

ROLLESTON ACCESS IMPROVEMENTS

TECHNICAL NOTE

APPROACH TO MULTI-CRITERIA ASSESSMENT

WAKA KOTAHI NZ TRANSPORT AGENCY

7 July 2021

QUALITY ASSURANCE

Rev.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
1	8 June 21	Version 1	MS	MM	AK	AN
2	23 June 21	Version 2 – updated following WK comments	MS	AK	AK	AN
3	7 July 21	Version 3 – added some option information	AN	MS	AK	AN

1 INTRODUCTION

This memo summarises the approach to multi-criteria assessments (MCAs) that are being undertaken as part of the Rolleston Improvements Detailed Business Case (DBC). The MCAs will be one of the tools being used to help the project team establish emerging preferred options for each of the following elements of the NZ Upgrade Programme (NZUP):

- **Flyover** – establishing the preferred alignment for a new flyover connection between Rolleston Drive and Hoskyns Road. The MCA will also help identify the preferred intersection arrangements at either end of the flyover.
- **Rolleston Drive South**. Improving safety outcomes while retaining some network connectivity is the key outcome desired for upgrading this intersection.
- **Dunns Crossing Road/Walkers Road Intersection**. A significant reduction in the risk of death and serious injuries (DSIs) is the key outcome required from upgrading the intersection. There is also a desire that this intersection will act as a gateway to Rolleston and the primary access to the industrial area for freight traveling from the south.
- **Service Lane** – the new service lane will deliver safe and efficient access to the Rolleston town centre (via Tennyson Street and Brookside Road) and some of the service businesses along the state highway corridor. **Waka Kotahi have confirmed that there is no need for the project team to assess alternative options**; but do need to ensure that the service lane design integrates safely with SH1.
- **Rail Network Improvements** – One of the outcomes required from the NZUP investment is improved connectivity between the Midland Line and the Main South Line in Rolleston.

These locations are shown in Figure 1.



Figure 1: Location of interventions

Other tools that will be used to help establish emerging preferred options are:

- Indicative cost estimates
- Traffic modelling (particularly for the flyover options)

The following sections outline the criteria that will be used in assessments as well as a summary of the methodology that will be employed.

2 APPROACH TO THE MCA

The MCA processes have looked to align as closely as possible with Waka Kotahi's MCA Template and User Guidance (March 2020), and where possible, a consistent set of criteria will be used for all assessments. Alternative weightings may end up being used for different MCAs as the relative risks (e.g. property) may be different

The NZUP scope is clearly defined, and as such we are at the point where we are refining options rather than considering fundamentally different alternatives.

We would therefore expect that most options being considered should inherently strongly support the delivery of the project Investment Objectives (IOs) and desired NZUP outcomes. A two-phase approach to the MCA has therefore been undertaken:

- **Phase 1:** A pass/fail of each alternative against the investment objectives and NZUP outcomes. Any alternatives which do not support the investment objectives or NZUP outcomes will be dropped at the end of this phase.
- **Phase 2:** MCA of remaining alternatives, focusing on criteria that correspond to the key project risks.

2.1 Phase 1: Pass/Fail vs IO's and NZUP Outcomes

2.1.1 Criteria

The themes of the investment objectives are:

1. Work towards zero injuries and deaths by reducing intersection conflicts.
2. Support a more connected community, resulting in liveability benefits.
3. Provide a more sustainable and resilient network.

The NZUP outcomes that the project must deliver are:

1. Improve safety for all road users by reducing the number of deaths and serious injuries (DSIs).
2. More inclusive access to economic and social opportunities in Rolleston by improving mode choice.
3. Enhance Rolleston's competitive advantage and business productivity by improving connectivity between the town centre and the industrial zone.
4. Reduce CO2 emissions associated with land transport.

2.1.2 KPIs

To help with the evaluation against the Investment Objectives, a series of KPIs have been identified.

IO 1: Work towards zero injuries and deaths

This investment objective will have two KPIs associated with it:

- DSIs – existing DSIs within the study area will be documented and analysis will be undertaken to determine the extent to which proposed interventions contribute towards improved safety outcomes.
- Reduced road/rail incidents – the number of incidents or near misses at existing level crossings will be documented and analysis will be undertaken to determine the extent to which proposed interventions contribute towards improved safety outcomes.

IO 2: Support a more connected community, resulting in liveability benefits

This investment objective will have four KPIs associated with it:

- Pedestrian travel times – considering the directness of connection between key areas and delays encountered crossing busy roads.
- Social connectedness – a qualitative KPI based on access to employment and recreational opportunities from residential areas (based on quantitative analysis of population within 15/30 minutes walking/cycling/PT/driving time of employment opportunities in iZone).
- Travel time between key locations – traffic modelling will be used to quantify changes in AM and PM peak travel time for the following key journeys (consistent start and end points will be determined by the modelling team):
 - Regional trip – Burnham (or southern extent of project area) to iZone and vice versa.
 - Regional trip – Rolleston town to Christchurch (or northern extent of project area) and vice versa.
 - Local trip – Rolleston town centre to iZone and vice versa.
- Freight connectivity – two aspects of freight connectivity will be determined. Rail connectivity improvements will be assessed by quantifying train movement time between the Midland Line and the Main South Line to the South of Rolleston. Road connectivity improvements will be assessed by

determining travel time changes for routes between iZone and Burnham, the Weedons Ross Interchange and Rolleston Town Centre.

It should be noted that, although the NZUP package will contribute to liveability benefits, other investment may be required to realise these benefits (for example, through the Rolleston Town Centre masterplan process). Therefore, no specific liveability KPIs have been defined, with the focus being on connectivity as a way of quantifying this particular investment objective.

IO 3: Provide a more resilient and sustainable network

This investment objective will have three KPIs associated with it:

- People throughput – quantified as the number of pedestrians, cyclists and public transport users crossing the State Highway and Rail corridors.
- Rail movements (proxy for freight on rail) – existing rail movements will be quantified along with the number of potential additional rail movements that could be unlocked by the intervention options.
- Resilience to unplanned events – qualitative assessment of changes to network resilience. This would in large part relate to reductions in the likelihood of crash related road closures.

2.2 Phase 2: MCA against key risks

2.2.1 Criteria

The proposed MCA criteria are provided within Table 1.

Table 1: MCA criteria

Theme	Definition
Investment Objectives	<ul style="list-style-type: none"> • Work towards zero injuries and deaths • Support a more connected community, resulting in liveability benefits • Provide a more sustainable and resilient network
Effects	<ul style="list-style-type: none"> • Engineering difficulty (inc. structures and stormwater) • Impact of construction (timeframes and temporary traffic management) • Property. • Consentability <ul style="list-style-type: none"> ◦ Noise and emissions ◦ Visual effects • Wider traffic impact, capturing impact to other road users • Rail impact • Interdependencies
Mitigation	<ul style="list-style-type: none"> • Impacts on Te Ao Maori • Additional works required to mitigate negative environmental and social effects

Excluded criteria

The following criteria, some of which are included within the Waka Kotahi's MCA User Guidance, have been excluded from this initial MCA.

- Wider economic benefits (included as a benefit on the Investment Logic Map).
- Safety in Design
- Climate change mitigation and adaptation
- Urban design
- Geotechnical
- Alignment with strategies.

The key rationale at this stage for excluding criteria is where there is unlikely to be notable differentiation between options. By limiting the number of criteria being assessed, a clear picture of the relative benefits/disbenefits of alternatives can be established. This removes a risk of weighting of key criteria being 'watered down' to make room for other criteria which are likely to have a low bearing on the final result.

2.2.2 KPIs

Each of the critical success factors identified above will be assessed using a standalone qualitative KPI:

Critical Success Factors

- **Engineering difficulty** – to consider difficulty of 'high ticket' items such as structures and potential stormwater treatments. The scale of engineering difficulty has a direct bearing on cost. In the case of the flyover options, consideration to be given to the ability to achieve the necessary grades to appropriately accommodate active modes.
- **Impact of construction** – considering potential impact of traffic management, covering duration (implicitly cost) and impact to the state highway/local road network. Also considering the impacts on direct neighbours (e.g. noise).
- **Property** – the number of properties that require acquisition, and number of properties where mitigation against negative effects (such as noise) would be required.
 - The primary focus is on the number of different properties that would need to be required, with a secondary focus on the sqm of land take required.
- **Consentability** – key consenting challenges will be highlighted for each intervention and these will be used to determine a consentability score. Key considerations are noise, vibration and visual impact.
- **Wider traffic impact** – the modelling will be used to understand the extent to which the improvements deliver on the aspirational road network hierarchy (NOF) and contribute to improved conditions for traffic across the wider network.
- **Rail impact** – the extent to which the proposed interventions deliver wider operational benefits to the rail network will be considered.
- **Interdependencies** – the viability of some options may be dependent on other infrastructure or availability of land. For example, the Moore Street extension.

Environmental, Social and Cultural Factors

Each of the environmental, social and cultural factors identified below will be assessed using a standalone qualitative KPI that will draw on quantitative analysis where appropriate:

- **Impacts on Te Ao Maori** – to be assessed in consultation with relevant Runanga.
- **Additional works required to mitigate negative effects** – this factor acknowledges that it may be possible to mitigate some of the negative effects of significant construction projects. It will therefore consider the extent to which mitigation is possible for the intervention options. The impact of some options, such as banning turns, may also have wider traffic and network efficiency implications.

3 EVALUATION APPROACH

In keeping with Waka Kotahi guidance, each of the criteria will be assigned to a particular subject matter expert (SME) from within the project team who will be responsible for undertaking the analysis. Each SME will be responsible for their own evaluation methodology and will be expected to present methodology, analysis and scoring in a workshop context. Where multiple quantitative KPIs are used to inform the evaluation of particular criteria, the approach to discerning the overall score will be clearly documented.

3.1 Scoring

In accordance with Waka Kotahi guidance, a -3 to +3 scoring scale was adopted.

Scoring will be undertaken relative to the do minimum. Generally, a score of zero will be taken as being 'as per the status quo', but with consideration that the network is experiencing rapid growth and other network changes are currently progressing. Table 2 provides the scoring scale.

Table 2: Scoring Scale – Network Options

Magnitude	Definition	Score
Large Positive	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment.	+3
Moderate Positive	Moderate positive impact, possibly of short-, medium- or long term duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.	+2
Slight Positive	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area.	+1
Neutral	Neutral – no discernible or predicted positive or negative impact.	0
Slight Negative	Minimal negative impact, possibly only lasting over the short term, and definitely able to be managed or mitigated. May be confined to a small area.	-1
Moderate Negative	Moderate negative impact. Impacts may be short, medium or long term and are highly likely to respond to management actions.	-2
Large Negative	Impacts with serious, long-term and possibly irreversible effect leading to serious damage, degradation or deterioration of the physical, economic, cultural or social environment. Required major rescope of concept, design, location and justification, or requires major commitment to extensive management strategies to mitigate the effect.	-3

3.2 Weightings

The following baseline weightings have been identified as a starting point for discussion:

Table 3: Weightings – Proposed Sensitivity Test

Categories	Criteria	
Effects	Engineering difficulty (inc. structures and stormwater)	20%
	Impact of construction	20%
	Property (no. impacted owners)	20%
	Consentability (inc. noise, CO2 and visual effects)	10%
	Wider transport impact	10%
	Rail Impact	5%
	Interdependencies	5%
Mitigation	Impacts on Te Ao Maori	5%
	Additional works required to mitigate negative environmental and social effects	5%

Sensitivity tests will be undertaken on the evaluation to determine whether applying different weights to the criteria results in different outcomes. The following weighting tests will be undertaken:

- Equal weighting – all criteria will be weighted equally.
- Agreed weightings (see Table 3) with stakeholders.

Further sensitivity tests can be run based upon feedback from stakeholders.

4 OPTIONS TO BE EVALUATED

This section outlines the long-list of options that will be tested through the proposed MCA framework.

4.1 Flyover

The assessment of the flyover options has been broken down into three areas:

- Tie-in on the southern side (purple)
- Bridge alignment (orange)
- Tie-in on the northern side (blue)

A list of the options being considered for each of these areas are provided on the next page and shown diagrammatically on Figure 2. Waka Kotahi have confirmed that a connection from the flyover into the service road is no longer part of the NZUP scope of works (green).

Note that the extension of Moore Street (red) is not yet committed, with land from the Ministry of Education school site yet to be obtained.



Figure 2: Flyover options

It has been assumed that an active mode only bridge (i.e. no vehicle connectivity) is outside of the NZUP scope. However, we will seek confirmation from Waka Kotahi that this is the case prior to proceeding with the MCA.

Tie-in on the southern side

- A. Connection between Kidman Street and Rolleston Drive north (PBC identified option).
- B. Continuation of Kidman Street.
- C. Continuation of Rolleston Drive.

Bridge Alignment

- A. Straight alignment across to Jones Road.
- B. 60 degree bridge alignment.
- C. 45 degree bridge alignment.
- D. 30 degree bridge alignment.
- E. Local road underpass (under SH and railway line).

Tie-in on the northern side

- A. Connection into the development land
- B. Connection into the south-west approach to the Jones Road/Carters development roundabout
- C. Connection into a new south-eastern approach to the Jones Road/Carters development roundabout

4.2 Rolleston Drive South

The following options have been considered for Rolleston Drive South:

- Do nothing.
- Signals.
- Roundabout (assumed to be two lane).
- Right turn-out movement banned.

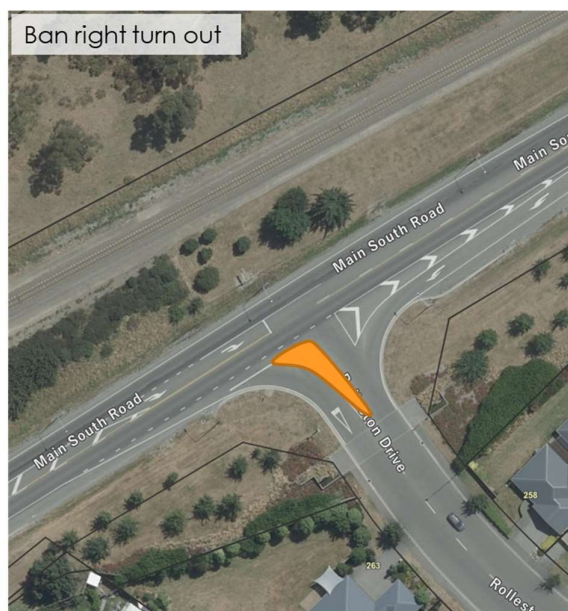


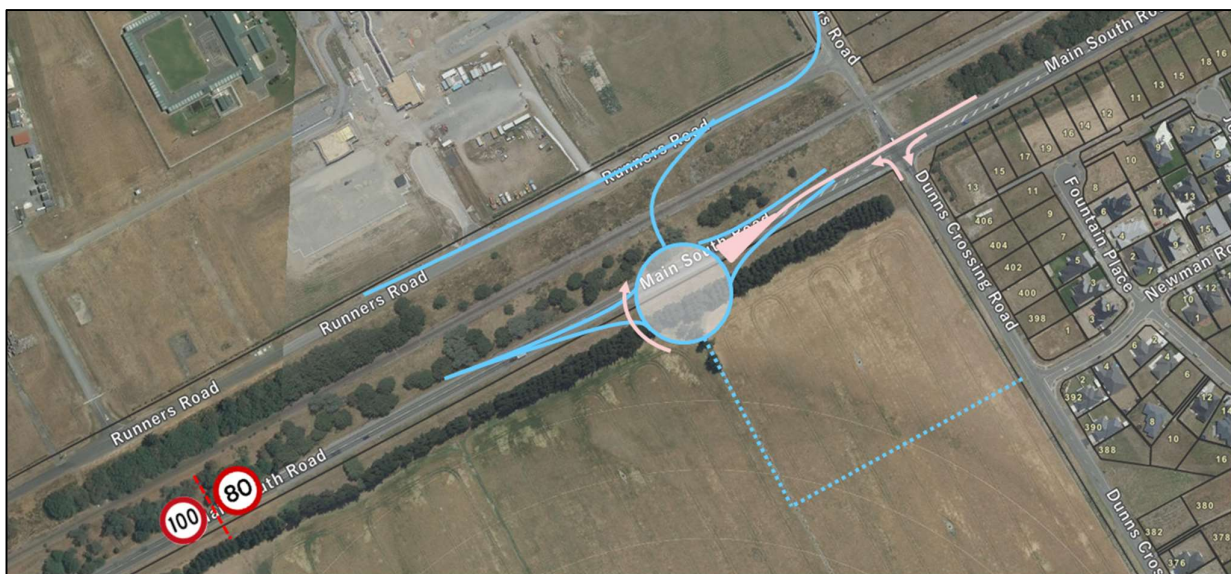
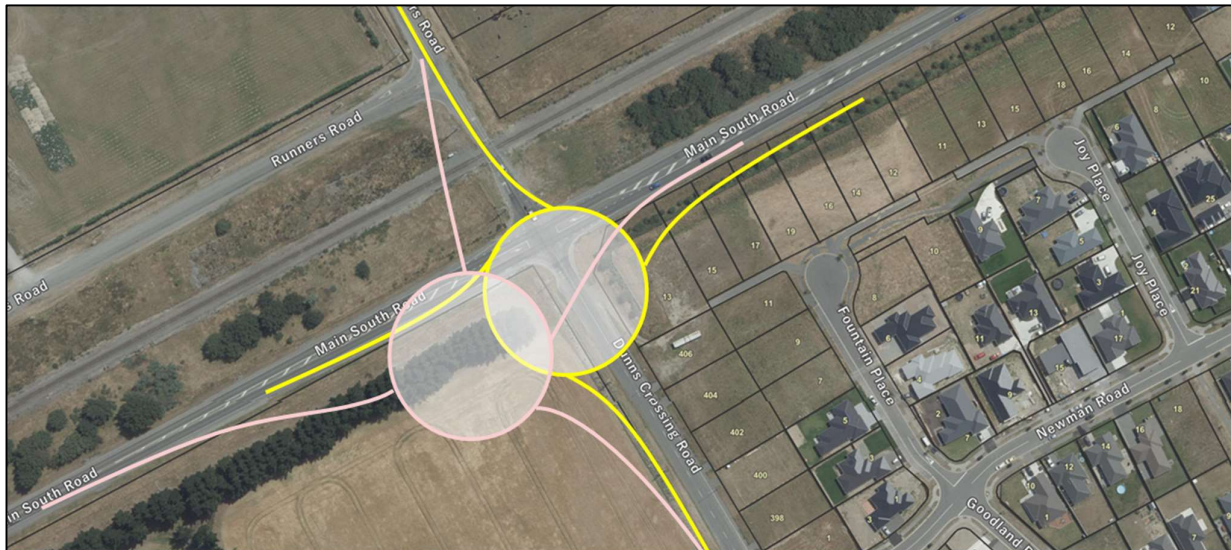
Figure 3: Rolleston Drive South options

4.3 Dunns Crossing Road / Walkers Road

The following options have been considered for Dunns Crossing Road / Walkers Road:

- Do nothing.
- Roundabout on top of the current intersection (yellow).
- Roundabout offset to the south-west of the current intersection, requiring the realignment of all approach roads (pink).
- Roundabout to the south of existing intersection, left-in/left-out only for Dunns Crossing Road and new road though the Plan Change 73 area (blue).
- Signal.

- Left-in/Left-out for both Walkers Road and Dunns Crossing Road. U-turns and access to Rolleston provided at a new roundabout at Rolleston Drive south.
- Oval (or lozenge) roundabout. Potential RIAWS on approaches to stop all traffic when a train is passing.
- Grade separated intersection.



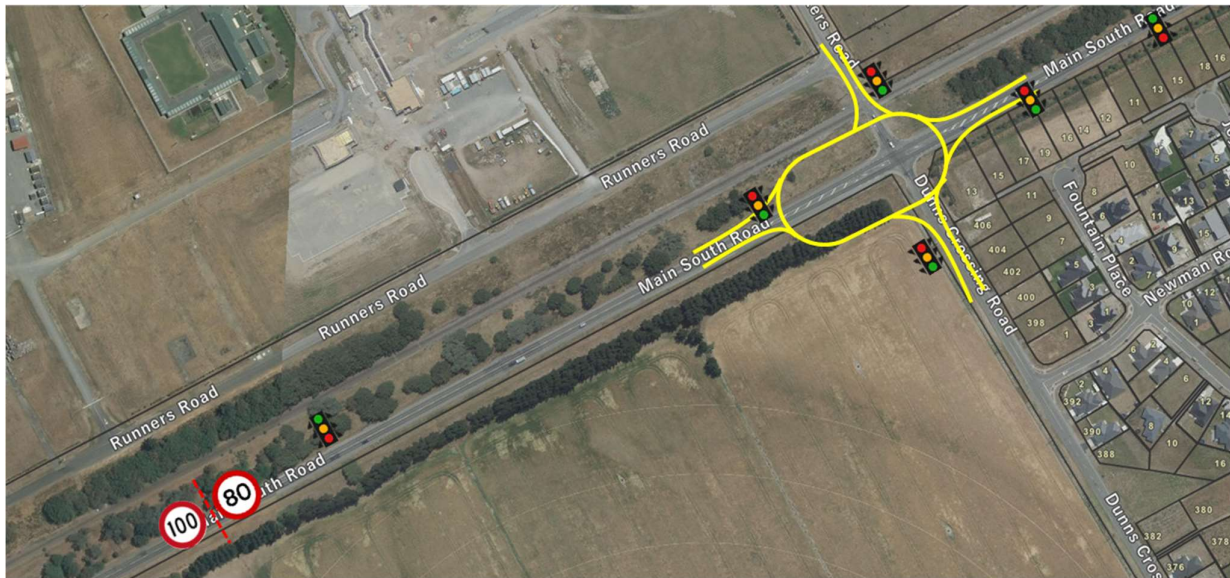


Figure 4: Dunns Crossing Road / Walkers Road options

4.4 Rail Improvements

The following options have been considered for rail improvements:

- Rail Option 1: Completion of triangle junction south of Rolleston station.
- Rail Option 2: Called Yard Option 1 :Additional shunting capacity in Rolleston station.
- Rail Option 3: Called Yard Option 2: Additional shunting capacity further north of LPC connection
- Rail Option 4: Signalling changes to improve connectivity between Midland Line and Main South Line (not illustrated – no infrastructure change)
- Rail Option 5: Completion of triangle junction with LPC siding

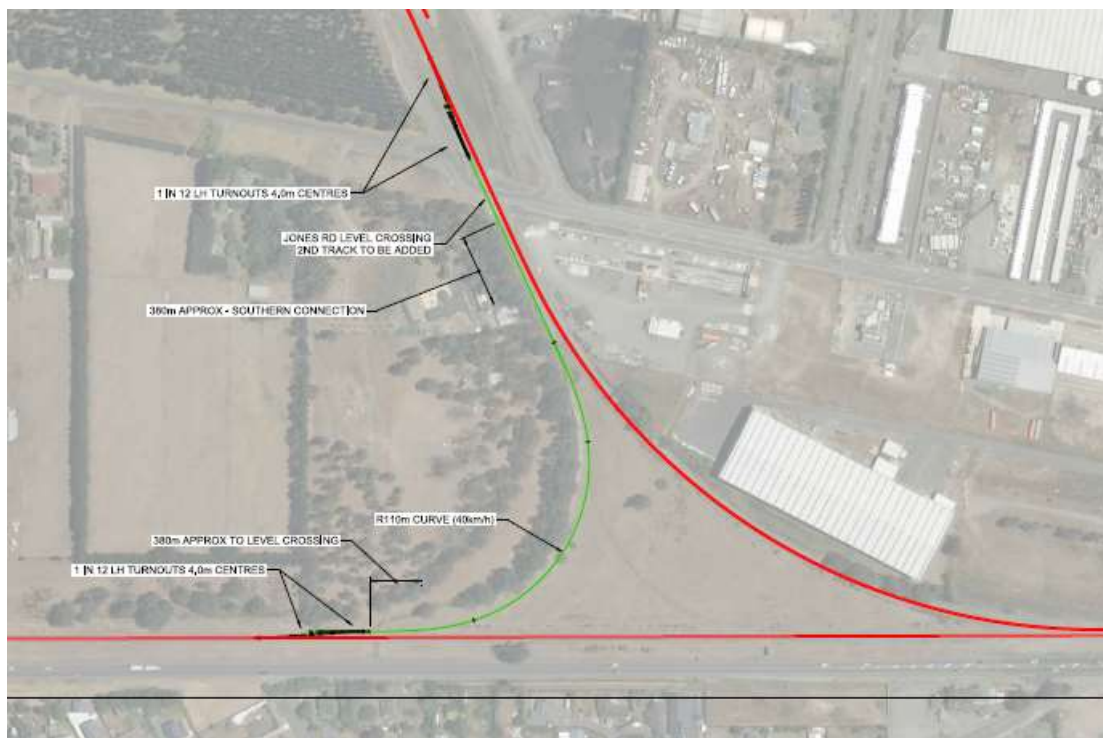


Figure 5: Rail Option1:



Figure 6: Rail Option 2: Yard Option 1



Figure 7: Rail Option 3: Yard Option 2



Figure 8: Rail Option 5: Completion of Triangle to LPC line