

Project Representative Report

**Item: Project Status Report 162 and Crossrail Response
Period 13 FY2021-22**

Date: Period 13 (5 March 2022 - 1 April 2022)

1 Overview

- 1.1 The P-Rep is in place to provide the Sponsors, TfL and the Department for Transport, with oversight of project delivery, advise and raise points of challenge to the Sponsors and scrutinise progress.
- 1.2 The P-Rep observations are shared with Crossrail and are discussed in detail by Crossrail, P-Rep and the Commissioner. Crossrail then produces a written response to the P-Rep report.
- 1.3 In line with the commitments made by the Mayor for greater transparency of the Crossrail project, please find below the latest P-Rep Sponsor Summary and Crossrail's Management Response.
- 1.4 It has been necessary to make some redactions to the reports prior to publication to protect commercially sensitive material. We have sought to keep such redactions to a minimum

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[REDACTED]
**Project Representative
Jacobs**

16 May 2022

Dear [REDACTED]

Re: Crossrail PRep Project Status Report 162 – Period 13

I am writing in response to the PRep Sponsor Summary cover letter for Period 13.

Reliability continues to build towards acceptable levels required for transition to Passenger Service with Timetable Demonstrations improving day by day and in recent weeks achieving the entry criteria for Revenue Service.

ELR200 signalling software that was successfully commissioned over the Easter period has achieved its main objective of improving reliability and removing Operational Restrictions. The SCADA communications system is now at the revenue service configuration, and we have rolled out the latest train software (version 5.7) throughout the train fleet. This advanced digital system is now ready for customers.

The assurance baseline for Revenue Service is now complete, including authorisations from the Office of Rail and Road and the London Fire Brigade. The opening date of the railway has been announced as 24 May 2022.

While I understand your concerns regarding progress of Stage 5B Minus, there are several actions in hand. A timetable trial for 20TPH was undertaken on 1 May 2022. This worked well and will assist in the pathway to a joined railway. The Great Eastern automatic transition is an important function that is required to be highly reliable. Work is underway to build this to the required entry level for Stage 5B.

I hope this response provides a useful summary of the measures in place to address the specific issues you have highlighted. A more comprehensive response focussed on the content of the Sponsor Summary report will be issued as an Appendix to this letter.

MOVING LONDON FORWARD





This is my final response to your periodic submission. Once we are in Revenue Service, you are aware that we will enact a planned organisational change that means I will step down as CEO. It has been an honour and a privilege to lead this incredible Programme to Passenger Service. I would like to thank the Project Representative for all its hard work and dedication over many years.

Kind regards,



Mark Wild
CEO, Crossrail

Appendix – CRL Response to Period 13 PRep Report

Programme Response Category	PRep Period 13 Sponsor Summary Content	CRL Period 13 Response
<p>Headlines: Progress and Look Ahead</p>	<p>CRL and RfLI continue to drive the agreed works for Stage 3a Opening under the broad headings of programme delivery, assurance completion, readiness preparations and reliability growth. The internal target start date remains ■ May 2022, but with much work still to do, this date is at risk. There is a need for improved railway reliability and for performance to stabilise at the high levels which are currently only occasionally being achieved. Nevertheless, momentum within the CRL and RfLI teams is building towards a formal opening, and a start to passenger services before the end of June 2022 is appearing an increasingly credible objective</p> <p>CRL has continued to close EOWs and SJ Dependencies to allow the completion of safety assurance delivery. Fewer than 20 open EOWs remain ahead of passenger service and only one SJ Dependency, related to London Fire Brigade (LFB) communications. All Technical Files were submitted by the end of March 2022 for ORR review, with several already accepted and returned. The safety assurance focus is shifting towards RfLI as it completes its readiness submissions for ITAP acceptance, in order to meet the Stage 3a Revenue Service Assured milestone of ■ April 2022. The same pressures that drove the delay of this milestone from ■ March 2022 last period, are causing the</p>	<p>Residual issues following the successful commissioning of the ELR200 signalling systems were resolved on 23 April 2022 such that 35 of the 36 Operational restrictions targeted for removal have been achieved. CRL has also completed the assurance baseline for Revenue Service with the exception of the Safety Justification (SJ) for Communications and Control. The LFEPA ■■■■■■■■■■</p> <p>■■■■ Letter of No Objection was received from the London Fire Brigade (LFB) on 5 May 2022. Timetable demonstrations continue to produce inspiring results. In line with the T-4 Go No/go review on 26 April 2022, Passenger Service will begin on 24 May 2022.</p> <p>The use of the 27 March milestone to focus and de-risk the safety assurance has paid dividends. Whilst additional ITAP meetings were booked in leading to 28 April 2022 de-risking milestone, some were removed, and others lightly used due to the reduced volume of submissions. The infrastructure was largely assured by 28 April 2022 with acceptance of the RFLI RSRAC and noting of the CESAC with defined outstanding items. The final item for acceptance is the LFB radio and the RFLI readiness.</p>

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	<p>imposition of a late and large workload on ITAP. As a consequence, many additional ITAP meetings have been arranged in April 2022 in order to deal with the high volume of submissions.</p> <p>The resolution of LFB communications issues in the Central Section cross passages is CRL's most important priority and is now critical to achieving revenue assured status. It is expected that the provision of a Letter of No Objection (LONO) by the LFB will be the last major Programme assurance activity ahead of passenger service, but the completion of the planned remedial works during April 2022 is challenging and it is likely that the assurance milestone will be missed.</p> <p>Since [REDACTED] March 2022, RfLI has been carrying out Timetable Demonstrations in which services have been operated without interruption from Trial Operations exercises and with reduced construction activity taking place. The objective has been to build reliability and embed learning from the Trial Operations phase, while seeking to improve on times-to-fix and to reduce the number of delays greater than 15 minutes. During the Timetable Demonstrations, the Passenger Performance Measure (PPM) has generally ranged between [REDACTED] and [REDACTED] (an average of [REDACTED] over 14 days of running up to [REDACTED] April 2022). However, there have been days of weaker PPM performance, caused, for example, by Timetable Processor issues and by the use of a particular subset of trains which appear more</p>	<p>The LFB Letter of Acceptance was received on 5 May 2022. This further supports the 24 May 2022 opening date announced.</p> <p>Agree. However, the Project Representative refers to PPM data from a date range outside the window that the report references on the front ("P13 FY21/22 - 5 March 2022 – 1 April 2022").</p>
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	<p>susceptible to failure than the rest of the test fleet.</p> <p>There have been improvements in the trends for delays greater than 15 minutes, but much work is still necessary to meet the threshold set for passenger service. The gradual reduction in the number of these delays is in part due to the greater experience and confidence of the RCC operational teams. However, sustained reliable performance of the railway continues to be affected by a range of problems, including GSM-R, management of Empty Coaching Stock (ECS) moves, PSDs, issues specific to trains and Under-Platform Extractors (which affect PSD operation).</p> <p>Although completed after the Period 13 reporting deadline, the Easter 2022 Blockade works were delivered largely as planned; overall performance has yet to be confirmed by CRL. Successful deployment of signalling software upgrade ELR200 and train software upgrade H5.7 is expected to provide directly, or to facilitate, reliability improvements to the railway, through the delivery of fixes or the removal Operational Restrictions. Updated assurance is in preparation and performance outcomes have yet to be fully assessed; however, success would provide important support to any commitment to passenger service. The Go/No-Go review for entry into passenger service has been deferred to April 2022, to provide more time to demonstrate that the railway has met planned reliability levels after ELR200</p>	<p>Noted.</p> <p>Two successful weekend blockades were achieved in April 2022. Highlights from the blockade include the completion of crank assembly work at Plumstead and TVS upgrade works. In addition, a successful Easter blockade saw the commissioning of the Communications and Control software upgrade 28.4, and signalling software upgrade, ELR200. As mentioned above CRL has now completed the assurance baseline for Revenue Service with the exception of the Safety Justification for Communications and Control which is subject to sign off of the Central Operating Section (COS) Entry into Revenue Service SJ and Declaration of Control of Risk. Residual issues following the successful commissioning of the ELR200 signalling system were resolved on 23 April 2022 with the removal of 35 out of 36 Operational Restrictions.</p>
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	<p>implementation. However, successful achievement of all of the reliability and assurance pre-requisites in the time available will prove difficult, and the target date of [REDACTED] May 2022 is at risk. The corresponding P80 date is [REDACTED] June 2022, which remains within the declared opening window of the first half of 2022.</p> <p>Significant scope remains for completion after Stage 3 opening and before transition through the Stage 5 opening sequence. CRL and RfLI continue to work towards an earliest start to Stage 5B Minus services in [REDACTED] 2022. However, with train rostering preparations needing to start by the end of [REDACTED] 2022, there will be little, if any, time to evidence operational passenger train performance in the Central Section, aside from a single 20 TPH service trial which is planned to be carried out in early May 2022.</p> <p>[REDACTED]</p>	<p>Following achievement of Trial Operations Part B, 143 Trial Operations dependencies have been transferred into Revenue Service together with 42 dependencies which were already allocated for Revenue Service. This resulted in 185 related SJ dependencies to go; additional dependencies may be identified. Of these, 53 had been mitigated for Revenue Service. On-going progress and prioritisation for subsequent stages is discussed weekly with all key stakeholders. However, at the time of writing, 117 dependencies remain open and mitigated for Revenue Service.</p> <p>It is train planning that needs to start [REDACTED] before Stage 5B commences to ensure the 5B train plan accommodates any closures or short-term changes which are being planned by NR or other operators. This train planning work leads to roster production in due course.</p> <p>In relation to the GEML signalling transition automatic function, several measures are in place. Timetable trial for 20TPH was done on 1 May 2022 with manual transition in place which worked well and helps to support a mitigation if needed. More timetable trials are planned to gain higher confidence.</p>
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	<p>CRL has been steadily reducing its workforce since the end of March 2022, but there are indications that planned demobilisations might be deferred over the next two periods¹. Loss of staff from the Bond Street Station team has threatened completion activities; similarly, RfLI and MTREL have experienced difficulties with recruiting and retaining resources.</p> <p>The Canary Wharf Station contractor demobilised at the end of March 2022. A small residual team is being retained, both to complete works required for passenger service, and to support a MoBo contract extension caused by late Asset Data delivery, and this is putting upward pressure on final costs.</p>	<p>Siemens have performed a number of optimisation fixes, which has resulted in excess of 98% success on transition, without a software change (to open the window). This was based on collecting data and performing a desk analysis. An over and back is planned in early May 2022 to measure the actual performance. Software change is being planned for ELR300 over Xmas, however, Siemens have been challenged to improve this date. All of this will feed into the DCS 1.3 risk modelling. MTR are evaluating the performance issues related to manual translation and mitigations like alternate timetables to be able to maintain the schedule.</p> <p>Demobilisations are taking place in line with the business plan, and these are kept under constant review and can be amended as necessary. Bond Street station's business plan has recently been baselined and some of the vacancies are being backfilled and others are being withdrawn. MTR and RfLI have seen a number of resignations. Some leavers have moved to other companies within the industry, and some have left the industry. Both MTR and RfLI continue to recruit to replace staff.</p> <p>Noted.</p>
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	<p>The Routeway contracts are being scrutinised by CRL. Scope confirmation is required against C620 cost allowances and further C660 cost pressures are likely. The latter are attributed to the LFB communications issues, and resilience support to RfLI at Bond Street Station after SC3 ROGS.</p> <p>Sponsors' particular attention is drawn to the following:</p> <p>The CRL/RfLI Go/No-Go review for passenger service has been deferred to ■ April 2022, increasing the risk on the target date for entry of ■ May 2022.</p> <p>The expected reliability outcomes from ELR200 deployment and the ongoing H5.7 roll-out have yet to be fully demonstrated.</p> <p>While reliability has improved during the Timetable Demonstrations, the criteria for passenger service are unlikely to be met by the time of the CRL/RfLI Go/No-Go review on ■ April 2022.</p>	<p>Noted.</p> <p>CRL responds to the Sponsors as follows:</p> <p>Stage 3A Opening date has been declared as 24 May 2022.</p> <p>As mentioned previously, residual issues following the successful commissioning of the ELR200 signalling system were resolved on 23 April 2022: 35 of the 36 Operational Restrictions targeted for removal have been removed. Timetable demonstration continues with encouraging results.</p> <p>This concern has been responded to previously.</p>
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	<p>Challenges with the resolution of LFB communications issues threaten the achievement of the Stage 3a Revenue Service Assured milestone on ■ April 2022.</p> <p>Incorporation of all remaining scope and risk mitigations into the development of DCS v1.3, together with a complete QSRA, might drive Stage 5B Minus opening into 2023.</p>	<p>Agreed. This remained the one real open dependency (Communications and Control SJ B30) for the 28 April 2022 milestone against Stage 3A opening.</p> <p>Period 13 reported position gave early indication of dates for Stage 5b- and subsequent phases, however this is subject to completion of the DCS1.3 and associated risk assessment.</p>
<p>Health & Safety</p>	<p>No incidents or accidents were reported from CRL’s construction related activities in Period 13. RfLI reported minor operational incidents, although these did not have an impact on safety. CRL has now improved the new system of safety measurement, and the reported safety statistics are now representative of site activities and reduced team sizes on the Programme. All safety metrics are within the parameters set by the Programme.</p>	<p>Agree and noted.</p>

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<p>Programme Overview:</p> <p>Schedule</p>	<p>At Period 13, CRL is reporting no changes from Period 12 for all deterministic, P50 and P80 Cardinal Milestone dates. The final mass evacuation exercises and other operational trials were substantially completed on █ March 2022 with Timetable Demonstrations taking place from █ March 2022.</p> <p>Delivery of safety assurance for the start of passenger service has continued throughout the period and the majority of SJs have been approved by ITAP. All Technical Files were submitted to the ORR, although resolution of the LFB communications issues will drive the release of the Authority to Place into Service (APIS) by the ORR into May 2022. Thus, while CRL continues to target █ April 2022 for the completion of the Stage 3a Revenue Service Assured Railway, not all pre-requisites will be met by that date.</p> <p>The forecast Stage 3a Opening deterministic date remains █ May 2022. The main risks to Stage 3a Opening remain system reliability thresholds not being met and the non-completion of LFB communications rectification works. The P80 date of █ June 2022 remains within the declared opening window of the first half of 2022.</p> <p>During Period 13, CRL has continued development of DCS v1.3 covering Stage 5B Minus, Stage 5B and Stage 5C. While CRL drives towards the deterministic dates for Stage</p>	<p>Noted.</p> <p>Agreed. The 28 April 2022 is CRL’s second de-risking milestone towards an assured railway for Stage 3A Revenue Service. The LFB’s Letter of Acceptance will be provided to the Office of Rail and Road (ORR) in support of the final APIS now needed. All others have now been received.</p> <p>As mentioned previously, residual issues following commissioning of the ELR200 signalling system have been resolved with 35 of the 36 Operational Restrictions targeted for removal have been removed and timetabled demonstrations have been encouraging.</p> <p>Noted. Resolution of LFB communication issues is required for Stage 3 Revenue Service.</p>
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<p>Commercial and Risk</p>	<p>5B Minus and Stage 5B, risks associated with several scope items need to be evaluated in the finalisation of DCS v1.3. These include the resolution of the LFB communications issues, a solution for the signalling transition issues at the GEML interface, implementation of Auto-Reverse, and the need for RfLI to reduce the maintenance backlog. While solutions are under development, the P50, rather than deterministic dates for Stage 5B Minus and Stage 5B, are more likely to be achieved</p> <p>At Period 13, CRL is reporting no change from its Period 12 forecast; the P50 AFCDC remains at £15.963m and the corresponding [REDACTED]. The Period 13 draft P50 AFCDC is £[REDACTED] above the current £825m funding threshold and £[REDACTED] under the £1.1bn funding limit</p> <p>As expected last period, CRL has implemented its Target AFCDC forecast using period-end project cost estimates, risks and opportunities. As a consequence of CRL's ongoing revision of its Budget Scenario, at Period 13, CRL is reporting a reduced Target AFCDC of £[REDACTED] and increasing Programme contingency by £[REDACTED]. Consequently, the Period 13 contingency allowances amount to £[REDACTED] of which £[REDACTED] is set aside under the COO reserve, and CTG4 is £[REDACTED] which includes £[REDACTED] of cost reduction opportunities. These opportunities can be</p>	<p>Agree.</p> <p>Target AFC was reported at [REDACTED], but Programme Contingency was increased to [REDACTED]. P13 contingency allowances amount [REDACTED] and CTG [REDACTED] (CTG includes [REDACTED] opportunities and COWD adjustments).</p>
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	<p>attributed to CRL actual Indirect Costs below forecast, potential release of Commercial provisions as a consequence of reduced exposure, and the outcome from rationalising Scope Gap allowances.</p> <p>While we maintain that CRL is successful in containing its costs and is beginning to identify some tangible cost reductions, we expect it to request the funding limit to increase. This is likely to be set close to CRL's target AFDC of £[REDACTED] which is £[REDACTED] below the current P50 AFDC and continues to be below the £[REDACTED] funding request limit.</p> <p>Although CRL is holding its forecast, £[REDACTED] of cost pressures across Routeway and Stations have emerged in the period. However, these costs have been offset from CRL's contingency provisions. We believe that the continued erosion of these contingencies will compromise CRL's opportunity to outturn to the £825m funding limit.</p> <p>As a consequence of moving to a contingency model, CRL has not undertaken a Programme QCRA this period. However, it has identified key areas of cost exposure above budget submissions made at Period 11, which suggests that approximately £[REDACTED] additional exposure might need to be covered by Programme contingency. The QSRA is unchanged from Period 12 but is presently indicating approximately £[REDACTED] additional exposure in respect of prolongation to Stages 5B Minus, 5B</p>	<p>The Programme continues to try to deliver as close as possible to the £825m funding envelope and minimise any further requirements.</p> <p>As mentioned above, the Programme continues to try to deliver as close as possible to the £825m funding envelope and minimise any additional requirements.</p> <p>Following reconciliation of the [REDACTED] additional exposure with project contingencies and other cost provisions, there is a potential [REDACTED] additional exposure to the Budget Scenario which may need to be covered by Programme contingency.</p>
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<p>Organisation</p>	<p>and 5C. Validation of these potential exposures is expected to be resolved once DCS v1.3 development has been completed.</p>	
<p>Stage 3 Trial Operations, Timetable Demonstrations and Passenger Service</p>	<p>Substantial demobilisation of the Canary Wharf Station contractor was achieved on █ March 2022, and CRL continues to progress the close-out of the Paddington Station contract. Bond Street is now the only station site on which a substantial number of resources is still engaged, and this is expected to continue until █ 2022.</p> <p>Both RfLI and MTREL face challenges with resource retention and recruitment. MTREL has undergone significant turnover of resources following recruitment and training, and this threat is expected to remain until stable passenger operation is achieved. RfLI is reporting difficulties with recruitment of maintenance staff, which might reflect a competitive labour market. In the meantime, Programme teams are demobilising as contract end dates take effect.</p> <p>Trial Operations ended on █ March 2022, with all but four exercises completed; a period of Timetable Demonstration started on █ March 2022. The purpose of the Timetable</p>	<p>CRL notes the Project Representatives comments regarding Canary Wharf and Paddington stations and agrees with the comments relating to Bond Street station.</p> <p>MTR have seen station-based customer service staff either resign, join LU, other train operators or leave the industry. MTR have recruited and are training further tranches of staff to replace those that have left. A degree of staff turnover in this area is to be expected and will continue in perpetuity.</p> <p>Agree.</p>

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	<p>Demonstration period is to lift reliability from the unsatisfactory average PPM level of [REDACTED] which was achieved during Trial Operations. The rationale is that operational focus can be applied to reliability growth without interruption from Trial Operations exercises and by minimising construction activity. The Timetable Demonstration period is expected to run until the start of passenger service.</p> <p>Reliability is expected to rise, and there are early indications that this is happening. In the first two weeks of Timetable Trials, the PPM averaged [REDACTED] and delays greater than 15 minutes occurred [REDACTED] times a day, while the criteria for entering passenger service are 95% PPM, and approximately 0.5 delays per day. Both measures have therefore yet to meet passenger service entry thresholds.</p> <p>RfLI will gather as much operating data as possible through April 2022 before it decides whether reliability is likely to meet the passenger service entry criteria by [REDACTED] May 2022. However, this will provide little time to gauge the impact of ELR200 software deployment, completed during the Easter 2022 Blockade, or of ongoing the H5.7 software deployment, which is scheduled for completion in early May 2022. RfLI is aware of the general risk of service disruption ‘cascading’ from minor defects, and it intends to limit the impacts at service start-up by operating trains at [REDACTED], but not allowing public access until [REDACTED]. This would allow</p>	<p>Agree.</p> <p>The H5.7 software rollout across the fleet was complete by 30 April 2022.</p>
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	<p>staff the opportunity to manage unforeseen issues without the pressure of managing passengers at the same time.</p> <p>The current primary causes of unreliability are GSM-R, management of ECS moves, PSDs, issues specific to trains and Under Platform Extractors (which affect PSD operation). There are plans to manage all of these, but it is uncertain whether they can be addressed sufficiently to support passenger service in ■■■ May 2022. RfLI and MTREL operating staff performance appears to be improved in the more stable operating environment of the Timetable Demonstration period, compared to Trial Operations. The start of passenger service is likely to see a return of some disruption as passengers interact with the railway, but staff will be able to put into practice their ‘embedded learning’ from the Trial Operations period. Rules and processes must also continue to be adapted to ensure service recovery is optimised.</p> <p>The Timetable Demonstration period has shown early signs of improved railway performance, but currently not enough to meet the reliability thresholds. Taken with the late delivery of the LFB communications remedial works, CRL and RfLI have deferred the Go/No-Go review to passenger opening on ■■■ May 2022, from ■■■ April 2022 to ■■■ April 2022. CRL and RfLI recognise that a decision at this time will be based upon limited reliability performance, and that it will carry risk.</p>	<p>Agree.</p> <p>CRL agrees that the Timetable Demonstrations have improved the railway’s performance. Stage 3A Opening date has been declared as 24 May 2022.</p>
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<p>Stations Commissioning and Handover</p>	<p>While the Canary Wharf Station contractor substantially demobilised as planned at the end of March 2022, a small residual team will remain engaged to deliver discrete packages of works that are required for the start of passenger service. The teams are targeting completion of the remaining 10 EOWs by [REDACTED] April 2022. Completion of the Asset Data scope has slipped, which will result in an extension of the MoBo works being undertaken by the contractor. This is expected to have further cost implications, which are currently not captured in the AFC.</p> <p>The Bond Street Station team is working toward a deterministic target of the end of [REDACTED] 2022 for opening to passengers. The team has a stretch target of the end of [REDACTED] 2022, but challenges remain. Most notably, completion of the fire stopping, and suppression works is targeting the end of [REDACTED] 2022 to complete, with the testing and commissioning activities to complete thereafter. The scope of physical works is reducing, and the remainder was scheduled for completion during the Easter 2022 Blockade. However, urgent LFB communications testing was prioritised at short notice and, with blockade performance results as yet unconfirmed, it is possible that the works at Bond Street Station will run on beyond April 2022. It will become apparent during Period 1 whether the deterministic date for opening will</p>	<p>MoBo work activities at Canary Wharf station have been extended. This has caused further cost implications; however, these costs are covered in Programme risk.</p> <p>Deterministic date for BIU (SC3ROGS) at Bond Street station is the end of [REDACTED] 2022 while opening for passengers is [REDACTED] 2022.</p>
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<p>Assurance</p>	<p>hold or whether the earlier stretch target date can be achieved. In the meantime, planning for the demobilisation of the Tier 2 contractors and of CRL’s own team will start.</p> <p>The Paddington Station ECHC documentation was signed prior to the end of March 2022, with full contract completion sign-off expected by the end of April 2022.</p> <p>The [REDACTED] April 2022 date for achieving the Stage 3a Revenue Service Assured Railway is at risk. This is primarily due to the need to resolve issues of inadequate coverage at Central Section cross passages, which have been raised by the LFB. [REDACTED]</p> <p>[REDACTED] A potential solution has been identified, but coverage trials need to be completed to verify designs and to allow implementation to proceed. CRL is aiming for completion by the end of April 2022, although risk remains and this date is not certain, so there is likely to be an impact upon the Stage 3a Revenue Service Assured milestone date of 28 April 2022. This issue must be resolved [REDACTED] final Technical File approval by the ORR.</p> <p>ITAP continues to make itself available to flexibly support CRL and RfLI safety assurance demands. Additional meetings have been</p>	<p>ECHC at Paddington station is expected to take place in early May 2022.</p> <p>Agreed for the time of writing this statement. The LFB’s Letter of Acceptance was received on 5 May 2022 and further supports the committed opening date announced.</p> <p>Agreed. The focus of recent ITAP meetings has been around the readiness to open at Stage 3A with a focus on the RFLI SJ and the CESAC to</p>
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<p>Future Stages</p>	<p>arranged and held through April 2022 and outstanding submissions have been progressively reviewed and accepted. Much of the outstanding work now lies with CRL and RfLI to ensure that the top-level submissions are aligned and persuasive in their expression of readiness for passenger service.</p>	<p>gain final acceptance. This is now expected to be achieved by 13 May 2022.</p>
	<p>The milestones for Stage 5 implementation are unchanged since last period, with the forecast dates given in Figure 2-1. However, the underpinning schedules for both Stage 5B and 5B Minus are still to be validated, and the P50 dates are subject to changes.</p>	<p>Agree.</p>
	<p>The decision to proceed with Stage 5B Minus will need to be made by the end of [REDACTED] 2022, to enable train planning to be developed in time for the deterministic start date of [REDACTED] 2022. The decision will be driven by whether the railway is capable of delivering a reliable and maintainable 22 TPH service and, as with last period, RfLI continues to establish the commitment criteria. There will be little, if any, passenger service experience to draw upon and RfLI and MTREL are expecting to have carried out one of six Stage 5B Minus demonstrations before the end of [REDACTED] 2022 decision deadline. Further train (H5.73) and signalling (ELR210) software upgrades are necessary, in conjunction with process improvements, to lift performance before the opening of Stage 5B Minus. Another</p>	<p>Agree.</p>

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	<p>programme of process improvement is likely to be required when the Central Section services run onto the GE and GW Main Lines.</p> <div style="background-color: black; width: 100%; height: 150px; margin: 10px 0;"></div> <p>The decision to proceed with Stage 5B will need to be made by late [REDACTED] 2022, when NR must be advised what service pattern will be introduced in the new [REDACTED] 2022 timetable. The availability of Auto-Reverse functionality at Westbourne Park and the delivery of system reliability remains two main areas of concern.</p> <p>Implementation of Auto-Reverse will require the prior delivery of infrastructure works, train software and signalling CBTC software changes. The works, as currently scoped¹⁰, could take until [REDACTED] to deliver. CRL wants to work</p>	<p>Siemens have done a number of optimisation fixes, which has resulted in a 98%+ success on transition, without a software change to open the window. This was based on collecting data and performing a desk analysis.</p> <p>A timetable trial for 20TPH was done on 1 May 2022 with manual transition in place. This worked well and helps to support a mitigation if needed. Additional trials are planned to provide better data and trial operational processes.</p> <p>An over and back is planned in early May 2022 to measure the actual performance and software change, ELR300, is being planned for the Christmas 2022 period. This all be captured in the DCS 1.3 risk modelling.</p> <p>Agree.</p> <p>Configuration schedules now show a forecast of [REDACTED] 2022 for fleet loaded. Testing of the train and signalling software in the CCOS to demonstrate the Auto-Reverse (AR) functionality will be in [REDACTED] 2022. However, after the late</p>
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Appendix – CRL Response to Period 13 PRep Report

	<p>with the ORR to establish if temporary measures (e.g. motion detectors) can be applied in the short term. Auto-Reverse functionality also requires changes to the train (H5.10) and signalling (ELR220) software configurations. There is currently little float, as these configurations are scheduled to be loaded by early [REDACTED], approximately [REDACTED] before the start of Stage 5B. There would also be little opportunity to assess whether any regressions had been introduced.</p> <p>Assessing the reliability of the service may be slightly easier than for Stage 5B Minus, as there is expected to be approximately [REDACTED] of Stage 3 passenger operations data, and the outputs from three or four 24 TPH service demonstrations, to assess. It is anticipated that, in conjunction with modelling, the data will demonstrate a PPM of [REDACTED] which will give NR confidence that the timetable plan is viable. It is therefore important that Stage 3 opens as soon as possible and performs well, in order to support growth towards the Stage 5B performance thresholds.</p> <p>Stage 5C marks when service patterns change from the two in Stage 5B Minus, to one in which GWML and GEML services are integrated through the Central Section. Current modelling by MTREL is achieving [REDACTED] with further work underway to meet the Sponsors Requirement of 95%. As with Stage 5B, it will need Stage 3 services to perform well to provide confidence that the timetable will perform as</p>	<p>[REDACTED] date for Stage 5B decision, and routine use of AR in the CCOS to prove reliability can only be undertaken when fleet load has completed in mid-[REDACTED]. Any temporary measures to allow AR at WBP have been agreed with the ORR.</p> <p>Agree.</p> <p>It is not 'timetable submission' in [REDACTED] 2022, but [REDACTED] is the date when the specification has to be agreed for May 2023 such that all operators can develop their timetables for submission in alignment with one another.</p>
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Appendix – CRL Response to Period 13 PRep Report

	<p>planned. The timetable submission date is in [REDACTED] for a May 2023 implementation.</p> <p>The common challenge to all of the Stage 5 opening stages is the provision of assurance in advance, that the railway will be sufficiently reliable for future timetable change. Notwithstanding the GEML signalling auto-transition issue, the lack of comprehensive reliability evidence by the end of [REDACTED] 2022 remains a major risk to starting Stage 5B Minus in [REDACTED] 2022. For Stage 5B, further performance evidence will be available, but a delivery schedule must be in place which gives confidence that Auto-Reverse will be available by [REDACTED]. Good progress with both of these issues will positively influence preparations for the delivery of Stage 5C in May 2023.</p>	<p>Agree.</p>
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Crossrail Project Representative

Crossrail Joint Sponsor Team

Sponsor Summary

Project Status Report 162

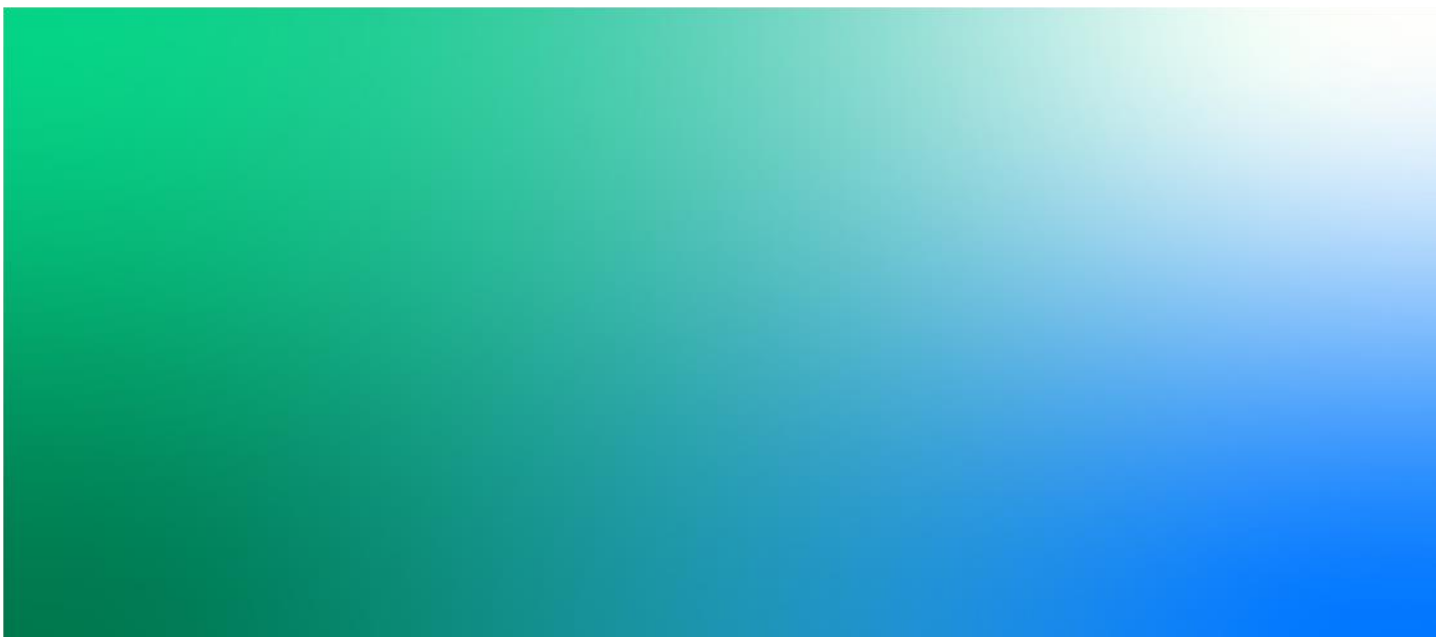
Period 13 | FY2021/22

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Sponsor Summary PSR 162

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Note: This report relies on the information set out in CRL's Period 13 reports augmented by more current information received by PRep during the course of our routine discussions with CRL since the Period close on 1 April 2022. Note that information emerging after the close of Period 13 is subject to formal confirmation by CRL in its Period 13 reports. This report is supplemented by our weekly reports to JST and regular meetings with JST staff.

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1.	25 April 2022	PSR 162 Period 13 FY 2021-22 Sponsor Summary v1.11 ~ Draft	████	████	████	████
2.	29 April 2022	PSR 162 Period 13 FY 2021-22 Sponsor Summary v1.12 ~ Final	████	████	████	████

Sponsor Summary

1. Headlines

1.1 Progress and Look Ahead

CRL and RfLI continue to drive the agreed works for Stage 3a Opening under the broad headings of programme delivery, assurance completion, readiness preparations and reliability growth. The internal target start date remains ■ May 2022, but with much work still to do, this date is at risk. There is a need for improved railway reliability and for performance to stabilise at the high levels which are currently only occasionally being achieved. Nevertheless, momentum within the CRL and RfLI teams is building towards a formal opening, and a start to passenger services before the end of June 2022 is appearing an increasingly credible objective.

CRL has continued to close EOWs and SJ Dependencies to allow the completion of safety assurance delivery. Fewer than 20 open EOWs remain ahead of passenger service and only one SJ Dependency, related to London Fire Brigade (LFB) communications. All Technical Files were submitted by the end of March 2022 for ORR review, with several already accepted and returned. The safety assurance focus is shifting towards RfLI as it completes its readiness submissions for ITAP acceptance, in order to meet the Stage 3a Revenue Service Assured milestone of ■ April 2022. The same pressures that drove the delay of this milestone from ■ March 2022 last period, are causing the imposition of a late and large workload on ITAP. As a consequence, many additional ITAP meetings have been arranged in April 2022 in order to deal with the high volume of submissions.

The resolution of LFB communications issues in the Central Section cross passages is CRL's most important priority, and is now critical to achieving revenue assured status. It is expected that the provision of a Letter of No Objection (LONO) by the LFB will be the last major Programme assurance activity ahead of passenger service, but the completion of the planned remedial works during April 2022 is challenging and it is likely that the assurance milestone will be missed.

Since ■ March 2022, RfLI has been carrying out Timetable Demonstrations in which services have been operated without interruption from Trial Operations exercises and with reduced construction activity taking place. The objective has been to build reliability and embed learning from the Trial Operations phase, while seeking to improve on times-to-fix and to reduce the number of delays greater than 15 minutes. During the Timetable Demonstrations, the Passenger Performance Measure (PPM) has generally ranged between ■ and ■ (an average of ■ over 14 days of running up to ■ April 2022). However, there have been days of weaker PPM performance, caused, for example, by Timetable Processor issues and by the use of a particular subset of trains which appear more susceptible to failure than the rest of the test fleet.

There have been improvements in the trends for delays greater than 15 minutes, but much work is still necessary to meet the threshold set for passenger service. The gradual reduction in the number of these delays is in part due to the greater experience and confidence of the RCC operational teams. However, sustained reliable performance of the railway continues to be affected by a range of problems, including GSM-R, management of Empty Coaching Stock (ECS) moves, PSDs, issues specific to trains and Under-Platform Extractors (which affect PSD operation).

Although completed after the Period 13 reporting deadline, the Easter 2022 Blockade works were delivered largely as planned; overall performance has yet to be confirmed by CRL. Successful deployment of signalling software upgrade ELR200 and train software upgrade H5.7 is expected to provide directly, or to facilitate, reliability improvements to the railway, through the delivery of fixes or the removal Operational Restrictions. Updated assurance is in preparation and performance outcomes have yet to be fully assessed; however, success would provide important support to any commitment to passenger service. The Go/No-Go review for entry into passenger service has been deferred to ■ April 2022, to provide more time to demonstrate that the railway has met planned reliability levels after ELR200 implementation. However, successful achievement of all of the reliability and assurance pre-requisites in the time available will prove difficult, and the target date of ■ May 2022 is at risk. The corresponding P80 date is ■ June 2022, which remains within the declared opening window of the first half of 2022.

Significant scope remains for completion after Stage 3 opening and before transition through the Stage 5 opening sequence. CRL and RfLI continue to work towards an earliest start to Stage 5B Minus services in ■ 2022. However, with train rostering preparations needing to start by the end of ■ 2022, there will be little, if any, time to evidence operational passenger train performance in the Central Section, aside from a single 20 TPH service trial which is planned to be carried out in early May 2022. ■

CRL has been steadily reducing its workforce since the end of March 2022, but there are indications that planned demobilisations might be deferred over the next two periods¹. Loss of staff from the Bond Street Station team has threatened completion activities; similarly, RfLI and MTREL have experienced difficulties with recruiting and retaining resources.

The Canary Wharf Station contractor demobilised at the end of March 2022. A small residual team is being retained, both to complete works required for passenger service, and to support a MoBo contract extension caused by late Asset Data delivery, and this is putting upward pressure on final costs. The Routeway contracts are being scrutinised by CRL. Scope confirmation is required against C620 cost allowances and further C660 cost pressures are likely. The latter are attributed to the LFB communications issues, and resilience support to RfLI at Bond Street Station after SC3 ROGS.

The Sponsors' particular attention is drawn to the following:

- The CRL/RfLI Go/No-Go review for passenger service has been deferred to ■ April 2022, increasing the risk on the target date for entry of ■ May 2022.
- The expected reliability outcomes from ELR200 deployment and the ongoing H5.7 roll-out have yet to be fully demonstrated.
- While reliability has improved during the Timetable Demonstrations, the criteria for passenger service are unlikely to be met by the time of the CRL/RfLI Go/No-Go review on ■ April 2022.
- Challenges with the resolution of LFB communications issues threaten the achievement of the Stage 3a Revenue Service Assured milestone on ■ April 2022.
- Incorporation of all remaining scope and risk mitigations into the development of DCS v1.3, together with a complete QSRA, might drive Stage 5B Minus opening into 2023.

¹ Executive Programme Performance Review held on 20 April 2022.

1.2 Health and Safety

No incidents or accidents were reported from CRL’s construction related activities in Period 13. RfLI reported minor operational incidents, although these did not have an impact on safety. CRL has now improved the new system of safety measurement, and the reported safety statistics are now representative of site activities and reduced team sizes on the Programme. All safety metrics are within the parameters set by the Programme.

2. Programme Overview

2.1 Schedule

The Period 13 completion milestones are set out in Figure 2 - 1.

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Figure 2 – 1: Summary of Programme Completion Cardinal Milestones²

At Period 13, CRL is reporting no changes from Period 12 for all deterministic, P50 and P80 Cardinal Milestone dates. The final mass evacuation exercises and other operational trials were substantially completed on [REDACTED] March 2022 with Timetable Demonstrations taking place from [REDACTED] March 2022.

Delivery of safety assurance for the start of passenger service has continued throughout the period and the majority of SJs have been approved by ITAP. All Technical Files were submitted to the ORR, although resolution of the LFB communications issues will drive the release of the Authority to Place into Service (APIS) by the ORR into May 2022. Thus, while CRL continues to target [REDACTED] April 2022 for the completion of the Stage 3a Revenue Service Assured Railway, not all pre-requisites will be met by that date.

² Period 13 Executive Programme Performance Review meeting pack issued 19 April 2022.

The forecast Stage 3a Opening deterministic date remains ■ May 2022. The main risks to Stage 3a Opening remain system reliability thresholds not being met and the non-completion of LFB communications rectification works. The P80 date of ■ June 2022 remains within the declared opening window of the first half of 2022.

During Period 13, CRL has continued development of DCS v1.3 covering Stage 5B Minus, Stage 5B and Stage 5C. While CRL drives towards the deterministic dates for Stage 5B Minus and Stage 5B, risks associated with several scope items need to be evaluated in the finalisation of DCS v1.3. These include the resolution of the LFB communications issues, a solution for the signalling transition issues at the GEML interface, implementation of Auto-Reverse, and the need for RfLI to reduce the maintenance backlog. While solutions are under development, the P50, rather than deterministic dates for Stage 5B Minus and Stage 5B, are more likely to be achieved.

2.2 Commercial and Risk

At Period 13, CRL is reporting³ no change from its Period 12 forecast; the P50 AFCDC remains at £15,963m and the corresponding ■. The Period 13 draft P50 AFCDC is ■ above the current £825m funding threshold and ■ under the £1.1bn funding limit.

As expected last period, CRL has implemented its Target AFCDC forecast using period-end project cost estimates, risks and opportunities. As a consequence of CRL's ongoing revision of its Budget Scenario, at Period 13, CRL is reporting a reduced Target AFCDC of ■ and increasing Programme contingency by ■. Consequently, the Period 13 contingency allowances amount to ■, of which ■ is set aside under the COO reserve, and CTG⁴ is ■, which includes ■ of cost reduction opportunities. These opportunities can be attributed to CRL actual Indirect Costs below forecast, potential release of Commercial provisions as a consequence of reduced exposure, and the outcome from rationalising Scope Gap allowances.

While we maintain that CRL is successful in containing its costs and is beginning to identify some tangible cost reductions, we expect it to request the funding limit to increase. This is likely to be set close to CRL's target AFCDC of ■, which is ■ below the current P50 AFCDC and continues to be below the ■ funding request limit.

Although CRL is holding its forecast, ■ of cost pressures across Routeway and Stations have emerged in the period. However, these costs have been offset from CRL's contingency provisions. We believe that the continued erosion of these contingencies will compromise CRL's opportunity to outturn to the £825m funding limit.

As a consequence of moving to a contingency model, CRL has not undertaken a Programme QCRA this period. However, it has identified key areas of cost exposure above budget submissions made at Period 11, which suggests that approximately ■ additional exposure might need to be covered by Programme contingency. The QSRA is unchanged from Period 12, but is presently indicating approximately ■ additional exposure in respect of prolongation to Stages 5B Minus, 5B and 5C. Validation of these potential exposures is expected to be resolved once DCS v1.3 development has been completed.

³ Period 13 Executive Programme Performance Review meeting pack issued 19 April 2022.

⁴ Period 13 Elizabeth Line Delivery Group meeting pack issued 27 April 2022.

2.3 Organisation

Substantial demobilisation of the Canary Wharf Station contractor was achieved on █ March 2022, and CRL continues to progress the close-out of the Paddington Station contract. Bond Street is now the only station site on which a substantial number of resources is still engaged, and this is expected to continue until █ 2022.

Both RfLI and MTREL face challenges with resource retention and recruitment. MTREL has undergone significant turnover of resources following recruitment and training, and this threat is expected to remain until stable passenger operation is achieved. RfLI is reporting difficulties with recruitment of maintenance staff, which might reflect a competitive labour market. In the meantime, Programme teams are demobilising as contract end dates take effect.

2.4 Stage 3 Trial Operations, Timetable Demonstration and Passenger Service

Trial Operations ended on █ March 2022, with all but four exercises completed⁵; a period of Timetable Demonstration started on █ March 2022. The purpose of the Timetable Demonstration period is to lift reliability from the unsatisfactory average PPM level of █⁶ which was achieved during Trial Operations. The rationale is that operational focus can be applied to reliability growth without interruption from Trial Operations exercises and by minimising construction activity. The Timetable Demonstration period is expected to run until the start of passenger service.

Reliability is expected to rise, and there are early indications that this is happening. In the first two weeks of Timetable Trials, the PPM averaged █, and delays greater than 15 minutes occurred █ times a day, while the criteria for entering passenger service are 95% PPM, and approximately 0.5 delays per day. Both measures have therefore yet to meet passenger service entry thresholds.

RfLI will gather as much operating data as possible through April 2022 before it decides whether reliability is likely to meet the passenger service entry criteria by █ May 2022. However, this will provide little time to gauge the impact of ELR200 software deployment, completed during the Easter 2022 Blockade, or of ongoing the H5.7 software deployment, which is scheduled for completion in early May 2022. RfLI is aware of the general risk of service disruption 'cascading' from minor defects, and it intends to limit the impacts at service start-up⁷ by operating trains at █, but not allowing public access until █. This would allow staff the opportunity to manage unforeseen issues without the pressure of managing passengers at the same time.

The current primary causes of unreliability are GSM-R, management of ECS moves, PSDs, issues specific to trains and Under Platform Extractors (which affect PSD operation). There are plans to manage all of these, but it is uncertain whether they can be addressed sufficiently to support passenger service in █ May 2022. RfLI and MTREL operating staff performance appears to be improved in the more stable operating environment of the Timetable Demonstration period, compared to Trial Operations. The start of passenger service is likely to see a return of some disruption as passengers interact with the railway, but staff will be able to put into practice their 'embedded learning' from the Trial Operations period. Rules and processes must also continue to be adapted to ensure service recovery is optimised.

⁵ The remaining exercises are expected to be completed during the Timetable Demonstration period.

⁶ As achieved between █ January and █ March 2022.

⁷ Start of Service (SoS) is recognised as a high risk period of the operating day, potentially affected by staff shortages, engineering works and faulty trains. Failures during this period can affect the morning peak services.

The Timetable Demonstration period has shown early signs of improved railway performance, but currently not enough to meet the reliability thresholds. Taken with the late delivery of the LFB communications remedial works, CRL and RfLI have deferred the Go/No-Go review to passenger opening on ■ May 2022, from ■ April 2022 to ■ April 2022. CRL and RfLI recognise that a decision at this time will be based upon limited reliability performance, and that it will carry risk.

2.5 Stations Commissioning and Handover

While the Canary Wharf Station contractor substantially demobilised as planned at the end of March 2022, a small residual team will remain engaged to deliver discrete packages of works that are required for the start of passenger service. The teams are targeting completion of the remaining 10 EOWs by ■ April 2022. Completion of the Asset Data scope has slipped, which will result in an extension of the MoBo works being undertaken by the contractor. This is expected to have further cost implications, which are currently not captured in the AFC.

The Bond Street Station team is working toward a deterministic target of the end of ■ 2022 for opening to passengers. The team has a stretch target of the end of ■ 2022, but challenges remain. Most notably, completion of the fire stopping and suppression works is targeting the end of ■ 2022 to complete, with the testing and commissioning activities to complete thereafter. The scope of physical works is reducing, and the remainder was scheduled for completion during the Easter 2022 Blockade. However, urgent LFB communications testing was prioritised at short notice and, with blockade performance results as yet unconfirmed, it is possible that the works at Bond Street Station will run on beyond April 2022. It will become apparent during Period 1 whether the deterministic date for opening will hold or whether the earlier stretch target date can be achieved. In the meantime, planning for the demobilisation of the Tier 2 contractors and of CRL's own team will start.

The Paddington Station ECHC documentation was signed prior to the end of March 2022, with full contract completion sign-off expected by the end of April 2022.

2.6 Assurance

The ■ April 2022 date for achieving the Stage 3a Revenue Service Assured Railway is at risk. This is primarily due to the need to resolve issues of inadequate coverage at Central Section cross passages, which have been raised by the LFB. ■

■ A potential solution has been identified, but coverage trials need to be completed to verify designs and to allow implementation to proceed. CRL is aiming for completion by the end of April 2022, although risk remains and this date is not certain, so there is likely to be an impact upon the Stage 3a Revenue Service Assured milestone date of ■ April 2022. This issue must be resolved before final Technical File approval by the ORR.

ITAP continues to make itself available to flexibly support CRL and RfLI safety assurance demands. Additional meetings have been arranged and held through April 2022 and outstanding submissions have been progressively reviewed and accepted. Much of the outstanding work now lies with CRL and RfLI to ensure that the top-level submissions are aligned and persuasive in their expression of readiness for passenger service.

2.7 Future Stages – Stage 5

The milestones for Stage 5 implementation are unchanged since last period, with the forecast dates given in Figure 2-1. However, the underpinning schedules for both Stage 5B and 5B Minus are still to be validated, and the P50 dates are subject to change⁸.

The decision to proceed with Stage 5B Minus will need to be made by the end of [REDACTED] 2022, to enable train planning to be developed in time for the deterministic start date of [REDACTED] 2022. The decision will be driven by whether the railway is capable of delivering a reliable and maintainable 22 TPH service and, as with last period, RfLI continues to establish the commitment criteria. There will be little, if any, passenger service experience to draw upon and RfLI and MTREL are expecting to have carried out one⁹ of six Stage 5B Minus demonstrations before the end of [REDACTED] 2022 decision deadline. Further train (H5.73) and signalling (ELR210) software upgrades are necessary, in conjunction with process improvements, to lift performance before the opening of Stage 5B Minus. Another programme of process improvements is likely to be required when the Central Section services run onto the GE and GW Main Lines.

[REDACTED]

The decision to proceed with Stage 5B will need to be made by late [REDACTED] 2022, when NR must be advised what service pattern will be introduced in the new [REDACTED] 2022 timetable. The availability of Auto-Reverse functionality at Westbourne Park and the delivery of system reliability remain two main areas of concern.

Implementation of Auto-Reverse will require the prior delivery of infrastructure works, train software and signalling CBTC software changes. The works, as currently scoped¹⁰, could take until [REDACTED] to deliver. CRL wants to work with the ORR to establish if temporary measures (e.g. motion detectors) can be applied in the short term. Auto-Reverse functionality also requires changes to the train (H5.10) and signalling (ELR220) software configurations. There is currently little float, as these configurations are scheduled to be loaded by early [REDACTED] approximately [REDACTED] before the start of Stage 5B. There would also be little opportunity to assess whether any regressions had been introduced.

Assessing the reliability of the service may be slightly easier than for Stage 5B Minus, as there is expected to be approximately [REDACTED] of Stage 3 passenger operations data, and the outputs from three or four 24 TPH service demonstrations, to assess. It is anticipated that, in conjunction with modelling, the data will demonstrate a PPM of [REDACTED], which will give NR confidence that the timetable plan is viable. It is therefore important that Stage 3 opens as soon as possible and performs well, in order to support growth towards the Stage 5B performance thresholds.

⁸ EPPR meeting held on 23 March 2022.

⁹ The first demonstration will be at 20 TPH.

¹⁰ A particular issue is gaining trackside access to erect fence lines.

Stage 5C marks when service patterns change from the two in Stage 5B Minus, to one in which GWML and GEML services are integrated through the Central Section. Current modelling by MTREL is achieving [REDACTED], with further work underway to meet the Sponsors Requirement of 95%. As with Stage 5B, it will need Stage 3 services to perform well to provide confidence that the timetable will perform as planned. The timetable submission date is in [REDACTED] for a May 2023 implementation.

The common challenge to all of the Stage 5 opening stages is the provision of assurance in advance, that the railway will be sufficiently reliable for future timetable change. Notwithstanding the GEML signalling auto-transition issue, the lack of comprehensive reliability evidence by the end of [REDACTED] 2022 remains a major risk to starting Stage 5B Minus in [REDACTED] 2022. For Stage 5B, further performance evidence will be available, but a delivery schedule must be in place which gives confidence that Auto-Reverse will be available by [REDACTED]. Good progress with both of these issues will positively influence preparations for the delivery of Stage 5C in May 2023.