS) Client Report and discussed via Level 3 assurance meetings each period.

2.2 Health, safety and assurance

The HS1 Health, Safety and Assurance strategy has three core components: bowties, assurance, and RM3.

Bowties: Following this year's Health, Safety and Assurance Strategy milestones to review and improve our use of bowties, we have identified improvements to our processes. We have developed a bowtie methodology for HS1 supported by software and used this to review the safety bowties.

Assurance: The output of the bowtie work drives the assurance plans, and the intention is to develop this further so that the bowties become the assurance plan, as they contain all of the relevant information. To support this process, the bowties will be reviewed as a minimum three times a year and integrated with HS1's corporate risk management process so that overlapping actions can be addressed. This will bring risk and assurance closer which will strengthen both processes.

HS1 and NR(HS) have developed a joint assurance plan which drives both organisations to share assurance activities across organisational boundaries. Oversight of assurance is provided by the joint HS1/NR(HS) Assurance Board which has an independent Chair. The Chair's role includes writing an annual stewardship report on the effectiveness of the Assurance Board, including the achievements of the Board during the year and plans for the coming year. The report is submitted to the HS1 Board Safety Committee.

Through our assurance framework we have identified a change in the safety risk profile from workforce to the management of major incidents on our infrastructure (Thames tunnels incident, dewirement leading to stranded train 9114 on Eurotunnel infrastructure at the interface with HS1). This has been reflected in our bowties and subsequently our assurance plans through the following actions: leading the system response to stranded trains risk, ensuring interface agreements are effectively discharged, and reviewing the maturity of NR(HS) operational capabilities. The Assurance Board will also review the effectiveness of the close out of recommendations following incidents and investigations.

Assurance site visits continue to drive value and engagement across the supply chain. Within HS1 there are three levels of assurance visit:

- Level 1 HS1 Senior Management Team
- Level 2 HS1 Engineering Heads
- Level 3 HS1 Client inspections

Levels 1 and 2 focus on engagement and culture through setting positive examples and acting on issues identified by frontline workers. These visits are aimed at HS1's role of assuring itself that the supply chain is delivering the contracts effectively. Level 3 visits are a means of discharging HS1 duties, particularly with regard to the Construction Design and Management (CDM) Regulations.

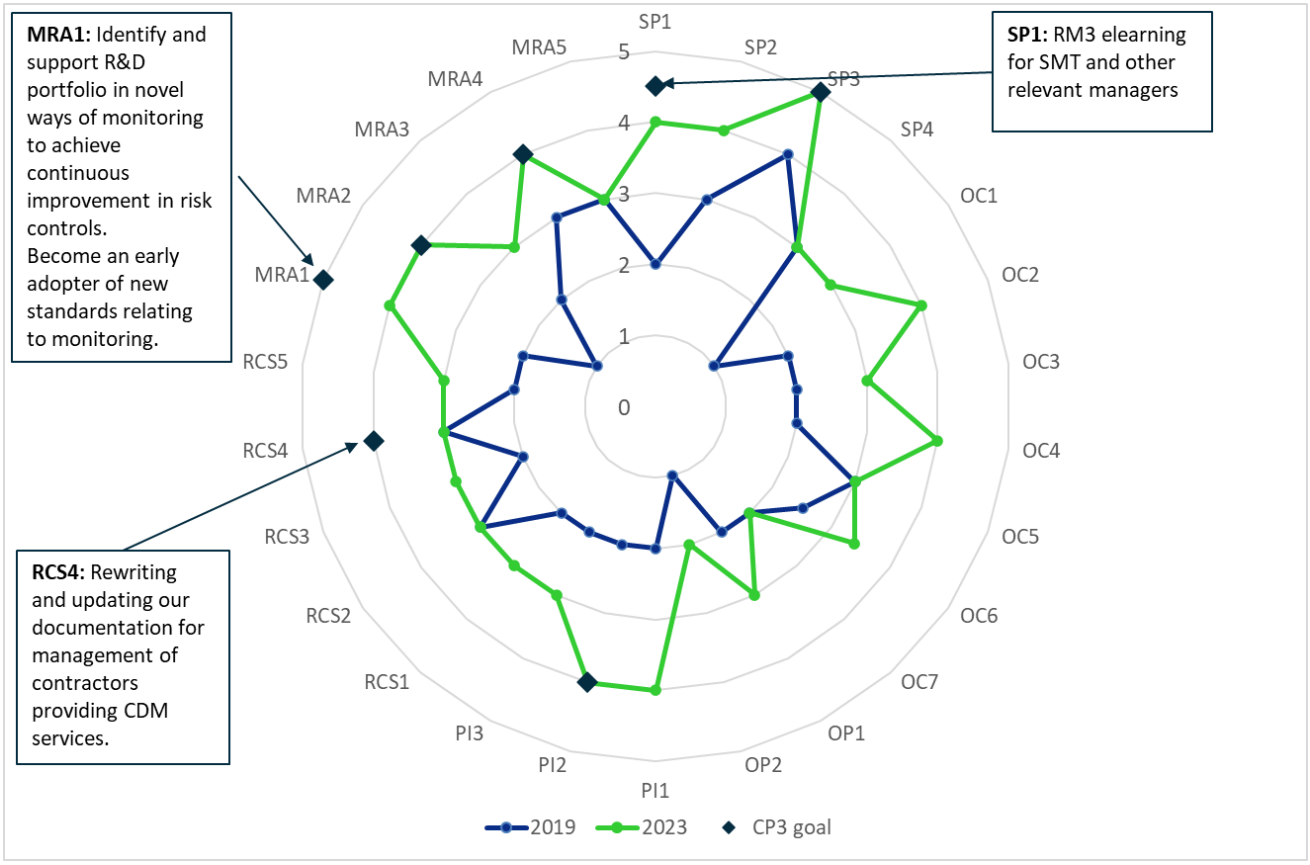
RM3: RM3 is the core approach to driving maturity improvements within HS1 and the supply chain. We identified and agreed with ORR the seven spokes of RM3 to be addressed within CP3. Our aim was to reach Level 4 or 5 in each of these by the end of CP3. The seven spokes are:

- SP1: Leadership
- SP3: Board governance
- P12: Objective and target setting
- RCS4: Control of contractors and suppliers
- MRA1: Proactive monitoring arrangements
- MRA2: Audit
- MRA4: Management review

Figure 4 compares the 2019 baseline with the results of an independent audit undertaken in 2023 and our goal for CP3 exit, noting the actions we are taking to achieve our remaining goals. We have achieved significant maturity improvements since 2019 which will form the foundation

for further improvement in CP4. Six of the seven selected spokes are now at maturity Level 4 or 5. The audit scored RCS4 (Control of contractors and suppliers) at Level 3 but noted *"however, the relationship with the HS1 partner organisations is considered to be more mature than this score indicates"*. The audit found no gaps against the CDM Regulations, but identified areas where clarity of the documents could be improved and recommended that these were reviewed and updated. Earlier in 2023 we had commissioned an audit of our management of contractors providing CDM services and have since reviewed and updated our documentation; which we expect will help move RCS4 maturity to Level 4 when next assessed.

Figure 4: RM3 maturity improvements



NR(HS) continues to integrate RM3 into its assurance processes. Improvement areas have been identified and will be addressed in the Safety Strategy Improvement Plan. HS1 conducts RM3 audits on NR(HS), the outputs of which will also feed into NR(HS)'s safety plan and strategy.

HS1 maintains a good relationship with the ORR Principal Inspector for High-Speed Rail. The organisations meet quarterly and discuss how sharing individual assurance activities can benefit both. Both HS1 and ORR have new leads in this area and this collaborative approach has continued.

The HS1 Health, Safety and Assurance Strategy is under review, there are minor changes proposed which reflect the organisational changes within HS1 and further refinement of the use of bowties in relation to assurance plans.

2.3 Sustainability

We continue to make good progress implementing the HS1 Sustainability Strategy. Highlights for 2023/24 include:

- Emissions from purchased electricity reduced by 45% since 2022/23 (market based methodology) as we continued to expand our renewable energy portfolio through Corporate Power Purchase Agreements (CPPA);
- In January 2024, we introduced the N-1 Energy Saving Scheme (discussed below);
- NR(HS) has recruited a Sustainability Manager and developed an NR(HS) Sustainability Strategy which aligns with the HS1 Sustainability Strategy;
- We have worked closely with NR(HS) to deliver a waste improvement plan for St Pancras International. In December 2023, we installed a Mobile Segregation Unit which will transform waste efficiency at the station by segregating waste streams and enabling re-use and recycling up to a target of 90%.
- We have continued to work with NR(HS) to implement station energy saving schemes including Building Management System (BMS) optimisation and lighting and control upgrades. We are finalising our Energy Savings Opportunity Scheme (ESOS) Phase 3 report which will help direct energy efficiency scheme funding in CP4 for both route and stations; we expect to complete this report by end June 2024.

We publish a comprehensive ESG report on the HS1 website in June each year setting out our performance to date and our priorities and plans for the future.

N-1 Energy Saving Scheme

HS1 has worked with UKPNS to implement the N-1 Energy Saving Scheme to reduce energy consumption and provide cost savings for train operators on HS1. Following a consultation with train operators, DfT and ORR we updated our Passenger Access Terms (PAT) to include the scheme. The N-1 Energy Saving Scheme came into operation in January 2024.

There are four electricity feeder stations for the HS1 route. Only two are required at any one time to operate the railway. For distribution system resilience, the remaining two feeder stations had operated in hot standby mode, which uses electricity. The N-1 Energy Saving Scheme involves switching one of these to cold standby mode, which does not use electricity. While this reduces the resilience of HS1, the risk of concurrent faults at two feeder stations causing an operational impact is very low. In the past five years there have been only two failures that would constitute an N-1 Event under the scheme and only one of those resulted in a performance payment to the TOCs.

UKPNS already switched an electricity feeder station to cold standby mode on maintenance days; forecast savings are from implementing N-1 on non-maintenance days. In a typical year, energy consumption savings are expected to be 3,300 MWh (carbon saving of 668 tonnes CO2e per annum). At winter 2023 energy prices this would result in a saving of c. £1.1m per year, which will be shared between the TOCs proportional to their usage.

As traction electricity costs are passed through to train operators directly, HS1 does not receive any financial benefit from this scheme.

Annual costs to UKPNS of approximately £45k to implement the scheme will be recovered from the TOCs, as will one-off implementation costs for HS1 of approximately £57k in the first year. In CP3, N-1 costs will be recovered via an annual TOC Contribution shared between the TOCs proportional to their usage.

3 Operational performance

The Signalling & Telecommunications (S&T) resilience plan, which was introduced to address negative trends, is showing positive outcomes.

Trespass remains a high impact issue and we continue to work at system level through the Trespass Reduction Group to prevent and mitigate impacts.

Disruption from Thames tunnels flooding in P10. Technical and operational investigations are complete and recommendations are being addressed.

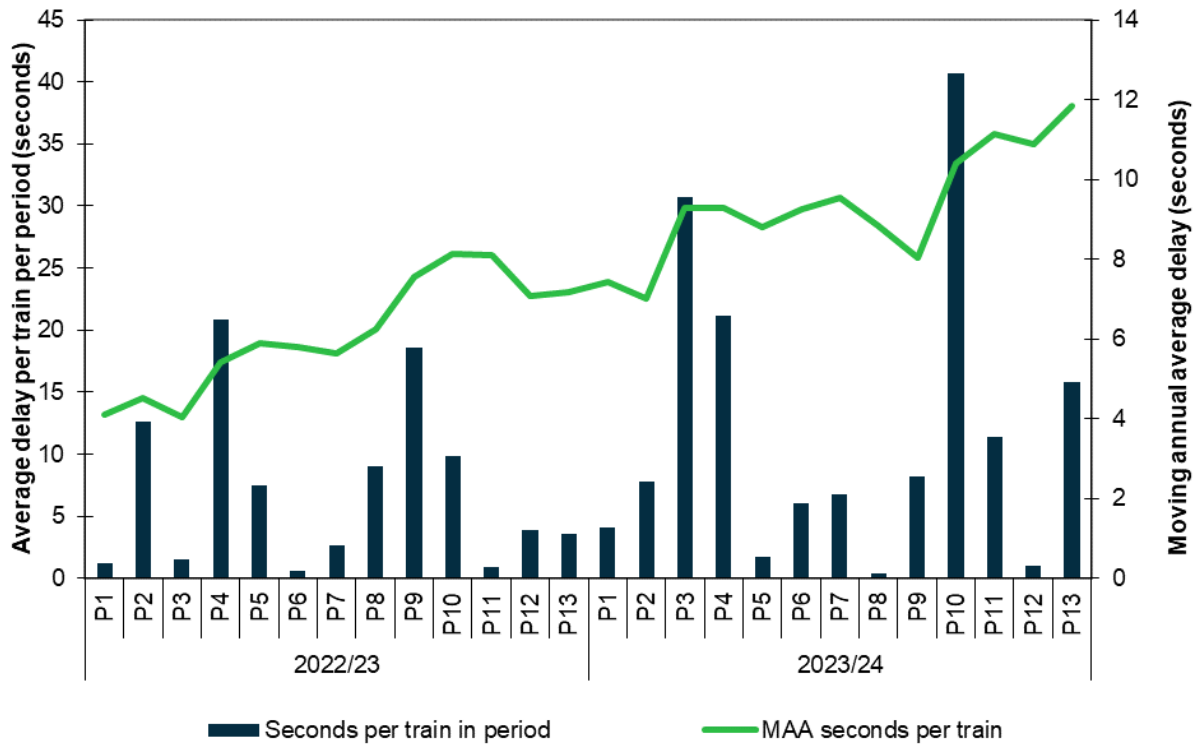
Overall station cleaning performance exceeded target and LET availability was only slightly below target as a result of implementation of performance improvement plans.

3.1 Route performance

2023/24 was a challenging year for route operational performance. Despite good underlying performance, a number incidents of caused significant delay and disruption.

The top-level service requirement for HS1 is average seconds delay per train for all incidents attributed to HS1. The measure is reported on both a period and MAA basis. Figure 5 shows seconds delay per train for all incidents on the HS1 infrastructure.

Figure 5: Seconds delay per train



We also report against a Significant Delays KPI, which includes all incidents with a performance impact of over 200 minutes. In 2023/24, there were 13 such incidents, as shown in Table 1.

Table 1: Significant delays

Period	Date	Delay minutes	Reason
2	06/05/2023	217	Trespass
3	01/06/2023	722	Points failure
3	10/06/2023	320	Trespass
3	11/06/2023	1,182	Multiple points failures
4	30/06/2023	382	Track circuit failure
4	15/07/2023	850	Vegetation on OLE
7	12/10/2023	239	Trespass

Period	Date	Delay minutes	Reason
9	16/11/2023	442	Possession overrun
10	29/12/2023	1,953	Thames tunnels flooding
10	04/01/2024	811	Trespass
11	24/01/2024	209	UPS fault leading to loss of smoke control in LT1
11	02/02/2024	618	Signalling issue caused by DTN renewal
13	08/03/2024	963	Points failure

The most significant performance impacts in the year were:

- The Thames tunnels were flooded causing significant disruption in P10. On 29 December there was single line working and on 30 December the HS1 route was closed for the full day. Significant resource and technical input was used to recover the situation, allowing services to recommence on 31 December. Independent technical and operational investigations are complete and recommendations are being addressed. Further details are provided in Appendix A2.
- In P3, there were 1,500 minutes delay over one weekend as a result of two consecutive points failures, while implementing single line working to route around an off-route OLE failure, further compounded by a trespass incident. These incidents highlighted the need for NR(HS) to improve resilience to multiple simultaneous significant events, and to expedite key components of the NR(HS) Operations Strategy. HS1 requested a formal Performance Improvement Plan with NR(HS), addressing:
    - Maintenance leadership, resource and capability plan;
    - Operational resilience including an effective network control function;
    - Interface management plans for both NRIL and Eurotunnel (ET) interfaces; and
    - Acceleration of maintenance evolution and the modernisation of how NR(HS) undertakes maintenance, operations, planning and response activities.

    Subsequent performance has shown improvement. Although it is too early to say for certain, evidence is growing that NR(HS) interventions are having a positive impact on performance.
- In P13, the delay impact of a points failure was exacerbated by the need for final checks to be completed by a separate team. As part of its Operations Strategy, NR(HS) is introducing multiskilling of rapid response teams; this is due for completion by the end of Q2 2024. This would mitigate the impact of similar incidents in future.

In 2022/23 the two greatest causes of delay were points failures and trespass incidents; we took the following steps to address these areas:

- We requested NR(HS) develop an asset resilience plan for S&T to address performance impacting issues associated with points failures, including both tactical and strategic actions.
- NR(HS) introduced an updated trespass mitigation strategy to reduce the number of trespass events and their operational impacts, building on the previous trespass strategy.

The following sections provide a summary of the actions delivered in 2023/24 to continue delivering improvements in these two areas.

Trespass and Security

Since the finalisation of the Trespass Strategy in June 2023. NR(HS) has turned the recommendations in the strategy into tangible actions:

- Physical trespass measures have been put in place following past events. For example, Medway viaduct has had zero trespass incidents since an additional fence line was erected, anti-trespass devices have been added at key locations such as York Way and the shorebase at St Pancras.
- Increased use of technology has been progressed with cable theft trackers and covert cameras deployed to hotspots across the network, along with ongoing trials of anti-trespass technology.
- At the end of the year, NR(HS) comprehensively reviewed the Trespass Strategy recommendations, reflecting its commitment to continuous improvement and adapting to changing environments. Utilising trend analysis and proactive measures, NR(HS) is aiming for a 10% reduction in delay minutes compared to 2023/24.

Collaborative working with the Land Sheriffs, MOMs and BTP team have further enhanced efficiency and coordination across the network, ensuring effective patrols and proactive identification of new trespass and crime risks with the utilisation of the BTP drone team.

Significant progress has been made in addressing trespass incidents and enhancing security across the network; we have seen early signs of reduction in the impact of trespass and will continue to monitor. While challenges remain, collaborative efforts and strategic initiatives have laid a solid foundation for continued improvement in the coming year.

Challenges persist, particularly at St Pancras, which remains a hotspot for trespass incidents. NR(HS) will intensify efforts in this area, bolstering patrols and expanding surveillance capabilities with CCTV analytics. Plans for 2024/25 include the integration of security measures into frontline operations and the creation of trend analysis dashboards to inform decision-making.

S&T Resilience

In 2022/23, at HS1's request, NR(HS) developed an asset resilience plan focusing predominantly on points failures, track circuits and reducing the number of faults by applying system thinking. Following the points failures in Q1 of 2023/24, NR(HS) re-evaluated the plan, building upon and accelerating actions. This included the completion of assurance activities, a change in

maintenance strategy for points detection and the delivery of an independent assessment of MCEM91 points reliability problems.

Progress against plan milestones is reported to HS1 on a periodic basis. NR(HS) has delivered on the eight milestones for the year. Two of the key workstreams in the plan are the independent assessment of the points reliability issues, which identified that the quality of the geometry on the S&C is the contributor of POE components failure. Systra shared the experience from MESEA (infrastructure maintainer of the Tours – Bordeaux SEA high speed line) in France. There are also ongoing plans for the installation of remote condition monitoring (RCM) across further assets; NR(HS) is awaiting quotations to replicate the equipment installed on points 2251 but also looking at other available RCM that can provide more detail over and above vibration.

Key achievements this year include:

- Expert training in the maintenance of the MCEM91 points - a training package was developed with Vossloh and training is underway;
- Installation of RCM on points 2251, to monitor the performance of the worst performing asset, allowing NR(HS) to intervene ahead of failure. Maintenance practice has been amended and weekly points cycles re-introduced;
- A number of actions to improve the performance of HPSS points and HVI track circuits at St Pancras, including acceleration of the renewal of the HPSS equipment. A trial of thermal temperature control solution (LEMUR-AG15) will commence before summer 2024 on two sets of HPSS.

Dewirements

Over the year there was one dewirement on HS1 infrastructure and three on other networks (NRIL and Eurotunnel (ET)) at the interface with HS1. None of these are included in the HS1 delay minutes above as they were caused by train faults (and three were off the HS1 infrastructure). There is no suggestion that the condition of the HS1 asset contributed to any of the dewirements. However, we are working as a system to learn from and improve our joint response to reduce disruption to passengers.

- **Ashford (10 June 2023):** A broken contact wire on the overhead line on NRIL Kent Route in the interface area due to a bird causing a short circuit. Learning points primarily concerned the effectiveness of interface arrangements between NR(HS) and NRIL. NR(HS) is working with NRIL to drive efficiency in the management of interfaces.
- **ET interface (30 November 2023):** A Eurostar train and passengers were stranded following a dewirement on the Eurotunnel side of the interface. After several hours, the train was hauled clear of the damaged OLE and returned to St Pancras International. Approximately 800 passengers were trapped on the stranded train for over eight hours.

  We are reviewing the outputs of the root cause investigation and managing risk with Eurotunnel. There is no evidence to suggest that the condition of the OLE equipment was a contributory factor to this incident.

AD Little was commissioned to review the management of the incident. Recommendations include the need to clarify incident response arrangements between ET and NR(HS), the need to review, clarify and simply interface arrangements between NR(HS) and ET, and the need to work with all system stakeholders to improve contingency plans to rescue passengers from stranded trains within an acceptable timescale. HS1 is leading a system response to closing out the actions from the AD Little report and aligning with RDG best practice. This includes a technical and operational working group with oversight from a steering group chaired by HS1. This year's assurance plans include a series of emergency planning exercises which will include stranded train exercises to test the implementation of the recommendations.

- **ET interface Cheriton (2 December 2023):** Overhead lines were down at Cheriton; there was no train in the section at the time. The root cause of this incident remains under investigation. In the interim, NR(HS) will expand and develop requirements for detailed inspection of the OLE asset in the surrounding area following an incident.
- **Singlewell (29 January 2024):** A Southeastern train was stranded with the OLE wires down over the train. SETL and NR(HS) worked to ensure timely evacuation of passengers and onward transportation to Ebbsfleet International. There is no evidence to suggest that the condition of the OLE was a contributory factor to this incident. Further advice is awaited from Southeastern to allow us to conclude the root cause. In the interim, NR(HS) will implement measures to improve the rigour of communication and decision making between train drivers and signallers.

UKPNS asset performance

UKPNS assets continued to perform extremely well with availability of 100% in 2023/24, exceeding the target of 99.9885%.

3.2 Stations performance

Stations performance is reported against a number of KPIs. The key measures of station performance are the availability of lifts, escalators, and travelators (LETs) and cleaning audit scores, both of which are reported below.

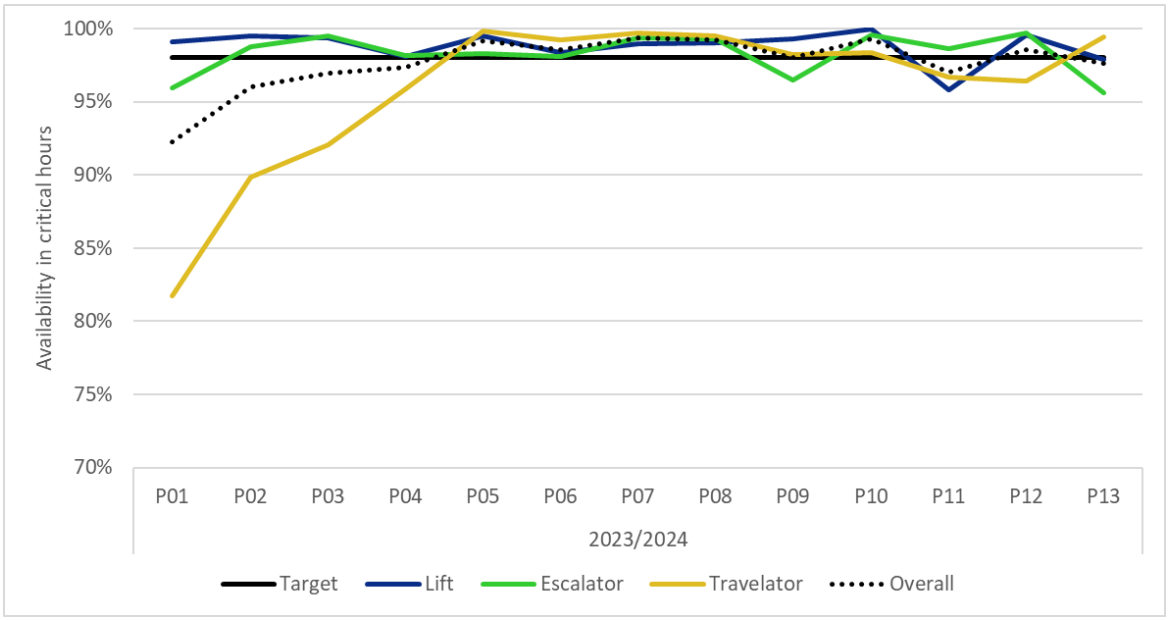
Management of the Tier 1 contracts by NR(HS) is critical to successful delivery of the contracts and meeting performance requirements. To address issues with delivery, which commenced in 2022/23, NR(HS) has worked with suppliers to change the operational teams delivering the contracts and worked directly with the directors of the suppliers to implement changes. This has resulted in improvements in 2023/24, reported below, with overall cleaning performance being above target and LET availability very close to target for the full year. This approach, although management heavy, will continue until our two core suppliers are consistently delivering contracted services and meeting stakeholder expectations. HS1 and NR(HS) are also in discussions with the TOCs regarding whether the current KPIs meet their requirements and those of their passengers.

HS1 focuses on understanding our station customers. We continually monitor customer feedback through our customer satisfaction programme Station Matters, to ensure we are getting the basics right and responding to changing customer needs, behaviours, and profiles. We monitor key drivers of overall satisfaction to ensure we invest our efforts in the right place; based on customer feedback we have invested in several station improvement initiatives including:

- Customer service training to NR(HS) Customer Service Assistants and SETL Passenger Hosts at Stratford International and Ebbsfleet International which resulted in improved customer satisfaction ratings across several service delivery measures.
- Launch of a digital map at St. Pancras International in Spring 2024 as a wayfinding solution to help customers navigate their way around the station (which is a key driver of satisfaction).

Figure 6 shows availability of passenger LETs for the three stations managed by NR(HS).

Figure 6: Availability of lifts, escalators and travelators



Following declining performance in 2022/23, at the start of 2023/24 NR(HS) put in place a tightly managed improvement plan with its specialist LET supplier, Schindler. Schindler continues to track well against the improvement plan with strong recovery and performance across the LET asset base. Despite the issues affecting availability early in the year, overall availability for the full year was 97.65%, only slightly below the target of 98%.

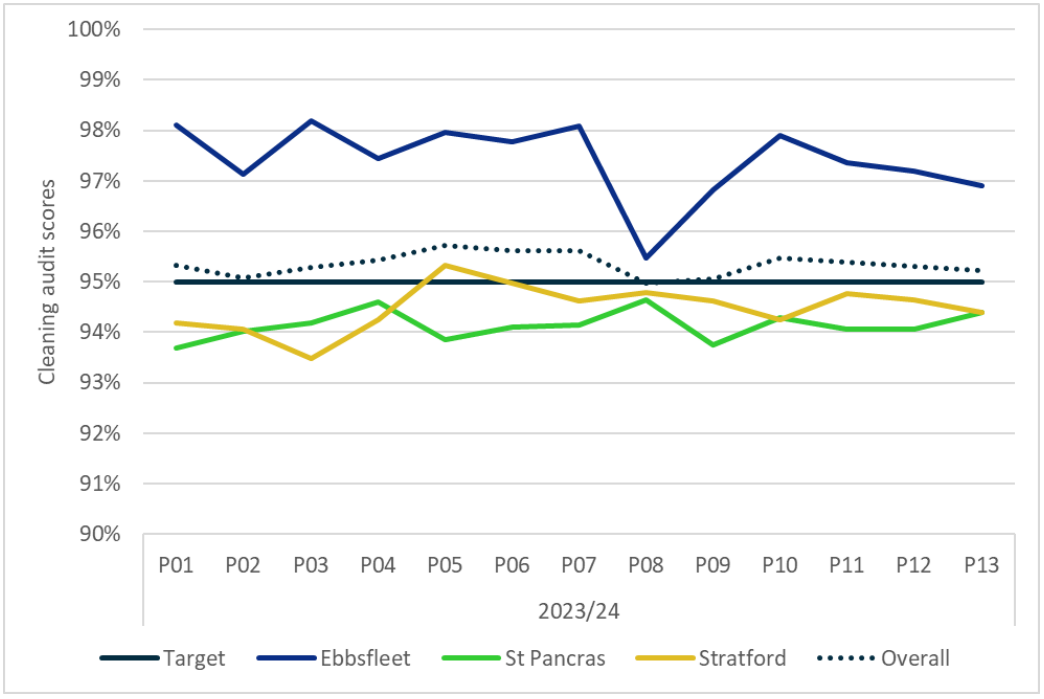
Below target overall availability at the start of the year was mainly due to travelator T1.2 in the International Zone at St Pancras International with issues following renewal of the departures lifts also contributing to missing the target. The catastrophic failure of the travelator drive assembly required new components. However, due to obsolescence, the manufacturer had changed the component dimensions; the new equipment would not fit the existing frame and major modifications had to be made to the travelator's internal structure which delayed returning the

asset to service. This change to components is now accounted for in planning other travelator renewals.

Performance in P11 was affected by the failure of Lift 2.2 and Travelator 1.2 at St Pancras, the impact of the latter continued into P12. We worked proactively with EIL to defer the full repair of the travelator until after the Easter break ensuring EIL could manage the large passenger volumes over Easter most effectively, using the travelator as a static walkway. Performance was also affected by outage of an escalator asset at Stratford in P9.

Figure 7 shows station cleaning audit scores for the three stations managed by NR(HS).

Figure 7: Station cleaning audit scores



Since taking on the combined soft services contract at the start of 2022/23, the NR(HS) cleaning contractor has not delivered a consistent product, leading to contractual targets being missed. The contractor has been delivering major changes to its internal staffing resource and notably its management team to improve consistency of delivery. A performance plan was agreed with NR(HS) at the start of 2023/24 in which a review of auditing and staff training were undertaken to ensure that the audit process and scoring were clearly understood by all parties. This has led the operations teams to deliver consistency of audits across the estate and therefore start delivering to target. The overall target of 95% was met or exceeded for every period of 2023/24.

As a result of Covid-19, EIL has not operated international train services from Ashford International since March 2020. The international station remains open, providing access to domestic train services and car parks within and adjacent to the international station. HS1 will continue to maintain the international areas of the stations in a cost-efficient manner, ensuring station asset condition and performance is maintained at sufficient levels to ensure a smooth recommencement of services when needed.

ABM took over Ashford station management from Mitie in October 2023 (P7). All Mitie staff transferred to ABM, resulting in a seamless transition with no negative effects on the operation or staffing. All cleaning KPIs at Ashford were 100% throughout the year. There is just one customer-facing LET asset (the concourse lift); availability was 100% apart from P13 where it was 98.5%, against a target of 98%.

4 Asset management

Full suite of asset management documents developed to support PR24 and the 5YAMS submission including SASs for route and station assets, risk-based totex modelling and renewals work banks.

HS1 supports the majority of renewals proposed by NR(HS) for CP4 as a result of assurance of NR(HS)'s asset management approach, strategies and renewals work bank including site visits. This assurance has reduced the CP4 work bank.

Delivery of the first HS1 system R&D strategy developed between HS1 and NR(HS)

4.1 Asset capability and condition

Asset capability has remained constant since commissioning with no projected reductions within the HS1 concession period. The maximum line speed remains the highest in the UK at 300km/h and the route availability meets all passenger and freight customer needs at 22.5 tonnes (axle loading). The maximum number of achievable train paths that the signalling system can deliver remains at 20 international trains per hour in each direction.

Asset condition information is key to informing decisions for the effective operation, maintenance, and renewal of the HS1 infrastructure.

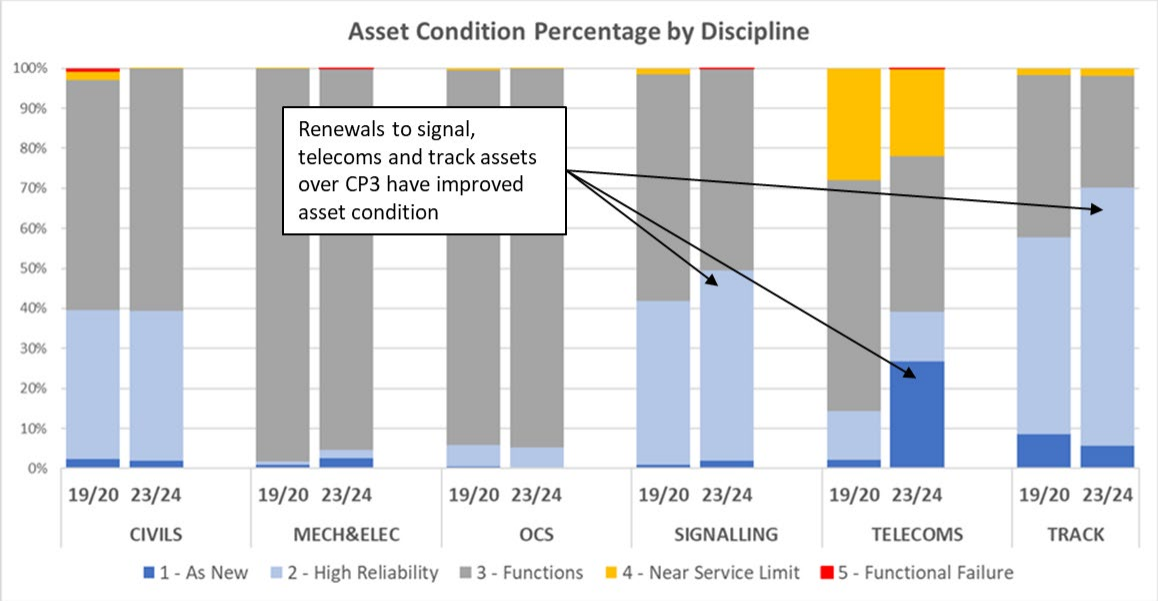
4.1.1. Route asset condition

Figure 8 shows the current asset condition scores within the NR(HS) Electronic Asset Management System (eAMS) by discipline, compared to the condition at the end of CP2 (2019/20) as reported in the PR19 5YAMS.

A high percentage of assets with a condition score of 4 or 5 are telecoms and signalling. The signalling ITCS system is at risk of obsolescence and the wider industry is moving to the next

generation of interlocking control system. This is being mitigated through strategic spares and close monitoring of obsolescence with the manufacturer, as the feasibility for the renewal is progressed. The telecoms DTN is also at risk of obsolescence and renewals work is planned for CP3. The remaining assets at condition 4 or 5 are either due for imminent renewal, low criticality or mitigated through actions such as spares holding.

Figure 8: Route asset condition by discipline

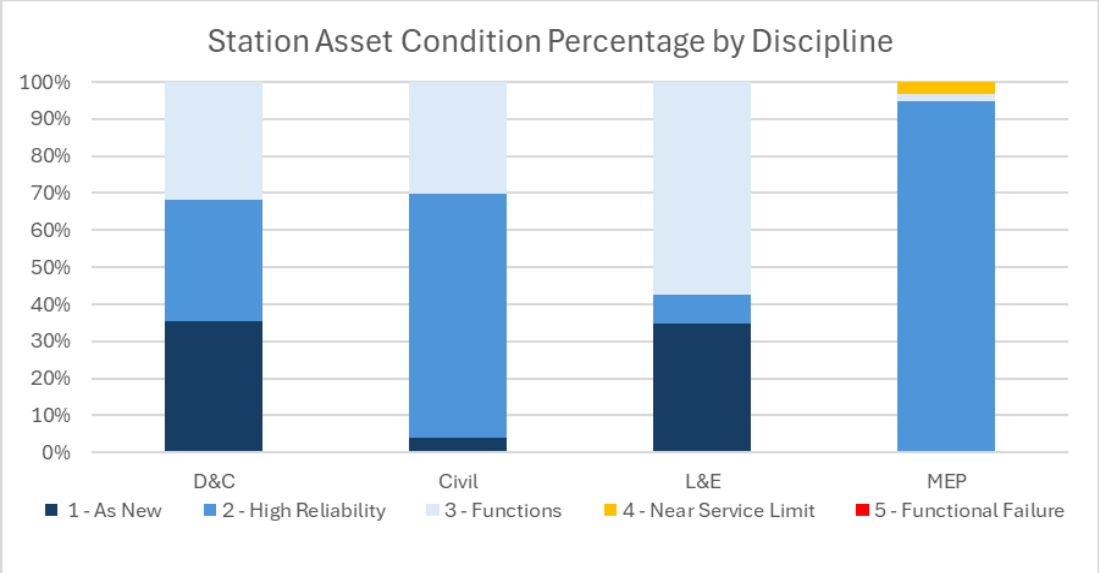


4.1.2. Stations asset condition

Figure 9 shows the current station asset condition scores by discipline, these take the condition information held in Concept, moderated by HS1 and NR(HS) to reflect the current condition. This condition information has been used to develop the maintenance and renewals plans detailed in the PR24 5YAMS.

Station assets are generally performing well overall and meeting their expected condition, although specific LET assets have experienced performance issues due to difficulties obtaining parts from the original manufacturer. We continue to manage minor leak issues on the transition roof at St Pancras station, until delivery of significant renewal work to address this in CP4.

Figure 9 Station asset condition by discipline



External consultants undertake a survey of all HS1 station assets every five years. These surveys are currently being procured and the surveys will be completed in 2024/25.

4.2 Obsolescence

Condition modelling and risk-based deterioration modelling is much less reliable for assets that are affected by obsolescence. Through the PR24 evaluation work it has become much clearer which assets are at risk of obsolescence. Track, civils and the overhead catenary system are not significantly impacted by obsolescence issues. Signalling and telecoms and mechanical and electrical assets are significantly impacted by obsolescence.

Obsolescence is one of the key asset management challenges and drivers for renewal activity. It is highly correlated to the inability to restore an asset to service or increased repair time, leading inevitably to reduced and compromised availability and potential service disruption. This risk is principally managed via regular dialogue with, and contractual obligations of, key suppliers.

The NR(HS) Strategic Asset Management Plan (SAMP) and supporting SASs set out four states of obsolescence for an asset or a system:

- Manufacturer continued and supported;
- Manufacturer discontinued but supported;
- Manufacturer discontinued and best endeavour support; and
- Manufacturer discontinued and not supported.

NR(HS) works with its suppliers to ensure early identification of impending obsolescence and to monitor the level of manufacturer support. Where long-term support contracts are not in place there is a risk that assets will become unsupported at relatively short notice.

Management plans are in place for all asset classes which are in the manufacturer discontinued and best endeavour/not supported states. The management plan is specific to the asset, for example, spares harvesting as types of equipment are renewed, or the development of new alternative components.

The summary of obsolescence by route asset class is shown in Table 2; this assumes that all CP3 planned renewals are completed during CP3.

Table 2: Asset obsolescence summary at March 2024

	Mechanical & Electrical Assets		Signal & Comms Assets	
Not Obsolete	Marshalling Boxes Axial Fans Seccardo Fans Attenuators Power Quality Filters Dampers Cross Passage Doors Stratford Pumps Stratford Control Route Pumps Route Control Tunnel Pipes UPS Systems Head House & Portal	Controllers Cooling Loops Signalling Room Aircon Signalling Room Gas Bottles Tunnel Fire Main Pipe Tunnel Fire Main Hydrants Detectors 10% of Tunnel lighting 60% of Building and trackside lighting 40% of Auxiliary Power Distribution 50% of Minor Aircon	80% of FOAEC FON 50% of VHME 50% of Signals Train Detection ITCS LAN 60% of GSM-R - Handsets 50% of DTN Automatic Train Protection	Switches Relays Markers 90% of POE – HPSS POE – MCEM 91
Manufacturer discontinued (supported)	Jet Fans Chillers Fan Coil Units Detector Heads & Sounders Control Panels 50% of Minor Aircon 40% of Building and trackside lighting		GSM-R - Base Station 70% of Rf Propagation 30% of GSM-R - Handsets	
Manufacturer discontinued (and best endeavour support)			10% of Rf Propagation VCS RCCS EMMIS	80% of LAN 10% of POE – HPSS 50% of DTN
Manufacturer discontinued (not supported)	90% of Tunnel lighting 60% of Auxiliary Power Distribution		System 10% of GSM-R – Handsets 20% of Rf Propagation 50% of Signals 50% of VHME	Server ITCS 20% of FOAEC CCTV 20% of LAN

4.3 Asset management system

This year a significant amount of time has been spent assuring the asset management approach to PR24 developed by NR(HS). This has included extensive document reviews, meetings and site visits. The assurance has comprised a number of stages, firstly reviewing the NR(HS) SAMP, then

the SASs, the risk-based deterioration models and finally the renewals work bank. Through this assurance, the renewals volumes have been reduced significantly between the early draft work bank to the final work bank. The assurance has given confidence in the renewals proposed and HS1 supports the majority; the outcome is detailed in the 5YAMS.

We published the HS1 SAMP in June 2022. Following the NR(HS) Target Operating Model (TOM) changes, and as part of the overall PR24 programme, the NR(HS) Asset Management Policy and NR(HS) SAMP were updated during 2023 to align with the HS1 SAMP. The new NR(HS) SAMP sets out a more targeted plan that will deliver against the Asset Management Policy and organisational objectives for CP4 and beyond. It builds on the work undertaken in CP3 to develop NR(HS)'s asset management capability across the HS1 route and station assets, now integrating approaches as a whole railway-system, across both route and stations assets.

The HS1 SAMP was reviewed and updated in April 2024 to ensure it remained appropriate. The update reflects the positive move towards passenger growth, as we have moved away from uncertainty on exiting the pandemic. It includes better line-of-sight between the AMOs and the KPI data used to measure achievement of the objectives. The scenarios and AMOs remain unchanged, as a result there is no impact on the SASs or work bank.

HS1 reviewed the SASs to ensure they held adequate information on the existing asset base, rate of deterioration, performance and risks. This was followed by assurance of the risk-based deterioration models where we challenged the methodology, the criticality scores and the frequency of intervention. Arcadis was appointed to undertake assurance of the Track SAS, track deterioration model and track renewals work bank. The assurance was led by a track subject matter expert and included a number of technical review meetings, comparison with current industry good practice, and emerging research.

Seven site visits were completed this year to provide assurance of the asset renewals proposed in CP4; these proved very beneficial. The asset maintenance engineers were able to describe in some detail the asset management good practice that is applied in practice, which aligned with and further expanded on the methods detailed in the SASs. The site visits also provided insight into the environment that our assets are exposed to and some of the particular challenges that will impact renewal costs. The ORR and TOCs accepted an invitation to attend one day of route site visits and one day of station site visits.

During 2023/24, the ORR was invited to attend meetings with each of NR(HS)'s Head of Discipline to discuss the work completed to generate the PR24 work bank. This included a discussion on the SASs and the asset management approach applied to developing the risk-based models for route and station assets.

The Station SASs were shared with the ORR in December 2023 and the Route SASs were shared in February 2024.

In preparing for ISO55001 certification we undertook an asset management gap assessment in November 2023 and an internal audit in February 2024. These assessments and audits identified a number of opportunities to improve the asset management system. We acted on all these actions to deliver:

- Improved line-of-sight between Asset Management Objectives (AMOs) and the KPIs, supporting the use of data to measure AMO achievement.
- A forward plan of internal asset management audits to support continuous improvement;
- A summary of the broad range of asset information held, where it is stored and the frequency of update.

In November 2023, HS1 collaborated with NR(HS) to present the track deterioration model at the Institute of Asset Management annual conference. The conference was attended by representatives from the rail industry and wider infrastructure owners. There was interest in our ability and determination to model our asset deterioration 40 years into the future when other businesses struggled to model beyond three years.

4.4 Asset information

HS1 personnel have been seconded into NR(HS) this year to support NR(HS) in planning to meet the CP3 commitments on asset information. HS1 has seen anecdotal evidence of improved asset information being used by NR(HS) to support the development of the SASs and deterioration models. We have been involved in the development of plans to further improve the quality of asset information, as detailed below. HS1 will closely monitor NR(HS)'s delivery of the asset information strategies and plans over 2024/25. A consistent improvement in overall data quality and completeness is needed to support our ongoing asset management decisions.

In March 2023, HS1 carried out a key assurance activity by auditing NR(HS) on the quality of asset information across route and stations assets. HS1 was pleased with the engagement by NR(HS) in the audit and is supportive of NR(HS)'s position, that a new Enterprise Asset Management System (EAMS2.0) is required to support the improvement of asset information. During the audit, NR(HS) acknowledged that there is work to be done to improve the standard of asset information and detailed its plans to do this through a series of prerequisite workstreams prior to the introduction of EAMS2.0, including data definition, data cleansing and asset data verification. The auditors were pleased with the plans and satisfied that they would deliver, therefore focus has shifted to supporting NR(HS) in the delivery of these plans.

Work is ongoing on the procurement of EAMS2.0, the new Enterprise Asset Management System for HS1 (see Section 4.4.1). There are several prerequisite workstreams to ensure successful implementation of EAMS2.0; HS1 has supported NR(HS) in the development of these key pieces of work. These workstreams are:

- Development of the first Asset Data Dictionary for route infrastructure assets, ensuring we have defined data parameters within clear asset groups and hierarchies for all route assets.
- Development of defined maintenance activities against asset types, allowing EAMS2.0 to enhance capability in workload planning and activity recording.
- Development of an updated Asset Information Strategy for NR(HS), in which NR(HS) will clearly articulate its immediate and longer-term holistic overview of asset information

transformation, defining more clearly the systems, data, people and processes required to ensure that asset information drives evidenced decision-making.

The workstreams are described in more detail in Section 4.4.2.

4.4.1. EAMS2.0

NR(HS) commenced the project to replace the current Electronic Asset Management System (EAMS2.0) in 2022/23, with initial stages of the programme focusing on scope development, system requirements and routes to market. Market engagement commenced in September 2023 and the successful provider was appointed in April 2024. This gives NR(HS) one year to mobilise, implement and move all disciplines' maintenance activity to a new system for CP4.

The new system will provide NR(HS) with an improved capability and structure through which to manage the assets, including maintenance planning and delivery, and the opportunity to transform the maturity of asset information. Implementing the system is a significant change which needs appropriate governance. The programme has been phased appropriately given this complexity, with the first implementation phase based on a minimum viable product (MVP) approach. At a high level, the MVP will provide:

- Planned preventive maintenance scheduling aligned to a new Asset Data Dictionary;
- Fault management and reactive maintenance scheduling;
- Improved reporting capabilities; and
- Mobility (handheld devices and maintenance scripting).

The programme milestones for the remainder of CP3 are:

- System configuration and implementation for M&E assets – October 2024
- All disciplines in route using the EAMS2.0 system in MVP format – April 2025.

As we enter CP4, the programme will continue to develop more advanced capabilities in the new system in a prioritised phasing. This will include integration with other tools and systems such as Geographic Information Systems (GIS).

HS1 welcomes NR(HS)'s plans for the introduction of EAMS2.0, which we believe will transform NR(HS)'s approach to maintenance and ultimately support integration of various digital tools and systems. HS1 has supported the delivery of EAMS2.0 by jointly developing the renewed Asset Data Dictionary for the route assets on HS1.

4.4.2. Data improvement

For EAMS2.0 to offer better asset information, there is a requirement to ensure the data in the system is of sufficient quality. Therefore, in parallel with EAMS2.0 market engagement and procurement, NR(HS) commenced a data improvement workstream, with the following stages:

- Asset Data Dictionary definition - complete
- High level data quality assessment identifying core focus areas by discipline – complete
- Data improvement in readiness for EAMS2.0 – March 2025.

The new Asset Data Dictionary includes a revised asset hierarchy, standard asset codes and key asset attributes which are asset specific. The data quality and availability assessment against the Asset Data Dictionary is complete. Assigning maintenance tasks to the assets in the asset register is now NR(HS)'s primary focus area to ensure key functionality in the EAMS2.0 project. The Asset Management and Maintenance teams for each discipline are working together to ensure a collaborative approach to EAMS2.0 inputs.

In addition to this activity, NR(HS) is undertaking data cleansing exercises of existing fault data to drive an improvement in fault trends for the remainder of CP3.

4.5 CP3 commitments

The PR19 ORR Final Determination included 28 route asset management recommendations and the PR19 DfT Final Decision included 11 station asset management recommendations. We provide quarterly updates on progress against these recommendations to the ORR.

At the end of 2022/23 (as reported in our 2022/23 AMAS) six of the recommendations remained open, four route and two stations. The two station commitments are now closed and the four route commitments are on target for completion by the end of CP3. A summary of progress against each of these recommendations is set out in Appendix A1.

4.6 Asset management maturity

HS1 has successfully completed the Stage 1 and Stage 2 assessment for route and station asset management and is awaiting issue of the ISO55001 certificate, expected end of June 2024. To support our continued asset management maturity HS1 arranged for delivery of a Certificate in Asset Management three-day training course in October 2023; the course was attended by colleagues from HS1, NR(HS) and EIL. HS1 also arranged a one-day course for colleagues who already hold a Certificate in Asset Management, providing a refresher on the requirements of ISO55001.

HS1: We entered into a contract with BSI to undertake a gap assessment against ISO55001, completed in November 2023, followed by formal Stage 1 and Stage 2 audits in February and April 2024. The gap assessment identified a number of specific areas for improvement which were addressed, allowing us to successfully complete the Stage 1 and Stage 2 assessment.

NR(HS): NR(HS) has held ISO55001 certification for route assets since 2018. In August 2023, BSI conducted a surveillance assessment to verify that elements of the ISO55001 certification were being effectively addressed. NR(HS) presented the changes to its Operating Model and Asset Management System; this was recognised as excellent continuous improvement and highlighted

in the audit report. At the recertification audit in March 2024, NR(HS) was successful in retaining its certification. NR(HS) has agreed with BSI the process to expand its certification to include St Pancras International Station, Stratford International Station, Ebbsfleet International Station and depots.

UKPNS: UKPNS continues to hold certification to the ISO55001 Asset Management Standard and regular annual audits take place to maintain this certification.

4.7 R&D

Long-term research activity has been a key focus this year. We are working with the University of Southampton to research the performance of track assets in extreme hot weather conditions, and with the University of Nottingham on asset degradation modelling. Both projects have outputs that will eventually feed our track deterioration model. These projects, along with other R&D activity delivered in CP3, are increasing the quality of data available to us to make decisions and demonstrate that our R&D portfolio is producing multiple outputs across different types of project that are contributing to our increasing capabilities.

The Enterprise System Modelling proof of concept project has recently commenced. The aim of this project is to develop a proof of concept by the end of May 2024 for an enterprise level digital twin that improves delivery by focusing on planning, ensuring that all key drivers and inputs are considered together in an organisation that is large and complex. If the proof of concept is successful, the digital twin will provide a tool to evaluate operational access and planning strategies to determine the optimum, by integrating maintenance and renewal work plans and assessing a range of drivers and constraints that influence the overall strategy, including:

- Access availability;
- Work types and locations;
- Total resource demands vs resource availability; and
- Productivity.

This is the first time this type of work is being trialled in the rail sector; success will allow us as a system to hold this up as an example to the rest of the industry.

There are currently eleven R&D projects in progress, including two OLE monitoring trials which are funded separately via the NR(HS) R&D budget. A full list of CP3 R&D projects, both in progress and completed, is included in Appendix A3.

During the year, we have worked to ensure the full R&D portfolio value is allocated to relevant projects. In January 2024, a review of initiatives identified circa £377k available to be reallocated from R&D initiatives that did not progress, initiatives that were funded from another budget and initiatives that came in under budget. A change request to release these funds for reallocation has been approved. It was also identified that, due to inflation in CP3, an additional £383k is available to spend during the control period. This gives a total of circa £760k to allocate to new

initiatives. Initial ideas were discussed at the March R&D Panel, and a full list of prioritised projects was taken to and assessed at the April R&D Panel. The final projects will be approved at the June R&D Panel, taking us to 100% committed spend.

The delivery of R&D initiatives in CP3 has been key to developing the approach to R&D in several PR24 strategies and has enabled the delivery of the first HS1 system R&D strategy developed between HS1 and NR(HS) to support the PR24 5YAMS submission. The R&D strategy details what has been achieved in CP3 and sets out robust plans for CP4, along with a pre-loaded pipeline of initiatives, to evidence the need for further R&D funding and demonstrate how CP4 plans are an evolution of CP3 activity. The strategy has been important in demonstrating how CP3 R&D activity has informed system thinking and contributed towards key strategies concerned with activities associated with the operation and maintenance of HS1, including the safety, sustainability, operations and infrastructure evolution strategies.

In May 2024, HS1 and NR(HS) held an R&D showcase to demonstrate the projects delivered over CP3 to all stakeholders, including TOCs, the ORR, the DfT and NRIL, demonstrating the benefits, outputs, and value for money. The showcase covered key highlights of CP3 successes, what we have learnt and what we can develop to ensure we start CP4 in the best possible position. A supplier marketplace allowed our stakeholders to interact with a number of suppliers and NR(HS) professional engineering heads to understand what the initiatives are intending to achieve and the key benefits they could provide to the HS1 system, if successful.

In September 2023, NR(HS) introduced a new Project Manager R&D (Change) role, to drive projects forward and ensure that all governance and reporting requirements are being met, that the remaining CP3 R&D portfolio is delivered, and the benefits are realised leading into CP4. In March 2024, NR(HS) introduced a new Head of Innovation role in the Engineering team to begin making the changes that the R&D strategy has specified, to continue building an innovative culture within NR(HS) and to get out into industry, collaborating and building partnerships with rail and other relevant organisations to allow the best possible spend of our R&D determination in CP4. Together with NR(HS), we are planning for future R&D panels with re-engaged stakeholders.

5 Renewals planning and delivery

Year 4 represents the best renewals performance in CP3 with route volume delivery at 120% of plan and stations volume delivery at 248% of plan. This has been achieved by accelerating several year 5 projects into year 4 through a holistic approach to portfolio planning.

Improvements in renewals planning, asset management and assurance maturity and governance.

Capitalising on access opportunities during industrial action with agile planning and accelerated delivery.

As per the Concession Agreement Schedule 10 Section 6.2 and HS1 Lease Section 4.6, the following section summarises the renewals work undertaken in 2023/24 and the work planned for 2024/25. It also describes improvements in the maturity of renewals governance and assurance. A detailed breakdown of route and stations renewals performance on a project-by-project basis is reported to ORR, DfT and the TOCs in the Quarterly Asset Renewals Review meeting in a format in line with that agreed with the ORR at the beginning of CP3.

5.1 Renewals governance and assurance

In year 4, HS1 has undertaken the following activities to improve the maturity of renewals governance and assurance.

Introduction of key milestone metrics: The intention of the milestones is to normalise volumes across different asset types and disciplines as all volumes are not equal in criticality/priority to ensuring the asset stewardship purpose. For example, each track crossing may warrant its own milestone due to its asset criticality but a milestone for marker boards may capture all marker board volumes within the year to reflect the completion of campaign of volumes. The milestones were proposed by NR(HS) and reviewed and amended by HS1 to allow them to be used to provide assurance that the right volumes are delivered to achieve the asset stewardship purpose.

HS1 briefings to the NR(HS) PM team: The purpose of these briefings is to improve knowledge of the overall environment in which renewals take place, the periodic review process and escrow framework. It is planned to use this method to target areas requiring maturity such as change management and benefits management.

Maturity in change management: We have moved towards NEC best practice for managing change, using a system of early warning notices and change requests. This has allowed greater

proactive discussion involving the right parties in respect of asset management decisions before risks are realised.

The following maturity improvement work is in progress:

Workflow management tool: We are investigating the use of workflow management tools to act as the single source of truth for authority levels, remove paper submissions and approvals away from email communication and to provide increased visibility to stakeholders. This is underpinned by the reporting alignment work done in year 3 and an improvement in quality of papers being issued by NR(HS) to HS1.

Renewals Governance Handbook: We are undertaking a review of the current CP3 Renewals Governance Handbook, identifying areas to mature governance to ensure it is fit for purpose for the work bank and aspiring to best practice by moving to a portfolio level governance approach.

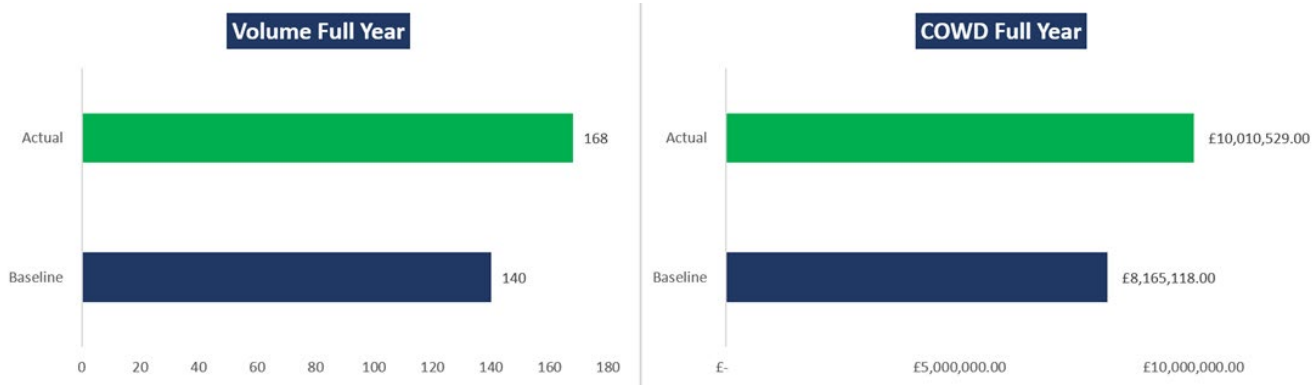
5.2 Route renewals

5.2.1. Route renewals delivery in 2023/24

Figure 10 shows the route renewals volume and cost of work done in 2023/24, compared with the baseline plan.

- Actual volume delivery (CP2 and CP3) in year 4 was 168 compared with planned volume delivery of 140 (120% of plan).
- Actual spend (CP2 and CP3) in year 4 was £10.01m compared with planned spend of £8.17m (123% of plan).

Figure 10: Route renewals year to date volume and cost of work done



Performance in year 4 has been the best experienced in CP3 with consistent over-delivery of renewals volumes and is a significant improvement from year 3 (73% of plan). This improvement has been achieved by greater integration of renewals, asset management and planning within the NR(HS) Infrastructure directorate as a result of the implementation of the Target Operating Model (TOM), and the continued maturity improvements in PMO, change, reporting and

assurance, driven by HS1. This has been supported by the work bank review exercise undertaken in 2022/23 (presented in the 2022/23 AMAS) to understand the asset management need and deliverability of the renewals work bank, which presented an assured renewals plan for the remainder of CP3. The work bank review process has set a clear and assured baseline plan which has allowed for agile management of change, prioritisation of works and the ability to respond to opportunities presented through industrial action to accelerate volume delivery.

NR(HS) accelerated works within the year through good planning of self-delivery works and was agile in mobilising to capitalise on access opportunities afforded by ASLEF industrial action:

- **Successful installation of insulator block joints during ASLEF strike:** In week 9, the NR(HS) team effectively carried out the installation of three insulator block joints (IBJs) on the CTRL Relief at St Pancras. This opportunity arose because of the ongoing ASLEF strike, which allowed extended access to the railway to execute the works ahead of plan. The replacement of these assets brings benefits including enhanced network reliability, reduced maintenance inspections and interventions, ultimately contributing to improved safety.
- **Strike action opportunity to complete the CTRL Relief re-rail at St Pancras:** During week 27, the NR(HS) track team successfully used the strike action opportunity to undertake 700m of re-railing and installation of two insulated rail joints at St Pancras on the CTRL Relief. Works were accelerated at short notice from week 31. All works were completed in the access window with no accidents or injuries.

This approach has meant that NR(HS) has exceeded its year 4 volume targets on Crossing replacements, ITCS test benches, Static Switches & Local Rectifiers, EZP & ERS, PSS Points Operating Equipment, Insulator Block Joints, and St Pancras Re-railing and has also been able to accelerate several year 5 projects into year 4 (Access gates and stairs, Ashford nadir pump controls, UPS rectifiers & batteries) through a holistic approach to portfolio planning. This is in line with the aims of the work bank review to set a credible and deliverable baseline for the year with opportunities for acceleration approved through the change processes. All projects are either within the budgets identified within the work bank review or have drawn down on approved project contingency. There have been no requests to increase project or portfolio budgets due to acceleration works.

There was an unplanned renewal of Switch 2364 in the Eurotunnel (ET) interface area due to a defect discovered during a routine inspection. A review has since been undertaken of all other switches with the same characteristics and it is a considered that there is a very low likelihood of a similar failure mechanism occurring. In addition, an improved inspection process has been introduced to mitigate against this failure mode. The improved early warning and change process was followed when NR(HS) became aware of the event. The DfT has approved payment of HS1's 50% liability from escrow; the remaining 50% will be paid by Eurotunnel.

In addition to volume and cost metrics, HS1 has introduced key milestones to provide assurance that the right volumes are delivered to achieve the asset stewardship purpose. 24 milestones were identified in the 2022/23 AMAS; 28 milestones have been delivered against a plan of 24 (117%). A further twelve milestones have been added through approved change to reflect the renewals acceleration and prioritisations where other milestones have been delayed. Figure 11 shows milestone progress.

Figure 11: Route renewals year 4 milestone progress

Project Name:	Milestone Name:	Baseline Completion	Actual Completion	Milestone Status:	Volume Associated:	Volume Completed to Date:	% of Milestone Volume Completed:
Bridge Expansion Joints (8 Structure)	1 x Volume Structure 473 Stratford West	24/P03		○	1.00	0.00	0%
ITCS Test Benches	4 x Volume	24/P07	24/P12	✓	4.00	4.00	100%
Mod Box's	2 x Volume	24/P08		○	2.00	0.00	0%
Mod Box's	3 x Volume	24/P07		○	3.00	0.00	0%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2044 St Pancras	24/P03	24/P07	✓	1.00	1.00	100%
LAN	2 x Volume	24/P04		○	2.00	1.00	50%
EZP & ERS	20 x Volume	24/P06	24/P09	✓	20.00	20.00	100%
DTN	1 x Volume	24/P06		○	1.00	0.00	0%
LRC	8 x Volume	24/P07	24/P08	✓	8.00	8.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2282 Lenham	24/P03	24/P03	✓	1.00	1.00	100%
Marker Boards	4.2 x Volume	24/P13		○	4.20	0.72	17%
MCEM91	4 x Volume	24/P13		○	4.00	0.00	0%
Switch Blades Yr1-5	1 x Volume 2018 St Pancras	24/P02	24/P02	✓	1.00	1.00	100%
Switch Blades Yr1-5	1 x Volume 2040 St Pancras	24/P04	24/P04	✓	1.00	1.00	100%
ITCS Test Benches	8 x Volume	25/P01	24/P13	✓	1.00	1.00	100%
Switch Blades Yr1-5	1 x Volume 2005 St Pancras	24/P06	24/P06	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2046 St Pancras	24/P06	24/P05	✓	1.00	1.00	100%
ITCS Test Benches	8 x Volume	24/P13	24/P12	✓	8.00	8.00	100%
Switch Blades Yr1-5	1 x Volume 2364 Eurotunnel	25/P11	24/P11	✓	1.00	1.00	100%
Re-Railing at St Panc 3k	0.7 x Volume	24/P10	24/P07	✓	0.70	1.49	213%
HPSS St Pancras Upgrades	7 x Volume	24/P08	24/P05	✓	7.00	15.00	214%
EZP & ERS	20 x Volume	24/P13	24/P10	✓	20.00	40.00	200%
LRC	12 x Volume	24/P13		○	12.00	1.00	8%
AR1603B - Static Switches and Local Rectifiers	26 x Volume	24/P13	24/P08	✓	26.00	30.00	115%
Crossings Renewals (6 per year) Yr1-5	1x Volume 2278 St Pancras	25/P02	24/P09	✓	1.00	1.00	100%
IBJ's Yr1-5	9 x Volume	24/P13	24/P07	✓	9.00	14.00	156%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2113 Ebbsfleet	24/P07	24/P07	✓	1.00	1.00	100%
Asford Nadir	2x Volume	25/P05	24/P10	✓	2.00	2.00	100%
UPS Batteries and Rectifiers	5 x Volume	25/P13	24/P10	✓	5.00	5.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2140 Ebbsfleet	25/P11	24/P10	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 21016 St Pancras	25/P13	24/P11	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2115 Crismill	25/P13	24/P12	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2107 Ebbsfleet	25/P13	24/P10	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2111 Ebbfleet	25/P13	24/P10	✓	1.00	1.00	100%
Access Stairs & Walkways	2 x Volume	25/P13	24/P07	✓	2.00	2.00	100%
Crossings Renewals (6 per year) Yr1-5	1 x Volume 2110 Ebbsfleet	25/P04	24/P10	✓	1.00	1.00	100%

Eight milestones were not delivered (in part or full) in year 4:

- **Mod Box (2 milestones):** a defect was identified with the product supplied to NR(HS), the product is being modified and will undergo product approval followed by delivery in year 5.
- **Bridge expansion joints:** delayed due to gaining agreement from the local authority on access. The bridge is in Newham near the Olympic Park and Westfield, initially it was assumed that work could be completed with a single lane closure, however, the contractor required full road closure. This has been agreed but will be outside the football season to minimise disruption. Planned for delivery in P5 year 5.
- **MCEM91 points operating equipment:** deferred to year 5 to prioritise common resource to continue the delivery of HPSS and achieve full CP3 volume target.
- **DTN:** small slippage (replanning) in migration activities to be complete in Q1 year 5 with soak period continuing to mid-year 5.
- **LAN:** delivery of LAN volumes required wheels free access, DTN also required this and was prioritised resulting in only one of the two volumes being delivered. Remaining volume to be complete in P4 year 5.
- **Marker Boards:** all marker boards have been purchased by NR(HS). NR(HS) will now close this project with the replacement strategy being fix on failure by maintenance teams.
- **Local Release Command:** delivery has begun but the project was delayed due to NR(HS) prioritising EZP/ERS as both projects utilised common internal resource.

In the 2022/23 work bank review (reported in the 2022/23 AMAS) a number of renewals were deferred from CP3 for delivery in CP4. Deferred renewals are recorded in a register detailing the justification, risk and mitigation. The deferred renewal register is reviewed frequently by NR(HS), and every six months by HS1. The work bank review had three projects in the Prolonged Delivery category (delivery starting in CP3 and continuing into CP4) which presented a higher performance risk: UPS renewal, fibre optic signalling renewal, and crossing replacement. HS1 has monitored the progress of these projects through the periodic renewals board to gain assurance of their progress:

- **Uninterruptible Power Supply (UPS):** Procurement for this project is in progress. NR(HS) has monitored the condition of these assets and, where necessary, accelerated the delivery of priority units (5 volumes have been delivered in year 4). These locations will be removed from the scope of the delivery contract.
- **Fibre Optic Signalling:** The Gate 4 paper for this project has been approved and delivery is being mobilised with the Gate 4 showing completion in year 1 of CP4.
- **Crossings:** NR(HS) has successfully accelerated this project bringing delivery of all volumes back within CP3 by the end of year 5.

5.2.2. Route renewals delivery proposed for 2024/25

Route portfolio milestones and volume baseline planned for 2024/25 are shown in Figure 12.

Figure 12: 2024/25 route renewals milestones and volume baseline

Project Name:	Milestone Name:	Baseline Completion	Actual Completion	Milestone Status:	Volume Associated:	Volume Completed to Date:	% of Milestone Volume Completed:
DTN	DTN Cut Over Commissioning Complete (Pre SOAK Testing)	25/P01	25/P01	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	Completion of Crossing 2020 St Pancras	25/P02	25/P02	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	Completion of Crossing 2027 St Pancras	25/P02	25/P02	✓	1.00	1.00	100%
Crossings Renewals (6 per year) Yr1-5	Completion of Crossing 2108 Ebbsfleet	25/P03			1.00	0.00	0%
Bridge Expansion Joints (8 Structure)	Completion of Expansion Joint - Structure 473 Stratford West	25/P04			1.00	0.00	0%
LAN	Finish On Site	25/P04			1.00	0.00	0%
AR1603B - Static Switches and Local Rectifiers	Works Completion - Finish on Site	25/P05			22.00	6.00	27%
Boundary Fencing	Works Completion - Finish on Site	25/P05			1.00	0.00	0%
5 RRAPS	Works Completion - 1 x RRAP Year 5	25/P06			1.00	0.00	0%
Crossings Renewals (6 per year) Yr1-5	Completion of Crossing 2021 St Pancras	25/P06			1.00	0.00	0%
Switch Blades Yr1-5	Completion of 1 x Switch - 2045 St Pancras	25/P07			1.00	0.00	0%
LRC	LRC Complete (28 x Volumes Year 5)	25/P08			15.00	8.00	53%
Switch Blades Yr1-5	Completion of 1 x Switch - 2017 St Pancras	25/P08			1.00	0.00	0%
Acoustic Barriers	Works Completion - Barrier 413A (St Pancras)	25/P10			1.00	0.00	0%
Expansion Joints (LEJ'S)	Completion of 4 x LEJ's at Medway Viaduct	25/P10			4.00	0.00	0%
HS0310 Re-Railing - Re-rail 10km of track at Section 1 ***	Completion of CAT:2 London Tunnel 1 - Up Line 108m, 1100 TRL1	25/P10			1.00	0.00	0%
Switch Blades Yr1-5	Completion of 1 x Switch - 2042 St Pancras	25/P11			1.00	0.00	0%
Borehole Pumps at Stratford	Works Completion - Finish on Site	25/P13			5.00	0.00	0%
EZP & ERS	Works Completion - Finish on Site - Tranche 1	25/P13			29.00	12.00	41%
Long Tunnel Drainage	Works Completion - Year 5 - 49 x Volumes	25/P13			25.00	0.00	0%
MCEM91	Works Completion - Finish on Site	25/P13			18.00	0.00	0%
Mod Box's	Volume : 3 x Mod Box Complete	25/P13			3.00	0.00	0%
Passive Drainage (Ashford Box)	Works Completion - Finish on Site	25/P13			41.00	0.00	0%
Renewal of UPS, Rectifiers and Batteries	Works Completion - 8 x Volumes Year 5	25/P13			8.00	0.00	0%

Figure 12 shows the milestones baselined at the start of year 5 and the performance against those milestones up to the point of submission of the AMAS, which is why some milestones are shown as being fully or partially delivered. There are some project names and milestone descriptions which are repeated in years 4 and 5 this is where there are annualised programmes of renewals and is not a duplication of volumes or milestones.

NR(HS) aims to deliver 184 volumes in year 5. Improved planning and substantial over-delivery in year 4 (including DTN, which is already compete, and EZP/ERS which is at an advanced state) allows greater focus on and more derisking of specific projects in year 5, instilling greater confidence in NR(HS)'s ability to deliver.

In addition to delivering the forecast CP3 renewals, NR(HS) has commenced development work for CP4; funding for this was identified in the 2022/23 AMAS. NR(HS) is developing 14 renewals that are planned to be delivered in years 1 and 2 of CP4. The scope includes development activities including programme, access, technical work scopes, procurement route, ground investigation and design requirements, delivery methodology and site constraints as well as early contractor involvements and site surveys. This will allow the projects to reach Gate 2-3 maturity ahead of CP4 and enable strong delivery of a number of complex projects in years 1 and 2 of CP4.

5.2.3. Project efficiency reporting

Many of the CP3 renewals are annualised delivery campaigns and therefore will not reach Gate 5 until the final year of CP3. In 2023/24, seven projects reached Gate 5 and have confirmed outturn costs. Table 3 shows the outturn cost for these projects compared with the efficient price included in the PR19 determination.

Table 3: PR19 budget v final costs for completed projects

Completed projects	PR19 budget (Base cost)	Final cost	Explanation of difference
Corsica Street head house monitoring	£150,000	£114,699	Efficiency as monitoring identified that no additional feasibility works were required.
GSM-R handsets	£280,000	£236,500	Efficiency from reduced volume requirement due to improved understanding of asset condition and technology development.
Signalling room 15 earth bonding	£69,578 *	£61,782	Efficiency in NR(HS) internal development costs being less that forecast and using internal NR(HS) labour for enabling works.

Access stairs and walkways	£920,000	£114,868	Scope and budget reduced in the 2022/23 work bank review process. Delivery within Gate 4 approved costs.
Lineside building doors	£910,000	£264,183	Scope and budget reduced in the 2022/23 work bank review process. Delivery within Gate 4 approved costs.
Ashford Nadir pump controls	£60,000	£180,123	Budget increased during the 2022/23 work bank review process. Delivery within gate 4 approved costs.
St Pancras section insulators*	£285,693	£285,693	Delivered to gate 4 approved budget.

* This project was not included in the PR19 determination and was brought in through an approved change control. The figure presented is the Gate 4 Base cost.

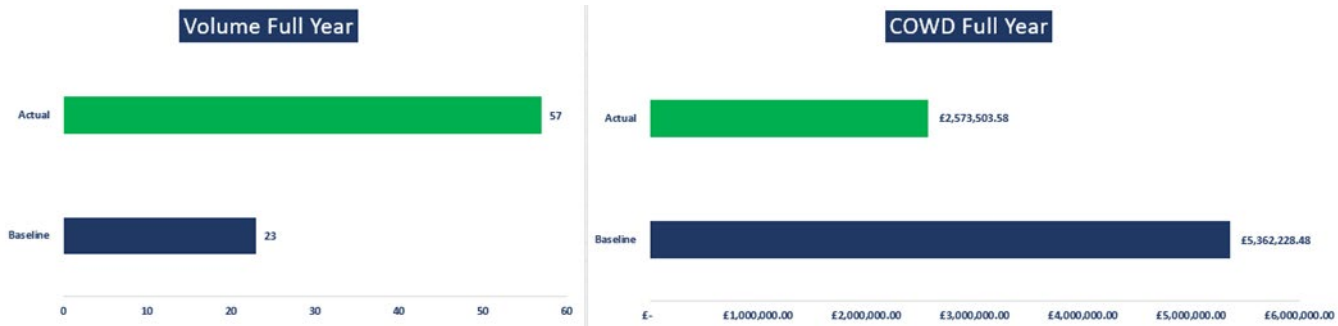
5.3 Stations renewals

5.3.1. Stations renewals delivery in 2023/24

Figure 13 shows the station renewals volume and cost of work delivered in 2023/24 compared with the baseline plan.

- Actual volume delivery in year 4 was 57 compared with planned volume delivery of 23 (248% of plan).
- Actual spend in year 4 was £2.57m compared with planned spend of £5.36m (48% of plan). This does not include NR(HS) PMO costs; NR(HS) is developing a paper to outline the costs to date which will likely be drawn down in year 5.

Figure 13: Stations renewals volume and cost of work done year 4



This represents good delivery performance in year 4 and an improvement in performance compared with year 3 (volume delivery 74%).

While all planned year 4 volumes on the Lift, Escalator and Travelator (LET) refurbishment project have been delivered to date, we have experienced issues with hand back either being delayed or the assets being taken out of service soon after hand back. These delays have driven 43% of the underspend to date. HS1 put in place additional programme management resource to support NR(HS) and identify improvement recommendations. The recommendations focused on improving the integrated plan of all activities, improved reporting and stakeholder management. NR(HS) and the delivery supplier have brought in new project management resource, undertaken a lessons learned exercise and made changes to the testing, commissioning and hand back process to ensure that suitable time is allocated to allow for items identified within these periods, and improvements to assurance reporting and stakeholder communication particularly around close out of assets.

NR(HS) continues to progress the temporary lift to support refurbishment of St Pancras lift 4.2 and has had discussions with potential new suppliers who have previously installed a temporary lift. As lift 4.2 has consistently achieved in excess of 98% availability over the past two years, NR(HS) has recommended deferral of the work to year 1 of CP4. Supplier identification, lift design and heritage work will all continue in the meantime. A detailed programme will be shared upon contract award; the current high-level timeline anticipates installation work will start on site in April 2025.

HS1 is currently leading the development phase of the space heating project. There have been delays to the detailed design at St Pancras due to the availability and accuracy of as-built information and additional structural design work required at Stratford and Ebbsfleet to enable the new air source heat pump (ASHP) technology to work effectively. Complexities to the delivery of this project include: potential changes in EU specifications for chillers, decommissioning windows for existing boilers and chillers (without disrupting operations), lead times for the new ASHPs, the location of the existing plant (chillers are roof mounted and could require road closures). It is expected that the delivery of the space heating project will continue into CP4 due to the complexity of design and delivery. This has been communicated to ORR, DfT and TOCs at the Quarterly Asset Renewals Review meetings. This change in strategy accounts for a significant part of the underspend in year 4 (c.£1.2m) which had assumed the purchase of heat pump equipment in year 4 ahead of delivery. Allowance has been made in the PR24 cost models for additional funds required to deliver the renewal, based on the emerging anticipated final cost. The procurement and delivery strategy is under development.

In addition to volume and cost metrics, HS1 has introduced key milestones to provide assurance that the right volumes are delivered to achieve the asset stewardship purpose. Nine milestones were identified in the 2022/23 AMAS, five milestones were added through change control within the year, and 14 milestones have been delivered against the baseline plan of 9 (156%). Figure 14 shows milestone progress in year 4. All planned milestones were delivered with the exception of the LV distribution boards which were identified in the Draft AMAS for deferral, and all new milestones were delivered.

Figure 14: Station renewals year 4 milestone progress

Project Name:	Milestone Name:	Baseline Completion	Actual Completion	Milestone Status:	Volume Associated:	Volume Completed to Date:	% of Milestone Volume Completed:
Lift and Escalators (all stations) Delivery	1 x Volume Travelator 3.4.1	24/P02	24/P01	✓	1.00	1.00	100%
Lift and Escalators (all stations) Delivery	1 x Volume Ebbsfleet Escalator 1	24/P04	24/P04	✓	1.00	1.00	100%
Lift and Escalators (all stations) Delivery	1 x Volume Lift 7.1	24/P04	24/P03	✓	1.00	1.00	100%
St Pancras UPS Replacement	3 x Volume	24/P04	24/P07	✓	3.00	3.00	100%
Lift and Escalators (all stations) Delivery	1 x Volume 2.1.1 St Pancras Escalator	24/P05	24/P05	✓	1.00	1.00	100%
Ashford Approach Road	NEW MILESTONE: Delivery into use - 16 x volumes	24/P06	24/P06	✓	16.00	16.00	100%
Fire Panel Replacement (Stra/Ebbs)	4 x Volume	24/P06	24/P06	✓	4.00	4.00	100%
Lift and Escalators (all stations) Delivery	1 x Volume St Pancras Lift 3.1	24/P07	24/P10	✓	1.00	1.00	100%
Lift and Escalators (all stations) Delivery	1 x Volume Stratford Escalator 2	24/P08	24/P08	✓	1.00	1.00	100%
CIS	NEW MILESTONE: Gateline CIS Delivery into use - P9 - 1 x volume	24/P09	24/P12	✓	1.00	1.00	100%
CIS	NEW MILESTONE: Platform Totems Delivery into use - P11 - 12 x volume	24/P11	24/P13	✓	12.00	12.00	100%
Renewal of Platform LV Distribution	10 x Volume	24/P12		○	10.00	0.00	0%
AR1641-2 BPWS	NEW MILESTONE: BPWS works completion on site - 14 x volume	24/P13	24/P13	✓	14.00	14.00	100%
Lift and Escalators (all stations) Delivery	1 x Volume St Pancras Escalator 2.2.1	25/P06	24/P08	✓	1.00	1.00	100%

Five new milestones were added to the work bank in year 4 through approved change processes. This included acceleration of escalator 2.2.1 refurbishment at St Pancras, replacement of 16 drainage covers on the Ashford Station approach road and the bringing forward of the boosted potable water system (BPWS) renewal volumes from year 5 in response to the deferral of the LV distribution boards. The CIS assets were not part of the HS1 asset base at the start of CP3 but it was agreed with DfT and ORR within CP3 that they would be included in HS1's asset base. Renewal development has been ongoing and a delivery gate 4 was passed in year 4 which added two milestones for the SETL gateline mainboard and platform totems at St Pancras.

Low voltage (LV) distribution boards: 10 platform distribution boards across St Pancras and Ebbsfleet were planned to be delivered in year 4. NR(HS) had identified corrosion on the kiosks/enclosures which house the distribution boards on the platforms at Ebbsfleet which was not in the original scope but was included in the procurement scope which went out to tender. Initial tender cost returns significantly exceeded the project budget. HS1 challenged this proposal to understand the risk and requirement for renewal in CP3. NR(HS) revised the scope to prioritise those kiosks which need to be delivered in CP3 with the remainder to be considered in PR24 for CP4. NR(HS) has identified a NRIL Southern Region framework and intends to retender the works through this framework based on the revised scope and better understanding of the methodology, with delivery to move into year 5. It is likely that the costs for Ebbsfleet will exceed the current budget, but it is believed there is sufficient headroom in the Ebbsfleet portfolio to deliver this without any increase to the escrow funding. This will be confirmed via a Gate 4 paper. HS1 has notified ORR and DfT of the potential deferral of this project and the impact is believed to be low. The deferral of this project to year 5 and has gone through the deferred renewal process to manage any risks posed by deferral and provide assurance.

5.3.2. Stations renewals delivery proposed for 2024/25

Figure 15 shows the stations portfolio milestones baselined at the start of year 5 and the performance against those milestones up to the point of submission of the AMAS. Good progress was made in year 4 delivery leaving the portfolio already ahead of plan for year 5 with the BPWS renewal complete in P1 of year 5. There are some project names and milestone descriptions which are repeated in years 4 and 5 this is where there are annualised programmes of renewals and are not duplication of volumes or milestones.

Figure 15: 2024/25 station renewals milestones and volume baseline

Project Name:	Milestone Name:	Baseline Completion	Actual Completion	Milestone Status:	Volume Associated:	Volume Completed to Date:	% of Milestone Volume Completed:
AR1641-2 BPWS	Works Completion - Finish on Site	25/P01	25/P01	✔	2.00	2.00	100%
CIS Phase 3 - Stratford Mainboard and Totems	Completion of mainboard and totems	25/P02			24.00	0.00	0%
Lift and Escalators (all stations) Delivery	Completion of Stratford Escalator - 04	25/P02			1.00	0.00	0%
Lift and Escalators (all stations) Delivery	Completion of St Pancras Lift PL02	25/P03			1.00	0.00	0%
St Pancras UPS Replacement	Works Completion - UPS 4	25/P03			1.00	0.00	0%
CIS Phase 3 - Ebbsfleet Mainboard and Totems	Completion of mainboard and totems	25/P04			43.00	2.00	5%
Lift and Escalators (all stations) Delivery	Completion of St Pancras Escalator - 2.1.2	25/P04			1.00	0.00	0%
Lift and Escalators (all stations) Delivery	Completion of St Pancras Lift 2.2	25/P09			1.00	0.00	0%
Survey & Renewal of Floor Finishes (Stra/Ebbs)	Works Completion - Finish on Site	25/P11			8.00	0.00	0%
Space heating, St Pancras, Stratford, Ebbsfleet	Contract Award	25/P13			1.00	0.00	0%

5.3.3. Project efficiency reporting

No projects reached Gate 5 in year 4 as the majority of renewals are programmes of work over the control period. Gate 5 papers in year 5 will include the minor combined Gate 5 paper for the Stratford and Ebbsfleet UPS refurbishment works, Ashford Approach Road – Drainage Cover replacement and the BPWS renewal.

5.4 UKPNS asset renewals

UKPNS operates, maintains, and renews the electrical substations and high voltage electricity distribution network on HS1. Significant renewal and replacement projects in 2023/24 were:

Supervisory Control and Data Acquisition (SCADA) replacement: This project uses existing fibre routes and adds new connectivity to complete a single fibre ring for the railway on which the SCADA traction system will operate. The single design, install and support contract with a build 'refresh and update' of key elements of the assets enables the system to be optimised at the term of the contract. The innovative project uses the latest remote condition monitoring techniques enabling improvements to the asset knowledge base. It will give UKPNS enhanced asset performance monitoring capabilities and should provide additional resilience to the overall electric distribution system and HS1 railway.

During the year the fitment and commissioning of the remaining sites was completed. The final site acceptance test was completed, and the system can now be used. Outstanding actions are the full training of the UKPNS control staff and completion of final snagging. The long programme of renewal of this asset was completed safely and without interruption to the railway.

Static VAR Compensators (SVCs) and load balancer control systems renewal and upgrade: As part of obsolescence management, UKPNS has renewed the control computers on the SVCs and the load balancer from the Mach 2.0 system to the latest Mach 3.0 system as well as other components of the SVC such as the ancillaries, cooling control cubicles and protection relays. This project will increase operational resilience and is the largest single project since the initial build of the power system. All four sites have been fitted with the new system with Sellindge feeder station being the final site to completed in late 2023. However, during energisation checks there were some unusual noise concerns associated with the Sellindge SGT5b and TT1 transformers. As a result, UKPNS has been advised by the manufacture (Hitachi Transformers) and supported by its own UKPNS asset management team, to complete a series of tests on SGT5b, prior to it feeding the railway. Therefore, the final commissioning tests have not been completed and cannot be completed until Sellindge SGT 5B is reenergised.

Relay renewals: Relays have already been successfully replaced at St Pancras AT1, AT2 and Stratford. On Section 1 of HS1, the existing distance protection and automation relays are being replaced with the new P44T relays that supply the traction feeds at Sellindge and Singlewell. At Sellindge, the new relays have been fitted and successfully commissioned into service. The remaining relays at Singlewell will be replaced in 2024. On Section 2, the fitment programme

for new relays at Choats Road is also scheduled for 2024. The traction relays will also interface with the new SCADA system for monitoring purposes.

SVC cooler banks: Cooler banks for the SVC equipment are being renewed to ensure the equipment operates at the optimal temperature. UKPNS has installed new SVC cooler banks at Singlewell to replace the existing cooler banks on two of the four SVCs. The cooler banks that were replaced were refurbished and used to renew the remaining cooler banks at Choats Road. During 2024, the remaining cooler banks at Singlewell will be refurbished to complete the project.

Building renewals: During the year several UKPNS buildings on the HS1 network received new doors, roofs were renewed, and air conditioning was renewed to ensure the temperature remains constant for the equipment located within these rooms.

6 Upgrades

The European Rail Traffic Management System (ERTMS) is a large signalling project due for implementation in CP5/CP6. We need to undertake early design and planning works to appropriately and efficiently plan for the full ERTMS project. These ERTMS early works will be undertaken over 2024/25. HS1 has competitively procured the supplier of these early works at an initial cost of c£678k. EIL and SETL were involved in the tender evaluation process.

The TOCs and DfT had originally agreed in principle that ERTMS early works could be funded upfront through a cost recovery arrangement, rather than via Additional IRC, which had the benefits of removing financing costs and faster commencement of the project. Due to commercial reasons, one party was not able to proceed. HS1 must therefore revert to making a Specified Upgrade proposal to the ORR to approve the project and associated AIRC. There may be a revision to the supplier's cost for the early works project given the material delay in commencement. HS1 is currently confirming this with the supplier and will ensure any price change is only that which is justified and efficient. We are not able to provide the details of the early works Specified Upgrade and AIRC in this AMAS as we have not yet confirmed these. The details will be provided in the Specific Upgrade proposal to the ORR that we plan to submit in June 2024.

7 Financial reporting

Income in the first three years of CP3 was much lower than the CP3 budget due to the reduced First Working Timetables (FWTs) from both EIL and SETL. The shortfall is being recovered through the volume reopener model. Total O&M revenue of £105.7m was £10.6m above the CP3 forecast as a result of higher recovery on EIL, SETL and freight.

Total HS1 internal costs of £12.6m were £0.9m above the CP3 forecast. Following an efficiency study, HS1 has implemented structural changes which will reduce internal costs in 2024/25 with current forecasts returning HS1 to the regulatory budget by the end of CP3.

7.1 Train numbers

As a result of the Covid-19 pandemic, the number of train services operated in the first three years of CP3 was significantly below the PR19 forecast. This continues to be the case in 2023/24 with train services remaining below pre-Covid levels. We agreed with passenger operators to perform volume reopeners at the Principal Change Date until the end of CP3. We are now measuring train paths against the assumptions used for the volume reopeners, rather than the PR19 forecast. A comparison of train paths billed against volume reopener assumptions is shown in Table 4.

EIL's total volumes in 2023/24 (FWT and spot bids) were lower than the volume reopener assumptions. SETL's total volumes remain below the domestic underpin. The total volumes charged to SETL and DfT in the year are broadly in line with the volume reopener assumptions. Although remaining below the underpin level, SETL's services have increased from December 2023, with 16 extra Springhead trains per day, Monday to Friday. These will run as spot services from December 2023 and will be incorporated into the FWT from June 2024.

Table 4: Analysis of train paths billed v volume reopener (as at P13 2023/24)

	Actual	VR	Var	Var %	PR19	Var	Var %
EIL	13,552	16,812	-3,260	-19%	17,700	-4,148	-23%
SETL + Underpin[1]	52,888	53,174	-286	-1%	55,400	-2,512	-5%
Freight	204	457	-253	-55%	454	-250	-55%
Total FWT trains	**66,644**	**70,443**	**-3,799**	**-5%**	**73,554**	**-6,910**	**-9%**
EIL Spot bids[2]	3,045	0	3,045		0	3,045	
SETL Spot bids	1,617	0	1,617		0	1,617	
Total Spot bids	**4,662**	**0**	**4,662**		**0**	**4,662**	
Total Trains	**71,306**	**70,443**	**863**	**1%**	**73,554**	**-2,248**	**-3%**

1 SET paths booked in FWT for 2023/24 = 44,142

2 EIL is billed full OMRC on spot bids up to the volume reopener assumption

7.2 Route OMRC revenue

The Operations, Maintenance and Renewals Charge (OMRC) for CP3 was initially set in 2020 through the PR19 process. The charges were set at a level which it was intended would enable HS1 to fully recover operating and maintenance costs over the life of the control period. With limited exceptions, the expectation would ordinarily be that charges remain fixed until 31 March 2025, subject to RPI indexation. The charges (excluding OMRCC) are rebased in line with the annual increase in RPI. For reference, the February 2023 RPI rate was 364.5 and the base RPI rate (February 2018) was 278.1. Please note that all £ values shown below are in nominal terms and there may be rounding differences.

As noted above, the Covid-19 pandemic has led to considerably reduced train operations compared with the PR19 forecast. The HS1 PAT requires OMRC to be reopened where the forecast volume varies by more than ±4% from the relevant baseline. The reopener sets revised OMRCA2 and OMRCB charges, based on updated expected train minutes, to ensure that HS1 continues to recover enough in charges to cover costs.

HS1 agreed with passenger train operators to perform annual volume reopeners until the end of CP3. During the third reopener (December 2022), HS1 identified a shortfall of £3m in February 2018 prices (circa £3.9m in February 2023 prices) in OMRCA2 and OMRCB because the percentage split of domestic services in the model did not align with the split of services set in the Domestic Underpinning Agreement. This overstated the expected total domestic minutes used to set the volume reopener charges. OMRCA2 and OMRCB charges increased by 2-4% in real terms in the third reopener to recover this shortfall over the remainder of CP3. HS1 has

used these rates for billing from P10 2022/23 to P9 2023/24. TOCs have paid these rates but have challenged HS1's ability to make this adjustment and continue to reserve their rights in respect of the invoices they are paying.

HS1 executed the fourth reopener for December 2023. Rates were shared with TOCs in December 2023, but it was noticed that the rates were slightly overstated as a result of the rail timetable year diverging from the normal P10 start date. HS1 has since re-issued the 2023 VRO decision and resulting charges.

In addition to funding operations and maintenance, an element of OMRC is designed to build up a fund for future renewals and this money is transferred into escrow. Both TOCs were offered a temporary escrow holiday from P1 2020/21 to P3 2021/22 inclusive and this offer was accepted by EIL. EIL will continue to repay the deferred amounts until the end of CP3.

OMRCC rates are reset every year in order to recover pass through costs and a wash-up is performed on an annual basis.

HS1 Ltd currently has Framework Track Access Agreements (FTAAs) in place with EIL and SETL. The FTAAs have agreed chargeable journey times for each service group and a rate per minute/per km per train. These parameters, together with train numbers, drive the revenue.

Income in the first three years of CP3 was much lower than the CP3 budget due to the reduced FWTs from both EIL and SETL, unrecovered OMRCA1 on trains not run and the shortfall identified during the third reopener noted above (£3m in February 2018 prices). However, the volume reopener model is built to ensure full recovery of OMRCA2 and OMRCB over the course of the entire control period and this, as well as recovery of the shortfall, means that OMRC income from passenger operators in 2023/24 is above CP3 budget levels. The over-recovery for freight reflects income on Ripple Lane.

O&M revenue of £105.7m is £10.6m above the CP3 forecast. This is due to:

- £4.6m higher recovery on EIL train paths;
- £4.6m higher recovery on SETL following the volume reopeners;
- £0.2m higher recovery on freight; and
- £1.2m from higher pass-through income.

Further breakdown and analysis of revenue appears in Statements 1 and 2 in Appendix A4.

7.3 Route OMRC expenditure

Overall OMRC expenditure (Statements 1 and 3 in Appendix A4) was £96.1m, £(0.9)m higher than the CP3 forecast. This is made up of a number of cost lines as described below.

7.3.1. Controlled track costs

The majority of spend in this category is for work carried out by NR(HS) under the Operator Agreement. This is a fixed price contract uplifted by RPI + 1.1% each fiscal year.

Controlled track costs were £0.3m below the CP3 forecast. The variance within this is:

- Subcontract costs showed a saving of £1.1m, split between BTP, National Grid Connections (NGC), NRIL charges and ORR regulatory costs.
- Staff costs and technical consultant costs were both above budget by £(0.7)m. The overspend in these elements is partly due to the additional business complexity which has resulted following the Covid-19 pandemic and the impact of industrial action. £0.9m of one-off costs have been incurred this year to action a restructuring to reduce our future cost base, as noted in Section 7.8.
- Other small variances, including R&D spend, made up the balance of £0.3m spend below CP3 forecast.

It should be noted that the CP3 forecast was set before the pandemic. The assumptions that had been used were immediately out of date and the steady state plan was no longer appropriate. HS1 is bearing the impact of cost rises within the control period to manage the concession. HS1 has conducted a detailed review of the organisation that is forecast to reduce costs in 2024/25.

7.3.2. Pass through costs

Pass through costs are charged to TOCs during the year based on the items agreed as part of PR19. At the end of each year, a wash-up adjustment is carried out to ensure that revenue collected matches the spend for these items. Overall, the pass-through cost was £1.2m higher than the CP3 forecast. Most of this overspend derives from a £2.0m overspend on non-traction power due to increased electricity cost on world markets.

We continue to work with operators to assess potential changes to the PAT as part of PR24. Progress on these areas will be shared as part of the PR24 process.

7.3.3. Freight costs

These are costs which are either specific to the operation of freight services or the costs of maintaining freight-specific infrastructure. Although a lower number of freight services are run, HS1 is still obliged under the Concession Agreement to maintain the assets and therefore incur costs, mainly for work carried out by NR(HS) or NRIL.

7.4 Station charges

The Long-Term Charge (LTC) was set for each station for CP3 to enable HS1 to fully recover the costs of funding station renewals. This was done through a process similar to the PR19 process

in consultation with industry stakeholders and the DfT, which had regulatory oversight of HS1 stations at the time. Within a control period, each LTC is subject to an annual RPI-linked adjustment, but the expectation would ordinarily be that charges remain fixed until 31 March 2025 (with limited exceptions).

Excluding recovery of amounts deferred through the escrow holiday, LTC income in 2023/24 was:

- St Pancras International £7.5m
- Stratford International £1.5m
- Ebbsfleet International £1.6m
- Ashford International £0.9m

Operations and maintenance costs for stations assets are called Qualifying Expenditure (Qx). Qx estimates are produced on an annual basis in accordance with the Station Access Conditions between HS1 and the train operators. Qx is not regulated. Total Qx across the four stations was £37.4m but is subject to final wash-up. Statement 7 in Appendix A5 provides further detail.

7.5 Renewals

£15.78m was withdrawn from escrow in the year.

£12.98m was for route renewals charged to route escrow. This compares to £9.4m the previous year.

The renewals charged to the respective station escrow accounts in the year were:

- St Pancras International £2.0m
- Stratford International £0.5m
- Ebbsfleet International £0.2m
- Ashford International £0.04m

This is £2.8m in total compared to withdrawals in the previous year of £4.5m.

Section 5 provides commentary on the delivery of route and station renewals.

7.6 Escrow accounts

Part of the OMRC and the LTC paid by TOCs is designed to fund future renewals of the HS1 railway and stations. The funds collected are paid into separate ring-fenced bank accounts (one for route and one for each of the four stations) each quarter.

At the end of 2023/24, the route escrow balance (excluding investments) was £73.98m. Funds invested were £86m with maturity dates of six to fifteen months. Statement 4 in Appendix A4 provides further detail on the balances.

The total escrow balance (excluding investments) across the four separate station escrow accounts was £33.7m. Funds invested were £41m. Statement 8 in Appendix A5 provides further detail on the balances.

Since December 2021 we have returned to maximising interest earned over the remainder of the control period compared to retaining cashflow availability. The two possible enhancements to help narrow the gap between interest earned and inflation are:

- Appendix 4 of Schedule 10 of the Concession Agreement has limited the ability and willingness of banks to take deposits since the terms are too prescriptive and lack flexibility to meet the latest banking norms. Therefore, we will be unable to maximise returns and increase diversification, which could lead to an even larger interest gap if changes are not made, especially as we have reached investment capacity. At DfT's request we are working with them to discuss whether any amendments could be made to this schedule.
- Expanding the scope of Authorised Investments to include money market funds and reverse repurchase agreements to enable us to diversify and increase returns while maintaining security over the balances.

7.7 Specified Upgrades

The Concession Agreement defines certain expenditure as Specified Upgrades or upgrades to the route infrastructure. Specified Upgrades and upgrades may be financed either through a grant from the Government, an increase in the Investment Recovery Charge known as an Additional Investment Recovery Charge (AIRC) or a combination thereof. Statement 5 of Appendix A4 sets out the expenditure on upgrades.

Early design and planning works for ERTMS will be undertaken over 2024/25 (see Section 6).

7.8 Management of efficiencies

7.8.1. HS1 efficiencies

As part of PR19, the ORR determined an efficient level of cost for the operations, maintenance and renewal of the route infrastructure. We are continuing to explore all opportunities to improve cost efficiency against this baseline. For renewals, the project costs in the PR19 determination were deemed to be the efficient cost of delivery. We review the final cost of each project once completed against the original CP3 determination cost and record the reasons for any differences (see Section 5.2.3).

The largest element of our cost is the agreements with NR(HS) for route and stations. We are working collaboratively with NR(HS) to improve efficiency. As noted in previous AMASs, we agreed a methodology for NR(HS) to report its efficiency against the CP3 route determination and this is set out in the next section.

For 2022/23, NR(HS) recorded outperformance of £1.6m; TOCs have been credited with their share of savings this year. In accordance with the provisions in the PAT:

- NR(HS) retained 50% (£0.8m);
- TOCs received 30% (£0.5m); and
- HS1 received 20% (£0.3m).

Electricity: Although we have faced challenges on electricity costs in 2023/24, we have continued with our overall strategy. HS1's Energy Purchasing Strategy (EPS) delivers 100% renewable electricity by April 2030, through the progressive introduction of Power Purchase Agreement (PPA) volume, aligned to 25% reduction in total consumption by 2030 and ongoing efficiency in purchasing by minimising unit costs. If market conditions allow, by April 2025 the majority of baseload (up to 80%) will be delivered through PPAs and the residual baseload will be REGO-backed subject to availability. The efficiency objective is delivered through the hedging approach adopted and agreed with the TOCs. Through this hedging approach, HS1 has historically achieved a relatively low wholesale weighted average price (WAP) and avoided significant market exposure to high prices. Although our WAP is currently higher than historic levels, our recent purchases for 2024/25 onwards indicate a reduction from current high levels. HS1 continues to operate within the parameters of the agreed strategy, has regular discussions with TOCs and engages TOCs on key decisions such as PPA trades. Our hedging position for 2024/25 shows a welcome reduction in charges relative to current prices.

Business rates: We are continuing to work with our rating consultants, the Valuation Office Agency (VOA) and TOCs to drive the business rates charge down. Through challenges to the VOA we reduced our assessment from £44.25m in October 2022 to £27.5m and have recently received a final non-binding offer from VOA to reduce this further to £25m. We have discussed this with TOCs and have signalled our willingness to accept this offer. We await formal confirmation of the revised amount from the VOA.

Stations Qx: For 2023/24, we have delivered cost savings, which are passed through to train operators, in the following areas:

- Other maintenance and projects: savings arising from reductions in works required and savings in structural examination costs by aligning with route structural examinations.
- Gas: securing backdated adjustments to historic gas bills.
- BTP: the police service agreements with BTP are scrutinised and challenged to deliver the right level of security and policing at an efficient cost. This has led to efficiency and costs below the CP3 budget. c70% of BTP charges are passed through to TOCs as part of stations Qx, who therefore benefit from constrained cost rises.

The savings in business rates and electricity discussed above also flow through to TOCs at stations to drive down Qx costs.

HS1 internal costs: We have undertaken a comprehensive review of our organisational structure and other HS1 costs. HS1 incurred £0.9m of costs associated with this restructure (impacting staff costs, other costs and technical support). This has resulted in c.£1.1m of savings going forward vs our 2023/24 actuals.

7.8.2. Costs under the Operator Agreement with NR(HS)

In the first year of CP3, NR(HS) introduced a new methodology, known as the fishbone analysis, to demonstrate how committed efficiencies are categorised and variances explained when comparing to its control period determination, based on the process used by NRIL. The fishbone diagram indicates the movement in costs from the exit point of CP2 through to the post-efficient position.

NR(HS) does not wish to share the fishbone analysis with HS1 for commercial sensitivity reasons. Similarly to the past three years, NR(HS) has agreed with HS1 and the ORR that it will share its CP3 year 4 efficiencies report including the fishbone analysis directly with the ORR, separate to the HS1 AMAS, in late May.

NR(HS) provides HS1 with a high-level summary table of its committed efficiencies on a quarterly and year-end basis. Figure 16 shows the NR(HS) Annual Efficiency Statement provided to HS1. The lack of detailed information prevents us from undertaking our own assurance of NR(HS)'s committed efficiencies. The ORR takes the role of agreeing, monitoring, and assuring that NR(HS) fulfils its efficiency requirements during CP3. We would welcome a summary of the ORR's views on how NR(HS) is delivering against its efficiency requirements, or any other feedback from the ORR, once it has reviewed NR(HS)'s fishbone analysis.

Figure 16: NR(HS) Annual Efficiency Statement

Reference	Name	BRAG Status (Monetary)	BRAG Status (Plan)	Current comments
E-001	Asset Management Effectiveness	Red	Red	While the efficiency has not been delivered in line with 5YAMS target, significant improvement has been made against last year through the increased delivery of renewals delivery by maintenance teams. The use of maintenance resource has helped to improve the out-turn for this efficiency through the reallocation of resource away from day-to-day maintenance and onto renewals. The S&T team has built on the good performance from last year, in particular from the delivery of crossings, ERS/EZP switches, and the DTN project. The Track team has contributed to the improvement, also on crossing project delivery, as well as St Pancras rerail and IBJs projects.
E-002	PSA - Contribution to NF	Blue	Blue	Negotiated reduction in national functions services under PSA for all of CP3. Continued monitoring of services and spend throughout the financial year, with a view to monitor Network Rail's reorganisation under GBR and any impact on PSA services in future years.
E-003	Subcontractors	Blue	Blue	A review of the service provision by our security supplier enabled a reduction in resource requirement while maintaining the same level of performance, which has driven the majority of this efficiency. Further savings were made due to the reduced level of reactive tamping spend. However, these savings have been partially eroded due to unexpected additional spend on points resilience and VCS maintenance.
E-004	Insurance	Blue	Blue	Efficiency attained due to renegotiation of lower premiums and no-claims upside.
E-006	PSA - SE Route - staff	Blue	Blue	Negotiated reduction in Southern Region resources under PSA for all of CP3, with a view to monitor Network Rail's reorganisation under GBR and any impact on PSA services in future years.
E-007	Civils & Environmental: contractor cost reduction	Blue	Blue	Reduced contractor costs due to increased use of inhouse staff to perform inspections.
E-008	Overtime / Rest Day - Ops	Red	Red	Through acceleration of the Operations Strategy for CP4, the Tactical Incident Command has been stood up, which is currently being covered through rest day working. This will continue to until new roles (Service Delivery Managers) are filled and fully trained. These roles aim to reduce the time it takes to respond and resolve performance issues and therefore reduce the impact to TOCs & passengers
E-009	Materials (Spares/Stock)	Blue	Blue	A review of the min and max levels for critical spares, and introducing a single controlling mind for managing materials, has led to an overall cost reduction for materials in the year.
E-010	Area support cost change	Blue	Blue	Review undertaken of support function allocation across NRHS route, to ensure cross charge to stations reflected. Updates to charging arrangements implemented.
E-011	Call-Off Contracts (infra)	Blue	Blue	Call off orders are now no longer used as such as this efficiency has been achieved.
E-012	Overtime / Rest Day (infra)	Red	Red	Efficiency not achieved this year due to vacancy cover across the S&T, M&E, OCS and Track maintenance teams. Further impacted by the additional cover needed for the Kings' Coronation.
E-013	Centralised Leased/Owned Plant	Red	Red	The underlying sustainable efficiency from centralising the management of plant has been achieved. However, this efficiency has been impacted by the reduction in renewals works requiring the use of the MPF and Stamm machines - reducing recoveries and increasing the net cost for the plant.
E-014	Hotel Accommodation	Red	Red	Additional hotel costs due to new starters/apprentices and hotel accomodation required for training courses
E-015	Centralised Vehicle Fleet Management	Red	Red	Increased fuel costs in current year due to market conditions. Furthermore, number of pool vehicles have not yet been reduced therefore expected efficiency has not been reached. This is due to the specificity of the required vehicle specifications.
E-016	Establishment efficiency	Blue	Blue	Efficiency achieved this year from the ongoing reduction in support functions' headcount through the implementation of the Target Operating Model (TOM) reorganisation, as well as vacancy gaps in the organisation (this is partially offset on other lines as this has driven increased overtime utilisation). This has been further enhanced by pay restraint across all pay grades, reducing payroll costs.
E-018	RCM (Instead of E-005)	Blue	Blue	Overhaul strategy reviewed. Overhaul tasks are now condition based, extending component life cycles and reducing maintenance costs
	Total Committed Efficiencies			
T-001	PSA - NRIL Guarantee	Blue	Blue	Reduction in NRIL guarantee fee agreed. Continued monitoring of Network Rail's reorganisation under GBR and any impact on PSA services in future years.
	Total Tailwinds			
H-002	Standards update incl cyber security	Blue	Blue	Assessment of cyber threat to ensure alignment to network and information systems directive. Actual costs are significantly less than expected therefore resulting in only partial usage of headwind.
H-004	S&T - Annual leave T&C changes	Blue	Blue	Terms and Conditions updated for S&T
H-006	SIMD - Recent building issues/aging buildings	Grey	Grey	Minimal drawdown required in year.
H-013	PSA - Provision required within PSA for buying training from NRIL	Blue	Blue	Competency requirement assessment has led to usage of headwind.
	Total Headwinds			
H-001	PSA - Train Planning/ Capacity planning	Red	Red	Increased accountability/outputs required to ensure the specific HS1 train planning requirements are achieved. This has been agreed through the PSA from year 2. Continued monitoring of Network Rail's reorganisation under GBR and any impact on PSA services in future year.
H-005	Increase in UTU Frequency	Grey	Grey	No drawdown expected as planned additional UTUs have not been needed. However, due to poor performance of NRIL, NRHS were not required to pay for one of the UTUs hence resulting in an efficiency
H-007	PSA - SE Route - Performance mgmt./ Delay attribution	Blue	Blue	Agreed improved service as part of PSA negotiation. Continued monitoring of Network Rail's reorganisation under GBR and any impact on PSA services in future years. Costs lower than target, headwind not required.
H-008	PSA - Site Access Control (SACC)	Grey	Grey	No drawdown required in year
H-010	Training alignment to NRIL	Grey	Grey	No drawdown required in year
H-011	Track - Grinding & Tamping Regime	Grey	Grey	No drawdown required in year
H-012	Establishment Headwind	Blue	Blue	New posts implemented in 5YAMS reviewed through the Target Operating Model (TOM) programme. As a result, reduction in cost as not all of the posts have remained in the organisation.
H-009	Civils - Increase in maintenance due to deterioration of assets	Grey	Grey	No drawdown required in year
	Total Enablers			

A1 CP3 commitments

The PR19 ORR Final Determination included 28 route asset management recommendations and the DfT Final Decision included 11 station asset management recommendations. The table below shows the recommendations which remained open at the start of 2023/24.

CP3 commitments

ORR/DfT ref	ORR/DfT recommendation	Action by date	2023/24 progress update	Comment on delivery
Route				
2	Undertake a follow up review of progress towards a goal of gaining ISO55001 accreditation	By March 2023	We are continuing to strengthen our asset management capability with a focus on asset information. NR(HS) has achieved ISO55001 certification for route. NR(HS) stations have prepared all documentation to achieve ISO55001 certification. Auditors completed day one of three in December 2023 and NR(HS) awaits auditors to confirm dates for final 2 days. HS1 has successfully completed the Stage 1 and Stage 2 audits and awaits the issue of the ISO55001 certification for the route and four stations.	Ongoing
3	Future 5YAMS to document and demonstrate the assurance	In advance of the CP4	HS1 provided ORR with the Assurance Framework, Health Safety and Assurance Strategy, and Health Safety and Assurance Audit Standard in October 2021.	Ongoing

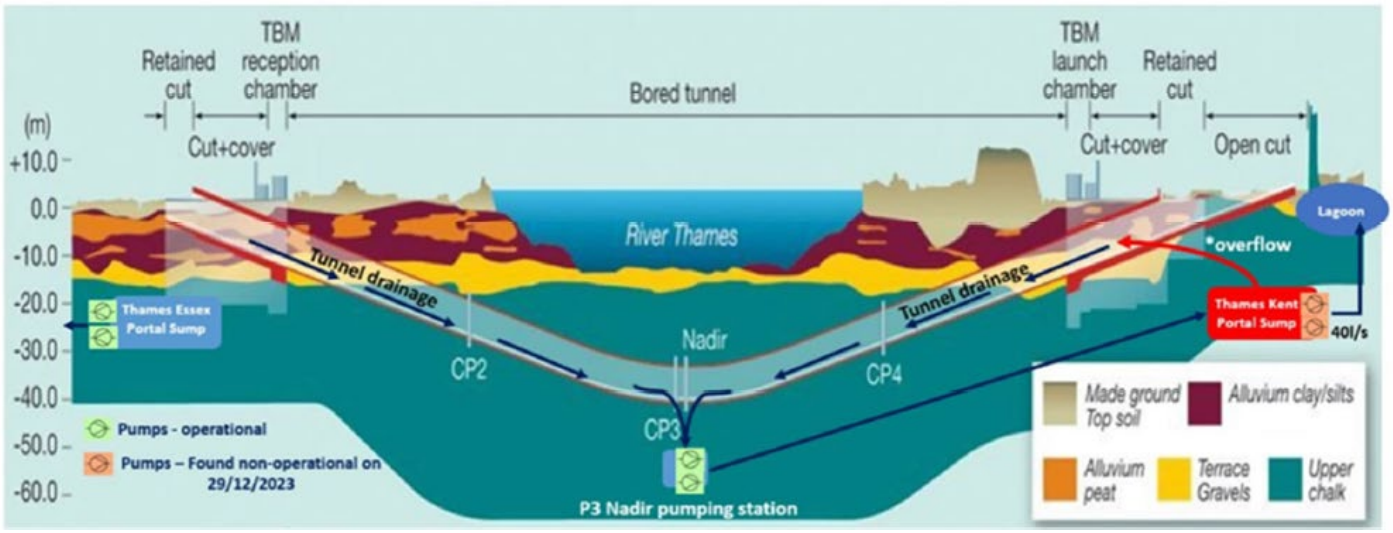
ORR/DfT ref	ORR/DfT recommendation	Action by date	2023/24 progress update	Comment on delivery
	activities HS1 has undertaken on NR(HS)	5YAMS submission	Assurance of the asset management approach and proposed renewals work bank was a key workstream identified for PR24. The first draft of the activities and themes that define this workstream was presented at the PR24 Steering Group in January 2022, the outcomes of the assurance were presented at the 11 December 2023 stakeholder workshop. Further details of assurance activities will be provided in the PR24 submission.	
11	HS1 to set out the minimum asset data requirements and then report on data quality annually.	At next revision or no later than 31 December 2020	NR(HS) route and stations were audited on asset information in March 2023. The audit found no non-conformances and asset condition was recorded for 99.5% of assets. We are working on a number of improvement areas for asset information capability (see Section 4.4). We have produced and issued to our strategic partners NR(HS), ABM and NCP an Asset Data Dictionary for stations and car parks to which they are required to align. NR(HS) has the following plans to improve Route Asset Information in preparation for a new Asset Management system to go live in April 2025:	Not yet complete. Delivery delayed to end of CP3

ORR/DfT ref	ORR/DfT recommendation	Action by date	2023/24 progress update	Comment on delivery
			• Asset Data Dictionary defined (to include aligned maintenance data) – completed December 2023 • High level data quality assessment – completed March 2024 • Data improvement complete in readiness for new EAMS – March 2025	
12	HS1 to review operations and maintenance risks ownership with funders.	Plan & programme to be developed and agreed by 31 March 2020	This commitment was postponed to focus on Covid-19 response actions. HS1 took a stocktake on the treatment of risk with NR(HS) and areas to explore with funders to better manage risk in CP4. This paper was shared with the ORR and TOCs. We then held an initial meeting with TOCs on the description of contract risks and possible improvements in September 2023. This paper has been shared with the ORR. From this work, and as part of the PR24 process, HS1 and NR(HS) have identified areas of cost risk that can be removed as other protections are in place. The CP4 contract risk proposal was presented to all stakeholders (including ORR) in December 2023. There was some discussion that potential changes to the allocation of performance risk could drive better outcomes. It was agreed that further exploration would be considered as part of the ORR-led discussions on risk and uncertainty.	HS1 has completed this commitment. Further discussions on possible changes will continue through the PR24 process

ORR/DfT ref	ORR/DfT recommendation	Action by date	2023/24 progress update	Comment on delivery
Stations				
8	HS1 to make further improvements to risk, and contingency forecasting and further efficiency gains should be expected at future control period reviews.	During CP3	We aligned asset hierarchies on ISO55000 against the LTC models and are progressing work with NR(HS) looking at how to apply standardised risk and contingency forecasting approaches against these hierarchies. We completed all SASs and totex models. The totex models contain risk profiles for each SAS embedded into the model. The process is in line with the route process. We have shared the PR24 SASs for St Pancras, Stratford and Ebbsfleet with the ORR.	Closed
10	HS1 to improve Life Cycle Cost modelling; in particular by moving to a model based on condition-based asset data. HS1 to improve Long Term Charge modelling to incorporate a more sophisticated approach to modelling risk and contingency indirect costs.	During CP3	We have moved towards a totex based model and this has been used to develop PR24 proposals for CP4 to CP11 (40-year outlook). ORR will receive the models as part of the PR24 submission.	Closed

A2 Thames tunnels flooding incident

Schematic of the water management system at Thames tunnels



NR(HS) Statement on the incident

On Friday 29th December, NR(HS) staff responded to reports that water was entering the Thames tunnel and found that both sump pumps at Thames Kent Portal (TKPL) had failed and water was accumulating in the down bore of the tunnel. Efforts were undertaken to restore the failed sump pumps but only one of the two was found to be serviceable, which was duly returned to service. The single pump restored maximum design pumping capacity to the sump but was clearly unable to adequately control the water inflow and late on Friday evening the flooding had spread into the HS1 Up bore tunnel.

From late Friday 29th and throughout Saturday 30th NR(HS) implemented a strategy to remove water from the TKPL Sump and both tunnels to restart train services from Sunday 31st December. This strategy accelerated lowering of water levels within the sump sufficiently to allow extensive maintenance to commence and enable reopening of the HS1 Up and Down bore tunnels for the start of service on Sunday 31st December.

This flooding incident caused the cancellation of the last 3 Southeastern services on 29th December and suspension of all train services on 30th December.

To contain the incident, NR(HS) restored one of the two sump pumps, thereby providing full maximum design pumping capacity at the TKPL and deployed additional temporary pumping capability alongside a 24/7 on site management to ensure water levels were sufficiently managed. In February, to remove the reliance on temporary pumps NR(HS) designed and installed a self-sufficient semi-permanent pumping solution to remotely manage water levels. This is an additional intervention over and above the original design capability for that location to manage the higher than typical water ingress at this location.

NR(HS) has instigated both operational and independent technical investigations into the cause of the flood and the incident management approach. Operational investigations have concluded and were mostly positive about immediate management of the incident, service recovery and ultimately management and mitigation of the risk at this location. There are 11 actions/key learning points which are being implemented; these centre mostly around improvements in reporting, roles and responsibilities and ensuring access to additional pumping capability is more readily available in an emergency situation.

An engineering consultancy was commissioned to carry out an independent technical investigation into the incident and the draft final version of their report was received on 14 April 2024. The report concludes that the immediate cause of the tunnel flood was water inflows into the TKPL sump filling it to the point that water overflowed into the tunnel bores through unsealed wall penetrations located around the inflow pipes from the Nadir pumps. There are also a number of key causal factors, including the failure of both pumps, and recommendations for future actions identified within the report which are currently under review.

Most importantly, from a safety perspective, in addition to the one replacement sump pump NR(HS) has installed two temporary pumps each with a pumping capacity of 25 l/s and an independent, closed loop pumping system containing two pumps, each with a pumping capacity of 40 l/s and its own dedicated control and alarm system. NR(HS) therefore considers the current risk at this location has returned to, or is lower than, the level at which NR(HS) was managing prior to the flood occurring and has provided assurance to our stakeholders that the water levels in this location are being managed and the risk sufficiently mitigated. NR(HS) has also reviewed assets at all other HS1 pumping locations to ensure there are no other sites at risk of flooding. As a consequence of the apparent alarm system deficiencies and the NR(HS) staff response to those alarms, NR(HS) has also introduced a manual process for retrieving, reviewing and processing infrastructure alarms and, in the medium term, plans to introduce a dedicated fault management facility which will manage faults from cradle to grave.

NR(HS) continues to work with HS1 Ltd on locating the source of the additional water at this location and is currently actively investigating potential sources such as a utility company asset leak, redundant utility assets funnelling water towards HS1 and our own track drainage arrangements within the vicinity of the Thames Kent Portal. NR(HS) is also planning for a permanent asset resolution at the TKPL to ensure the assets at that location are fit for purpose. Subject to the conclusion of the redesign of the asset, NR(HS) assumes that costs associated with the permanent asset resolution could be contained within the proposed CP4 cost envelope. The redesign work will follow usual renewal project gate process.

HS1 Statement

This incident was devastating for the travelling public who should have been able to rely on HS1's infrastructure to travel but they were let down, and the impact was extremely difficult for our customers, the train operators. HS1 apologises for this and will work hard to use this incident to improve.

It is clear that there are lessons to learn from this incident and we now have a thorough, honest technical report, that details openly what happened, we can start improving systems and

processes to prevent a similar incident in the future. Some of the findings have been difficult for NR(HS), but the strength of a long term relationship is that it can withstand incidents such as this. These will include response to longstanding alarms, understanding asset risk and any shortcomings in existing designs. This will take place in a structured manner and will cover all asset classes.

There is no conclusive evidence to point to the source of the water. The independent technical investigation indicates that it is most likely that the inflowing water was a result of several kilometres of track drainage having water backed up. With this in mind, HS1 will continue our investigations with water companies to make sure that potential sources are reviewed, and will look to carry out a full system resilience study as part of an accelerated renewals process. HS1 is, however, confident that the NR(HS) life extension work carried out post-incident is robust and provides a safe and resilient asset for train operators to rely on until the renewals process is underway.

Although this incident has placed an understandable strain on the relationship between HS1 and NR(HS), HS1 has welcomed the recent transparency to resolve the matter from both a safety, commercial and technical perspective.

A3 R&D projects

The table below lists CP3 R&D projects in progress and completed.

Function	Project	Description
In Progress		
Civils	Use of Drone Technology for inspections	Trial of inspections on lineside buildings and structures using Unmanned Aerial Vehicles (UAVs). Consider whether to develop NR(HS) UAV standard or adopt NRIL standard.
Civils	Drones for Vegetation Management (Railscape)	Carry out herbicide spraying and vegetation surveying on steep embankment slopes using UAVs.
S&T	Remote Condition Monitoring on points (Vossloh)	To be able to predict requirements for an intervention on switch and crossing assets subjected to track voiding, and increase the performance of the assets through improved and targeted maintenance interventions.
S&T	Fibre Optic Acoustic Sensing (FOAS) on Switches and Crossings	Equipment to be installed that can define asset condition; trigger maintenance interventions when required and provide feedback on the quality of the intervention once completed. Part of the strategy to increase predictive maintenance capabilities on HS1.
Track	In-service monitoring on Eurostar (Phase 3) (University of Birmingham/MoniRail)	Use of existing vehicles to capture track data. Phase 3 - permanent fit of equipment, analysis of track data and correlation to ride quality.
Track	Lateral stability / hot weather (University of Southampton)	To understand the impact hot temperatures will have on our track
Planning	Enterprise System Modelling	Proof of concept trial to test an Enterprise System Model for our maintenance planning activity.
E&P	OLE Monitoring Improvement Phase 3 (Hitachi)	Hitachi owned monitoring system (equivalent to OLErt and PANDAS) to be installed on 5 Class 395 vehicles. Hitachi to provide and install all hardware, provide and process the raw data and make available on a web platform for NR(HS) analysis. The system also has real time alarms built in.
E&P	Infrastructure monitoring using MPV (Cordel)	Automated monitoring system (Cordel) fitted to MPV to monitor OCS static geometry. Aims to remove planned maintenance inspections and only intervene by exception. Cordel to provide

Function	Project	Description
		and fit hardware; process raw data and provide outputs via a web platform. Funded by NR(HS).
Stations	OpenSpace	Real-time passenger monitoring solution to enhance the customer experience in our stations, and enhance the efficiency of station operations, providing benefit to TOCs.
Track	High Speed Railway Degradation Modelling (University of Nottingham) Project 1 Asset Degradation Modelling	Develop and apply methods by which data can be used to predict the expected time that renewal will be necessary.
Completed projects		
Civils	TunnelVision - technology based inspection of tunnels (Arup)	Automate the visual examination of London and Thames tunnels.
Track	In-service monitoring on Eurostar (Phase 1) (University of Birmingham (UoB) /MoniRail)	Use of existing vehicles to capture track data. Phase 1 - investigate frequent damage to Eurostar wheels.
Track	In-service monitoring on Eurostar (Phase 2) (University of Birmingham (UoB) /MoniRail)	Use of existing vehicles to capture track data. Phase 2 - develop a platform for automated data processing and design and implement a measuring system to identify track and ride quality issues.
Asset Mgmt	ArcGIS Geospatial Information Model (GIS)	Investigate the feasibility of a shared GIS system for HS1 Ltd and NR(HS). As a system we have a need to share and see information across organisations but have never had the systems or standards to allow this to happen.
HS1	5G Augmented Reality Digital Twin	To deliver data about our assets to our people via augmented reality.
E&P	OLE Monitoring Improvement Phase 2 Installation of PANDAS V OLE/Pantograph dynamic monitoring system onto Class 395 Fleet	Similar to OLErt - remote condition monitoring system which allows NR(HS) to identify overhead line defects using wireless technology with an integrated camera module.
E&P	OLE Monitoring Improvement Phase 1 Installation and trial of OLErt system onto Southeastern 395 fleet.	Continual monitoring of performance of the pantograph and its movement in line with the OLE contact wire which provides data that, upon analysis, identifies potential incident sites.

Function	Project	Description
Civils	Digital bridge inspections (Waldeck)	Digital examination of 8 bridges on HS1 using laser scanning and 360° cameras set up from a position of safety to capture and facilitate off site identification of potential faults and assessment of asset condition and performance.
Civils	Remote conditioning monitoring of major structures	To install instrumentation on major structures to capture better data and be able to maintain by exception.
Track	Remote monitoring of S&C (University of Birmingham (UoB) /MoniRail)	Hitachi sponsored project for UoB to look monitor specific assets on the ground. 2076 points at Stratford were chosen to fit the sensors and generate data.
Completed projects funded outside the R&D portfolio		
Track	Under Sleeper Pads (TiFlex)	Adoption of under sleeper pads (at key sites) to extend tamping intervals and make cost efficiencies.
Track	PandoScope (SOL solutions)	To use PandoScope technology to review ballast condition for CP3 ballast cleaning campaign.
Track	Probabilistic approach to high speed data sets (University of Edinburgh)	PhD sponsored by LORAM (grinding) to investigate tamping effectiveness. We provided track geo data for them to apply machine learning to look at track degradation rates which concluded in a research paper in April 2023.
Track	Track Deterioration Model (PA Consulting)	Build asset management capability to improve our understanding of the asset base, creating the opportunity to reevaluate the work bank to realise the benefit of improved asset interventions and better value for money.

A4 Route financial reporting

Collection and Application of OMRC payments

All values in nominal £m

As at Period 13 2023/24

Statement 1: Analysis of O&M financial performance

Statement 2: Analysis of O&M income

Statement 3: Analysis of O&M costs

Statement 4: Analysis of the route escrow account

Statement 5: Upgrades

Statement 6: Net debt

STATEMENT 1: ANALYSIS OF O&M FINANCIAL PERFORMANCE

	Actuals YTD	CP3	Variance Fav/(Adverse)
Income			
Operations and Maintenance	79.8	70.4	9.4
Pass through	25.9	24.7	1.2
Total O&M income	105.7	95.1	10.6
Cost			
NR(HS)	53.3	53.5	0.1
Subcontract	3.8	4.9	1.1
Internal	12.6	11.7	-0.9
Sub total: Controlled costs	69.8	70.1	0.3
Pass through costs	25.9	24.7	-1.2
Freight	0.4	0.4	0.0
Total O&M Costs	96.1	95.2	-0.9
Net Performance Regime Cost	0.0	0.0	-0.0
Net Position			
Net income / (spend)	9.6	-0.1	9.8

STATEMENT 2: ANALYSIS OF O&M INCOME

	Actuals YTD				CP3				Variance Favourable / (Adverse)			
	EIL	SET	Freight	Total	EIL	SET	Freight	Total	EIL	SET	Freight	Total
Operations and Mtce	29.4	50.0	0.4	79.8	24.8	45.4	0.2	70.4	4.6	4.6	0.2	9.4
Pass through	6.8	19.2	0.0	25.9	7.2	17.5	0.0	24.7	-0.4	1.7	0.0	1.2
Total O&M income	36.2	69.2	0.4	105.7	32.0	62.9	0.2	95.1	4.2	6.3	0.2	10.6

Higher O&M income in 2023/24 due to Volume Reopener model assumptions driving Years 1 – 3 under-recovery into last two years of the control period.

STATEMENT 3: ANALYSIS OF O&M COSTS

	Actuals YTD	CP3	Variance Fav/(Adverse)
NR(HS)	53.3	53.5	0.1
BTP	1.0	1.3	0.4
NGC Connections fees	0.4	0.6	0.2
NRIL costs	1.8	2.0	0.2
GSMR	0.4	0.4	0.0
ORR regulatory and Safety	0.2	0.5	0.3
Total Sub-contract	3.8	4.9	1.1
Staff Costs	6.7	6.0	-0.7
Technical Support/Consultancy	2.2	1.5	-0.7
Office running costs	1.6	1.6	0.1
Other Costs	1.9	2.1	0.2
R&D	0.3	0.5	0.2
Total Internal	12.6	11.7	-0.9
Total Controlled Track Costs	**69.8**	**70.1**	**0.3**
Insurance	3.7	3.9	0.3
Power non EC4T	4.4	2.3	-2.0
Rates	10.9	11.1	0.2
UKPN Fees and Renewals	7.1	7.4	0.3
Total pass-through	25.9	24.7	-1.2
NR(HS)	0.1	0.1	0.0
NRIL costs	0.2	0.2	0.0
HS1 costs	0.1	0.1	0.0
Total Freight	0.4	0.4	0.0
Upgrades	0.0	0.0	0.0
Total OMRC	**96.1**	**95.2**	**-0.9**
Performance regime net cost / (income)	0.0	0.0	-0.0

Statement 4: Analysis of the Escrow Account Route

A) Reconciliation of movements in period to 31 March 2024	Actual	CP3 *	Variance
Opening balance current account	27.13	126.36	
Opening balance investment	100.00		
Deposits Maturing	(60.00)		
Deposit Placed	46.00		
Total Escrow b/fwd	113.13	126.35	(13.22)
Transfer In	43.14	28.94	14.20
Interest	2.69	1.18	1.51
Total transfers in	**45.83**	**30.12**	**15.71**
Drawdowns	(12.98)	(17.39)	4.41
Service Charge	0.00		0.00
Total drawdowns	(12.98)	(17.39)	4.41
Closing balances	73.98	139.08	6.90
Closing Investments	86.0		
Closing balances	159.98	1.18	1.51

Statement 5: Upgrades Actuals 23/24

i) Analysis of Specified Upgrades and other upgrades HS1 has carried out in respect of the Review Year

	Period Ending 9 December 2023			Cumulative since 01/04/2020			
	Actual	CP3	Difference	Actual	CP3	Difference	Total CP3
Specified Upgrades	0	0	0	0	0	0	0
Other Upgrades	0	0	0	0	0	0	0
Total Upgrades	0	0	0	0	0	0	0

ii) Analysis of Specified Upgrades and other upgrades HS1 intends, or is required, to carry out in respect of the Year followint the Review Year

	Period Ending 9 December 2023			Cumulative since 01/04/2020			
	Actual	CP3	Difference	Actual	CP3	Difference	Total CP3
Specified Upgrades	0	0	0	0	0	0	0
Other Upgrades	0	0	0	0	0	0	0
Total Upgrades	0	0	0	0	0	0	0

Statement 6: Net Debt			
in £m	Actual	CP3	Difference
Opening Net Debt	0	0	0
Income	0	0	0
Total Expenditure	0	0	0
Total financing costs	0	0	0
Closing Net Debt	0	0	0

The charging model assumed no debt. The charges are based on the principle that HS1 recovers its Operating & Maintenance costs in full over the life of the control period. Should significant and material variations occur, and it is agreed with the ORR that the additional costs should be logged, then it is anticipated that this page would be used to record the logged charges and any associated finance costs. To date there have been no significant and material events, and none are anticipated.

A5 Stations financial reporting

All values in nominal £m

As at Period 13 2023/24

Statement 7: Analysis of Stations Qx

Statement 8: Escrow account summary

STATEMENT 7: ANALYSIS OF STATIONS Qx

	As at P13, Financial Year 2023/24			
	YTD	Budget	Var	Var %
St Pancras	27.1	27.6	0.5	2%
Stratford	4.0	4.5	0.5	11%
Ebbsfleet	4.1	5.0	0.9	19%
Ashford	2.2	2.8	0.6	21%
Total Stations Qx	**37.4**	**39.9**	**2.5**	**6%**

HS1 Limited
Asset Management Annual Statement
OMRC Collection & Application
Actual period ending 31 March 2024

Statement 8: Escrow account summary
in Current Account £m

St Pancras	Account
Opening Balance	5.2
Receipts	9.8
Withdrawal	(2.0)
Interest	0.5
Service Charges	(0.0)
Deposits Matured	18.5
Deposit Placed	(13.5)
	0.0
Closing Balance	18.5
Investments	28.5
Closing Balance	**47.0**

Ebbsfleet	Account
Opening Balance	1.5
Receipts	2.2
Withdrawal	(0.2)
Interest	0.2
Service Charges	(0.0)
Deposits Matured	5.5
Deposit Placed	(3.0)
	0.0
Closing Balance	6.0
Investments	5.0
Closing Balance	**11.0**

Stratford	Account
Opening Balance	1.0
Receipts	1.7
Withdrawal	(0.5)
Interest	0.1
Service Charges	(0.0)
Deposits Matured	4.5
Deposit Placed	(2.0)
	0.0
Closing Balance	4.8
Investments	4.0
Closing Balance	**8.8**

Ashford	Account
Opening Balance	1.0
Receipts	1.3
Withdrawal	(0.0)
Interest	0.1
Service Charges	(0.0)
Deposits Matured	4.5
Deposit Placed	(2.5)
Closing Balance	4.4
Investments	3.5
Closing Balance	**7.9**

HS1 Asset Management Annual Statement 2023/24