Institute of Railway Technology

SUMMARY OF REVIEW OF THE ARTC PROPOSED UPGRADE PLAN TO ACHIEVE V/LINE PASSENGER CLASS 2 TRACK GEOMETRY ON THE VICTORIAN NORTH EAST RAIL LINE

by

Institute of Railway Technology

Monash University

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EXECUTIVE SUMMARY

The Institute of Railway Technology (IRT) at Monash University was engaged by ARTC to undertake an independent review of the proposed upgrade plan for the North East Rail Line in Victoria. This review is to form a view on if the scope (the methodology applied and the prioritised scope defined) would achieve V/Line Passenger Class 2 track geometry. A funding commitment of $235M has been made available with the upgrade works being delivered as an ARTC Major Project. The key outcomes of the review are:

- The upgrade plan targets punctuality, ride quality and resilience (relating to operations).

- ARTC have undertaken an in-depth assessment of the North East Rail Line and developed significant supporting data to derive the proposed upgrade plan.

- The majority of the upgrade cost is targeting the introduction of either 50 mm or 100 mm of clean ballast into the existing track structure.

- The upgrade plan principally addresses the removal of mud holes, upgrades to level crossings and bridges, drainage, tamping and lining and ballast refreshment. These activities appear reasonable and targeted to achieve the objectives.

- Delivery of the defined Project scope will achieve V/Line Passenger Class 2 track geometry at the completion of the project. In this report the ongoing requirements post upgrade for maintaining the track to V/Line Passenger Class 2 track geometry have not been addressed.

It is considered that the proposed plan targets the key criteria outlined and should provide a much-improved and more maintainable track at the completion of the works within the current budget of $235M.

DISCLOSURE NOTICE

(Please read before reading report)

PURPOSE:

This summary report is a deliverable of an independent review performed by the Institute of Railway Technology at Monash University of the North East Rail Line upgrade plan proposed by ARTC.

The purpose of the review is to form a view if the methodology applied and the prioritised scope defined for the upgrade to the North East Rail Line in Victoria would achieve V/Line Passenger Class 2 track geometry at the completion of the upgrade program.

This document provides a summary of key findings. Additional information can be found in the comprehensive reports provided as part of the study.

AUDIENCE:

The work described in this report was commissioned by ARTC and should not be relied upon by other organisations.

ASSUMPTIONS/QUALIFICATIONS:

The observations, conclusions and recommendations made in this report are based on information provided by ARTC.

FURTHER INFORMATION:

Further information can be obtained from Mr. Ravi Ravitharan at the Institute of Railway Technology.

EXTERNAL SOURCE MATERIALS:

The Institute of Railway Technology (IRT) and/or Monash University do not accept responsibility for the validity or accuracy of any source material or data used in this study that was not generated by IRT.

Institute of Railway Technology

Monash University (Clayton Campus)

17 College Walk (Building 31), Victoria 3800, Australia

Telephone: +61 3 9905 1986 Facsimile: +61 3 9905 1972

www.irt.monash.edu

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1   BACKGROUND

The Commonwealth Government have committed $235M funding to upgrade the existing Victorian North East Rail Line (NERL) to achieve V/Line Passenger Class 2 standard performance [1-2]. ARTC have developed a project plan on how to utilise the funding in order to upgrade the network to the required Class 2 standard. The ARTC upgrade plan aims to improve:

- Train punctuality;
- Ride quality; and
- Track resilience.

ARTC has engaged the Institute of Railway Technology (IRT) at Monash University to conduct an independent review of the upgrade plan. This summary report focusses on assessing the capability of ARTC's upgrade plan to deliver a V/Line Passenger Class 2 track on the North East Rail Line. Ongoing maintenance requirements to sustain the performance at V/Line Passenger Class 2 standard post upgrade was not covered in the review.

The purpose of this document is to summarise key findings of the review only. More detailed reports have been produced as part of the detailed study.

Details of the scope of work were provided by ARTC and these are summarised in Table 1. The review assessed these work activities to determine the efficacy of the proposed program.

TABLE 1: WORK ACTIVITY PRIORITISATION AS PROVIDED BY ARTC

Work activity priorities		Attribute being addressed		
		Punctuality	Ride Quality	Resilience
1	Mud hole removal: undercut and full width ballast cleaning	✓	✓	
	Resurfacing: tamping and lining		✓	
	Turnout reconditioning: including replacement of steelwork components where necessary, tamping and ballast cleaning	✓	✓	✓
	Signalling – Replacement of overhead line wire with underground cabling	✓		✓
	Signalling – Installation of backup power supplies to minimise signalling outages	✓		✓
2	Cess drain improvements			✓
	Rail grinding		✓	✓
3	Bridge works: Conversion of transom underbridges to ballast top deck and realign rails or re-transom transom underbridges which have gauge or line issues		✓	✓
4	Recondition bridge ends and level crossings		✓	✓
5	Ballast depth improvement: 50-100 mm ballast depth increase depending on track conditions		✓	✓

2   KEY FINDINGS

The following is a summary of the key findings of the investigation.

2.1   INFORMATION TO SUPPORT THE PROPOSED UPGRADE PLAN

ARTC supplied a range of information to facilitate the review. Overall this data was found to be of very high quality, indicating that significant effort had been placed on ensuring a detailed understanding of the NERL network existed. Key data included:

- An excel based worksheet summarising the current condition of the asset and proposed upgrade activities within each section;
- NERL maintenance records covering the period 2003 to 2018; and
- Detailed plots of asset condition.

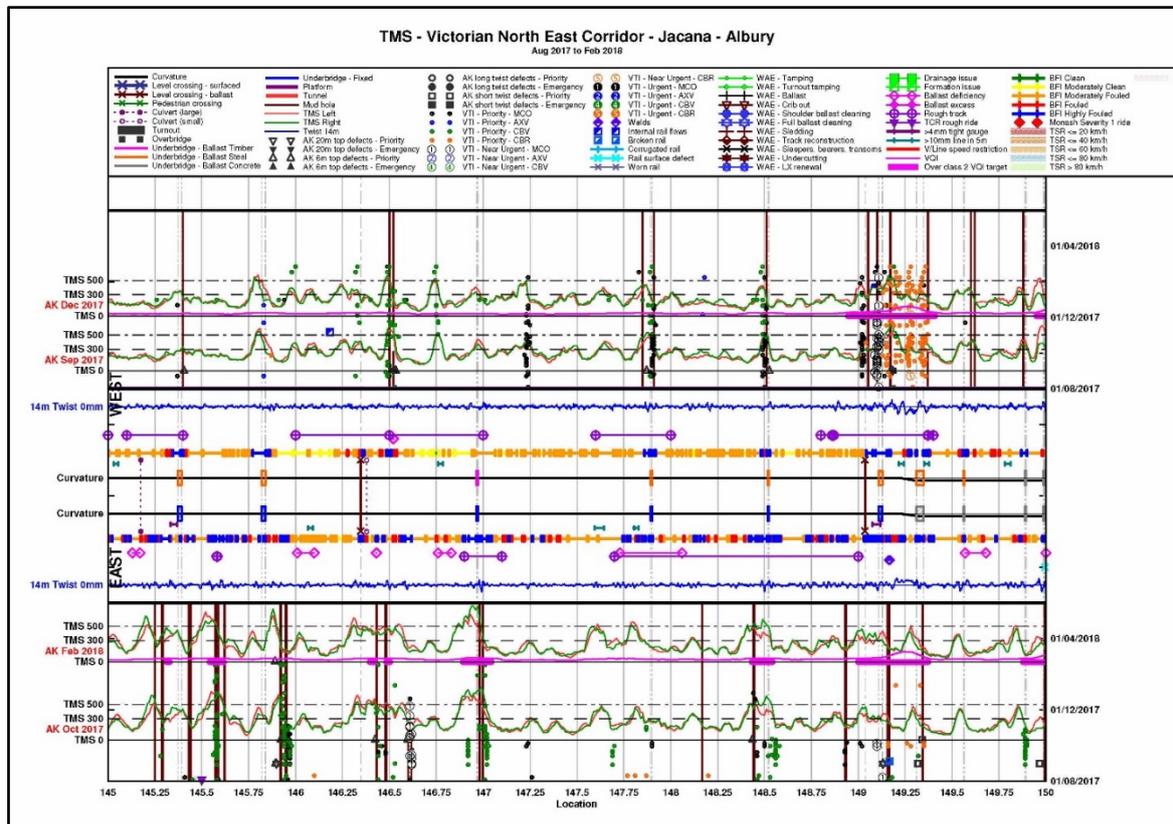An example of the asset condition plot is shown in Figure 1.

FIGURE 1: DETAILED CONDITION DATA UTILISED BY ARTC IN DEVELOPING THE NERL UPGRADE PLAN

2.2   UPGRADE PLAN SUMMARY

Based on the analysis of the information by ARTC, the following are the key components of the proposed upgrade plan to achieve V/Line Passenger Class 2 track standards at the completion of the project:

- Identification and removal of all existing mud holes:

    o Currently 234 locations on the east track and 137 locations on the west track have been flagged

    o Where formation issues also need to be addressed, these will be actioned during the upgrade

    o Small regions of ballast cleaning have been identified

- Addition of new, high quality, angular ballast across the majority of the network (between 50 mm and 200 mm) to facilitate improved geometry retention

    o Ballast additions will be supported by tamping and lining across the Network to achieve desired track standard

    o Drainage is also to be addressed across the Network

- Replacement of a significant number of short transom deck bridges to ballast top

    o Existing bridges are difficult to maintain to required geometry standards

- Rail grinding (minimum single pass) across the entire network

Given the age of the NERL, significant ballast fouling exists across much of the Network. Whilst it would be preferable to undertake full width ballast cleaning across the Network, this is not possible within the current funding commitment of $235M.

2.3   CRITERIA TO ASSESS TRACK CONDITION

An important criteria in determining upgrade priorities is the assessment of track condition. ARTC focus of the Top Moving Sum as the primary parameter to assess track condition. Additional information is also available including the Victorian Quality Index (VQI), VTI hits as well as passenger ride data from V/Line's Instrumented Revenue Vehicles (IRV). Whilst these multiple parameters exist, the findings of the study indicate that whilst each of the parameters has pros and cons, in general, all of these parameters identify similar track locations as being poor. Figure 2 shows an example of this measured data with an overlay of TMS, vehicle ride and mud hole locations, showing the high level of correlation between each.

All data indicates that the focus on mud hole removal must be a high priority, as there is a very high correlation with poor ride and high TMS levels.

Currently approximately 150 km of the NERL Network sits below the required V/Line Passenger Class 2 VQI limit, with these locations being targeted during the upgrade program.
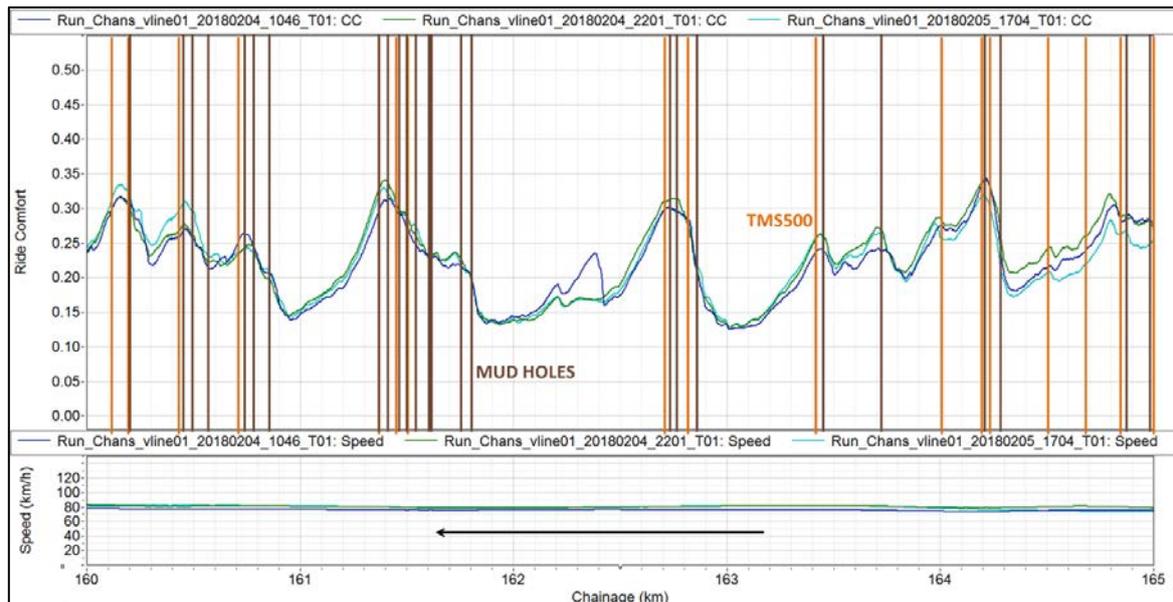
FIGURE 2: INSTRUMENTED REVENUE VEHICLE DATA (RIDE COMFORT) OVERLAYED AGAINST ARTC MUD HOLE LOCATIONS AND TMS500 PEAK LOCATIONS (EAST TRACK).

2.4 SUMMARY

The following summarises the key findings of the review.

- The current NERL upgrade plan aims to achieve V/Line Passenger Class 2 track standards across the majority of the network at the completion of the upgrade.

- The majority of the upgrade cost is targeting the introduction of either 50 mm or 100 mm of clean ballast into the existing track structure.

- A site inspection was conducted between Seymour and Benalla. Based on this visual assessment, the focus on (i) mud hole removal, (ii) ballast addition in conjunction with tamping and lining and (iii) transom deck bridge replacement was reinforced.

- The ongoing requirements to maintain the V/Line Passenger Class 2 track geometry has not been addressed as part of this review.

- Given the overall condition of the NERL in terms of ballast quality and fouling, the proposed plan targets the key criteria outlined and should provide a much-improved and more maintainable permanent way at the completion of the works within the current funding commitment of $235M.