Completing the Elizabeth line

5 April 2023

Contents

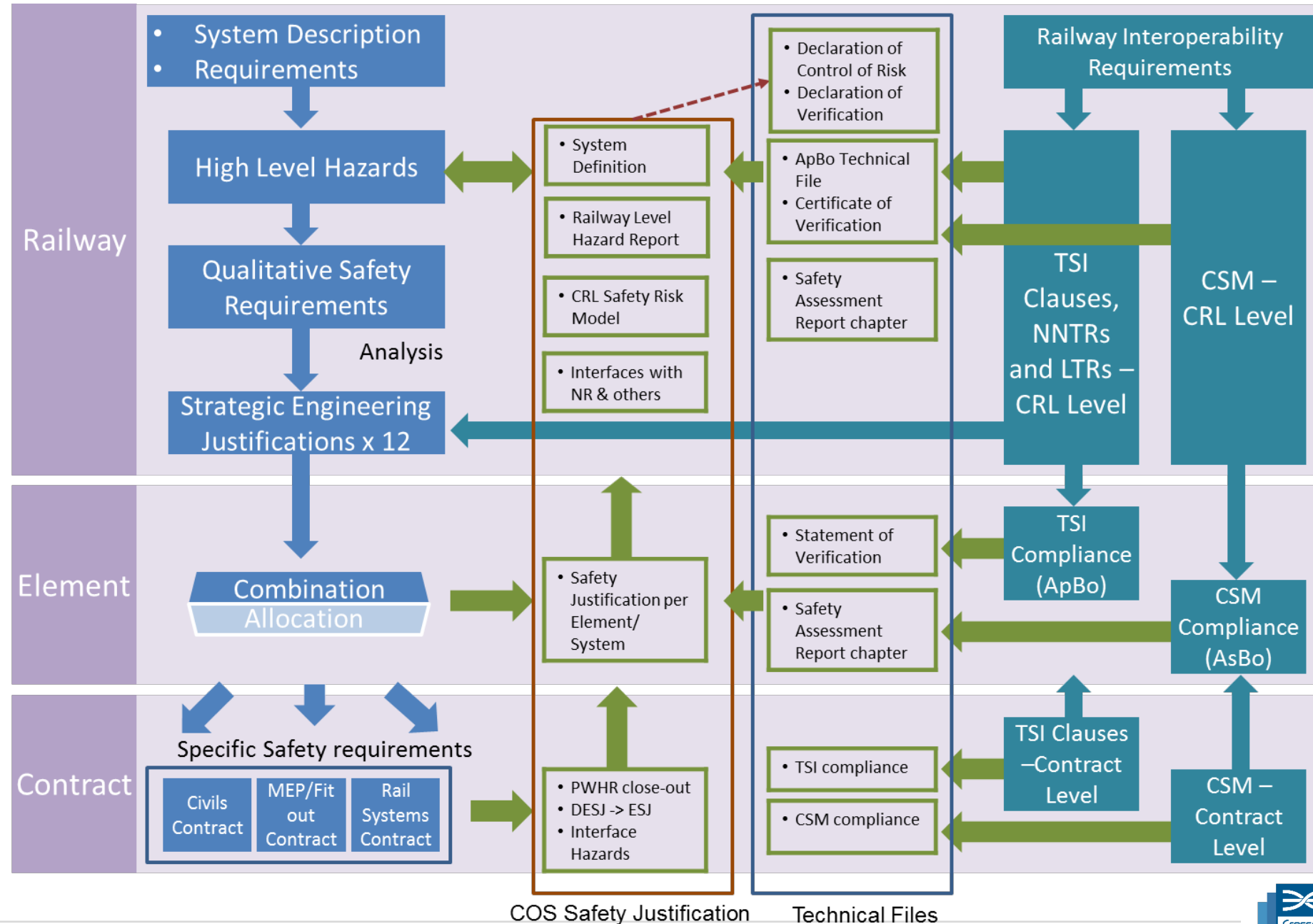# Systems Assurance - Safety

Hayat Zerkani Head of System Safety & Interoperability

1. How It's brought together

## Legislative Framework

- Interoperability Directive [2008/57/EC]
  - TSI compliance
  - Approved Body (ApBo)
- Safety Directive [2004/49/EC]
- Common Safety Method Regulation [Regulation (EU) 402/2013)]
  - Significant Change
 - Assessment Body (AsBo)

2. Get a grip on Complexity

- Each contract produced Engineering Safety Justifications (ESJs) – (Design ESJs at Final Design Overview, FDO), built in some cases on Product Safety Cases

- CRL produced the Integrated Safety Justifications (1 per element / railway system – (Interim Safety Justifications at FDO)

- CRL produced Integrated COS SJ and CESAC (Crossrail Engineering Safety and Assurance Case)
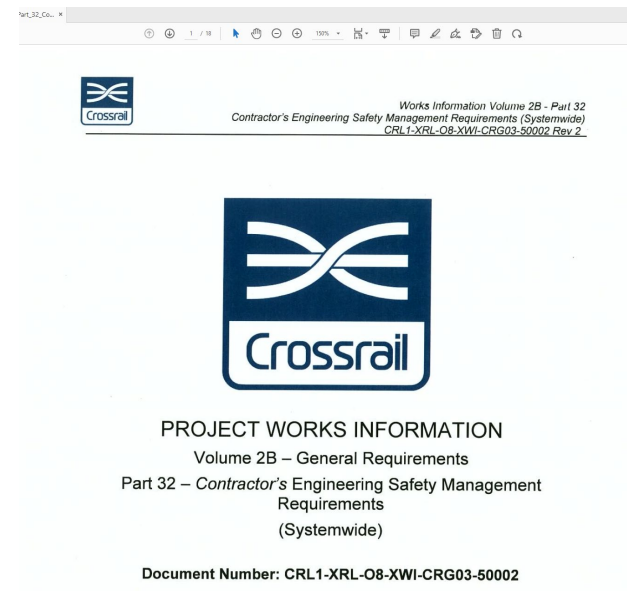

Central Operating Section System Safety Deliverables Hierarchy
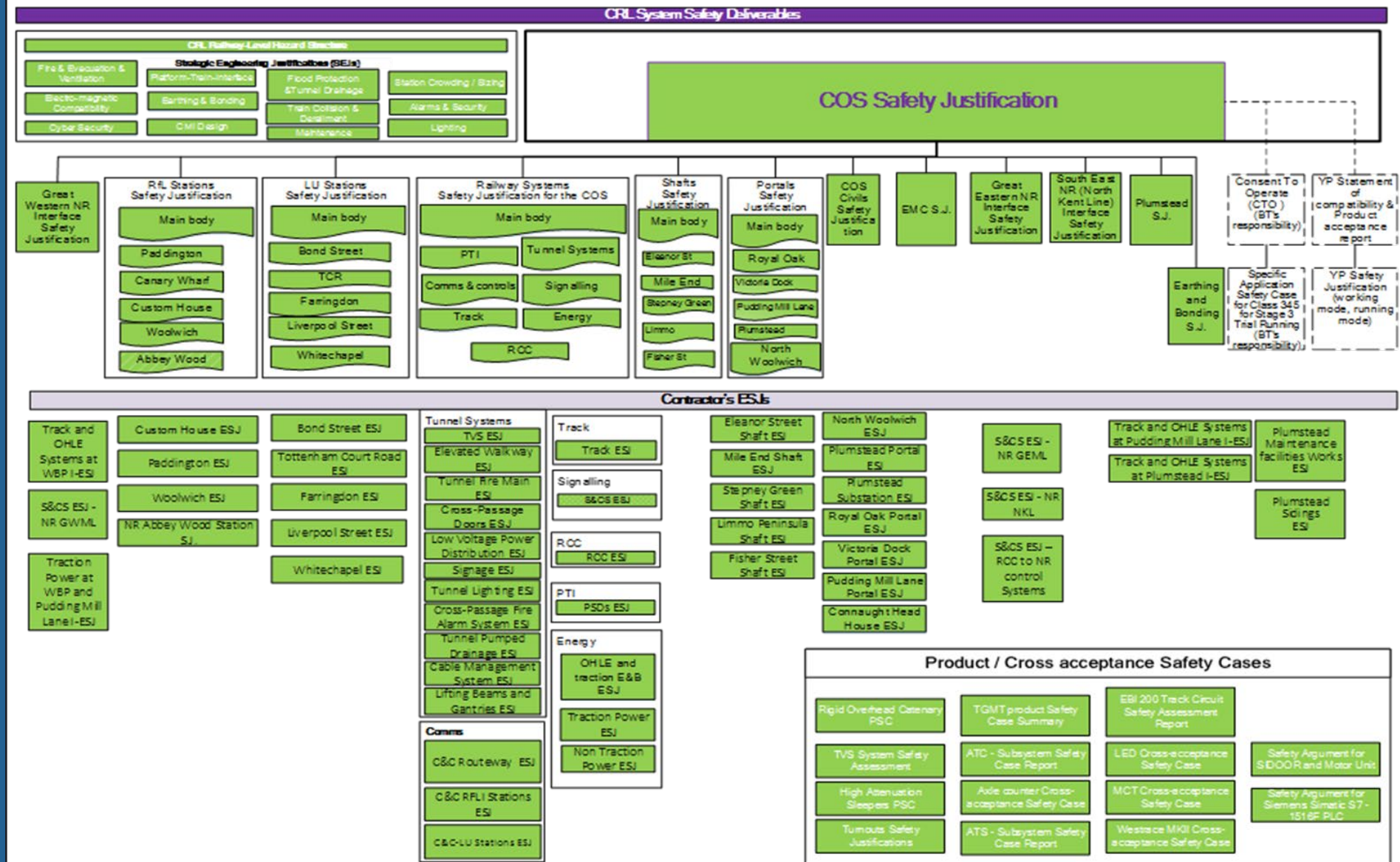
3. Progressive Assurance

- In 2019, introduction of the staged railway configurations

- CRL Safety Assurance strategy reset: management of agreed deferred functionality to allow progress to next configuration

- Safety Justifications with dependencies

- Agree acceptable dependencies with stakeholders:
  - ➢ Structured Engineering Judgement (STEJ)
  - ➢ Agree mitigations (e.g. Operating restrictions)

- Summarise status of dependencies and acceptability in 'Risk Statement'

- Accepted by System Review Panel RAB-C and later RFLI ITAP

- Sign 'Declaration of Control of Risk'

- Update deliverables for each configuration
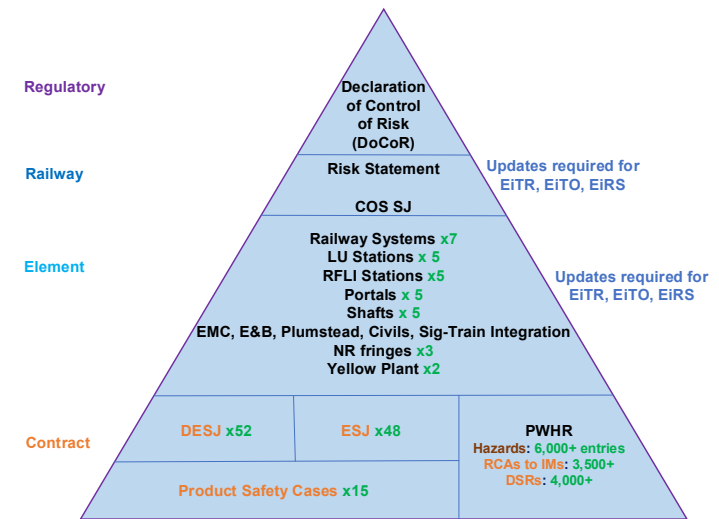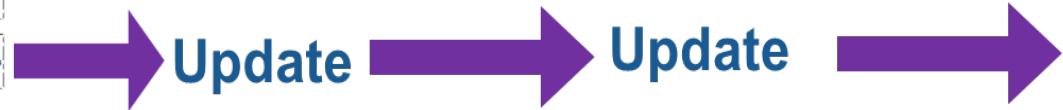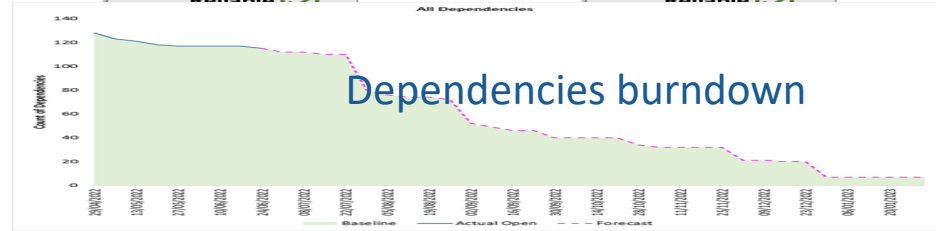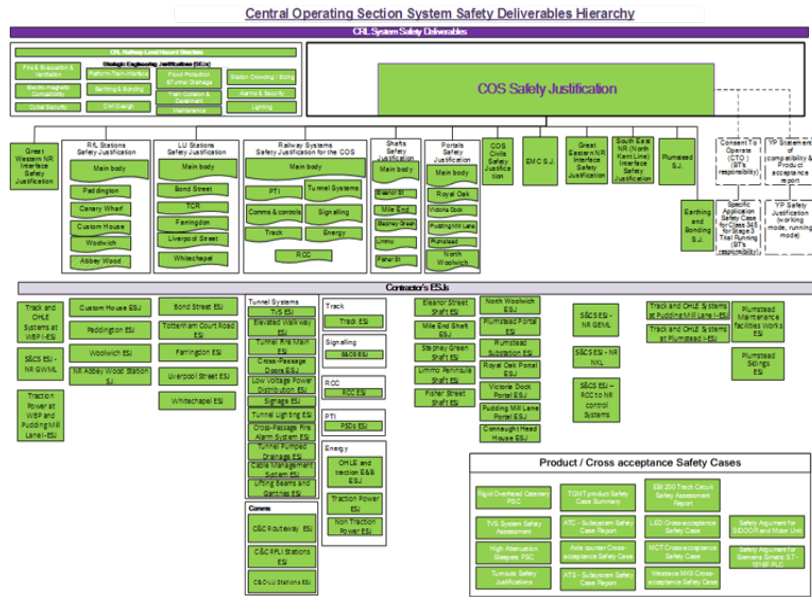
4. Consistency of safety management approach through all contracts

- Project Works Information for all contractors

- CRL ESM Reference Manual (Plan and other procedures) as a basis for all, used by AsBo to audit against

- Single Hazard Record (PWHR) for all
  - ➢ Core satisfaction to CSM
  - ➢ Allowed and evidenced Risk Control Action Transfer to IM/Operator
  - ➢ Risk Acceptance defined
  - ➢ Safety Requirements closure evidenced

- CRL Central team review/acceptance of all deliverables/hazards

Contractor's ESM Requirement
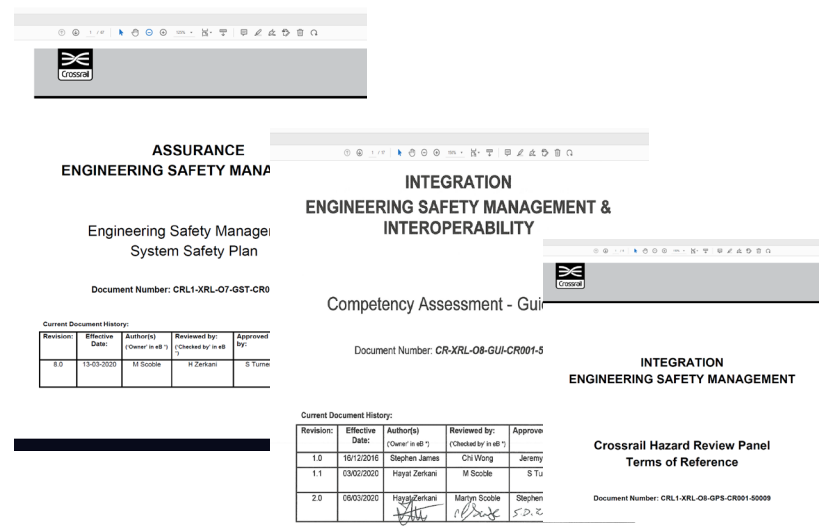
Works Information Volume 2B - Part 32
Contractor's Engineering Safety Management Requirements (Systemwide)
CRL1-XRL-O8-XWI-CRG03-50002 Rev 2

PROJECT WORKS INFORMATION
Volume 2B – General Requirements
Part 32 – Contractor's Engineering Safety Management Requirements
(Systemwide)

Document Number: CRL1-XRL-O8-XWI-CRG03-50002

ESM Reference Manual

One Hazard Record for all (PWHR)

## CRL Central Team Reviews/Accepts all

5. Robust Control Mechanism, Focus, Completeness

- Robust Controls: Aligning Dependencies with outstanding works and programme of delivery

- Focus on the deliverable easier by remote working:
  - ➢ Tools that can be used by all remotely
  - ➢ Strong working relationship well established before COVID

- Completeness:
  - ➢ Top down approach to hazard and risk management
  - ➢ Bottom up approach
  - ➢ Robust review process: Contractor/ISA, CRL, AsBo, RFLI/LU then RAB-C

- Everything by the book from the start! However, not always popular!

Robust Controls

SJ Dependencies Burndown Graph

Revenue Service EOWLs
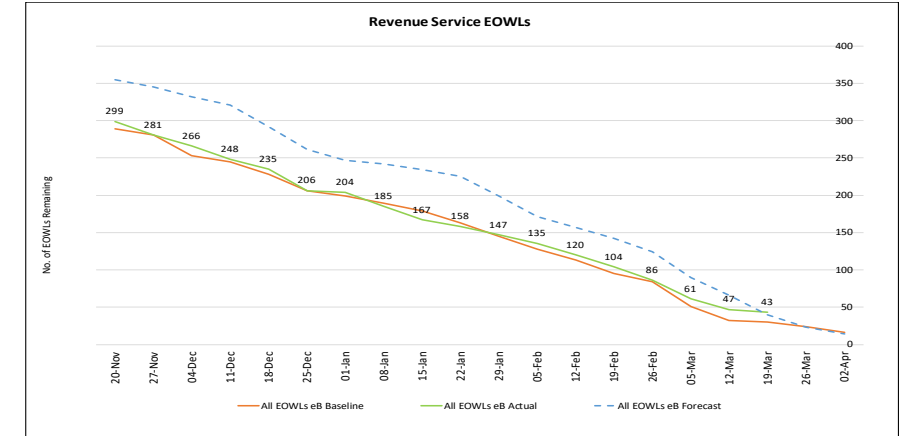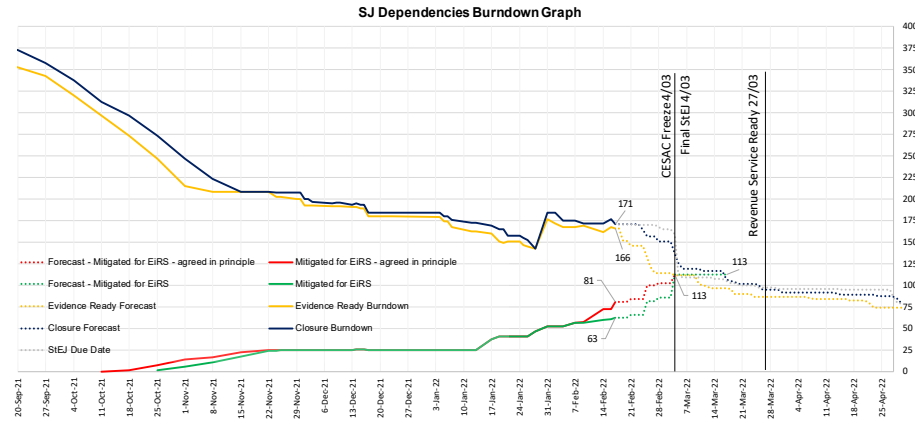
Focus and Remote working

ITAP Submission by duration
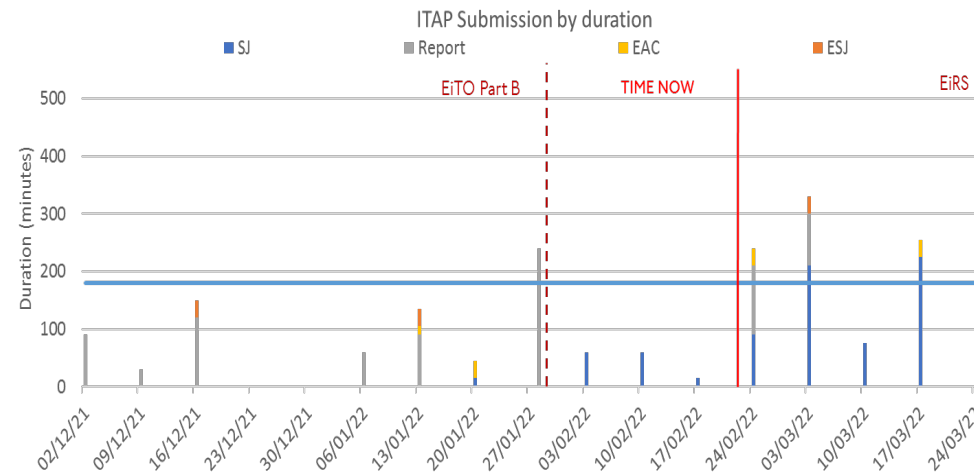
ORR confirms green light for Elizabeth Line