



## **Crossrail Project Representative**

Crossrail Joint Sponsor Team

**Sponsor Summary**

**Project Status Report 129**

**Period 6 FY2019-20**

**18 August 2019 – 14 September 2019**

Document No. B2111500/129/1.6

11 October 2019



**Official ~ Sensitive Commercial**

## Sponsor Summary PSR 129

Project no: B2111500  
Document title: Sponsor Summary for PSR 129  
Document No.: B2111500/129/1.6  
Date: 11 October 2019  
Client name: Crossrail Joint Sponsor Team  
Client no: RM 3730  
Author: [REDACTED]  
File name: PSR 129 Period 06 FY 2019-20 Sponsor Summary v1.6

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Note: This report relies on the information set out in CRL's Period 6 reports augmented by more current information received by PRep during the course of our routine discussions with CRL since the Period close on 15 September 2019. Note that information emerging after the close of Period 6 is subject to formal confirmation by CRL in its Period 6 reports. This report is supplemented by our weekly reports to JST and regular meetings with JST staff.

### Document history and status

Revision	Date	Description	By	Review	Approved
1	8 October 2019	PSR 129 Period 06 FY 2019-20 Sponsor Summary v1.4	[REDACTED]	[REDACTED]	
2	11 October 2019	PSR 129 Period 06 FY 2019-20 Sponsor Summary v1.6	[REDACTED]	[REDACTED]	[REDACTED]

# Sponsor Summary

## Health & Safety Performance

Two scaffolders suffered significant injuries when a scaffold tower they were working on collapsed at Farringdon Station. [REDACTED]. The root cause of the issue has still to be communicated, as the issue has legal ramifications. CRL is not content with this approach, as valuable learning could be shared, and has written to the Principal Contractor.

CRL has recognised the pressure its own teams are facing to meet the challenging targets ahead and have provided access to the mindfulness app ‘Headspace’ to all members of the project. The app provides techniques to aid stress relief and is both innovative and forward-looking. This approach by CRL should be commended and considered by other major programmes.

Due to current performance levels by the Tier 1 contractors (some are scoring themselves perfect scores in safety performance), CRL is being forced to intervene. CRL may want to consider making the contractors performance more visible, to increase accountability. Contractor H&S reports, currently sent to their JV Boards, have been requested; however, to date not all contractors have replied. This is a disappointing response.

H&S KPI	Target	Aim	Period 4	Period 5	Period 6
HSPI	2.20	-	2.70	2.68	2.67
RIDDOR AFR	0.15	0.06	0.08	0.08	0.08
HPNM	-	-	0.31	0.37	0.35
LTI	0.23	0.15	0.14	0.15	0.16

Figure 1 - 1 ~ Health and Safety Performance COS

## Programme Delivery

### Underpinning the DCS (Cost & Schedule)

This period, CRL has retained the [REDACTED]. This slippage results in the Stage 3 Opening forecast moving [REDACTED]; this is still within the opening window.

The main driver for this slippage is the delay to the production of the Engineering Safety Justification (ESJ) for Systemwide, due to assets not being tested, the sub-optimal quality of documentation and volume left to complete. While the key dates generally continue to be maintained, we are seeing widespread float compression and drift in the period, with 40 milestones slipping, compared to 21 improving. A number of these milestones have slipped more than 20 days in the period (with an individual maximum of 84 days) and CRL may want to consider employing a threshold (say 20 days), against which a justification should be provided for slippage. We also note a number of the contractors’ Level 3 dates are showing negative float, in comparison to the CRL schedule, with differing views being exhibited; this is most notable at Paddington.

In comparison with the original project dates (Project Team and Tier 1 contractor signed-off plans), 71 of the 120 milestones are now forecast to be late, with 47 Cardinal Milestones and 14 Board commitment dates showing a late date. While these reflect an overall shift in the general

dates, at present, we would not recommend a re-baseline of the schedule, to ensure the Programme’s focus is maintained. As we have stated previously, while there are issues with the DCS, the robustness is much improved upon that of the previous MOHS.

An increase in number of milestones is scheduled for completion in the next 8 weeks (20% of overall cardinal milestones), which includes a number of stations SC3 dates. This period will define the success of the overall programme going forward and stretch CRLs ability to deliver Stages 3, 4 and 5. As well as providing early experience, learning from the Shafts and Portals must be embedded in the handover processes for the Stations, scheduled over the next 4 months.

CRL is currently updating its procedures to reflect its new ways of working, and we note that the planning process is one which is still to be updated. This increases the risk of inconsistent approaches to the structure and update of the DCS, although CRL does have a structured planning team to limit anomalies.

**Assurance, Oversight & External Bodies Review**

CRL’s assurance process continues to be reconstructed. Highlights in the period include:

- 70% of the procedures still to be updated and communicated to the team - target end of October 2019
- CRL has stated that the two TARs are to follow an output-based approach, and while there is some analysis of the output, it does not fully underpin this methodology. As such, CRL must be clear in advising of the limitations of this approach to Sponsors and the CRL Board. CRL is planning to provide a verbal update to its findings at the October 2019 CRL Board.
- CRL has completed its first Period Assurance Report (PAR); this has raised 4 key issues:

Issue	CRL Response
H&S Culture	Stand-down brief and strategy refresh
Productivity	Commercial renegotiations, Productivity Manager appointed, CIF
Technical Assurance	Review of safety integration to be undertaken by ADL by 30 September
Clear Scope Definition Roll-out	CRL to consider single point guiding mind approach

*Figure 1 - 2 ~ Issue vs CRL Responses*

- Of the 29 criteria assessed by the CRL assurance team, 4 are ranked ‘high-risk’ and 25 ‘at risk’. A verbal update is planned each period for the Executive Group, rather than the CRL or Sponsor Board. We advise Sponsors that this report should be issued for their review.
- TfL audit team has initiated its first two reviews, focusing on CRL’s forecasting process and workforce planning. It is still awaiting external consultants to supplement the existing team and to complete the remaining reviews identified in its plan.

KPMG has been re-engaged by Sponsors to carry out a follow-up to its previous report and to provide Sponsors with a Preliminary view of emerging thinking and changes to the CRL scenarios. A presentation is expected to be made at the November 2019 Sponsor Board.

The Infrastructure Project Authority (IPA) has also been engaged by DfT to carry out a review of CRL’s assurance process. A presentation is expected to be made at the November 2019 Sponsor Board.

As stated previously, co-ordination of the Three Lines of Defence, PRep, KPMG, Expert Panel, IPA, JST and TfL audit activities is key to ensuring there is no duplication and they cover a wide range of subjects. It is also important that CRL's limited management bandwidth is not adversely diverted from the challenge in hand to support these reviews.

**Programme Execution**

CRL has appointed a 'productivity lead' to maximise the work the Delivery Teams are completing on site. In our view, this is a positive intervention, even though it is disappointing that the Tier 1 contractors do not feel obliged to carry out this task themselves. This approach has led CRL to adopt a 24/7 working arrangement at Liverpool Street, Paddington and Whitechapel Stations, to ensure the contractors' work is completed as soon as possible, and that prolongation of costs are limited.

In addition to accelerating the contractors' works, we highlighted in our last report that, given the behaviours currently being demonstrated by the Tier 1 contractors, CRL may want to consider

[REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED]. While this approach is not risk free, it was an approach that was successfully employed by the Olympics Delivery Authority (ODA) and other large programmes, such as Doha Metro.

CRL is becoming increasingly dependent upon the Tier 1 contractors and their design consultant partners to provide the paperwork for Technical Assurance and Handover. We highlighted this issue in our PSR 125 and have re-affirmed in this report. Understandably, CRL appears to be trying to fill the void created by the Tier 1 contractors, rather than holding them to account. This approach does, however, result in the contractors' true level of performance being masked. As such, CRL may want to consider 'Making Performance Visible', to highlight the performance of the individual contractors and their design partners, as well as providing a comparative performance across the Crossrail Programme, enabling best practice to be shared.

**Cost, Commercial & Risk**

The AFCDC has reduced by £1m in Period 6 to £15,004m. [REDACTED]  
[REDACTED], but represents an overspend of £41m above Sponsors Funding of £14,963m.

CRL has identified headline emerging and evolving threats to the AFCDC which may be compensated by potential opportunities. CRL has identified these as 'Headwinds' and 'Tailwinds' respectively. Presently, the threats outweigh opportunities by a considerable margin, with a differential of adding between [REDACTED] to the current AFCDC.

Additionally, CRL is reporting that eleven Programme Milestones are forecast to be delayed beyond the Board Commitment date of which one, Eleanor Street Shaft, cannot be recovered. The impact of this is included in the current AFCDC. CRL is investigating mitigation for the remaining milestones and will provide an update to its November AFCDC to incorporate the impact of unmitigated delays and the re-assessment of risk provision.

The Period 6 AFCDC shows that £41m of savings is required to come under or equal the funding package. Current scenario indicates that CRL mitigation and savings targets could exceed [REDACTED].

It is apparent to us that the Crossrail Team is focusing strongly on delivery, which does increase the risk this will be to the potential detriment of commercial constraint. We are observing that across the Projects, the use of risk allowances as a perceived 'funding' source, in order to offset increases in AFCs. We believe that Risk items should be individually reviewed, mitigated or retired as part of the periodic process and a new QRA being undertaken as a result of the review, not as a 'drawdown' against risk to fund an AFC increase. We are concerned that some CRL processes appear not to be informing decision-making but have transitioned into a recording and reporting of the resultant impact of a decision, are therefore not achieving the intended value or benefit. Cost increases are being realised where decisions are being taken expeditiously in order to achieve schedule dates. We note and recognise that CRL has identified these issues and has prepared an AFDCD and Risk Update Paper for CRL Board attention on 10 October 2019.

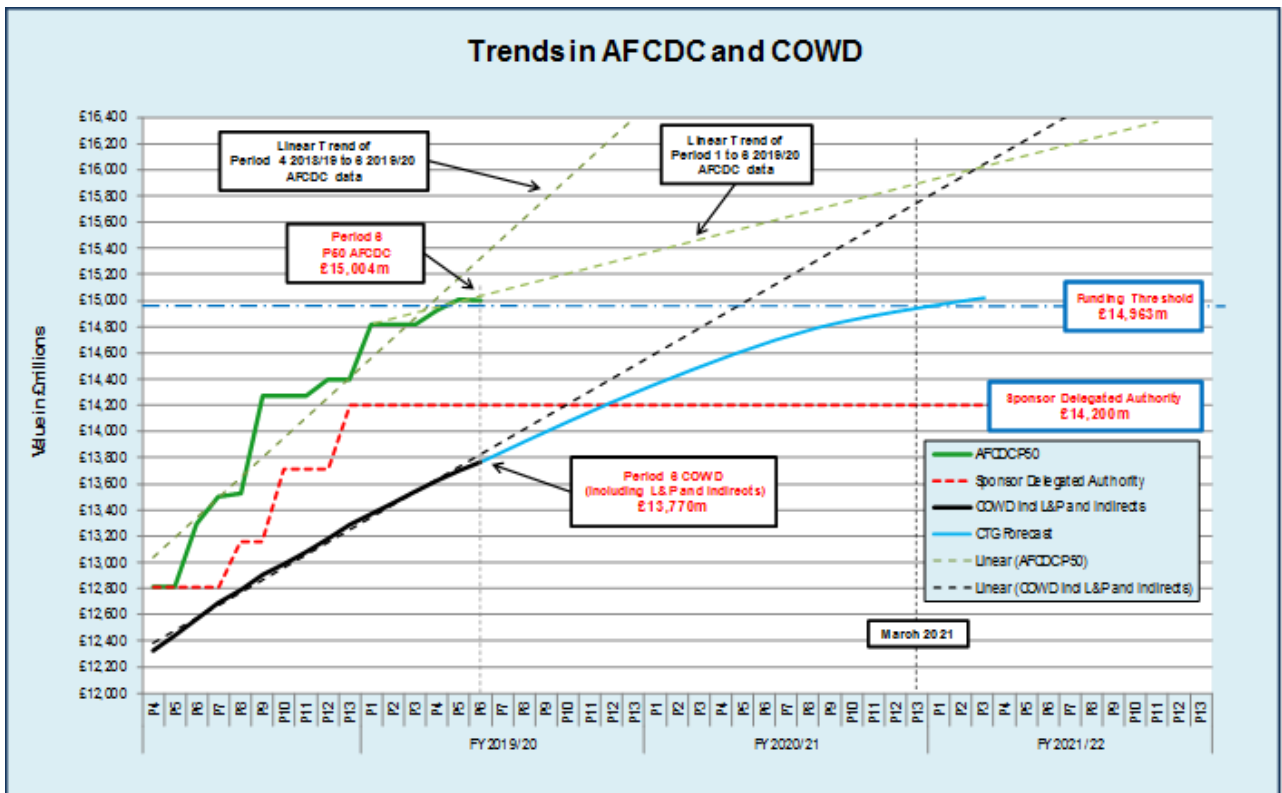


Figure 1 - 3 ~ Trends in AFDCD & COWD

### Stage 2 Phase 2

The principal risk to Stage 2B Opening is now the production and compilation of safety authorisation evidence. The forecast date for the software that enables driver training to start has slipped by 2 weeks in the period<sup>1</sup>. The risk to the train's software development programme has receded with the successful completion of the '39' formal integration tests with the wayside ETCS.

██████████ We would expect the delay in this period to put pressure upon that date.

<sup>1</sup> RSD Period 7 Week 2 Dashboard.

## Stage 3

### Stations, Shafts and Portals (SSP)

CRL has issued instructions confirming that KENTEC fire panels, many of which have already been installed, will need to be replaced. This will have a schedule impact on forecast SC3 dates for Stations, Portals and Shafts, because of procurement lead times and re-work for installation of the replacement panels.

[REDACTED]

The concentration of resources on achieving the handovers at Victoria Dock and Pudding Mill Lane Portals has clearly had an impact on the other sites. This level of effort may not be sustainable, given the schedule for the other assets to meet DCS timeframes.

There is a continued trend of progressive delays in the forecast dates over the last four periods (Periods 3, 4, 5 and 6). The rates for the submission of certification documentation, O&M Manuals and Red-Line Drawings, on all Portals and Shafts, may still be too optimistic and that further delays could still occur.

### Dynamic Testing

Strategic planning has been recently made more complicated in the period, by the identification by Siemens of software errors during off-site factory testing of configuration P\_D+10. Although investigations continue, it is already understood by CRL that recovery from these errors will have a significant influence upon how Dynamic Testing will be completed. Siemens has confirmed that corrections will be implemented in configuration P\_D+11, which, unavoidably, will now contain functionality which is critical to entry into Trial Running. Production of this configuration was already part of the Siemens strategic plan for software development, and it is understood that the timings associated with P\_D+11 delivery contained within the DCS will be adhered to. However, P\_D+11 is not due to be made available to the Central Section until 9 December 2019, [REDACTED].

Early investigations have shown that the errors are contained within the Automatic Train Protection (ATP) component of P\_D+10. Siemens has therefore agreed with CRL that P\_D+10 will still be deployed as planned but using the corresponding tested ATP component from P\_D+8. Clearance of the ATP test logs associated with P\_D+8 has been prioritised by Siemens, and the reduced P\_D+10 configuration (which has become known within the Crossrail Signalling fraternity variously as 'P\_D+10 Minus', 'Lite' or 'Hybrid') was loaded onto the CIF on 27 September 2019; the configuration is planned to be made available to the Central Section on 6 October 2019, in line with the DCS.

While outline plans are progressively being put in place to reduce the practical impact upon Dynamic Testing, the arrangements for supporting document preparation, submission and safety assurance review have not yet been finalised. The impact goes beyond the need for further incremental safety approvals to maintain testing progress. BT must now confirm that it is still able to secure final safety assurance associated with the integrated Rolling Stock/Signalling software, given the revised software build proposals; it also needs to reconcile the proposed timescales with its declared deadline of 11 November 2019, for the provision of assurance documentation by Siemens. CRL is working closely with BT on the issue, and their review continues.

Despite the positive and collaborative contributions from all affected parties to date, this is a significant set-back in a critical workstream of Crossrail Programme delivery, with the full implications still to be established by CRL. Taken together with the current status of all other pre-Trial Running critical activities, and the difficulties associated with the completion of outstanding scope during the Trial Running period, which have not yet been fully assessed, a delay to the start of Trial Running on [REDACTED] as originally conceived appears inevitable.

CRL has still yet to secure enough GEML interface possessions to allow Siemens to demonstrate the correct functioning of the interface prior to Trial Running. With no opportunity for improvement in late 2019, CRL has focussed upon bookings in the first quarter of 2020. NR has recently offered 5½ hours of access across the interface on Friday and Sunday nights<sup>2</sup>, in early 2020, and CRL is considering how that additional time might assist. CRL believes it can address MTR-C's concerns using possession availability after the start of Trial Running, because the peak demand for access does not occur until up to 6 weeks later, as part of the ramp-up of multiple train headway trials. Sufficiency of GWML interface possession bookings is still subject to Siemens confirmation of transition testing scope.

### Approvals, Assurance and Agreements

RAB(C) and subsidiary Sub-Groups have continued to meet in the period, although the anticipated bow-wave of submissions to support the start of Trial Running has not yet occurred. RAB(C) has confirmed recently<sup>3</sup> that it has the current capacity to process up to 8 documents per month; approximately 70 documents must be accepted to achieve ROGS, which illustrates the size of the safety approval challenge.

Following the formal handovers to RfL last period of Pudding Mill Lane and Victoria Dock Portals, anomalies with the assurance certification and supporting documentary evidence have been identified. While these are not necessarily safety-related issues, it should be noted that RAB(C) approval is given on the assumption that full and certified evidence will be delivered to RfL-I, as set out in the documents under review; if not, the basis of the approval is undermined, and confidence in the process is weakened. Further handovers have been deferred by RfL, pending the outcome of CRL's investigations.

Following the initial presentation to RAB(C) on 17 July 2019, CRL has developed its Crossrail Engineering Safety and Assurance Case (CESAC) strategy and has made a further presentation<sup>4</sup>. The CESAC strategy has been proposed as a means of articulating the Assurance Case, not just for the End State railway, but also for the interim states of Trial Running, Trial Operations and the Staged Openings. It will rely upon Structured Engineering Judgements (StEJ), in conjunction with formal assurance documentation, to support the development and acceptance of the Safety and Assurance Case for Crossrail. Delivery of the strategy would: require an early commitment from interfacing partners (i.e. CRL, RfL-I, MTR-C); changes to the way safety arguments are already being presented; re-runs of formal safety, operability and maintainability reviews for the interim states; and, most significant of all, the establishment of an independent panel of experts to carry out the formal Judgements.

The proposal is considered by CRL to be the best (and possibly only remaining) means of achieving an overall approval in line with DCS timescales. While the development and delivery of the CESAC is a significant workload with an outline estimated additional cost of [REDACTED], we would anticipate there will be opportunities for partners to provide direct support. Approval of the CRL Board will be sought, and we expect to provide an update next period.

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<sup>2</sup> Signalling Vis-Board Review held on 30 September 2019.

<sup>3</sup> Sponsor Board held on 20 September 2019.

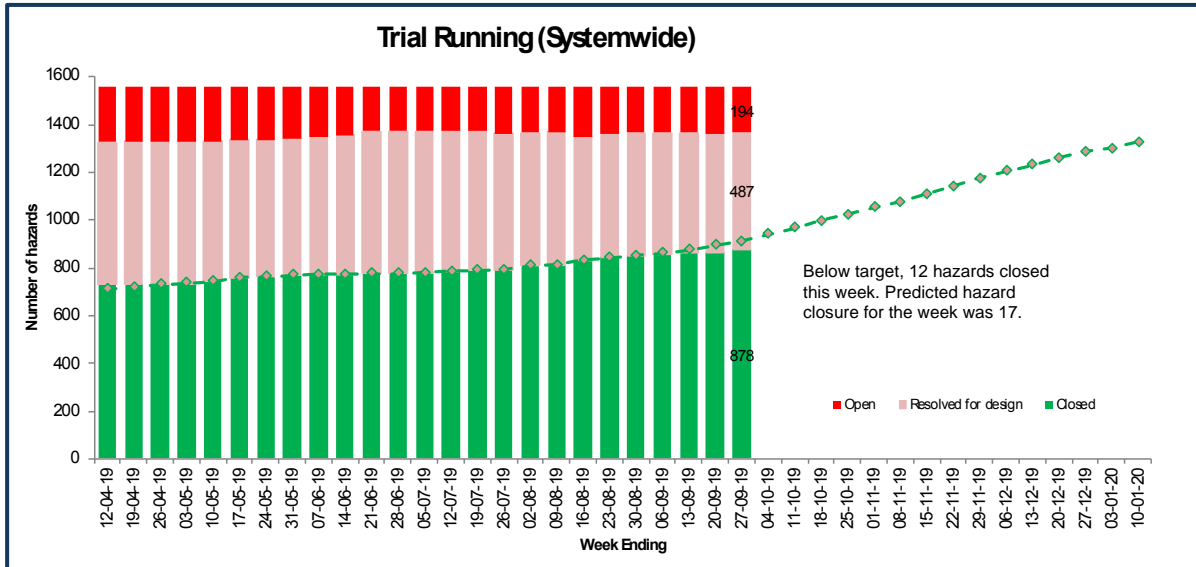
<sup>4</sup> RAB(C) Meeting held on 26 September 2019.



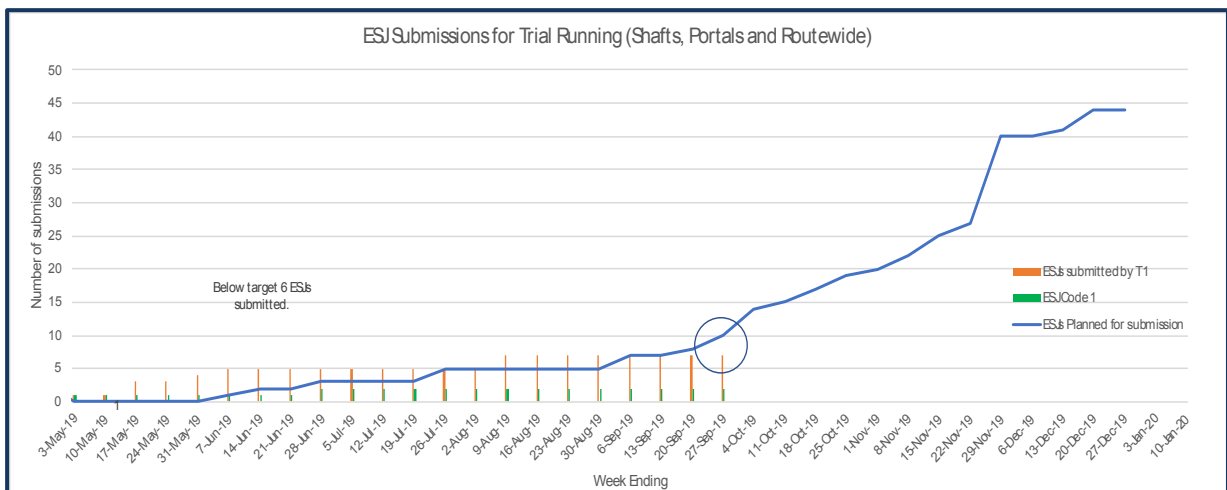
The completion of safety assurance evidence is beginning to lag behind what is required to meet the DCS schedule<sup>5</sup>. This is the case for both Routeway and Shafts & Portals Hazard Closure. These are the building blocks to the completion of ESJs and SJs, and there will be consequential impacts upon these key deliverables.

The delays are being caused by slower production of Testing & Commissioning evidence than planned, and a lack of approved O&M Manuals.

Figure 1 - 4 and Figure 1 - 5 from the CRL Assurance Vis-Board illustrate the issue:



**Figure 1 - 4 ~ Hazard closure for Trial Running systems. Required for Engineering Safety Justification**



**Figure 1 - 5 ~ Engineering Safety Justifications – Trial Running. Required for T- Minus process**

The overall situation is illustrated by the CARE system, where each Element Handover deliverable is tracked.

<sup>5</sup> Re-baselined from EOP during Period 4.

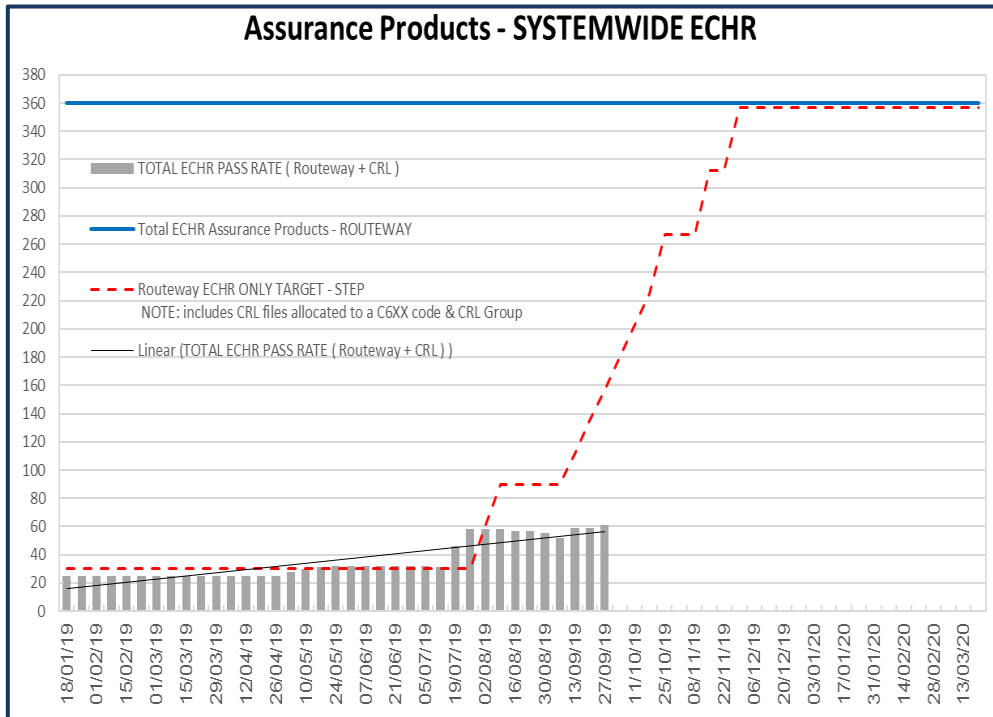


Figure 1 - 6 ~ Assurance Products – Systemwide ECHR

As we stated in our last report, either this will continue, and the DCS targets will be missed, or the evidence will be produced by contractors in large ‘chunks’ at the end of the submission period. There will be concerns about quality with such an approach, and CRL would need to significantly increase its resources to cope. CRL is aware of the issue, and it forms one of the five ‘tightening’ workstreams.

This situation is synonymous with Routeway and Plumstead Depot. We have illustrated the overall issue for O&M Manuals in the figure below.

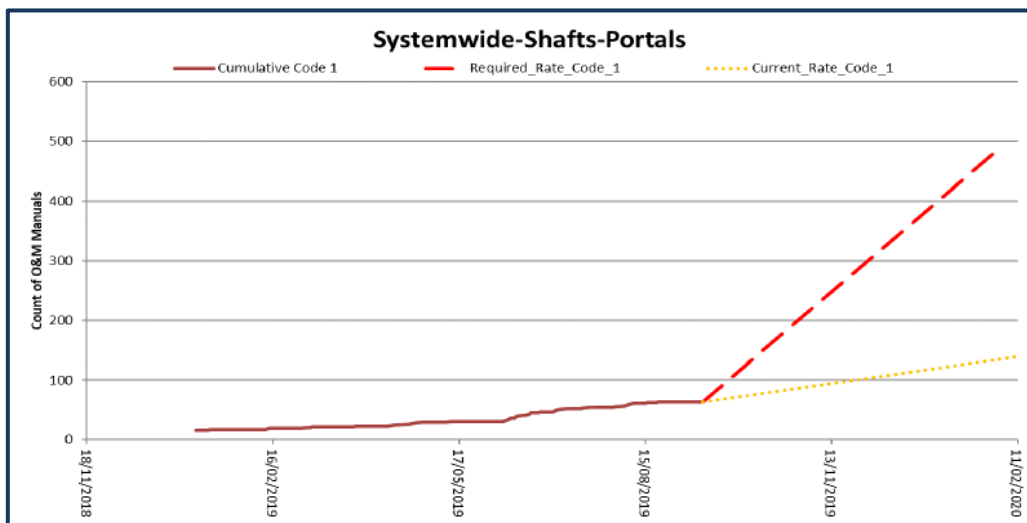


Figure 1 - 7 ~ O&M Manuals Packages – Systemwide-Shafts-Portals

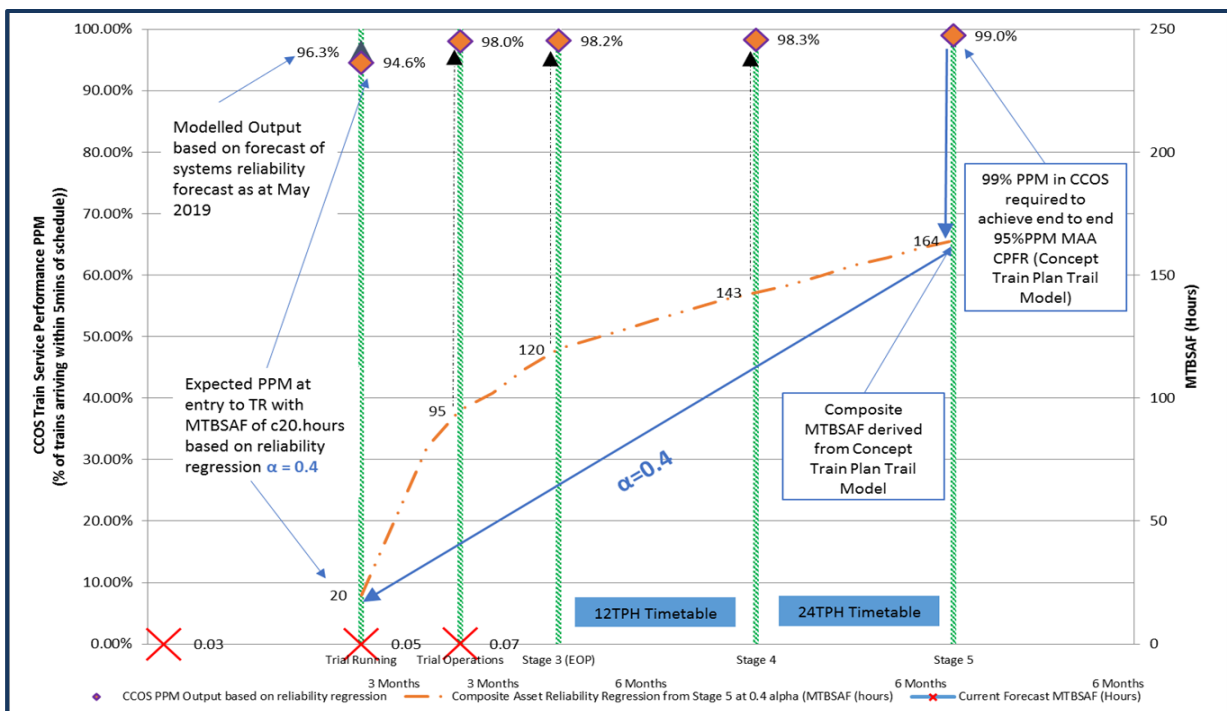
For the As-Built Drawings<sup>6</sup>, the IMs have accepted 3% from C660 and 17% of MEPA equipment (i.e. 1% increase for MEPA from Period 5). This rate of acceptance is not fast enough for Trial Running and CRL has agreed the submissions which are critical with the IMs to achieve this; however, even this will prove challenging.

Aside from the general delay to the Handover process, the other emerging concern is the level of residual works that will exist post-Stage 3 Opening. We recognise that there is an imperative to open Stage 3, but if there is an excessive level of works to be carried post Stage 3 then it could have consequences for Stages 4 and 5B. These works could be necessary for these Stages to proceed but will be more difficult to implement in an operational environment and could disrupt reliability growth. We will be assessing this area in more detail in the coming Period reports.

We believe an emerging key issue for the project will be the pace of reliability growth. This is recognised within RfL and CRL, who are trying to produce tangible progress in this area. Difficulties so far have been a lack of evidence being produced during Dynamic Testing, as Multi train testing has been limited and the TCMS and signalling systems are still being integrated.

CRL will need to establish a reliability baseline and will carry out reliability exercises during Dynamic Testing, such as 8-hour periods mimicking the service. This could be at the expense of functional testing, which will need to be carried at some other point in what is an intense Dynamic Testing schedule.

Figure 1 - 8 is CRL's initial work in assessing what that baseline could be, and how that would affect the growth required to meet the DCS<sup>7</sup>.



The graph assumes 3 months each for Trial Running and Trial Operations, and 6 and 12 months respectively for the opening of Stages 4 and 5 after opening of Stage 3. This matches the DCS.

Figure 1 - 8 ~ System Reliability Growth

<sup>6</sup> CRL Period 6 Handover Report.

<sup>7</sup> Reliability Board presentation on 10 September 2019.

The key points from the graph are that the entry points for each stage are measured by Mean Time Before Service Affecting Failure (MTBSAF) hours. These correlate to the PPM values at the top of the graph. The graph shows an MTBSAF of 20 hours to enter Trial Running, 95 for Trial Operations, 120 for Stage 3, 143 for Stage 4 and 164 for Stage 5B. The current MTBSAF is circa 6 minutes. There is no specific requirement to start Trial Running with a minimum of 20 hours MTBSAF, but a lower figure is likely to result in a longer Trial Running period.

### Stage 4 Summary

The context of reliability growth must also be related to the timetable bidding process. This starts with MTR-C bidding for the timetable 55 weeks before its start date. NR will require a minimum of 40 weeks' notice before the start date, that the operation will be robust.

[REDACTED]

### Stage 5 Summary

There has been an improvement in the Stage 5A programme in the period, due to increased flexibility in the SAT submission review process. The current NR forecast is that infrastructure works will be approved for passenger service by mid-November 2019. It is likely that the service will open using RLUs, which will have no service capacity impact, but will restrict the opportunity for the reliability growth which would have been of direct benefit to Stage 3 Opening.

### RLU – FLU Swap-Out

The FLU fleet has been slowly increasing its services on the Hayes & Harlington service, but the MTIN remains poor, reaching 760 in Period 6. However, the passengers are generally not affected due to the relatively minor nature of many of the faults and the speed of manual intervention. There is unlikely to be a significant improvement in performance until the Z1.00 software configuration is installed on the trains, currently forecast for the end of November 2019<sup>8</sup>.

This date is past the decision point of 15 November 2019 set by MTR-C as to whether FLUs or RLUs should start the 5A service. We therefore currently expect RLUs to open the service in December 2019.

### Stage 5A Opening - NR

The DOO CCTV programme has been improved since Period 5, as confidence in the SAT submissions has increased. This has led to more flexibility in the review and Operations Proving activities. As a result, the final Operations Proving activity in Period 5 was scheduled for early December 2019, but it has now been brought forward to mid-November 2019.

<sup>8</sup> Period 7 Week 2 RSD Dashboard. Z1.00 is also required to enable to the FLUs to operate the Stage 5A service.

## Stage 5B Opening

We have no additional commentary upon the progress of West Inner station enhancement works to that provided by CRL in its Period 6 Programme report.

The issue we raised in our last report concerning deletion/amendment of scope from the ONFR remains to be resolved between NR and RfL.

## Key Areas of Concern in the Period

We have agreed with the CRL Executive Team to hold a specific working session to provide greater understanding of the issues we feel have still not been fully addressed by CRL, as detailed in our previous letters. We see this as a constructive approach and will report back separately the conclusion of this session.

I would like to take this opportunity to highlight the key issues from the Period Report that we consider require further action or explanation to Sponsors by the CRL Leadership Team:

- a. We note the increasingly large number of issues with respect to handover paperwork and engineering assurance documentation. Could CRL demonstrate the alignment of current levels of production with the dates in the DCS?
- b. When does CRL believe it will have a detailed cost and schedule for the period of the project post-ROGS?