



Digital Railway
Joint Development Group

Summary Paper

TRU SDO 01 Analysis and additional benefits of ETCS

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Digital Railway



NetworkRail



Working together for a better railway:



Background

Analysis conducted in late 2017 assessed the capabilities of Digital Railway technologies on the baseline infrastructure and identified journey time, capacity and performance benefits that could be achieved on the Transpennine Route with Digital Railway technologies.

The next stage identified was to investigate whether Digital Railway technologies could reduce the number and / or scope of the SPOs required to meet the full DfT outputs.

Therefore, the TRU Digital Train Control formed a collaborative team from current and potential suppliers with expertise in developing ETCS schemes to respond to the following three problem statements in support of the TRU OBC submission in July of the same year.

This paper summarises the outputs of these problem statements at a high level for ease. For a full understanding of methodologies adopted, assumptions used and detailed outputs – the full slide deck should be reviewed.

Problem Statement 1

Design development to date has selected a number of significant civils/track interventions (with high costs associated) as preferred which are therefore presented within SDO 01 to the DfT.

Therefore, please propose / develop the ideal combination of ETCS Level 2 and conventional interventions in the West of Leeds area, concentrating on the key interventions highlighted via the TRU/JDG collaboration workshop:

- SPO 09/10 –Stalybridge
- SPOs 11 and 12 –Diggle and Marsden (in conjunction)
- SPOs 13 and 14 –Huddersfield station and remodel between Huddersfield (excl) and Ravensthorpe (in conjunction)

Outputs

Key observation is that all 3 suppliers utilised different methodologies and modelling tools but all drew very similar conclusions. It was further noted by all suppliers that the conventional scheme was very close to the limit in terms of constructability and optimisation.

SDO 01: capacity and performance with ETCS

- Headway: ETCS L2 could give TPE trains an average technical headway improvement of 34-40s compared to conventional signalling.
- Journey Times: No significant difference in journey times for the Class 802 or Freight
- Small ETCS journey time savings for local/freight services may be possible through restrictive aspect controls and more optimised braking profiles.
- Improved driving opportunities: ETCS gives better information and should allow drivers to handle the train more consistently
- Performance: It can be seen that generally Average Minutes Lateness (AML) improves between Huddersfield and Leeds as a result of improved “buffer” between flighted services. Performance of the timetable is generally better in the Down direction, due to a smaller speed differential between passenger and freight services

Note: Ultimate consistency in driving, leading to Journey Time and energy performance comes from “ATO with driver” as on Thameslink.

Capacity and performance analysis of ETCS on SDO1 concluded that headway can be reduced with ETCS and this resulted in performance improvement compared to conventional signalling. The performance improvement means there is opportunity to reduce infrastructure and deliver at a similar performance as SDO1. Suppliers focused on Stalybridge, Huddersfield, Ravensthorpe and found the following...:

Stalybridge

It appears that the remodelling at Stalybridge could be de-scoped, provided that the required Linespeed Improvements (LSIs) are delivered. ETCS L2 would offer the opportunity to increase the capacity and robustness of the Stalybridge layout without substantial remodelling.

3-platform layout at Stalybridge with conventional signalling would be able to accommodate the ITSS timetable with minor amendments; provision of ETCS L2 with no signals and hence zero overlaps would allow the unperturbed timetable to be accommodated with no amendments.

Huddersfield

It appears that Huddersfield Station will require some form of intervention, however, optimisation of signalling through the use of ETCS could potentially de-scope the extent of the required works. The work study demonstrated that the timetable could operate through Huddersfield station without the need for additional through platforms.

All works noted that significant problems occurred at Huddersfield in the Down Direction, application of ETCS would optimise the signalling to improve traffic flow and optimise headways through this area.

Ravensthorpe

The grade separated junction at Ravensthorpe and the four tracking between Huddersfield and Ravensthorpe could be de-scoped. With the implementation of ETCS some four tracking would be required but the provision of additional bi-directional signalling via ETCS could remove the grade separated junction and reduce the four tracking closer to Mirfield.

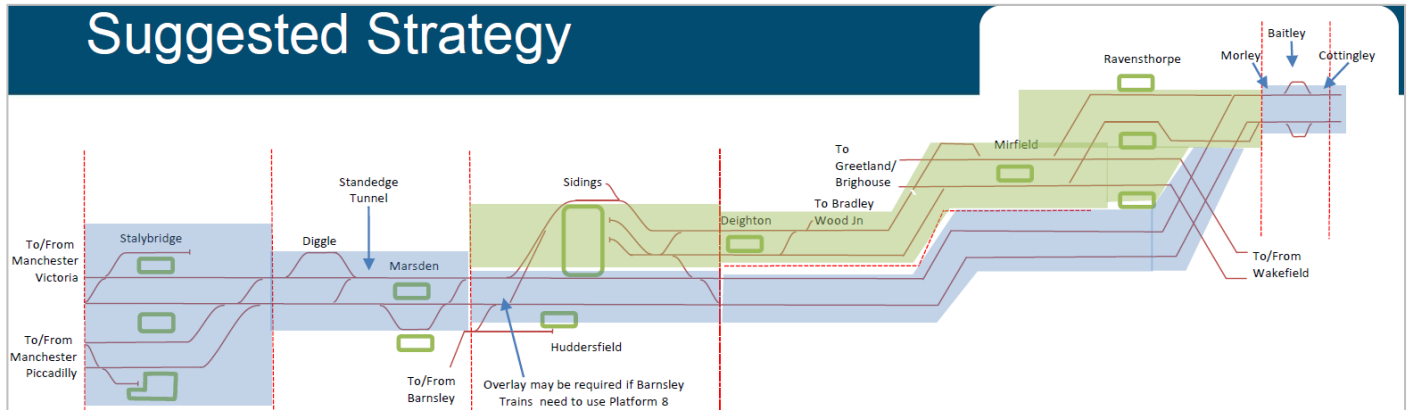
This conclusion was caveated by the need to optimise the current timetable allowing trains to pass at Mirfield instead of Ravensthorpe. It was also noted that it would have a potentially negative impact on both journey time and performance.

Problem Statement 2

Please provide a high level strategy – aligned to TRU’s proposed tranche delivery – which details the migration (Stalybridge to Cottingley) from today’s railway to ETCS Level 2 no signals (noting any exceptions captured in the list of assumptions).

Outputs

Suggested Strategy



Service Routes	Final scheme configuration
Manchester – Leeds	ETCS only signalling, no conventional signals. All trains operate using ETCS with optimised headways and performance.
Huddersfield – Bradford	Overlay is retained on the slow side of Huddersfield and the slow lines to Bradley Wood Junction to facilitate the unfitted Northern Trains class 158 stock.
Huddersfield – York	Overlay is retained on the slow side of Huddersfield and the slow lines to Ravensthorpe Junction for the route to Wakefield.
Bradford – Kings Cross	Overlay is retained on the lines connecting Brighouse – Wakefield to facilitate unfitted Grand Central stock operating this route.

High level principles

- Avoid having two Signalling Systems during track works
- Stable Infrastructure for ETCS
- Plain line sections first for lower risk
- Deliver early benefits where possible

Staging

1. Diggle / Marsden area – 2022/23 – ETCS first
2. Stalybridge – 2023 – ETCS first
3. Batley area – 2023/2024 – ETCS first
4. Ravensthorpe – 2024 – ETCS overlay (slow lines)
5. Ravensthorpe – 2025 – ETCS first (fast line)
6. Huddersfield – 2026 – ETCS overlay

Problem Statement 3

Other than contribution to the DfT strategic outputs, what additional benefits could deployment of ETCS Level 2 (Stalybridge to Cottingley) provide? This should focus on, but not be limited to: track access, maintenance, operational flexibility, and benefits to TOC/FOC stakeholders.

Outputs

Key benefits

- Bi-directionality
- Driveability – conventional scheme pushes signalling implementation to its limits especially, modified aspect sequences due to considerable amount of banners and mix of 3 and four aspects.
- Signal sighting / spacing requirements - The nature of track geometry and alignment at numerous sections in TRU results in poor sighting which demands additional mitigation. This elevates the SEU rate thereby increasing the scheme cost, where Signal Sighting will generally consume significant design effort. Additional 'blocks' can be implemented to improve for example platform re-occupation time, where conventional signals would not be possible or practicable.
- Safety
 - SPAD / collision / over speed protection
 - Level crossings: opportunities to optimise 'red' time and 'count down times'
 - Temporary speed restrictions: opportunity to increase safety of red zone working
- Maintenance – reduced lineside infrastructure to maintain and vegetation control for signal sighting avoided. Associated lifecycle cost reduction.