

NARROMINE TO NARRABRI ROUTE OPTION CONSIDERATIONS

Explanatory Note (March 2018)

In its 2015 report to the Australian Government, the Inland Rail Implementation Group recommended that the alignment determined in the 2010 Inland Rail Alignment Study (IRAS) be adopted along the majority of the Inland Rail corridor.

The IRAS assessed a range of alternative route options in the Narromine to Narrabri region and specifically included consideration of use of the Coonamble line and alternative greenfield routes.

Between 2014 and 2016 further work was undertaken to refine the IRAS alignment. This alignment is referred to in all subsequent studies as the 2016 Base Case alignment.

In 2016 further work was undertaken on the following basis.

Feedback from stakeholders and the community suggested that alternative options between Narromine and Narrabri be considered that:

- make greater use of the existing Coonamble Line; and
- travel through the Pilliga State Forest, rather than through multiple private properties.

Meetings with local Councils during the week commencing 11 October 2016 also raised alternative options, including:

- Narromine to Eumungerie, approximately parallel to Eumungerie Road; and
- using the Coonamble line to the north of Curban and then heading east between Armatree and Gulargambone to reduce impacts on high productivity farming land to the north of Gilgandra.

In addition to the above, options were also developed for Narromine to Curban via the Coonamble Line, thus bypassing Dubbo.

As a consequence a range of options were studied in 2016 and in October 2016 a preliminary Multi-Criteria Analysis (MCA) workshop was held and refined those options down to a smaller number.

The process of reducing the number of options to be further considered eliminated making use of the Coonamble line from Curban to Coonamble and then on to Gwabegar. Despite having been previously been eliminated in the IRAS study on the basis of the added distance such an option involved, and hence the negative impact on the Inland Rail service Offering, community requests had led to this option being again considered, and it was again eliminated because of the added distance of such an option.

The key options after that preliminary workshop which were carried forward were:

- whether to go east or west (the 2016 alignment) of Narromine;
- whether to use the Coonamble line north of Curban to Gulargambone compared to the 2016 alignment; and
- the Pilliga State Forest options in the north.

There were also some options considered that would be described more as refinement decisions. Section Options were also identified for further investigation.

During November 2016 those options were the subject of community consultation and in December 2016 a formal MCA was held taking into account the preliminary MCA and the results of community consultation.

That workshop agreed which options would progress to further community consultation in 2017 and between March and May 2017 some 400 landowners were consulted about options in their respective areas.

In May 2017 a further MCA workshop was held based on that consultation and the significant changes were to go to the east of Narromine and also to use the Pilliga State Forest routes in the north. That MCA did not support the Coonamble line options.

There were then a series of internal papers which resulted in the Alignment recommendation paper which went to the Minister and which was adopted.



Australian Rail Track Corporation

Inland Rail - Narromine to Narrabri MCA Workshop Report (15 December 2016)

March 2017

Executive summary

Purpose

This report summarises the outcomes of a multi-criteria analysis (MCA) workshop held on 15 December 2016 to review additional route options on the Narromine to Narrabri (N2N) section of the Inland Rail project.

The objectives of the workshop were to:

- Compare route options using the ARTC MCA criteria and process.
- Determine which options would be subject to further investigation and community consultation in Q1 2017.

This MCA follows a preliminary MCA held on 27 October 2016 and feedback received from the local community during a series of local information sessions held between 14-19 November 2016.

MCA Process

The options were assessed using the standard Inland Rail MCA criteria and weightings, a copy of which is provided in Appendix A.

Outcomes

The outcomes from the workshop were that the following options should be progressed for further consultation with key stakeholders and the community in early 2017.

Table ES-1 MCA Options for future investigation

	Section	Description
A	Narromine <ul style="list-style-type: none">• 2016 Concept Alignment (Narromine West)• Options 101+107 (Narromine East)	The Eastern option provided positive technical viability due to better flooding and geotechnical conditions with a negative assessment operationally due to the challenges with connectivity to the north as the alignment will be elevated.
B	Narromine to Curban <ul style="list-style-type: none">• 2016 Concept Alignment• Option 109 (Paper road), Combinations or refinements can be derived following landowner consultations.	The eastern option follows Eumungerie Rd then a series of paper roads. It has better geotechnical and flooding conditions and a reduced property impact made it marginally more positive than the Concept Alignment.
C	Curban to Gilgandra, <ul style="list-style-type: none">• 2016 Concept Alignment• Option 206 (Coonamble line to Gulargambone and then along Box Ridge Road)	There was strong community support for the option that utilises the Coonamble line to Gulargambone then follows Box Ridge Road toward Mt Tenandra which is reflected in the results showing a positive result for Community and Stakeholder risk. The Concept alignment is superior or equal in all other aspects.

Section		Description
D	Mt Tenandra to Baradine – <ul style="list-style-type: none"> 2016 Concept Alignment (Potential minor departures, subject to landowner consultation and geotechnical investigations) 	The Concept Alignment remains the only option.
E	Baradine to Narrabri West <ul style="list-style-type: none"> 2016 Concept Alignment Options 403a and 404a (Pilliga Forest Way) Option 413 (Twenty Foot Road) 	<p>The option that follows an existing road through the State Forest then joins the Newell Highway alignment ranked superior to the Concept Alignment in all aspects reviewed.</p> <p>Option 413 to be compared to the Newell highway option. To also consider future options for viaduct location.</p>
F	Narrabri <ul style="list-style-type: none"> 2016 Concept Alignment <p>To investigate alternative options for the viaduct location and assess flood risks.</p>	Options to the east of Narrabri were constrained by existing and future residential subdivisions. The eastern option was not supported by Narrabri Council or by feedback from the local community at the November workshop.

The above options are shown on Figure ES-1.

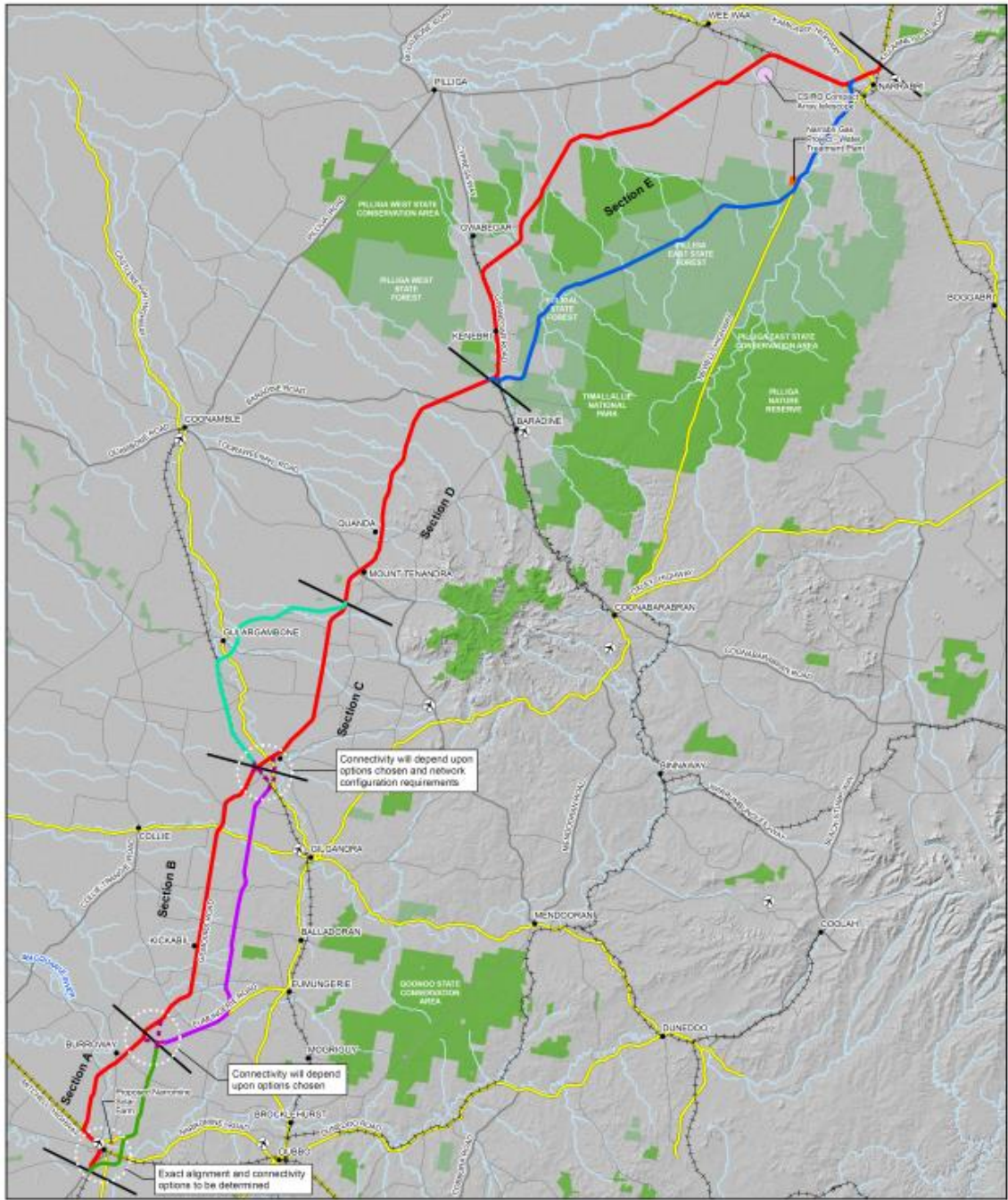


Figure ES-1 Options to progress for landowner consultation

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Appendices

- Appendix A - MCA Criteria
- Appendix B - Key MCA Criteria for Options Evaluation
- Appendix C - MCA Workshop Options Scoring

1. Introduction

1.1 Purpose

This report summarises the outcomes of a multi-criteria analysis (MCA) workshop held on 15th December 2016 to review the current route options on the Narromine to Narrabri (N2N) section of the Inland Rail Programme.

1.2 MCA workshop objectives

The objective of this workshop was to:

- Determine which options to take forward for further investigation and consultation with local land owners and the community in February/March 2017.

1.3 Report structure

Section 1 provides general background on the need for the Inland Rail project and the performance criteria requested by potential users of the line.

Section 2 provides an overview of the earlier work completed to in 2006 and 2010.

Section 3 summarises the recent work completed in 2016 to refine the 2010 alignment and commence consultations with the community and key stakeholders.

Section 4 summarises the MCA process.

Section 5 presents the alternative options being considered.

Section 6 details the MCA workshop outcomes.

Section 7 provides details on the next steps.

1.4 The need for Inland Rail

Inland Rail is a new 1700 km freight rail connection between Melbourne to Brisbane that avoids the congested Sydney network and travels via regional Victoria, New South Wales and Queensland.

Freight volumes on the east coast of Australia will more than double in the coming decades and existing networks will not cope without further investment. Inland Rail will provide an efficient and sustainable solution to this growing freight challenge. It will connect capital cities, farms, mines and ports, creating jobs, reducing supply chain costs and making Australian exports more competitive.

The natural constraints of the existing east coast rail network mean that rail only takes approximately 30 per cent of the freight task. We know that where a road competitive service exists, such as the Melbourne to Perth rail line, that rail dominates the market, taking more than 80% of the freight load. Inland Rail will deliver a road competitive service that sees rail take its fair share of the freight task on the east coast.

A typical train travelling on Inland Rail will have the capacity of 108 B-Doubles and will complete the journey from Melbourne to Brisbane in less than 24 hours with reliability, availability and pricing competitive with road.

1.5 Inland Rail Service Offering

The Inland Rail Service Offering was developed in consultation with all of Australia's major rail freight customers and freight owners including Asciano, Genessee and Wyoming, SCT, Aurizon, Woolworths, Coles, Graincorp, Namoi Cotton, Bluescope and VISY. Also included in the consultation were key agricultural stakeholders including NSW Farmers and the National Farmers Federation and peak bodies such as NRMA.

This consultation with the organisations who will actually use Inland Rail has clearly defined the performance outcomes that industry requires. These key performance outcomes are outlined below.

- Transit time between Melbourne and Brisbane less than 24 hours, to be competitive with road
- 98% reliability
- Double stacked containers
- Train length of 1,800 m, with option of future increase to 3,600 m
- Maximum speed 115 km/h
- Target grade of 1:100 (1:80 maximum (compensated))
- Target curve radii 1200 m (minimum 800 m)

2. Previous studies

2.1 Inland Rail Alignment Study (IRAS)

There have been two major Inland Rail studies undertaken to date.

The North-South Rail Corridor Study (2006) considered four potential corridors for Inland Rail to determine which would deliver the best economic and financial outcome. The 'far western corridor' through Parkes was identified as the preferred option.

The Inland Rail Alignment Study (IRAS) (2010) looked at the far western corridor in detail and considered a range of alternatives to develop an optimum alignment for Inland Rail. This alignment has been referred to as the Base Case alignment has been used as the basis for development of the Phase 1 Concept Assessment and the Inland Rail Business Case (ARTC 2015).

2.2 Review of IRAS

The Inland Rail Alignment Study was completed in 2010 and forms the main body of work documenting development of the Base Case alignment. The study encompassed the full length of the Inland Rail line between Melbourne and Brisbane and was primarily based on desk top investigations.

Between 2014 and 2016 ARTC completed detailed aerial survey, site investigations and further design work to develop the IRAS Base Case alignment up to the Phase 1 2016 Concept Alignment.

In September 2016, GHD was requested to review the IRAS study and to update the route selection process between Narromine and Narrabri using the more comprehensive data sets that are now available. This study also included consideration of other options that were beyond the original scope of the IRAS.

The route options considered in the IRAS report are shown in Figure 2-1 and Figure 2-2 below.

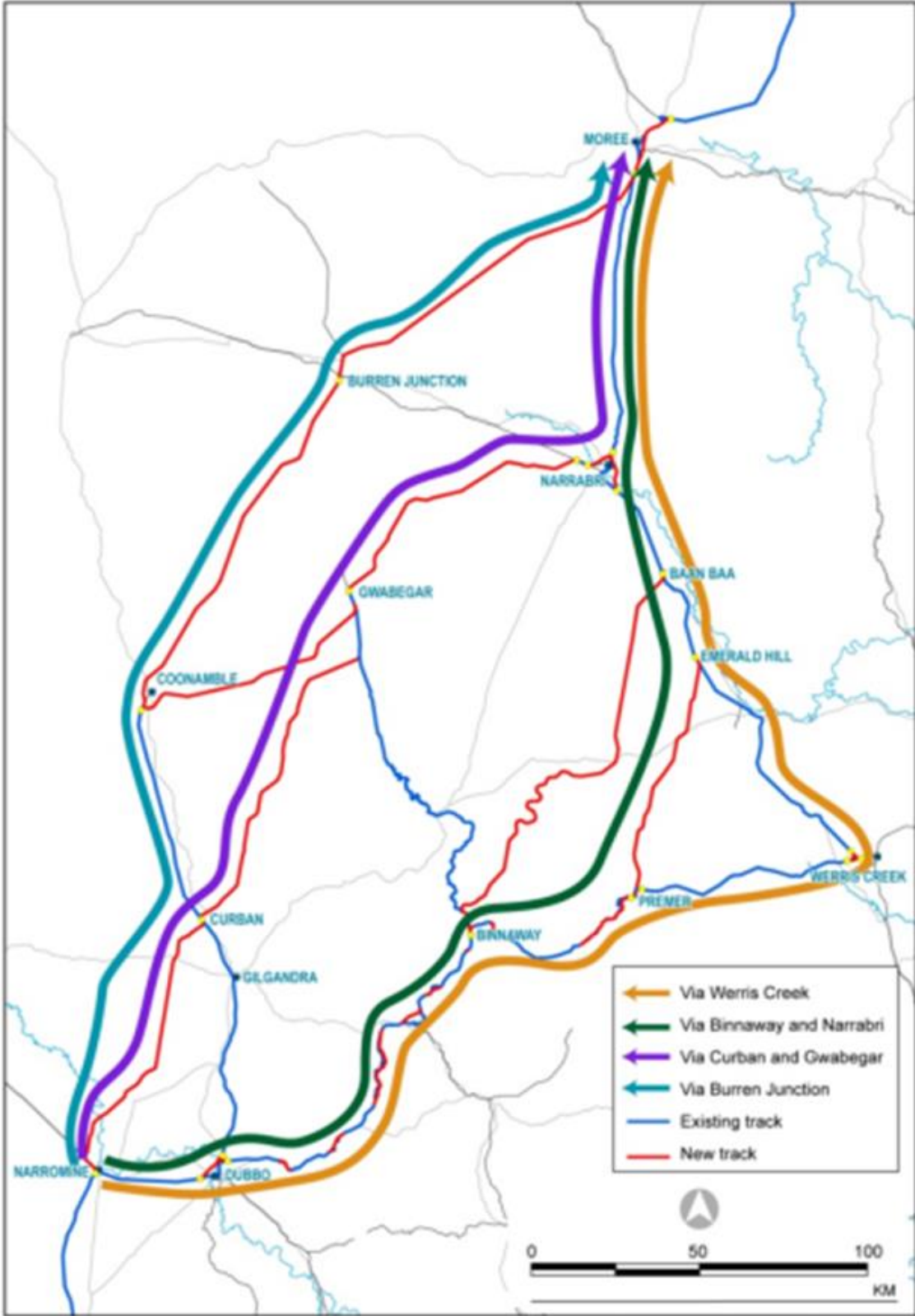


Figure 2-1 IRAS Parkes to Moree Corridors

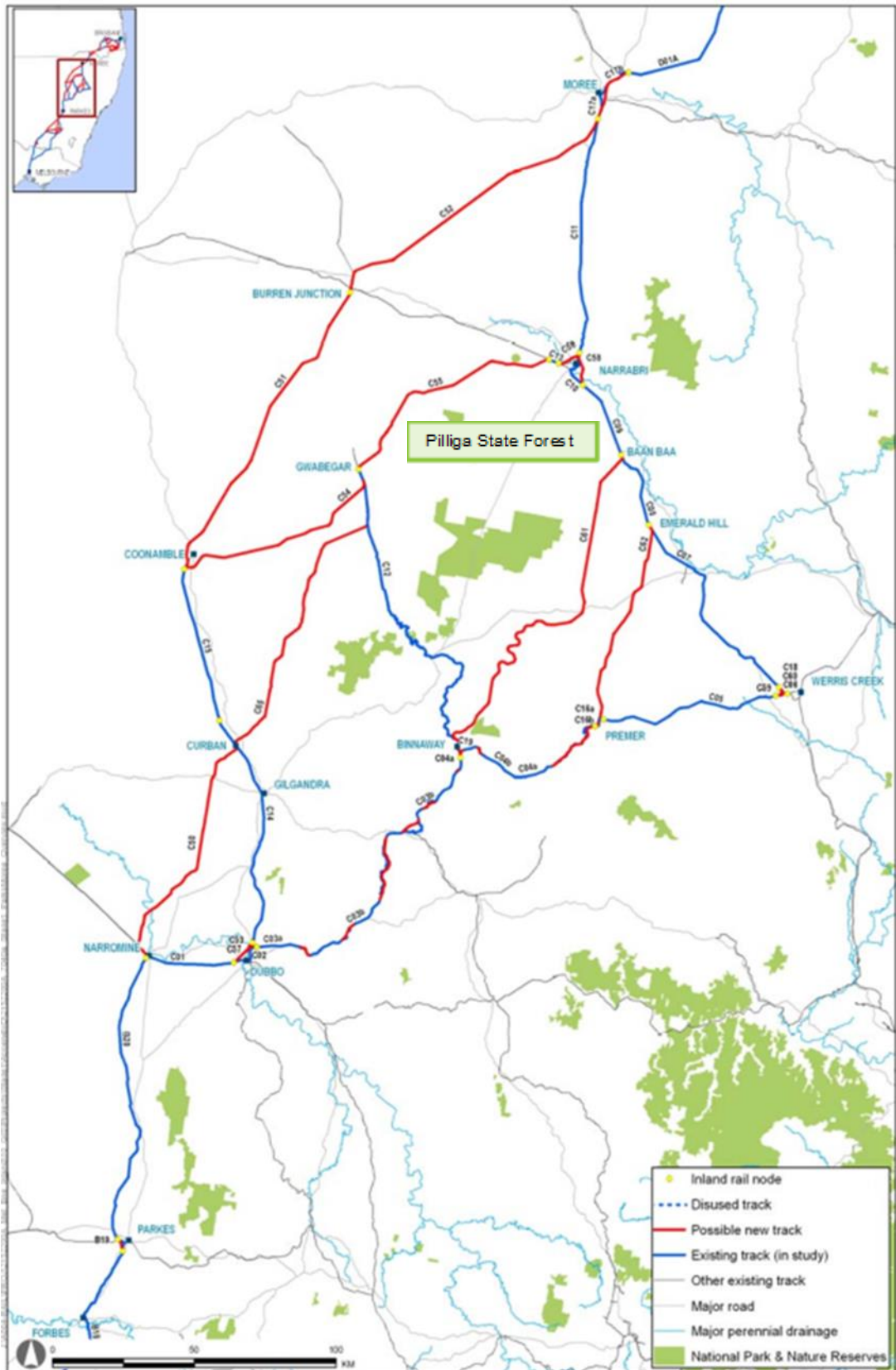


Figure 2-2 N2N IRAS Route Options

The outcomes from the IRAS review were:

- The route options considered between Narromine and Narrabri were included in the alignment development between Parkes and Moree. Sections of existing track between Parkes and Narromine and Narrabri and Moree were however common to most options.
- The options can be broadly grouped into 3 corridors:
 - **Corridor 1 - East of the Warrumbungles:**
Using the existing rail line between Narromine and Narrabri via Dubbo and Werris Creek, including deviations at Binnaway and Pindar to reduce the overall length.
 - **Corridor 2 – West of the Warrumbungles:**
Shorter, more direct routes between Narromine and Narrabri that included options incorporating sections of the existing Coonamble line.
 - **Corridor 3 – Via Burren Junction**
A route to the west of the Warrumbungles using the Coonamble line up to Coonamble and then taking a direct greenfield route from Coonamble to Moree, bypassing Narrabri and the existing track between Narrabri and Moree. This route passes through an extensive flood plain area.
- Route options considered in the IRAS are shown in Figure 2.2. These did not consider options through the Pilliga State Forest.
- Consideration appears to have been given to alternative routes that are described in the text of IRAS Appendix D, but are not shown within the figures within the report. For example, a route section G03 was proposed between the Coonamble line, approximately 3 km to the north of Gilgandra, and Gwabegar. This is in line with anecdotal correspondence that more options were considered as part of the IRAS than were presented in the final report.
- The IRAS scope covered the entire Inland Rail corridor and did not extend to consider minor alignment deviations between Narromine and Narrabri.
- The N2N section provided the most significant opportunity to reduce the overall length of Inland Rail from 1,880 km, for the reference case to the east of the Warrumbungles, to 1,730 km for a more direct greenfield route to the west of the Warrumbungles.
- Whilst the capital cost of the greenfield option was estimated to be greater than upgrading the brownfield corridor via Werris Creek, the reduction in travel time was considered to provide benefit by generating additional freight traffic and also reducing operational costs. This resulted in the economic analysis favouring the shorter route in Corridor 2, to the west of the Warrumbungles, being taken forward as the Base Case alignment.

3. Alignment refinement

3.1 Refinement of 2010 alignment

A preliminary route for Inland Rail was developed as part of the Inland Rail Alignment Study (IRAS), ARTC, 2010. Some minor improvements were made in early 2016 to produce a refined 2016 Concept Alignment. These were principally at:

1. Curban, for operational interfaces with the Coonamble line.
2. Yarrie Lake Road, to reduce the number of impacts on small lot holdings.

3.2 Stakeholder feedback May - October 2016

Between May and October 2016, ARTC consulted with key stakeholders on the 2010 alignment and the proposed minor modifications. The feedback on Inland Rail was generally positive and Councils in particular recognised the benefits that it could bring to the region both during construction and operation.

Specific comments received on the alignment were:

- There may be positive benefits to an alignment through the Pilliga forest (geographically between Baradine and Narrabri) to join the Newell Highway.
- It was noted that the existing Coonamble line had been upgraded since the 2010 IRAS report was completed and the underlying basis of assessment to discount options using the Coonamble line should therefore be reviewed.
- The triangle of land to the north of Gilgandra, bounded by the Coonamble Line and the western edge of the Warrumbungle range was of high agricultural value and options should be investigated to mitigate impacts on wheat farmers in this area.

In addition to the above, a broader review of additional options was also undertaken to confirm that alternative routes had been considered and that the preferred alignment was the best overall solution that meets the requirements of the Service Offering.

A preliminary MCA workshop was held in October 2016 to review the options that had been developed and to select a series of potential routes to take forward to the community for further consultation and comment.

3.3 Community feedback November 2016

Between 14-19 November 2016, a series of community information sessions were held at:

- Narrabri
- Baradine
- Coonamble
- Coonabarabran
- Curban
- Gilgandra
- Narromine

Local residents were notified via a letterbox drop and through advertisements in the local media and there was generally good attendance that captured many land owners along the route.

Feedback obtained from the information sessions was reviewed and considered by the project team. Suggested route alternatives were checked and where these were considered to offer potential improvements on the 2016 Concept Alignment, alternative options were developed for further investigation.

The alignment refinement process is shown in Figure 3-1.

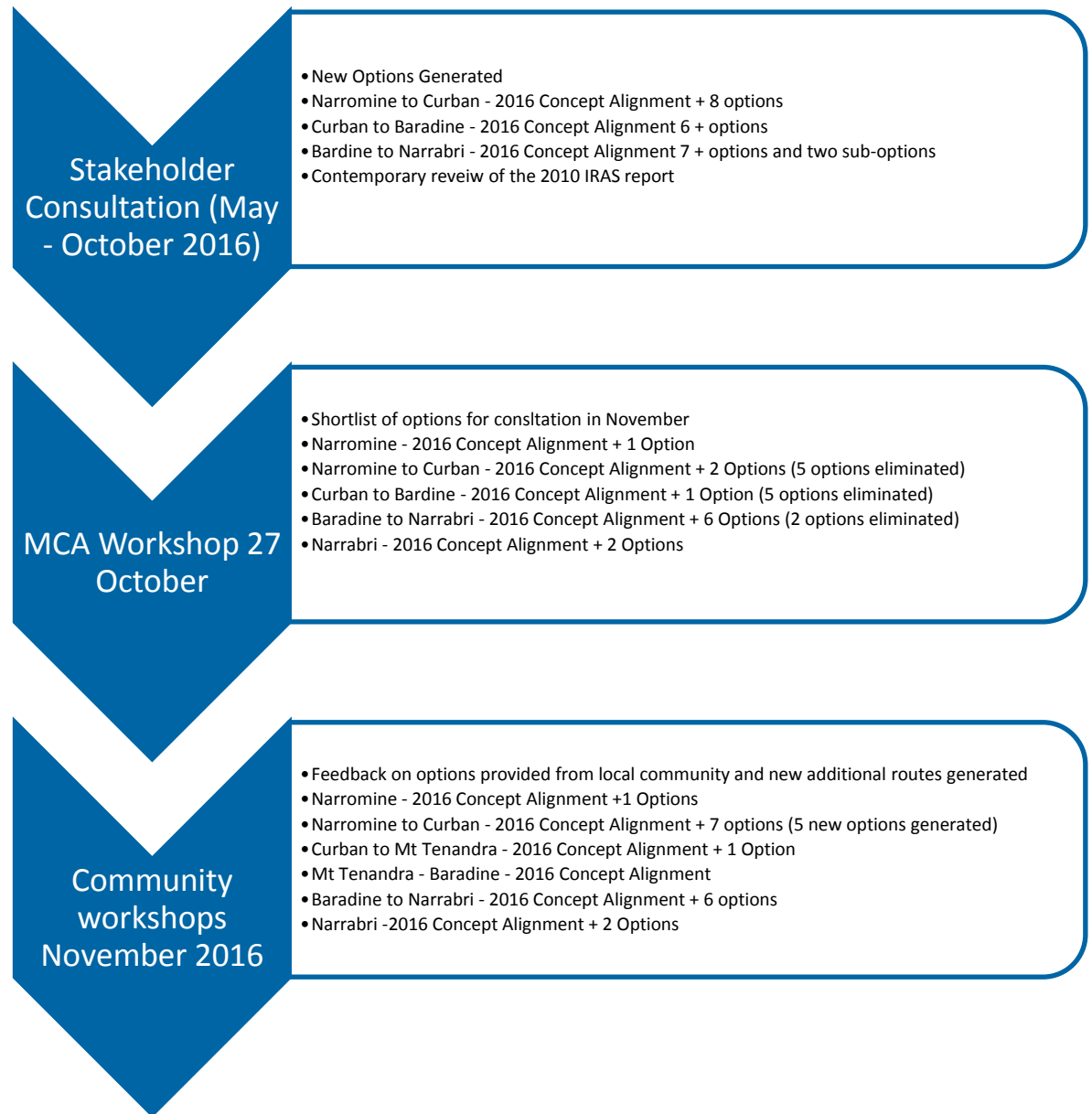


Figure 3-1 Summary of alignment refinement process

4. Project status

4.1 Narromine to Narrabri project status

The Narromine to Narrabri project is currently in the Concept Design Phase and several route options are being considered. As such, preliminary studies on the options are being based on desk top information, supported by targeted field inspections. Initial consultations with key stakeholders and the local community have been completed and the outcomes have provided valuable feedback that has been taken into account when assessing options.

The information presented in this document is intended for the purpose of comparing alternative options at the Concept Design Phase. Additional information will be obtained in the future to enable engineering designs to be developed. This may affect the options selection process and result in alternative alignments or changes to the preferred alignment(s) selected from the MCA process. This information could include:

- Geotechnical investigations
- Flood studies
- Topographical survey
- Outcomes of discussions with approval authorities and other interest groups, in particular the Office of Environment and Heritage, Transport for NSW, Roads and Maritime Services, the Department of Planning and Environment and local aboriginal land councils.

4.2 Basis of information

The basis of information used to derive data for options comparison is summarised in Table 4-1.

Table 4-1 Basis of information for options assessment

Criteria	2016 Concept Alignment	Additional options
Technical viability		
Topographical survey	Aerial LiDAR survey, accuracy ± 150 mm	"Shuttle data", accuracy ± 10 m - ± 30 m
Geotechnical investigations	Desk top mapping studies. Visual inspections from public roads. Limited trial pits in road reserves and materials testing	Desk top map studies. Visual inspection from public roads.
Utilities	Utility information provided by DBYD 2 km either side of alignment.	No utility data.
Concept Design	Horizontal and vertical alignment. Preliminary earthworks quantities.	Horizontal alignment.
Safety		
Road/rail interfaces	Number of public and private level crossings estimated from aerial photographs.	Number of public and private level crossings estimated from aerial photographs.
Operations		
Operational modelling	RailSys modelling with allowance for passing loops	Transit times estimated from track length and average speed.

Criteria	2016 Concept Alignment	Additional options
Constructability		
Constructability and interfaces with existing railways	MCA subjective assessment of complexity based on anticipated geotechnical conditions and possession regimes.	MCA subjective assessment of complexity based on anticipated geotechnical conditions and possession regimes.
Environmental		
Ecology	Desk top database searches. Rapid field surveys.	Desk top database searches. Rapid field surveys.
Aboriginal heritage	Desk top database searches. Rapid field surveys.	Desk top database searches. Rapid field surveys.
Community and Property		
Property/land ownership	Corrected cadastral lot boundaries. Land ownership details 2 km each side of alignment.	Cadastral lot boundaries (not corrected). Land ownership details requested.
Approvals and stakeholder risk		
State/Federal Government	Project briefing provided	Project briefing provided
Local Government	Project briefing provided	Project briefing provided
State Forests/NPWS/EPA	Project briefing provided	Project briefing provided

It should be noted that Options 107,108, 111, 112 and 113 have been added since 20 November 2016 and have not been subject to geotechnical, ecological or aboriginal heritage investigations.

4.3 Current corridor

As noted Section 2.3, the current corridor for the N2N section is on the western side of the Warrumbungles range.

Routes to the east of the Warrumbungles would either have grades steeper than 1% or be too long, leading to transit times that could jeopardise compliance with the Service Offering criteria of an overall transit time of less than 24 hours.

4.4 Coonamble Railway Line

The Coonamble line runs between Dubbo and Coonamble and is approximately 145 km long. It is part of the Transport for NSW (TfNSW) Country Rail Network (CRN) and is maintained by John Holland. It is used almost exclusively for the transport of grain and agricultural produce. There are no passenger services.

Upgrade works have been carried out on the line since the 2010 IRAS assessment. It is understood that these related to the replacement of drainage culverts and bridge structures and that no significant works have been completed to upgrade the track formation, ballast, rail or sleepers.

The rail is of various sizes that are all equal to or less than 53 kg. Sleepers are generally steel with some minor sections with concrete sleepers.

Works required to bring this line up to a standard to comply with the Inland Rail Service offering would include formation reconditioning plus new ballast and replacing the track with 60 kg rail and concrete sleepers. Culvert and bridge structures would all need to be assessed for capacity and flooding and it is likely that the majority would need to be replaced to bring these up to the standard required for Inland Rail.

5. MCA Methodology

5.1 Consistent approach

The preferred route for Inland Rail between Narromine and Narrabri will be selected using standard industry methodology for the assessment of linear infrastructure projects such as railways, roads, pipelines etc. The decision making process will take into account compliance with the Service Offering, cost and impacts on a number of criteria assessed as part of the MCA process.

A number of potential route options have been identified that each have different benefits and impacts. These options were discussed with key stakeholders and the local community, as noted in Section 3 above. Feedback from consultations was taken into account and, where required, options were modified or additional options added.

The options were firstly evaluated against the Inland Rail Service Offering, in terms of vertical and horizontal alignments plus the ability for trains to meet the required section run time. Options that did not satisfy these criteria were eliminated and not considered further.

The remaining options were evaluated using an MCA process against a standard set of criteria to select that alignment that, on balance, maximises the benefits and has the least overall negative impacts.

5.2 MCA weightings

To ensure consistency in the route selection process across the Inland Rail Programme, ARTC has adopted a consistent set of MCA criteria used for selection of the preferred alignment. The process was set out in a technical note MCA Review, 18 April 2016, Arup/SMC. This memo, along with full details of the weighting criteria and scoring are contained in Appendix A.

Each alternative option is compared against 2016 Concept Alignment.

The weighting criteria are:

Table 5-1 MCA criteria and weightings

MCA Criteria	Weighting
Technical viability	17.5%
Safety assessment	17.5%
Operations	15.0%
Constructability and schedule	12.5%
Environmental impacts	12.5%
Community and property impacts	12.5%
Approvals and stakeholder risk	12.5%

The scoring criteria comprises a five point assessment scale as per the table below. It should be noted that the "score" is a comparative score only between the options. Only discrete score values were used in the MCA, no attempt was made to interpolate between the values for scoring purposes.

Table 5-2 MCA scoring matrix

Comparison to Base Case	Score
Significant improvement	10
Improvement	5
Neutral	0
Decline	-5
Significant decline	-10

5.3 Workshop attendees

The above options were assessed at an MCA workshop held at ARTC, Brisbane on 15 December 2016.

The workshop attendees were:

Table 5-3 MCA Workshop attendees

Name	Role	Company
	Inland Rail Communications and Engagement Manager - NSW	ARTC
	Ecologist	GHD/Umwelt
	Inland Rail Technical Advisor	TA (Arup/SMEC)
	Inland Rail Senior Project Advisor	ARTC
	Inland Rail N2N Project Manager	ARTC
	Inland Rail NSW Environmental Manager	ARTC
	Geographical Information Systems	GHD
	Engineering Project Manager	GHD
	Inland Rail Engineering Manager (by phone)	ARTC
	Inland Rail Community Engagement Lead – N2N	ARTC
	Inland Rail Design Manager	ARTC
	Geotechnical Engineer	GHD/Jacobs
	Manager Business Development, Hunter Valley	ARTC
	Aboriginal heritage consultant	GHD/Umwelt
	Inland Rail Programme Delivery Manager NSW/VIC	ARTC
	Inland Rail Property Management and Acquisition Officer - NSW	ARTC
	Environmental and statutory approvals	ARTC
	Engineering Design Manager	GHD
	Inland Rail Director – Operations and Engineering Integration	ARTC

5.4 Process

Each option was assessed using the MCA criteria described in Section 5.1.

Options were assessed in the following order:

- Baradine to Narrabri West
- Narrabri
- Curban to Mt Tenandra and Mt Tenandra to Baradine (Barwon)
- Narromine to Curban
- Narromine options
- Collie Road Option

Detailed MCA scoring sheets are contained in Appendix C.

A summary of the outcomes and results from the scoring are provided below.

6. MCA Workshop

6.1 Additional options

The 2010 IRAS considered a limited number of route options between Narromine and Narrabri. The report concluded that the shorter alignment on the western side of the Warrumbungle range had a better economic performance due to its reduced length that would allow an overall transit time between Melbourne and Brisbane of less than 24 hours.

This recommendation was subsequently supported in the Inland Rail Business Case, ARTC, 2015.

As noted in Section 3, the IRAS alignment was reviewed in 2016 and two refinements were made, firstly to improve operations at Curban and secondly to reduce impacts on residents along Yarrie Lake Road.

The alignments were presented to stakeholders and local communities at meetings and workshops between May and November 2016. The feedback received was that additional alignments should be considered and in particular:

- The option of using the existing Coonamble line should be reviewed in more detail.
- There is an opportunity to have a combined transport corridor along Eumungerie Road where the road and rail could run parallel to one another.
- Impacts on highly productive agricultural land to the west of Curban should be avoided.
- A route through the Pilliga State forest would reduce the impacts on people with properties between Gwabegar and Narrabri.

The consultation process resulted in the development of alternative alignments on various sections of the route between Narromine and Narrabri. The first stage of this process was completed in October 2016 when a number of alignments were refined to produce a short list for further consultation with the local community in November 2016. The outcomes from the November workshops resulted in further alignment refinements to arrive at the list of options presented in Table 6-1 below and shown in Figure 6-2.

A review of these options was completed at the MCA workshop held on 15 December 2016.

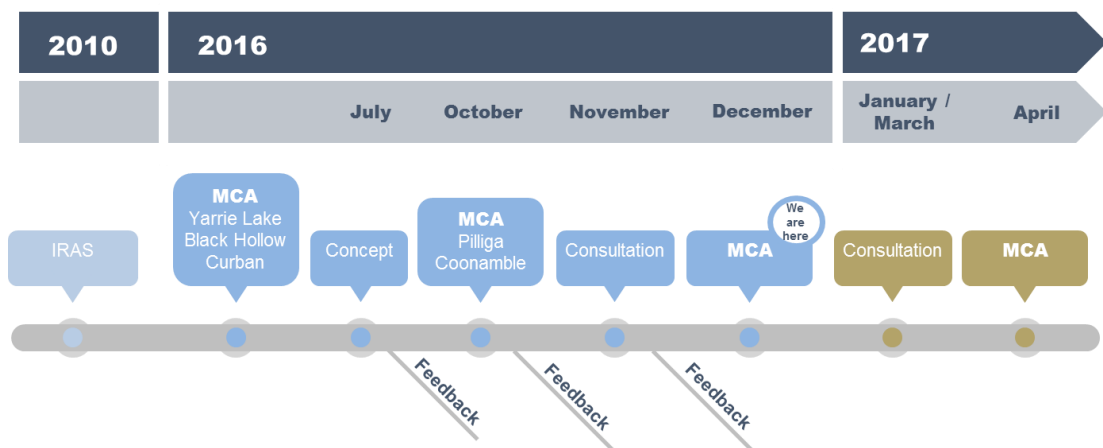


Figure 6-1 Summary consultation timeline

Table 6-1 Narromine to Narrabri additional options

Section	Options for further investigation
Section A - Narromine	<ul style="list-style-type: none"> • 2016 Concept Alignment (Narromine West) • Options 101+107 (Narromine East)
Section B - Narromine to Curban	<ul style="list-style-type: none"> • 2016 Concept Alignment • Option 101 (using Coonamble line via Eumungerie Road) • Option 107 (Narromine East and 2016 Concept Alignment) • Option 108 – Watershed • Option 109 – Paper road • Option 112 – Option 101 with a bypass of Gilgandra • Option 113 – Parallel to Newell Highway
Section C - Curban to Mt Tenandra	<ul style="list-style-type: none"> • 2016 Concept Alignment • Option 206 (Coonamble line to Gulargambone) • Option 111/206 – Collie Rd to Gulargambone
Section D – Mt Tenandra to Baradine	<ul style="list-style-type: none"> • No significant options deviating from Concept design. Potential minor changes following landowner consultations and geotechnical investigations.
Section E – Baradine to Narrabri	<ul style="list-style-type: none"> • 2016 Concept Alignment • Options 403 and 404 (along Pilliga Forest Way) • Options 408 and 409 (most direct route) • Option 413 (Options 403/404 combined with 401 to connect to 2016 Concept Alignment near Yarrie Lake via Forest Way)
Section F - Narrabri	<ul style="list-style-type: none"> • 2016 Concept Alignment • Narrabri East option (connecting to Pilliga options)

6.2 Narromine

6.2.1 General

Inland Rail could pass either to the east or west of Narromine. The option of using the existing track through the centre of Narromine was discounted due to alignment constraints, speed restrictions, noise and vibration and potential grade separation of existing level crossings to avoid severance of the town centre.

The selection of the eastern or western route will also be influenced by the preferred route between Narromine and Curban and the optimum connection to the Parkes to Narromine section.

6.2.2 Options

The Narromine options are shown in Figure 6-3 The key features are summarised in Table 6-2.

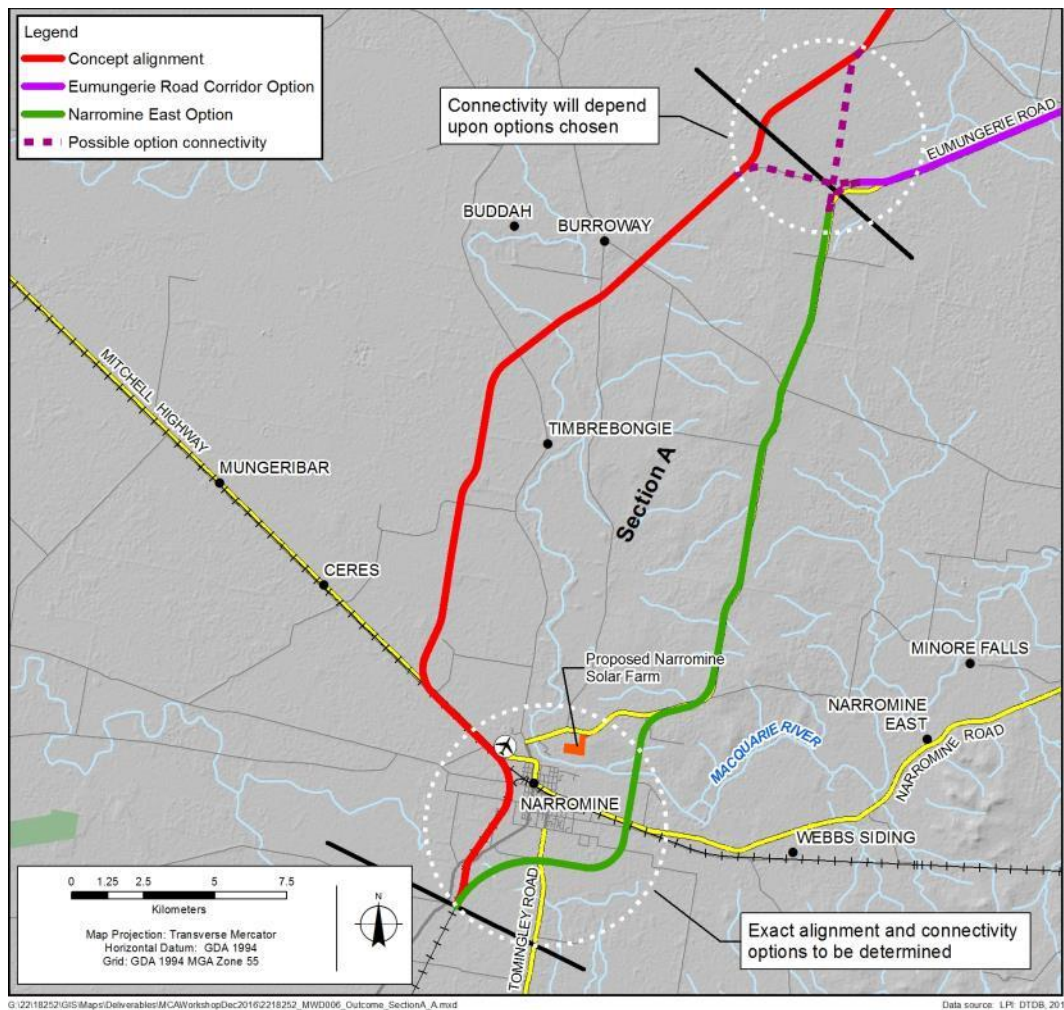


Figure 6-3 Narromine options

6.2.3 Issues and constraints

Issues and constraints around Narromine include:

Eastern alignment

- Flooding from Wallaby Creek and the Backwater Cowal.
- Property impacts, including pivot irrigation, existing and proposed subdivisions.
- Noise and vibration.
- Utilities, including HV electricity substation and gas pipeline.
- Grade separation of the Mitchell Highway and the Main Western Railway. Preliminary indications are that Inland Rail would be taken over these assets and would then continue on a viaduct over the Macquarie River.
- Connectivity between Inland Rail and the Main Western Line.
- Crossing of the Macquarie River.

Western alignment

- Flooding from the Macquarie River. Local feedback was that during flood events the river breaks its banks, resulting in wide scale flooding to the west. This is consistent with the 1:100 year flood mapping.
- Property impacts, including cropping areas and irrigation schemes.
- Crossing the Macquarie River.
- Grade separation of the Mitchell Highway. For the western alignment, Inland Rail would join the Main Western railway and the Mitchell Highway would be taken over the railway line. The highway would need to be realigned to achieve an appropriate crossing angle. This would result in additional property impacts.

For both options, connectivity between the Main Western Line and Inland Rail requires careful consideration.

For the eastern alignment, a grade separation of Inland Rail over the Main Western line would preclude any connectivity and trains using the Main Western Line would have to access Inland Rail via Dubbo and Curban.

For the western alignment, Inland Rail joins the Main Western Railway and freight would be able to access Inland Rail to the south. Connectivity to the north could also be provided, if required, but this would impact on the grade separation of the Mitchell Highway. An alternative route north would be via Dubbo and Curban.

6.2.4 Opportunities

The opportunities at Narromine are:

- Using the existing Main Western railway to minimise property impacts.
- A rail alignment to the east of Narromine could create an opportunity for Narromine Council to realign Tomingley Road, parallel to the rail line, to provide a heavy goods bypass of the town centre for north-south traffic.

- The eastern alignment would provide a simpler grade separation of the Mitchell Highway and Main Western line, but would not provide connectivity between the two railway lines.
- The eastern alignment would follow higher ground to the north east of Narromine that would reduce flood risks and could have better geotechnical conditions to win materials for construction.

6.2.5 Narromine MCA Outcomes

The introduction of alternative options between Narromine and Curban has provided the opportunity to consider potential routes to the east of Narromine.

The existing alignment through the centre of Narromine is not considered suitable for Inland Rail due to the tight radius curve, a 55 km/h speed restriction, three level crossings and interfaces with existing grain handling terminals.

A new alignment on the eastern side of Narromine would therefore be required that would avoid the residential areas and then turn in a northerly direction to cross the Main Western rail line, the Mitchell Highway and the Macquarie River.

The eastern alignment was reviewed at the MCA Workshop and the outcomes are summarised in Table 6-2.

Table 6-2 Narromine Option MCA outcomes

Option	Option 101 – East Narromine
Description	Leaves the existing Parkes to Narromine railway to the south of Narromine and heads in an easterly direction across farmland with pivot irrigation. Crosses the Macquarie River, Mitchell Highway and the Main Western Railway to the east of Narromine. Follows the line of elevated ground, clear of the Macquarie River flood plain, to follow Eumungerie Road
MCA Score	1.35
Comment	<p>Avoids Narromine airport and offers opportunity for improved crossing angle of Mitchell Highway (subject to further concept design). Crossing of Macquarie River upstream of Narromine maybe beneficial to reduce flooding impacts and gain higher ground quicker with improved geotechnical conditions.</p> <p>Further investigations and design required to determine flooding risks from the Backwater Cowal, assess impacts on pivot irrigation, check impacts on electricity substation.</p> <p>ARTC to also confirm connectivity requirements to the Main Western railway with TfNSW/CRN</p>
Agreed actions	<ul style="list-style-type: none"> • Aerial survey of Eastern Option with sufficient information for flood studies. • Flood study for Backwater Cowal. • Confirm 1:100 year flood extents for Macquarie River. • Further discussions with Narromine Council to confirm status of proposed subdivisions. • Develop concept design to same level as the 2016 Concept Alignment. • Consultation with all affected property owners.

6.3 Narromine to Curban

6.3.1 General

Inland Rail uses the existing Parkes to Narromine railway to arrive at Narromine from the south. The route then heads in a north easterly direction for approximately 90 km towards Curban.

Six primary route options and two sub-options have been identified on the basis of:

- Minimising property impacts.
- Minimising flood risk from the Macquarie River and local catchment flooding.
- Maximising potential for improved geotechnical conditions, leading to improved constructability and reduced maintenance.
- Using the existing Coonamble line to reduce property impacts.

6.3.2 Options

The Narromine to Curban options are shown in Figure 6-4. The key features are summarised in the tables in Table 6-3.

Option 107 is a sub-option that allows the East Narromine Option to connect through to the 2016 Concept Alignment or Option 109 etc. It was not directly evaluated in the MCA Workshop.

It was considered that Options 108 and 113 were intermediate solutions between Option 109 and Option 101. They had similar issues to those options and were not therefore directly evaluated by the attendees. The final alignment of any alternative alignment between Gilmores Road and the Newell Highway will be subject to future land owner consultation.

Option 112 is a bypass around Gilgandra and would be considered in conjunction with Option 101 along the Coonamble line. Both options were scored in the workshop.

Option 111 runs along Collie Road and connects to Option 206 at Gulargambone. This option was considered to be longer than the 2016 Concept Alignment and too far to the west, with increased geotechnical and flooding risks.

6.3.3 Issues and constraints

The key issues in this section are:

- Potential for reduction in property impacts through using the existing Coonamble line between Eumungerie and Curban/Gulargambone. Whilst this would offer some benefits, the route would be longer, would require two grade separations of the Newell Highway and would either result in noise and vibration issues in Gilgandra or trigger a bypass around Gilgandra.
- Geotechnical conditions for construction of Inland Rail. As a general rule, black soils (vertosols) are more prevalent to the west. These may present potential problems with trafficability during construction, materials availability for construction and shrink/swell movement during operations.
- Local flooding issues across generally flat terrain, particularly from Kickabil Creek at the intersection of Gilmours Road and Link Road.
- Impacts on properties, particularly where one owner owns multiple lots that could be bisected by a particular alignment.

The key constraints and design considerations in this area are:

- “Black” soils and associated issues with constructability, and maintenance.
- Materials availability for construction of the railway embankment.
- Property impacts, including cropping and irrigation schemes.
- Flooding from local catchments.
- Major structures:
 - Grade separations of the Newell Highway (Options 101 and 112 only).
 - Grade separation of the Oxley Highway.
- Noise and vibration and potential severance in the town of Gilgandra (Options 101 only).
- Potential Gilgandra bypass (Options 112 only).
- Track possession requirements and impacts on grain movements for upgrade of the Coonamble line.

6.3.4 Opportunities

Opportunities, including those identified through the consultation process, are:

- Locating the railway on the north-south watershed between Eumungerie Road and Gilgandra. This area would have less drainage and flooding issues and has a greater potential to win material for earthworks construction than the 2016 Concept Alignment.
- Following higher ground to the north east of Narromine to reduce flood risk and improve the potential to win local construction materials.
- Following Eumungerie Road to create a road and rail transport corridor and reduce severance impacts. Note that this is subject to confirmation of property boundaries.
- Using the existing Coonamble line to reduce property impacts.
- Collie Road appears to have a wide road reserve (Option 111).

6.3.5 Narramine to Curban outcomes

The MCA Workshop outcomes are summarised in Table 6-3.

Table 6-3 Narramine to Curban MCA outcomes

Option	Option 101 – Eumungerie Road/Coonamble Line
Description	Follows Eumungerie Road to join Coonamble Line north of Eumungerie and then Coonamble line to Curban
MCA Score	-3.56
Comment	<p>For Coonamble Line - Two grade separations of Newell highway required, including one in Gilgandra. One grade separation of Oxley Highway required in Gilgandra. Potential noise and vibration impacts on Gilgandra residents.</p> <p><i>Longer route and higher interfaces with Coonamble Line traffic scored negatively. Higher construction complexity and costs associated with additional grade separations</i></p>
Agreed actions	<ul style="list-style-type: none"> No further consideration
Option	Option 112 – As Option 101 with Gilgandra bypass
Description	Option 101, but using a section of option 113 to bypass Gilgandra
MCA Score	-2.04
Comment	<p>Similar comments to option 101, but reduction in impacts through Gilgandra.</p> <p><i>Longer option with negative impacts on travel time and train operations on the Coonamble line.</i></p>
Agreed actions	<ul style="list-style-type: none"> No further consideration
Option	Option 109 – Paper Road
Description	Generally parallel to the 2016 Concept Alignment, but follows “paper roads” further to the east on the back property boundaries.
MCA Score	0.69
Comment	<p>Discussions with local land owners raised concerns about disruption to access roads if Inland Rail is constructed along Gilmores Road. May be preferable to locate the alignment at the rear of the properties and follow a series of “paper roads” that are owned by Council. Some adjoining property acquisition is also likely to be required.</p> <p><i>Potential marginal improvement on the 2016 Concept Alignment as removes impacts on property accesses.</i></p>
Agreed actions	<ul style="list-style-type: none"> Aerial survey. Develop concept design to same level as the 2016 Concept Alignment <p>Consultation with all affected property owners.</p>

Option	Option 111 – Collie Road
Description	Alignment parallel to Collie Road as far as the Oxley Highway, then heads in north easterly direction to Gulargambone
MCA Score	-1.96
Comment	Option considered to have higher geotechnical and flooding risks, being further to the west. Some benefits along Collie road with regard to property acquisition and access, however these are lost once the route crosses the Oxley Highway. <i>2016 Concept Alignment preferred.</i>
Agreed actions	<ul style="list-style-type: none"> No further consideration

The highest scoring option was 109 with a score of 0.69, indicating a marginal potential improvement over the 2016 Concept Alignment. The scores for all other options were negative, indicating that, on balance, the 2016 Concept Alignment or option 109 would be preferred, rather than deviating further east and using the Coonamble line.

Community feedback had requested consideration of the Coonamble line. This option, scored negatively at -3.56, indicating that the 2016 Concept Alignment was, on the whole, preferable. The key reasons why the Coonamble line scored poorly were:

- Longer route resulting in additional time, cost and fuel.
- Two grade separated interchanges required to take the Newell Highway over the new Inland Rail line. One of these could be in Gilgandra with associated property impacts.
- Potential operational issues with interfaces at existing grain terminals on the Coonamble line.
- Noise and vibration issues through Gilgandra, or a new Gilgandra bypass.
- Issues with construction alongside Eumungerie Road through rolling terrain. The railway would need to be constructed through a series of cuttings and embankments to maintain grades at less than 1%. It would therefore be offset from the road and generally be either higher or lower than existing levels.

6.4 Curban to Mt Tenandra

6.4.1 General

Between Curban and Mt Tenandra, the 2016 Concept Alignment takes a direct route, initially following National Park Road, and then veering north across open farming land. The 2010 IRAS considered an alternative route using the existing Coonamble line between Curban and Coonamble and then heading east along a greenfield route to Kenebri. This option was considered to be longer and more expensive than the new, more direct, track and was therefore discounted.

A number of additional options were considered at the MCA workshop held on 27 October. Options that continued along the Coonamble line to Combara or Coonamble and then headed east were discounted due to their additional length, increased transit time, poor geotechnical conditions, lack of suitable materials for railway construction and poor drainage.

The outcome of the October MCA was that the 2016 Concept Alignment was generally preferred, but that option that used the Coonamble line up to Gulargambone and then followed Box Ridge Road to Mt Tenandra was a compromise that should be taken forward and discussed with the community.

The two options were presented at the community information sessions held in November 2016 and in general the alternative option via Gulargambone received favourable support as it made use of the existing rail and road infrastructure corridors, thus reducing impacts on agricultural land.

6.4.2 Options

The Curban – Mt Tenandra options are shown in Figure 6-5 below.

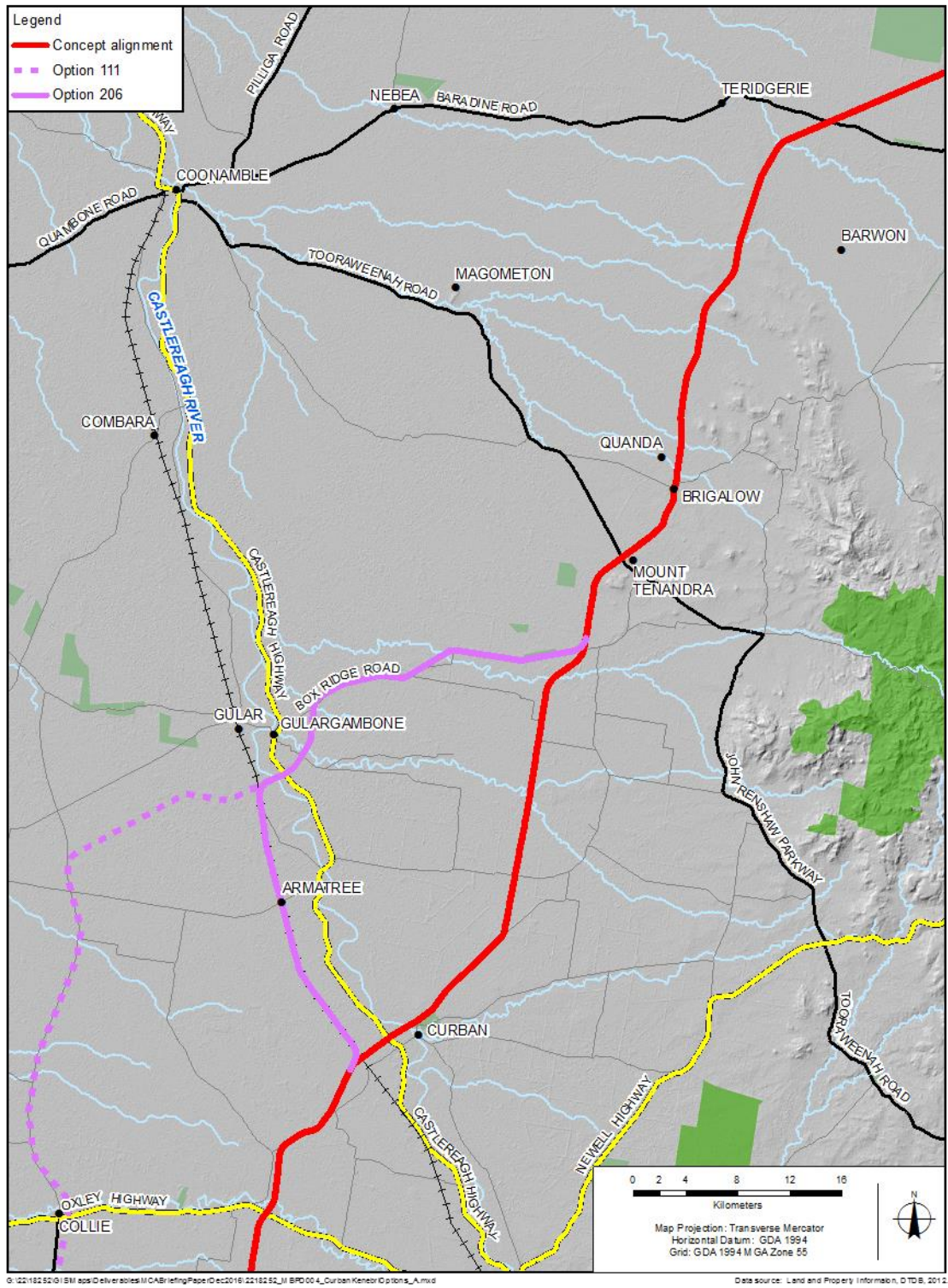


Figure 6-5 Curban to Mt Tenandra options

6.4.3 Issues and constraints

The key constraints between Curban and Mt Tenandra are:

- High productivity farm land immediately west of Curban.
- Connectivity to the Coonamble Line, including the existing grain siding at Curban.
- Interfaces with other grain sidings of the Coonamble line, if this becomes the main Inland Rail route.

- Flooding from the Castlereagh River, particularly to the south of Coonamble.
- Areas of highly reactive (black) soils that are expected to increase in depth from east to west.
- Poor drainage over flat areas where flood waters are slow to drain away.
- Water volumes at creek crossings increase from east to west.
- Track possession requirements and impacts on grain movements for upgrade of the Coonamble line.
- Train control systems if Inland Rail trains under ATMS interface with local traffic on the Coonamble line.

6.4.4 Opportunities

Feedback from community consultations is that, where practical, the community would like to see impacts on high productivity agricultural land avoided and greater use made of the Coonamble line.

For approximately 30 km past Curban, the 2010 Base Case passes through prime agricultural land. This area also experiences sheet flooding from water running off the Warrumbungles. This section of the route was not received favourably during the local consultation sessions.

The alternative option uses the Coonamble line to Gulargambone and then heads east, following Box Ridge Road. This would result in approximately 12 minutes additional run time but would provide the following opportunities:

- The Coonamble line forms the watershed between runoff from the Warrumbungles and water flowing westwards to the Macquarie Marshes. Using the Coonamble line would reduce drainage impacts.
- An inspection of the site showed that the road reserve adjoining Box Ridge Road is generally wide enough to accommodate a 40 m wide rail corridor, with limited property acquisition for curve easing. This would reduce acquisition requirements from agricultural land.
- Leaving the Coonamble line to the south of Gulargambone would reduce impacts on residents.

6.4.5 Curban to Mt Tenandra outcomes

Previous investigations had identified a number of alternative options in this area, including extending Inland Rail to Coonamble. These options were reviewed at the MCA Workshop in October 2016 and the majority were discounted, in favour of Option 206. This option was presented to the local community at information sessions held in November 2016.

The Option 206 alignment between Curban and Mt Tenandra is shown in Figure 6-5.

The MCA score was -0.4, indicating that it is marginally less preferential than the 2016 Concept Alignment. The key areas of difference were that the option is longer which would result in an increase in journey time. The interfaces with local CRN traffic the Coonamble line were also considered to be a negative if local grain trains required paths between intermodal freight trains to travel the short distance between Curban and Gulargambone. Railway signalling interfaces between the two operating systems also need to be resolved.

Option 206 scored positively with regard to reduced property impacts and local government support.

The ranking from the MCA was not considered to be significant and it was concluded that both options should be taken forward for further consultation with all landowners and the community. ARTC also undertook to consult with TfNSW to further quantify the impact of Inland Rail on operations on the Coonamble line.

Table 6-4 Curban to Mt Tenandra MCA outcomes

Option	Option 206 – Coonamble line to Gulargambone
Description	Follows the Coonamble line north from Curban until Gulargambone and then heads east following Box Ridge Road.
MCA Score	-0.4
Comment	<p>Consultation with the local community and Gilgandra Council had raised concerns about impacts of Inland Rail on agricultural land to the west of Curban. An alternative route was investigated via the Coonamble line and Box Ridge Road reserve. This route is longer, but reduces property impacts.</p> <p><i>The MCA assessment concluded that the longer transit time associated with the option together with the operation issues associated with the interface with a short section of the Coonamble line were likely to outweigh the impacts on property, but additional information was required before a final decision could be made.</i></p>
Agreed actions	<ul style="list-style-type: none"> • Aerial survey for option. • Develop concept design to same level as the 2016 Concept Alignment. • Consultation with all affected property owners. • ARTC to consult with TfNSW to quantify operational impacts from interfaces with the Coonamble line.

6.5 Mt Tenandra to Baradine

6.5.1 General

The section of track between Mt Tenandra and Baradine is constrained by the foothills of the Warrumbungle range to the east and flat poorly drained soils to the west. No major deviations were proposed from the 2016 Concept Alignment.

6.5.2 Options

No options were proposed.

Minor deviations from the 2016 Concept Alignment may occur following consultation with land owners and detailed geotechnical investigations. These could reduce potential impacts on farming operations and/or improve ground conditions for construction and operation.

6.5.3 Issues and constraints

Constraints between Mt Tenandra and Baradine include:

- Poorly drained “black” soils (vertisols), increasing to the west.
- Elevated ground and remnant basalt outcrops to the east. Routes through these areas could involve deep cuttings.
- High productivity farm land.

6.5.4 Opportunities

Opportunities in this area include:

- Moving the alignment to the east to:
 - Reduce the potential exposure to black soil areas.
 - Improve cross drainage.
 - Win sandstone and basalt that could potentially be used for embankment fill and ballast.

Prior to making decisions on changing the alignment between Mt Tenandra and Baradine, further discussions should be held with land owners to understand issues and impacts on properties and farming activities.

Geotechnical investigations should also be completed to confirm the nature and extents of black soil areas and the suitability of underlying soils and rock for construction materials.

Consultation with local aboriginal land councils and the Department of Crown Lands should be undertaken to understand issues relating to alignment changes that could impact on local land forms.

6.5.1 Mt Tenandra to Baradine outcomes

No significant route deviations were identified between Mt Tenandra and Baradine.

It was recognised that the 2016 Concept Alignment may be subject to minor changes in this area following consultation with land owners, discussions with stakeholders and completion of geotechnical investigations.

6.6 Baradine to Narrabri

6.6.1 General

From Baradine, the 2016 Concept Alignment follows the disused Gwabegar rail corridor towards Gwabegar and then heads in a north easterly direction across farmland and scattered forests towards Narrabri. The final 10 km of the route have been changed from the 2010 IRAS alignment to use the existing Narrabri – Walgett rail corridor in order to minimise impacts on residents adjoining Yarrie Lake Road.

The 2010 IRAS did not consider alternative options in this section.

Stakeholder and community feedback was that an alignment through the Pilliga State Forest should be considered to reduce impacts on properties between Kenebri and Narrabri.

A visual site inspection was completed by ARTC and GHD on 11 October 2016 by driving along the Pilliga Forest Way. This preliminary inspection indicated that the existing track could be suitable for construction access. A subsequent meeting with NSW State Forests and the National Parks and Wildlife Service confirmed that this option could be feasible.

6.6.2 Options

The Baradine - Narrabri West options are shown in Figure 6-6 below.

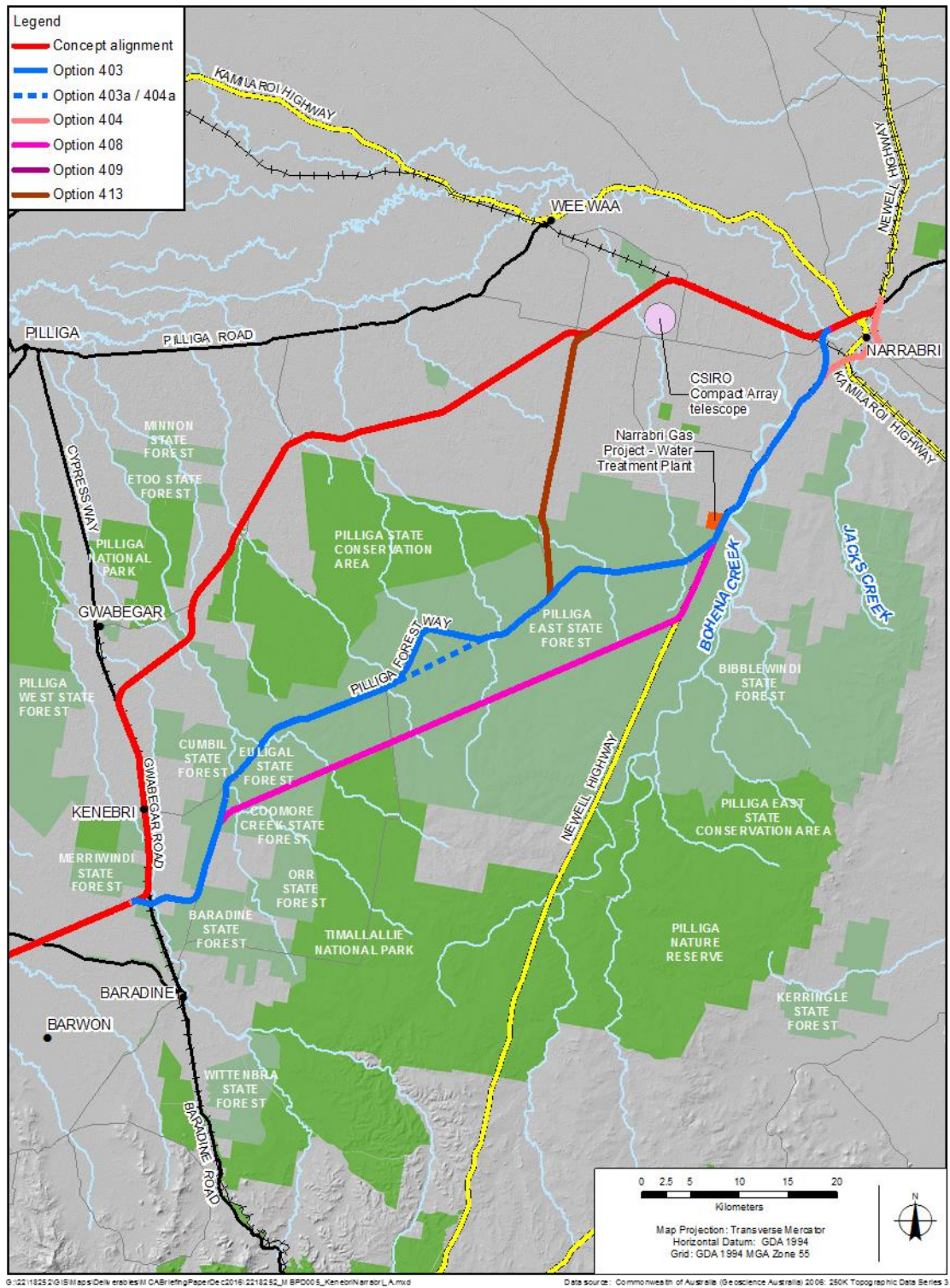


Figure 6-6 Baradine to Narrabri West options

6.6.3 Issues and constraints

Constraints between Baradine and Narrabri West include:

- Cumulative environmental impacts from multiple activities within the Pilliga State Forest, including coal seam gas development and commercial forestry operations.
- Potential opposition from environmental groups.
- Proximity to the Pilliga State Conservation Area, Pilliga National Park and Timmallallie National Park.
- Potential unknown aboriginal heritage sites and artefacts.
- CSIRO Compact Array telescope to the west of Narrabri.
- Santos' coal seam gas development and associated infrastructure.
- Residential zoning along Jacks Creek and the popularity of this area for large lot residential developments and hobby farms.
- Jacks Creek/Bibblewindi State Forest identified as being a productive commercial forest area.
- Potential flooding from Bohena Creek.
- Potential bush fire risk and impacts on reliability.
- Grade separation of the Newell Highway.
- Lack of good quality construction fill materials along the 2016 Base Case alignment.

6.6.4 Opportunities

The opportunities from a route through the Pilliga would be:

- Property acquisition from one land owner over a length of approximately 80 km.
- Improved geotechnical conditions on weathered sandstone.
- Reduced drainage impacts, being higher in the catchment.
- Opportunities for balanced cut to fill earthworks through more undulating terrain.
- Reduction in level crossings.
- Reduction in noise and vibration impacts on nearby residents.

6.6.5 Baradine to Narrabri West MCA outcomes

The principal objective of the MCA was to evaluate whether route options through the Pilliga State Forest were preferable to the 2016 Concept Alignment. It was recognised that further consultation, survey work and design would be required to select a preferred alignment through the State Forest.

As such similar options were combined and three core options were considered in the evaluation, being Options 403a/404a, Options 408/409 and Option 413.

The outcomes from the MCA are summarised in Table 6-5.

Table 6-5 Baradine to Narrabri West MCA outcomes

Option	Options 403a + 404a Pilliga Forest Way
Description	Alignment follows Cumbill Road, then Pilliga Forest Way to Newell Highway. Deviation 403a, 404a to cut corner at Schwagers Bore, subject to detailed survey.
MCA Score	3.72
Comment	Options 403 and 404 follow existing tracks through the Pilliga Forest. These options would have the least impact on the existing vegetation. The approach into Narrabri would follow the Newell Highway. <i>Preferable to 2016 Concept Alignment in all assessment categories.</i>
Agreed actions	<ul style="list-style-type: none"> • Aerial survey for option. • Develop concept design to same level as the 2016 Concept Alignment • Consultation with all affected property owners. • Consult with environmental and community groups
Option	Options 408 + 409 Direct line
Description	408 and 409 follow a direct line through the State Forest until the Newell Highway. Where they have a similar alignment to 403 and 404.
MCA Score	2.62
Comment	Potentially reduced flooding and drainage issues along with improved geology higher up the catchment. Lack of existing forest tracks potentially increases risk for emergency response. <i>Preferable to 2016 Concept Alignment in most assessment categories.</i>
Agreed actions	<ul style="list-style-type: none"> • Aerial survey for option. • Develop concept design to same level as the 2016 Concept Alignment • Consultation with all affected property owners. • Consult with environmental and community groups
Option	Option 413 Twenty Foot Road to 2016 Concept Alignment
Description	Option 413 is similar to 403a/404a until the junction with Twenty Foot Road. From here it heads north following existing forest roads until it joins the 2016 Concept alignment near the intersection of Yarrie Lake Road.
MCA Score	1.29
Comment	Alternative option for approach into Narrabri. To be compared with Newell Highway option when more detail is available. <i>Preferable to 2016 Concept Alignment in most assessment categories.</i>
Agreed actions	<ul style="list-style-type: none"> • Aerial survey for option. • Develop concept design to same level as the 2016 Concept Alignment. • Consultation with all affected property owners. • Consult with environmental and community groups.

6.7 Narrabri

6.7.1 General

The N2N section of Inland Rail joins the existing Narrabri to Moree (Mungindi) Railway north of Narrabri. Inland Rail has to cross from the south to the north of Narrabri on either the eastern or western side.

The 2016 Concept Alignment is on the western side and crosses the Namoi River/Narrabri Creek flood plain on a 4 km long viaduct. Whilst this is a practical engineering solution that locates the railway above the 1:100 year flood level as well as grade separating the Kamilaroi Highway and other minor roads, it would be expensive to construct and would have a visual impact across a relatively flat flood plain.

Furthermore, over 2000 properties in Narrabri are already at risk from flooding in the 1:100 year event. If Inland Rail is constructed downstream of the town, there is a risk that property owners affected by future flooding could allege that it was caused by the new rail line and potentially seek compensation. A route on the eastern side (upstream) of town would mitigate this risk.

Potential alignment options at Narrabri include:

- **Narrabri West:** crossing the floodplain to the west of town as per the Concept Alignment.
- **Narrabri East:** alignment on the eastern side, between the airport and town.

Using the existing rail line through Central Narrabri was considered, but this option was discounted due to the track alignment and level crossings resulting in signposted speeds in the order of 10-20 km/h, impacts on existing level crossings and modifications to infrastructure required to accommodate Inland Rail traffic. On this basis it was decided not to take this option forward for further discussion with stakeholders and the community.

6.7.3 Issues and constraints

The constraints to consider in the selection of options for Narrabri include:

Narrabri West (2016 Concept Alignment)

- 1:100 year flood levels and impacts on afflux from viaduct construction. Preliminary studies indicate that upstream flood levels could be raised by around 50 mm and that this could lead to increased inundation.
- Geotechnical conditions and impacts on location and cost for a 4 km long viaduct.
- Noise impacts from trains operating on an elevated structure.
- Viaduct levels set above the 1:100 year flood level to provide grade separation of Island Road and the Kamilaroi Highway.

Narrabri East

- Recent subdivision developments and future use of this area for residential growth.
- 1:100 year flood levels and potential impacts from construction of new structures.
- Flight path envelopes for Narrabri Airport.
- Solutions for grade separating the Newell (x2) and Kamilaroi highways.

6.7.4 Opportunities

Opportunities at Narrabri include:

- Crossing the Namoi river and Narrabri Creek upstream of Narrabri to potentially reduce flooding impacts.
- Reducing the viaduct length either by finding an alternative location or using a combination of earth embankments and a viaduct structure.
- Connections to existing intermodal facilities.

6.7.5 Narrabri outcomes

The outcomes from the MCA are summarised in Table 6-6.

Table 6-6 Narrabri MCA outcomes

Option	East Narrabri
Description	Connecting to a route through the Pilliga State Forest, this options would cross over the Kamilaroi Highway and the existing rail line and bypass Narrabri to the East, before connecting to the existing Narrabri – Moree line
MCA Score	-4.07
Comment	<p>Consultations with Gilgandra Council and the local community confirmed that the area to the east of Narrabri is planned for future residential expansion and is not preferred. This is reflected in the cadastral property boundaries where new subdivisions are evident. Grade separations would also be required over the Newell Highway and the existing Narrabri-Werris Creek rail line.</p> <p><i>The MCA assessment concluded that the Narrabri East option was not preferred.</i></p>
Agreed actions	<ul style="list-style-type: none"> • No further consideration.

Option	Central Narrabri
Description	Follows existing rail alignment through Narrabri
MCA Score	-2.99
Comment	<p>Significant restrictions due to tight radius curves on existing alignment and level crossings. Current signposted speed limit is 10-20 km/h. Structural modifications to station etc. required to accommodate double stacked containers. Noise and vibration impacts on residents in Narrabri.</p> <p><i>The MCA assessment concluded that the Narrabri Central option was not preferred</i></p>
Agreed actions	<ul style="list-style-type: none"> No further consideration.

The East Narrabri option was compared to the 2016 Concept Alignment and the MCA score was -4.07. The East Narrabri option scored negatively for all criteria and was not considered to be a preferred option. The key factors influencing the assessment were two additional grade separations of the Newell Highway, impacts on utilities, potential grade separation of the Narrabri – Werris Creek Railway that would reduce connectivity with Inland Rail and zoning of the east Narrabri area for future residential subdivisions.

The Central Narrabri option was also considered. This also scored negatively at -2.99, indicating that the 2016 Concept Alignment is the preferred option. As noted previously, alignment, level crossing and structural clearance constraints within Narrabri would create significant technical difficulties to utilising the existing alignment for Inland Rail through Narrabri.

The 2016 Concept Alignment to the west of Narrabri includes a 4km long viaduct over the Namoi River/Narrabri Creek flood plains. This is a significant component of the N2N project that will require further investigation in its own right, including:

- Detailed flood studies.
- Geotechnical investigations.
- Topographical Survey.
- Development of options, including consideration of alternative locations for the viaduct that could reduce overall impacts. Note that this may impact on the alignment in this section.
- Noise and vibration studies.
- Aboriginal heritage assessment and consultations.
- Continued consultation with landowners, the community and key stakeholders.

7. Summary and next steps

7.1 Workshop summary

An MCA workshop was held on 15 December 2016 to review additional alignment options developed between Narromine and Narrabri. The objectives of the workshop were to:

- Eliminate options that were considered unlikely to proceed.
- Determine which options to take forward for further community consultation in the first quarter of 2017.

The outcomes of the workshop were:

Table 7-1 Summary of route options for further consultation and investigation

Section	Options for further consultation and investigation
Narromine	<ul style="list-style-type: none"> • 2016 Concept Alignment (Narrabri West) • Options 101+107 (Narrabri East)
Narromine to Curban	<ul style="list-style-type: none"> • 2016 Concept Alignment • Option 109 (Paper road alignment), but combinations or refinements can be derived following landowner consultations.
Curban to Mt Tenandra	<ul style="list-style-type: none"> • 2016 Concept Alignment • Option 206 (Coonamble line to Gulargambone and then along Box Ridge Road).
Mt Tenandra to Baradine	<ul style="list-style-type: none"> • 2016 Concept Alignment (Potential minor departures, subject to landowner consultation and geotechnical investigations).
Baradine to Narrabri West	<ul style="list-style-type: none"> • Options 403a and 404a (along Pilliga Forest Way) • Option 413 (connects to 2016 Concept Alignment near Yarrie Lake) to be retained, pending confirmation of viaduct location at Narrabri and comparison with Newell Highway approach to Narrabri.
Narrabri	<ul style="list-style-type: none"> • 2016 Concept Alignment • Develop further options for viaduct which may involve alternative alignments to the west of Narrabri.

These options are illustrated in Figure 7-1.

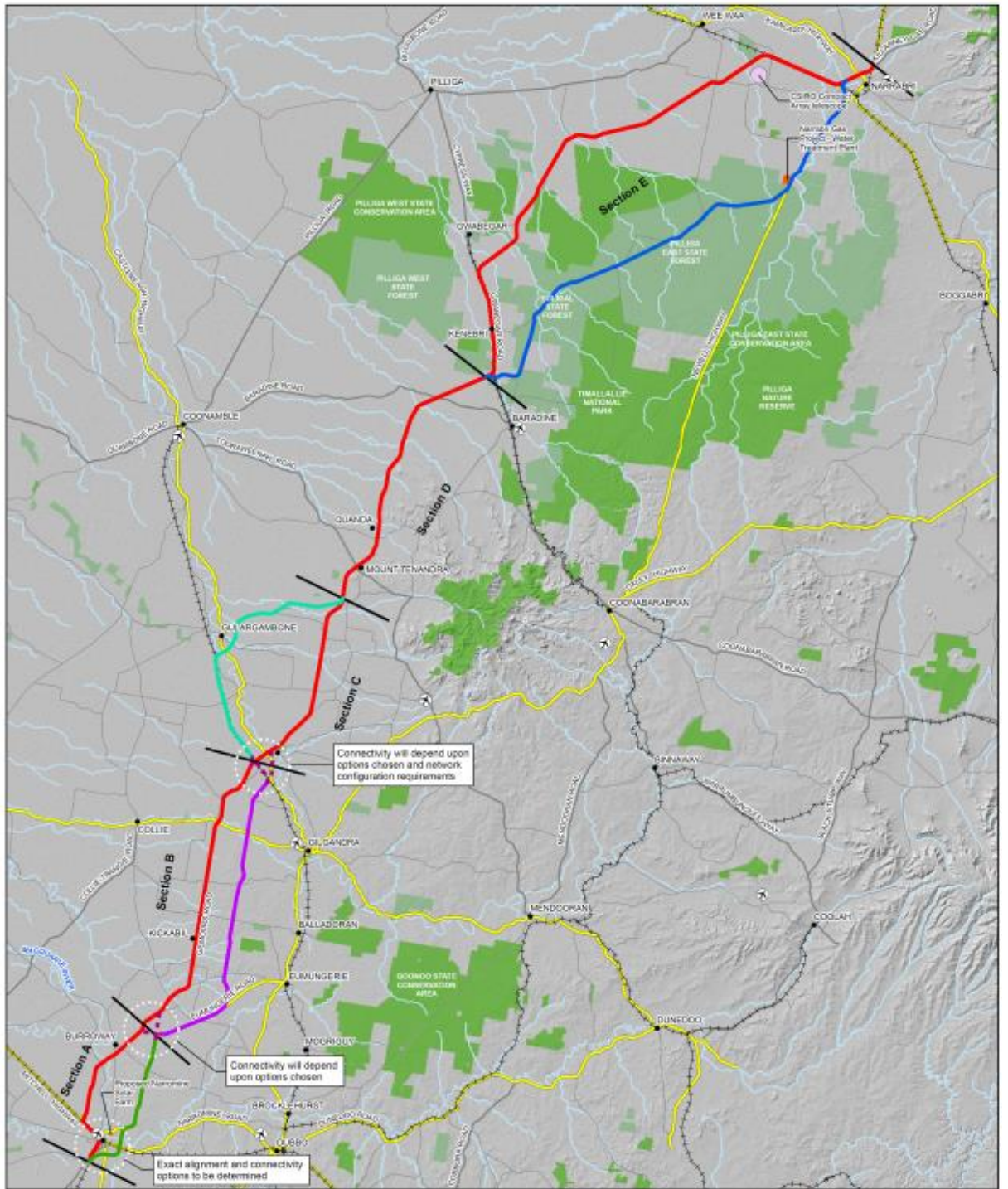


Figure 7-1 Options for landowner consultation

7.2 Next steps

The next steps are to further develop the options shown in Table 7-1 to provide supporting information for alignment refinement and selection of a preferred Inland Rail alignment.

The key activities to be undertaken are:

Ongoing community and stakeholder consultation

- Consultation with all land owners in the study areas for the 2016 Concept Alignment the options listed in Table 9.1 to identify specific concerns and constraints.
- Engagement with regional stakeholders to gather key feedback on the alternative alignments being considered.
- Engagement with environmental and community groups interested in the Pilliga State Forest.

Railway operations

- ARTC to meet with TfNSW to discuss the operational aspects of the Country Rail Network (CRN), the NSW Freight Strategy and Inland Rail.

Development of engineering designs

- Aerial Survey of alternate corridors for the options being considered to provide detailed topographical information.
- Development of engineering designs for the options to an equivalent standard of the 2016 Concept Alignment.
- Development of options for the Narrabri viaduct, including:
 - Review of current flood studies and development of a scope of work for further flood investigations and modelling.
 - Review of local road infrastructure and grade separation/level crossing requirements.
 - Review of property boundaries and land uses that would be impacted by the viaduct.
 - Identification of options for the viaduct location.
 - Development of options for the viaduct structure.
 - MCA review and selection of preferred viaduct option.

Environment and heritage

- Identification of areas of environmental significance and completion of rapid field surveys to verify desk top data.
- Engagement with local aboriginal land councils.

8. Limitations

This report: has been prepared by GHD for Australian Rail Track Corporation and may only be used and relied on by Australian Rail Track Corporation for the purpose agreed between GHD and the Australian Rail Track Corporation as set out in Section 1.1 of this report.

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Appendices

Appendix A - MCA Criteria

Subject MCA Review

Date 18 April 2016

Job No/Ref 248172

The following document includes a rapid review of the MCA (multi criteria analysis) completed for Inland Rail projects. This includes previous MCA work by Parsons Brinkerhoff and Arup, and the Principles and Guidelines for Economic Appraisal of Transport Investment Initiatives document prepared by Transport for New South Wales. This review was completed personnel not directly involved in the MCA process for these previous projects.

MCA intent

Intent to adopt a robust methodology for the next stage of inland rail project delivery, which

- Can be consistently applied by multiple consultant teams across projects.
- Provides transparency of process and procedural rigour
- Directly aligns to ARTC and Australian Government objectives and policy
- Does not unravel works or decisions made during previous study phases

Purpose of the Review

The purpose of the review is

- Provide an overview of the approach adopted in each study/ document
- Highlight the advantages or disadvantages of each approach
- Recommend a framework for adopting a consistent MCA methodology

It is important to note that a one stop shop may not fit all project scenarios, and the MCA process adopted for the IRAS and study phase was appropriate and relevant based on the level of assessment and design completed at that time. It is conceivable that more detailed metrics may be necessary once additional information becomes available due to ground-truthing of spatial constraints and issues, design progression and stakeholder and community inputs.

IE granularity of the assessment should be refined commensurate to the level of detail available.

Previous Information

The Melbourne –Brisbane Inland Rail Alignment Study (IRAS) completed in 2010 followed on from the 2005 study which undertook a high level analysis of various corridors and routes for an inland railway from Melbourne to Brisbane.

The previous corridor and route information from 2005 was reviewed and updated by the IRAS study. The IRAS study evaluation framework for the short listed route options was based on three broad criteria

- Cost (capex)
- Journey time saving
- Environmental impacts

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The journey time saving assessment was completed based on a reference case. The reference case was the alignment with the minimum capital expenditure required. The IRAS was based on a journey time of 27 hours for Inland Rail.

Safety considerations were specifically reported on in the IRAS working papers 2 and 10. The focus of the documentation was the assessment of functional railway route options based on defined characteristics of the alignment.

Parsons Brinkerhoff Assessment

The Parsons Brinkerhoff MCA (Memo dated 28 April 2015) is based on technical issues with a defined weightings for the Gowrie to Kagaru (G2K). The review notes that the assessment criteria is based on the Melbourne – Brisbane Inland Rail Strategic Review and Service Offering (ARTC, August 2014).

The assessment process expands the broad criteria noted for the route assessment in the IRAS (2010) reporting.

The MCA process was applied to alignment options after the accepted industry practice of constraints mapping/ review for environment and engineering issues.

The MCA is nested in an overall process which includes

- Compliance with MBIR service offering (yes/ no response)
- Comparative Capex (this was originally proposed as capex and opex, however opex was removed as it was considered included in the weighted MCA assessment).
- Safety Assessment of the proposed alignment, including
 - Operational safety (30%)
 - Public Safety (20%)
 - Road safety interfaces (30%)
 - Emergency response (20%)
- Weighted MCA including
 - Technical viability (25%)
 - Operations, including opex (20%)
 - Constructability and schedule (10%)
 - Environmental Impacts (15%)
 - Community and property impacts (15%)
 - Approvals and stakeholder risk (15%)
 - Commentary regarding the definition of the weighting was not included in the document.

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For the evaluation of each of the areas and sub areas, except the compliance with the MBIR service offering are scored with a 5 point scoring key of 10, 5, 0, -5, -10, where 10 is significant improvement on basecase, 0 no significant effect and -10 significant decline on basecase.

Weightings for the MCA criteria were established through a workshop process, with a subsequent workshop process to agree and assign scores.

The Weighted MCA components were assessed at a broad scale level, and consequently are reliant upon many assumptions. Documentation is generally subjective and descriptive, with some attempt at quantification of impacts/ issues. However, the level of design and constraint detail available at the time was suited to the approach adopted.

The cost (Capex) and the safety case outside the MCA process was included as part of the reporting and contributed to the summary. The three items were not combined for an overall weighting. This can influence the decision making compared with an assessment where the safety is included as part of the MCA. Additionally the combined capex and opex assessment was split (when the opex was included in the MCA) which may distort the whole of life evaluation.

Arup Assessment

The Arup MCA (nd) is based on the Infrastructure Australia (IA) strategic priorities and weightings for the Port of Brisbane extension (Acacia Ridge to Port of Brisbane).

The review notes that the assessment criteria is based on the Infrastructure Australia (IA) strategic priorities.

The MCA process was applied to alignment options after the accepted industry practice of constraints mapping/ review for environment and engineering issues.

The MCA areas of assessment and weighting is:

- SP1 Expand Australia's productive capacity and SP3 Diversify Australia's economic capabilities (10%)
- SP2 Increase Australia's productivity (15%)
- SP4 Build on Australia's global competitive advantage (35%)
- SP5 Develop our cities (10%)
- SP6 Reduce green house emissions (10%)
- SP7 Improve social equity and quality of life (20%)

Commentary regarding the definition of the weighting was not included in the document.

The assessment areas criteria for assessment was defined, including if it was a qualitative or quantitative measure. This provides procedural rigour, enabling other parties to understand the metrics for each criteria and scoring process.

For the evaluation of each of the areas and sub areas are scored with a 7 point scoring key of -3, -2, -1, 0, 1, 2 and 3, where -3 is highly detrimental, 0 neutral and 3 highly beneficial.

Principals and Guidelines for Economic Appraisal of Transport Investment Initiatives, Transport for New South Wales

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The Transport for New South Wales document (March 2013) includes the outline and use of MCA assessments. The document outlines a process which is the industry standard in New South Wales and includes an example which considers the quantitative and qualitative assessment of areas including economic, social, environmental and strategic fit and relevant sub objectives such as project implementation cost, reduced risk of death or injury, reduce greenhouse gas emissions. Weighting of the criteria is discussed, however the guidelines note that 'the weighting framework may be subjective'. The Parsons Brinkerhoff and Arup assessments noted above align with the principles defined in this document.

Adopting an MCA approach for Inland Rail MCA for the Phase 1 assessments

Adopting a standard MCA for the Inland Rail Phase 1 assessments should consider:

- The ability of the option to meet the project operational and technical objectives (alignment design characteristics, transit times, passing loop locations etc)
- Planning, transport (road network), environmental, cultural heritage, visual, agricultural and social impacts and opportunities, taking into consideration project specific 'local influences'
- Direct and indirect property impacts, including severance and future land use impacts.
- Community and stakeholder values
- ISCA metrics

These are similar to those included in both the Parsons Brinkerhoff and Arup assessments.

The weightings adopted by the Parsons Brinkerhoff and Arup assessments were agreed through a workshoping exercise. Weightings can be perceived as emphasising the significance of a particular criteria, but they can also be seen as a deliberate tool to intentionally skew an outcome. Therefore their adoption should be on a case by case basis. Weightings can be used with greater benefit as a sensitivity test, to evaluate whether a specific criteria is a differentiator or not, and test the outcome of the unweighted MCA. Suggested initial weightings are noted below.

Additionally it is proposed that the scoring is based on a 5 point scale (not a 7 point scale), enabling capture of positive and negative attributes. The subjectiveness of an assessment using a 7 point scale can be increased.

Metrics should be defined for each (MCA) criteria, to allow for a consistent approach to documentation.

Local influences

Local influences may require more detailed consideration, and can be tailored to suit each package. These could draw out more detail for themes such as:

- Urban (noise, visual amenity, severance, property impacts)
- Tunnels (air quality and emissions, life cycle costs)
- Key environmental areas such as protected flora and habitat, flooding, protected areas
- Cumulative and indirect impacts

Proposed MCA

The proposed approach adopts the Parsons Brinkerhoff process as the basis – as this aligns with the decision making with the 2010 base case and provides robustness over the project. However, the weightings noted below are modified, based on the potential importance on construction delivery. Additionally, safety has been incorporated into the assessment and opex has been combined with the capex. The weightings should be confirmed prior to the final assessment. The proposed assessment is:

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- Compliance with MBIR service offering (yes/ no response)
- Comparative Capex and opex
- Weighted MCA including:
 - Technical viability (17.5%)
 - Alignment
 - Impact on PUP and other assets
 - Geotechnical conditions
 - Flood immunity
 - Future proofing
 - Safety Assessment (17.5%) - Comparative safety review of options to consider net changes in
 - Operational safety
 - Public Safety
 - Road safety interfaces
 - Emergency response
 - Construction safety
 - Operational approach, including opex (17.5%* *refer below)
 - Impact on travel time
 - Reliability and availability
 - Network interoperability and connectivity/ interface with rail terminals and network
 - Constructability and schedule (12.5%* *refer below)
 - Construction duration
 - Construction access
 - Construction complexity
 - Resources/ material sources
 - Interface with operational railway
 - Staging opportunities
 - Environmental Impacts (12.5%)
 - Ecological impacts
 - Visual impacts

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- Noise and vibration impacts
- Flooding and water way impacts
- Air quality
- Effect on greenhouse gas emissions
- Community and property impacts (12.5%)
 - Property impacts
 - Indigenous and non-indigenous heritage (note this is included in this section rather than the environmental section to align with the PB process)
 - Impact on community eg road impacts
 - Community response
 - Current and future land use and links to economic impacts
- Approvals and stakeholder risk (12.5%)
 - Planning and approval requirements
 - State/ Federal agency buy in
 - Local government buy in
 - Other statutory and regulatory approvals
 - Service Authorities – utilities and others

Local influences (project specific criteria) should be added to the assessment areas above as required.

The weightings for operational approach, including opex and constructability and schedule are proposed to be changed from those in the PB assessment. The change is based on the increased importance on constructability and schedule. Initially, operational approach has decreased from 25% to 20% and constructability and schedule has increased from 10% to 15%, which was updated when safety was added to the evaluation.

The sub weightings for each of the areas should be evenly distributed. Weightings should be sensitivity tested. This should include a scenario where no element is weighted higher than others. Any change in the outcome/ ranking of options should be reviewed.

Assessment of Criteria

It is recommended that a 5 point assessment scale (instead of a 10 point scale) is adopted to assess against the base case of 2010, except for the updated G2C alignment which adopts Gowrie to Grandchester QT/QR alignment.

10	Significant improvement
5	Improvement
0	Neutral
-5	Decline
-10	Significant decline

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Confirmation of criteria

It is proposed that the MCA process is 'tested' with the TA project engineer and one or two IR project manager(s). Additionally the project engineer is included in the assessments regarding consistency and approach.

Category	Criteria	Quantitative or	
		Qualitative	Criteria Information
Technical Viability	Alignment	Quantitative	Comparison of changes to alignment geometry (grade, curves, ability to provide consistency of operation speed etc.)
	Impact on PUP and other assets	Qualitative	Assessment of the impact on PUP with the alignment (note the time frames for PUP approval is noted below)
	Geotechnical conditions	Qualitative	Assessment of geotechnical conditions
	Impacts on existing road and rail networks	Quantitative	Assessment of impact on road and rail networks (note road/rail crossings are included in safety below)
	Flood immunity/ hydrology	Qualitative	Assessment of ability to deliver flood immunity and changes to hydrology
	Future proofing	Qualitative	Assessment of the potential for upgrades to the rail infrastructure in the future eg extend loops for 3600m trains
Safety assessment of the proposed alignment	Operational safety	Qualitative	Track geometry Height of rail above natural surface Conflict points
	Public safety	Qualitative	Risk of trespass eg rural locations are considered to have lower occurrence of
	Road safety interfaces	Quantitative	Assessment of crossings including * highway/ motorway crossings * distribution road crossings * local and property access crossings
	Emergency response	Qualitative	Access to site eg remoteness access to emergency services
	Construction safety	Qualitative	Assessment of high risk construction activities eg large cuttings, working in waterway areas
Operations	Above rail opex	Qualitative	Comparison of above rail opex
	Below rail opex	Qualitative	Comparison of below rail opex e.g. complexity, structural elements, ability to maintain through running whilst maintaining sections
	Effect/ Impact on travel time	Quantitative	Comparison of travel time between base case and proposed option
	Effect on reliability and availability	Qualitative	Comparison of reliability between the based case and proposed option
	Network interoperability and connectivity	Qualitative	Qualitative assessment of interoperability and connectivity to the existing network and effect on existing/ new customers
Constructability and schedule	Construction duration	Quantitative	Assessment of the comparative difference in construction duration between the option and base case
	Construction access	Qualitative	Assessment of locations for site access during construction including * adjacent road access * access from existing railway corridors * access from properties
	Construction complexity	Qualitative	Assessment of the construction complexity and specialisation of workforce or equipment
	Resources/ material sources	Qualitative	Assessment of material sources for granular materials
	Interface with operational railway	Qualitative	Qualitative assessment to the number of interfaces with existing operational railway
	Staging opportunities	Qualitative	Assessment of staging opportunities
Environmental impacts	Ecological impacts (flora, fauna and habitats)	Quantitative	Assessment of the impact on * flora * fauna * remnant vegetation and habitats * Reserves, state forest, national park
	Visual impacts	Qualitative	Total qualitative extent to which the option would result in a landscape or visual change to sensitive receptors/ viewers (generally residential properties, conservation areas or open space)
	Noise and vibration impacts	Quantitative	Total number of * residential receptors within 200m of the corridor * sensitive receptors within 200m of the corridor * commercial/ industrial receptors within 200m of the corridor

	Flooding and waterway impacts	Qualitative	Qualitative assessment of the impact of * flooding * waterway crossings and impacts
	Effect on air quality	Quantitative	Total number of * residential receptors within 200m of the corridor * sensitive receptors within 200m of the corridor * commercial/ industrial receptors within 200m of the corridor
	Effect on greenhouse gas emissions	Qualitative	Estimated Tonnes of GHG emissions based on: * consideration of construction emissions and other operational factors such as lighting and ventilation Note it is considered that the differences between options for GHG emission factors for road transport with consideration of the extent to which options allow for modal shift from road to rail is generally considered neutral, if this is differently include in the assessment
Community and property impacts	Property impacts	Quantitative	Total number of * residential properties impacted * rural properties impacted * commercial/ industrial properties impacted * civic/ other properties impacted * severance of properties
	Heritage	Qualitative	Assessment of the impact on * Indigenous heritage * non indigenous heritage
	Impact on community e.g. road	Qualitative	Assessment of the impact of the changes to the community including * accessibility through changes to the road network or town/ business/ suburb centres * impact on community and civic facilities and businesses
	Community response (community stakeholder risk)	Qualitative	Overall qualitative assessment of: * Supports long term assessment of region * community stakeholder risk * community resistance and perception of environmental risk
	Current and future land use impacts	Qualitative	Overall qualitative assessment of: * supports long term assessment of region * impact on existing development * impact on future development
Approval and stakeholder risk	Planning and approval timescale	Qualitative	Assessment of likely planning approvals and duration
	State/ Federal agency buy in	Qualitative	Assessment of agency support for the option
	Local government buy in	Qualitative	Assessment of local government support for the option
	Other statutory and regulatory approvals	Qualitative	Assessment of other approvals required
	Service authorities (utilities/ other)	Qualitative	Assessment of * changes to significant (HV/ trunk/ distribution) utilities changes * changes to local utilities networks

Appendix B - Key MCA Criteria for Options Evaluation

Client: ARTC, Inland Rail
 Project: Narromine to Narrabri (N2N)
 Contract: NSW-TC-04562
 Title: N2N Options MCA Data: Narromine to Curban

Criteria	Sub-criteria	Metric	Concept Alignment	Option 101	Option 107	Option 108	Option 109	Option 112	Option 113	Comments (relating to the score)					
Technical viability	Alignment														
		Total Track length	93.4km	104.3km	92.3km	103.8km	97.6km	105.3km	104.1km						
		Greenfield	86.2km	60.6km	92.3km	92.3km	94.1km	76.0km	92.6km						
		Brownfield	7.2km	43.7km	0.0km	11.4km	3.5km	29.3km	11.4km						
		Impact on PUP and other assets													
		Detailed information not available. Assume similar impacts													
		Geotechnical conditions													
		Length existing formation reconstruction (brownfield)													
			7.2km	43.7km	0.0km	11.4km	3.5km	29.3km	11.4km						
		Length formation type A													
			TBA	TBA	TBA	TBA	TBA	TBA	TBA						
		Length formation type B													
			TBA	TBA	TBA	TBA	TBA	TBA	TBA						
		Comparative costs for track formation													
			TBA	TBA	TBA	TBA	TBA	TBA	TBA						
	Safety assessment of the proposed alignment	Impacts on existing road and rail networks													
		Brownfield: Number of existing LX's													
			2	20	0	5	1	14	5						
		Brownfield: Road underbridge													
			0	0	0	0	0	0	0						
		Brownfield: Impacts to existing stations													
			0	1	0	0	0	0	0						
		Brownfield: Impacts to existing major structures													
			1	5	0	1	1	1	1						
		Grade Separations (Primary Roads_													
			2	4	4	4	4	6	4						
		LX - Arterial Roads													
			0	0	0	0	0	0	0						
		Sub Arterial Roads													
			10	4	8	8	7	4	6						
		Local Roads or Track Crossing													
		34	36	45	44	37	44	48							
Operational approach, including opex	Flood immunity/ hydrology														
		Track length in designated flood plain													
			Base	Similar	Similar	Less	Similar	Similar	Similar		Options are generally higher in catchment				
		% of alignment with brownfield flooding requirement													
			8%	42%	0%	11%	4%	28%	11%						
	Constructability and schedule	Future proofing													
			Detailed information not available. Assume similar impacts												
				Base	Similar	Similar	Similar	Similar	Similar	Similar					
		Environmental and heritage impacts	Operational safety												
				Interfaces with existing lines / sidings / grain traffic											
					4	8	3	4	4	6	4				
			Community and property impacts	Public safety											
					Brownfield: Number of existing LX's										
						2	20	0	5	1	14	5			
					Brownfield: Impacts to existing stations										
						0	1	0	0	0	0	0			
				Number of road crossings (total)											
					48	64	57	61	49	68	63				
				Number of direct interfaces with Towns/public spaces											
					Base	Similar	Similar	Similar	Similar	Similar	Similar		Narrabri impacts to be discussed separately		
Approvals and stakeholder risk				Road safety interfaces											
				Brownfield: Number of existing LX's											
					2	20	0	5	1	14	5				
				Number of road crossings (total)											
				48	64	57	61	49	68	63					
	Approvals and stakeholder risk	Emergency response													
				Severance of public roads (emergency access routes)											
				Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete					
		Approvals and stakeholder risk	Construction safety												
				Track possessions / protection officers (brownfield v greenfield)											
					Possession Main Western Line and Walgett Line	Possession Main Western Line and Walgett Line	Possession Main Western Line and Walgett Line	Possession Main Western Line and Walgett Line	Possession Main Western Line and Walgett Line	Possession Main Western Line and Walgett Line	Possession Main Western Line and Walgett Line				
					Base	Similar	Similar	Similar	Similar	Similar	Similar				
				Any differentiators											
			Approvals and stakeholder risk	Effect/ Impact on travel time											
					Transit time at average of 81km/h (minutes)										
						69	77	68	77	72	78	77		Options from 1 minute shorter to 9 minutes longer	
Approvals and stakeholder risk				Effect on reliability and availability											
					Interfaces with existing lines / sidings / grain traffic										
						4	8	3	4	4	6	4			
					% of alignment with brownfield flooding requirement										
						8%	42%	0%	11%	4%	28%	11%			
	Approvals and stakeholder risk			Network interoperability and connectivity											
					Interfaces with existing lines / sidings / grain traffic										
						4	8	3	4	4	6	4			
		Approvals and stakeholder risk		Construction duration											
					Detailed information not available. Assume similar impacts										
						n/a	n/a	n/a	n/a	n/a	n/a	n/a			
				Approvals and stakeholder risk	Construction access										
						Detailed information not available. Assume similar impacts									
						n/a	n/a	n/a	n/a	n/a	n/a	n/a			
			Approvals and stakeholder risk		Construction complexity										
						Relative to Concept Alignment									
						Base	Better -	Similar	Better -	similar	better	Better			
Approvals and stakeholder risk					Resources/ material sources										
						Detailed information not available. Assume similar impacts									
							n/a	n/a	n/a	n/a	n/a	n/a	n/a		
					Approvals and stakeholder risk	Interface with operational railway									
						Distance of construction in operational corridor									
							7.2km	43.7km	0.0km	11.4km	3.5km	29.3km	11.4km		
						Number of connections with existing lines									
						4	2	2	2	2	4	2		Assume overbridge over Main Western	
	Approvals and stakeholder risk	Staging opportunities													
						Detailed information not available. Assume similar impacts									
						n/a	n/a	n/a	n/a	n/a	n/a	n/a			
		Approvals and stakeholder risk		Ecological impacts (flora, fauna and habitats)											
						% of high impacts									
						35%	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown			
			Approvals and stakeholder risk	Visual impacts											
						Detailed information not available.									
						Base	Similar	Similar	Similar	Similar	Similar	Similar			
Approvals and stakeholder risk				Noise and vibration impacts											
						Residences within 100m									
						1	10	1	2	2	1	2			
				Approvals and stakeholder risk	Flooding and waterway impacts										
						Number of water crossings (named, unnamed)									
							33	40	29	43	34	40	32		
					Approvals and stakeholder risk	Effect on air quality									
						Detailed information not available. Assume similar impacts									
							Base	Similar	Similar	Similar	Similar	Similar	Similar		
	Approvals and stakeholder risk					Effect on greenhouse gas emissions									
						Detailed information not available. Assume similar impacts									
							Base	Similar	Similar	Similar	Similar	Similar	Similar		
		Approvals and stakeholder risk				Property impacts									
						Properties impacted									
							77	72	86	102	84	92	118		
						Total impacted area									
						315 ha	233 ha	339 ha	350 ha	302 ha	282 ha	346 ha			
Approvals and stakeholder risk			Heritage												
						European heritage impact: items crossed									
						0	0	0	0	0	0	0			
				Aboriginal heritage impact: items crossed											
						TBA	TBA	TBA	TBA	TBA	TBA	TBA			
			Approvals and stakeholder risk	Impact on community e.g. road											
					Relative to Concept Alignment										
						Base	Worse	Similar	Similar	Similar	Similar	Similar		Gilgandra impact	
	Approvals and stakeholder risk			Community response (community stakeholder risk)											
					Relative to Concept Alignment										
						Base	Similar	Similar	Similar	Similar	Similar	Similar			
		Approvals and stakeholder risk		Current and future land use impacts											
					Relative to Concept Alignment										
						Base	Similar	Similar	Similar	Similar	Similar	Similar			
				Approvals and stakeholder risk	Planning and approval timescale										
						Relative to Concept Alignment									
						Base	Similar	Similar	Similar	Similar	Similar	Similar			
Approvals and stakeholder risk					State/ Federal agency buy in										
						Relative to Concept Alignment									
							Base	Similar	Similar	Similar	Similar	Similar	Similar		
					Approvals and stakeholder risk	Local government buy in									
						Relative to Concept Alignment									
							Base	Similar	Similar	Similar	Similar	Similar	Similar		
			Approvals and stakeholder risk			Other statutory and regulatory approvals									
						Relative to Concept Alignment									
							Base	Similar	Similar	Similar	Similar	Similar	Similar		
	Approvals and stakeholder risk					Service authorities (utilities/ other)									

Client: ARTC, Inland Rail
Project: Narromine to Narrabri (N2N)
Contract: NSW-TC-04562
Title: N2N Options MCA Data: Curban to Kenebri

Criteria	Sub-criteria	Metric	Concept Alignment	Option 206	Comments (relating to the score)
Technical viability	Alignment				
		Total Track length	38.8km	54.5km	
		Greenfield	38.8km	31.8km	
		Brownfield	0.0km	22.7km	
	Impact on PUP and other assets				
		Detailed information not available. Assume similar impacts	Base	Similar	No detailed information available.
	Geotechnical conditions				
		Length existing formation reconstruction (brownfield)	0.0km	22.7km	
		Length formation type A	TBA	TBA	
		Length formation type B	TBA	TBA	
		Comparative costs for track formation	TBA	TBA	
	Impacts on existing road and rail networks				
		Brownfield: Number of existing LX's	0	7	
		Brownfield: Road underbridge	0	0	
		Brownfield: Impacts to existing stations	0	0	
		Brownfield: Impacts to existing major structures	1	1	
		Grade Separations (Primary Roads_	1	1	
	LX - Arterial Roads	0	0		
	Sub Arterial Roads	3	3		
	Local Roads or Track Crossing	14	10		
Flood immunity/ hydrology					
	Track length in designated flood plain	Base	Similar	Option is lower in catchment	
	% of alignment with brownfield flooding requirement	0%	42%		
Future proofing					
	Detailed information not available. Assume similar impacts	Base	Similar		
Safety assessment of the proposed alignment	Operational safety				
		Interfaces with existing lines / sidings / grain traffic	1	3	
	Public safety				
		Brownfield: Number of existing LX's	0	7	
		Brownfield: Impacts to existing stations	0	0	
		Number of road crossings (total)	18	21	
		Number of direct interfaces with Towns/public spaces	Base	Similar	
	Road safety interfaces				
		Brownfield: Number of existing LX's	0	7	
		Number of road crossings (total)	18	21	
	Emergency response				
	Severance of public roads (emergency access routes)	Assessment not yet complete	Assessment not yet complete		
Construction safety					
	Track possessions / protection officers (brownfield v greenfield)	Possession Walgett Line	Possession Walgett Line		
	Any differentiators	Base	Similar		
Operational approach, including opex	Effect/ Impact on travel time				
		Transit time at average of 81km/h (minutes)	29	40	Option is 11 minutes longer
	Effect on reliability and availability				
		Interfaces with existing lines / sidings / grain traffic	1	3	
	% of alignment with brownfield flooding requirement	0%	42%		
Network interoperability and connectivity					
	Interfaces with existing lines / sidings / grain traffic	1	2		
Constructability and schedule	Construction duration				
		Detailed information not available. Assume similar impacts	n/a	n/a	
	Construction access				
		Detailed information not available. Assume similar impacts	n/a	n/a	
	Construction complexity				
		Relative to Concept Alignment	Base	Better -	
	Resources/ material sources				
		Detailed information not available. Assume similar impacts	n/a	n/a	
Interface with operational railway					
	Distance of construction in operational corridor	0.0km	22.7km		
	Number of connections with existing lines	1	1		
Staging opportunities					
	Detailed information not available. Assume similar impacts	n/a	n/a		
Environmental and heritage impacts	Ecological impacts (flora, fauna and habitats)				
		% of high impacts	5%	Unknown	
	Visual impacts				
		Detailed information not available.	Base	Similar	
	Noise and vibration impacts				
		Residences within 100m	0	9	
	Flooding and waterway impacts				
		Number of water crossings (named, unnamed)	9	15	
	Effect on air quality				
		Detailed information not available. Assume similar impacts	Base	Similar	
	Effect on greenhouse gas emissions				
		Detailed information not available. Assume similar impacts	Base	Similar	
	Property impacts				
		Properties impacted	33	34	
		Total impacted area	152 ha	121 ha	
Heritage					
	European heritage impact: items crossed	1	0		
	Aboriginal heritage impact: items crossed	TBA	TBA		
Impact on community e.g. road					
	Relative to Concept Alignment	Base	Similar		
Community response (community stakeholder risk)					
	Relative to Concept Alignment	Base	Better -		
Current and future land use impacts					
	Relative to Concept Alignment	Base	Similar		
Approvals and stakeholder risk	Planning and approval timescale				
		Relative to Concept Alignment	Base	Similar	
	State/ Federal agency buy in				
		Relative to Concept Alignment	Base	Similar	
	Local government buy in				
		Relative to Concept Alignment	Base	Similar	
Other statutory and regulatory approvals					
	Relative to Concept Alignment	Base	Similar		
Service authorities (utilities/ other)					

Client: ARTC, Inland Rail
Project: Narromine to Narrabri (N2N)
Contract: NSW-TC-04562
Title: N2N Options MCA Data: Option 111/206

Criteria	Sub-criteria	Metric	Concept Alignment	Option 111/206	Comments (relating to the score)	
Technical viability	Alignment					
	Total Track length		91.9km	113.0km		
	Greenfield		91.9km	113.0km		
	Brownfield		0.0km	0.0km		
	Impact on PUP and other assets					
	Detailed information not available. Assume similar impacts			Base	Similar	No detailed information available.
	Geotechnical conditions					
	Length existing formation reconstruction (brownfield)		0.0km	0.0km		
	Length formation type A		TBA	TBA		
	Length formation type B		TBA	TBA		
	Comparative costs for track formation		TBA	TBA		
	Impacts on existing road and rail networks					
	Brownfield: Number of existing LX's		0	0		
	Brownfield: Road underbridge		0	0		
	Brownfield: Impacts to existing stations		0	0		
	Brownfield: Impacts to existing major structures		0	0		
	Grade Separations (Primary Roads_		2	2		
	LX - Arterial Roads		0	0		
	Sub Arterial Roads		8	8		
	Local Roads or Track Crossing		32	31		
Flood immunity/ hydrology						
Track length in designated flood plain		Base	Similar		Options are generally higher in catchment	
% of alignment with brownfield flooding requirement		0%	0%			
Future proofing						
Detailed information not available. Assume similar impacts			Base	Similar		
Safety assessment of the proposed alignment	Operational safety					
	Interfaces with existing lines / sidings / grain traffic			1	1	
	Public safety					
	Brownfield: Number of existing LX's		0	0		
	Brownfield: Impacts to existing stations		0	0		
	Number of road crossings (total)		42	41		
	Number of direct interfaces with Towns/public spaces		Base	Similar		Narrabri impacts to be discussed separately
	Road safety interfaces					
	Brownfield: Number of existing LX's		0	0		
	Number of road crossings (total)		42	41		
	Emergency response					
	Severance of public roads (emergency access routes)			Assessment not yet complete	Assessment not yet complete	
Construction safety						
Track possessions / protection officers (brownfield v greenfield)			Possession Coonamble Line	Possession Coonamble Line		
Any differentiators			Base	Similar		
Operational approach, including opex	Effect/ Impact on travel time					
	Transit time at average of 81km/h (minutes)			68	84	Option is 16 minutes longer
	Effect on reliability and availability					
	Interfaces with existing lines / sidings / grain traffic			1	1	
% of alignment with brownfield flooding requirement			0%	0%		
Network interoperability and connectivity						
Interfaces with existing lines / sidings / grain traffic			1	1		
Constructability and schedule	Construction duration					
	Detailed information not available. Assume similar impacts			n/a	n/a	
	Construction access					
	Detailed information not available. Assume similar impacts			Base	Better	adjacent colliie road
	Construction complexity					
	Relative to Concept Alignment			Base	more difficult	gilgaid
	Resources/ material sources					
	Detailed information not available. Assume similar impacts			n/a	n/a	
Interface with operational railway						
Distance of construction in operational corridor			0.0km	0.0km		
Number of connections with existing lines			4	2	Assume overbridge over Main Western	
Staging opportunities						
Detailed information not available. Assume similar impacts			n/a	n/a		
Environmental and heritage impacts	Ecological impacts (flora, fauna and habitats)					
	% of high impacts			35%	Unknown	
	Visual impacts					
	Detailed information not available.			Base	Similar	
	Noise and vibration impacts					
	Residences within 100m			1	1	
	Flooding and waterway impacts					
	Number of water crossings (named, unnamed)			32	27	
	Effect on air quality					
	Detailed information not available. Assume similar impacts			Base	Similar	
	Effect on greenhouse gas emissions					
	Detailed information not available. Assume similar impacts			Base	Similar	
	Property impacts					
	Properties impacted			64	96	
	Total impacted area			341 ha	423 ha	
	Heritage					
	European heritage impact: items crossed			1	0	
	Aboriginal heritage impact: items crossed			TBA	TBA	
Impact on community e.g. road						
Relative to Concept Alignment			Base	Similar		
Community response (community stakeholder risk)						
Relative to Concept Alignment			Base	Similar		
Current and future land use impacts						
Relative to Concept Alignment			Base	Similar		
Approvals and stakeholder risk	Planning and approval timescale					
	Relative to Concept Alignment			Base	Similar	
	State/ Federal agency buy in					
	Relative to Concept Alignment			Base	Similar	
	Local government buy in					
	Relative to Concept Alignment			Base	Similar	
Other statutory and regulatory approvals						
Relative to Concept Alignment			Base	Similar		
Service authorities (utilities/ other)						

Client: ARTC, Inland Rail
Project: Narromine to Narrabri (N2N)
Contract: NSW-TC-04562
Title: N2N Options MCA Data: Baradine (Gwabegar) to Narrabri (excluding Narrabri)

Criteria	Sub-criteria	Metric	Concept Alignment	Option 403/404	Option 403a/404a	Option 408/409	Option 413	Option 413a	Comments (relating to the score)	
Technical viability	Alignment									
		Total Track length	113.0km	98.6km	96.5km	94.8km	113.1km	110.9km		
		Greenfield	80.5km	98.6km	96.5km	94.8km	99.4km	97.3km		
		Brownfield	32.5km	0.0km	0.0km	0.0km	13.7km	13.7km		
		Impact on PUP and other assets								
		Detailed information not available. Assume similar impacts		Base	Similar	Similar	Similar	Similar	Similar	No detailed information available.
		Geotechnical conditions								
			Length existing formation reconstruction (brownfield)	32.5km	0.0km	0.0km	0.0km	13.7km	13.7km	
			Length formation type A	TBA	TBA	TBA	TBA	TBA	TBA	
			Length formation type B	TBA	TBA	TBA	TBA	TBA	TBA	
			Comparative costs for track formation	TBA	TBA	TBA	TBA	TBA	TBA	
		Impacts on existing road and rail networks								
			Brownfield: Number of existing LX's	18	0	0	0	8	8	
			Brownfield: Road underbridge	0	0	0	0	0	0	
			Brownfield: Impacts to existing stations	0	0	0	0	0	0	
			Brownfield: Impacts to existing major structures	0	0	0	0	0	0	
			Grade Separations (Primary Roads_	0	0	0	0	0	0	
		LX - Arterial Roads	1	0	0	0	0	0		
		Sub Arterial Roads	2	0	0	0	1	1		
		Local Roads or Track Crossing	15	0	0	0	7	7		
	Flood immunity/ hydrology									
		Track length in designated flood plain	Base	Similar	Similar	Similar	Similar	Similar	Options are generally higher in catchment	
		% of alignment with brownfield flooding requirement	29%	0%	0%	0%	12%	12%		
	Future proofing									
	Detailed information not available. Assume similar impacts		Base	Similar	Similar	Similar	Similar	Similar		
Safety assessment of the proposed alignment	Operational safety									
		Interfaces with existing lines / sidings / grain traffic	3	1	1	1	2	2		
	Public safety									
		Brownfield: Number of existing LX's	18	0	0	0	8	8		
		Brownfield: Impacts to existing stations	0	0	0	0	0	0		
		Number of road crossings (total)	53	56	56	54	50	50		
		Number of direct interfaces with Towns/public spaces	Base	Similar	Similar	Similar	Similar	Similar	Narrabri impacts to be discussed separately	
	Road safety interfaces									
		Brownfield: Number of existing LX's	18	0	0	0	8	8		
		Number of road crossings (total)	53	56	56	54	50	50		
	Emergency response									
	Severance of public roads (emergency access routes)		Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete	Assessment not yet complete		
Construction safety										
	Track possessions / protection officers (brownfield v greenfield)		Possession Walgett	No Possessions	No Possessions	No Possessions	Possession Walgett	Possession Walgett		
	Any differentiators		Base	Similar	Similar	Similar	Similar	Similar		
Operational approach, including OPEX	Effect/ Impact on travel time									
		Transit time at average of 81km/h (minutes)	84	73	71	70	84	82	Options up to 14 minutes shorter	
	Effect on reliability and availability									
	Interfaces with existing lines / sidings / grain traffic	3	1	1	1	2	2			
	% of alignment with brownfield flooding requirement	29%	0%	0%	0%	12%	12%			
Network interoperability and connectivity										
	Interfaces with existing lines / sidings / grain traffic	3	1	1	1	2	2			
Constructability and schedule	Construction duration									
		Detailed information not available. Assume similar impacts		n/a	n/a	n/a	n/a	n/a		
	Construction access									
		Detailed information not available. Assume similar impacts		n/a	n/a	n/a	n/a	n/a		
	Construction complexity									
		Relative to Concept Alignment		Base	Better +	Better +	Worse	Better	Better	Improved cut to fill in Pilliga, improved access along proposed route from forest way
	Resources/ material sources									
		Detailed information not available. Assume similar impacts		n/a	n/a	n/a	n/a	n/a	n/a	
Interface with operational railway										
	Distance of construction in operational corridor		13.6km	0km	0km	0km	13.7km	13.7km	Gwabegar line assumed not operational	
	Number of connections with existing lines		3	1	1	1	2	2	Includes Gwabegar line	
Staging opportunities										
	Detailed information not available. Assume similar impacts		n/a	n/a	n/a	n/a	n/a	n/a		
Environmental and heritage impacts	Ecological impacts (flora, fauna and habitats)									
		% of high impacts		17%	4%	4%	5%	20%	20%	
	Visual impacts									
		Detailed information not available.		Base	Better	Better	Better	Better	Better	Screened by Pilliga State Forest
	Noise and vibration impacts									
		Residences within 100m		12	1	1	1	2	2	
	Flooding and waterway impacts									
		Number of water crossings (named, unnamed)		39	48	47	57	54	53	
	Effect on air quality									
		Detailed information not available. Assume similar impacts		Base	Similar	Similar	Similar	Similar	Similar	
	Effect on greenhouse gas emissions									
		Detailed information not available. Assume similar impacts		Base	Similar	Similar	Similar	Similar	Similar	
	Property impacts									
	Properties impacted		68	27	27	27	40	40		
	Total impacted area		354 ha	105 ha	105 ha	120 ha	233 ha	233 ha		
Heritage										
	European heritage impact: items crossed		0	0	0	0	0	0		
	Aboriginal heritage impact: items crossed		TBA	TBA	TBA	TBA	TBA	TBA		
Impact on community e.g. road										
	Relative to Concept Alignment		Base	Similar	Similar	Similar	Similar	Similar		
Community response (community stakeholder risk)										
	Relative to Concept Alignment		Base	better	better	better	better	better	Impacts on Narrabri. To discuss Pilliga impacts.	
Current and future land use impacts										
	Relative to Concept Alignment		Base	Better	Better	Better	Better	Better	Pilliga options reduce impacts on private lots	
Approvals and stakeholder risk	Planning and approval timescale									
		Relative to Concept Alignment		Base	Similar	Similar	Similar	Similar	Similar	
	State/ Federal agency buy in									
		Relative to Concept Alignment		Base	Similar	Similar	Similar	Similar	Similar	
	Local government buy in									
		Relative to Concept Alignment		Base	Better	Better	Better	Better	Better	Prefer Pilliga, but not Jacks Creek
Other statutory and regulatory approvals										
	Relative to Concept Alignment		Base	Worse	Worse	Worse	Worse	Worse	Environmental impacts through Pilliga	
Service authorities (utilities/ other)										

Appendix C - MCA Workshop Options Scoring

Option Assessment

Provide information in the pale blue cells

Adjustments for local areas of importances can be added with confirmation by ARTC eg tunnels

Package	Narromine to Narrabri
Option Reference	Options around Narromine
Drawing/ sketch reference (if applicable)	
Option Description	Option leaves existing rail line to south of Narromine and travels on the eastern side to join Option 101 alongside Eumungerie Road
Option Assessment Framework	
1. Compliance with MBIR service offering	All options comply with the Service Offering
2. Comparative capex and opex	No capex estimates during this MCA phase
Comment(s) on comparative capex and opex	

3. Multi criteria analysis

Criteria	Sub-criteria	Sub Criteria Weighting	Narromine East				Comments (relating to the score)
			Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score	Weighted score	
Technical viability	Alignment	20%	0				No significant differentiators between options
	Impact on PUP and other assets	20%	0				No significant differentiators between options
	Geotechnical conditions	20%	10	25	4.75	0.83125	Eastern option joins higher ridge over Macquarie river with better geotechnical conditions.
	Impacts on existing road and rail networks	15%	5				Eastern option expected to pass over the Mitchell Hwy and Main Western Line.
	Flood immunity/ hydrology	20%	10				Eastern option on viaduct over floodplain and then on higher ground.
	Future proofing	10%	0				No significant differentiators between options
Safety assessment of the proposed alignment	Operational safety	25%	0				No significant differentiators between options
	Public safety	10%	0				No significant differentiators between options
	Road safety interfaces	25%	-5	0	-0.25	-0.04375	Eastern option crosses Tomingely Road and other access roads.
	Emergency response	20%	0				No significant differentiators between options
	Construction safety	20%	5				Eastern option does not involve trackwork on existing line under possession arrangements.
Operational approach, including opex	Effect/ Impact on travel time	33%	0				No significant differentiators between options
	Effect on reliability and availability	33%	0	-5	-1.665	-0.24975	No significant differentiators between options
	Network interoperability and connectivity	33%	-5				Eastern option would not connect to Main Western Line, but opportunity for triangle south of
Constructability and schedule	Construction duration	20%	5				Improved geotechnical conditions on eastern route after Macquarie River crossing
	Construction access	15%	0				No significant differentiators between options
	Construction complexity	15%	5	25	4.25	0.53125	No rail possession work, improved goetech after Macquarie River crossing.
	Resources/ material sources	15%	10				Alignment over higher ground with potential for winning structural fill material.
	Interface with operational railway	20%	5				No significant interface with CRN Network
	Staging opportunities	15%	0				No significant differentiators between options
Environmental and heritage Impacts	Ecological impacts (flora, fauna and habitats)	20%	0				No significant differentiators between options
	Visual impacts	15%	-5				Greater visual impacts south of Narromine, compared to using existing rail corridor.
	Noise and vibration impacts	15%	0	0	0.25	0.03125	No significant differentiators between options
	Flooding and waterway impacts	20%	5				Eastern option has less impact on Macquarie River flood plain.
	Effect on air quality	15%	0				No significant differentiators between options
	Effect on greenhouse gas emissions	15%	0				No significant differentiators between options
Community and property impacts	Property impacts	20%	0				Both options will involve property acquisition
	Heritage	20%	-5				Marginal increased risk of heritage impacts for eastern option.
	Impact on community e.g. road	20%	0	5	1	0.125	No significant differentiators.
	Community response (community stakeholder risk)	20%	5				Marginal preference for option from feedback especially if combined with freight bypass.
	Current and future land use impacts	20%	5				Marginal preference for option from feedback especially if combined with freight bypass.
Approvals and stakeholder risk	Planning and approval timescale	20%	0				No significant differentiators between options
	State/ Federal agency buy in	20%	5				Eastern option would not involve interface with CRN network
	Local government buy in	20%	0	5	1	0.125	No significant differentiators between options
	Other statutory and regulatory approvals	20%	0				No significant differentiators between options
	Service authorities (utilities/ other)	20%	0				No significant differentiators between options
TOTAL SCORE						1.35	

Summary/ Recommendation

1. Compliance with MBIR Service Offering: The Narromine East Option and the 2016 Concept Alignment both comply with the Service Offering.
2. Comparative Capex and opex: No Capex estimates have been made during this phase of the MCA. Both options would involve significant costs for crossing the Mitchell Highway and Macquarie River.
3. Multi criteria Analysis: The MCA analysis scored the eastern option at 1.35, indicating that, on balance, it is preferable to the 2016 Concept Alignment.

Consideration of cumulative and indirect impacts

Option Assessment

Provide information in the pale blue cells

Adjustments for local areas of importances can be added with confirmation by ARTC eg tunnels

Package	Narromine to Narrabri
Option Reference	Narromine to Curban
Drawing/ sketch reference (if applicable)	
Option Description	Multiple route options between Narromine and Curban including use of the Coonamble Railway Line
Option Assessment Framework	
1. Compliance with MBIR service offering	All options comply with the Service Offering
2. Comparative capex and opex	No capex estimates during this MCA phase
Comment(s) on comparative capex and opex	

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub Criteria Weighting	Option 101 (Orange)				Option 109 (Purple)				Option 112 (Brown)				Comments (relating to the score)
				Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score	Weighted score	Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score	Weighted score	Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score	Weighted score	
Technical viability	17.5%	Alignment	20%	-5				0								Longer alignment to deviate to the east and connect with the Coonamble line. No significant differentiators between options Marginally poorer geotechnical conditions anticipated on Option 101. Options 101/112 involve 2 additional grade separations of Newell Hwy plus interface with CRN Options are further to the east and therefore anticipated to have fewer drainage issues. Additional constraints around Gilgandra, constrained to CRN corridor. No significant differentiators between options Additional risks to public safety by routing Inland Rail through Gilgandra. Two additional grade separations on the Newell Highway. No significant differentiators between options Track possession works on CRN line. Additional interfaces with the Newell Highway. 101 will be slower through Gilgandra Risk of impacts from connections with existing grain sidings Interfaces with CRN on Coonamble line to be resolved to minimise impacts on grain operations. Options are longer and would involve track possession works. No significant differentiators between options Track possession works on CRN line. Additional interfaces with the Newell Highway. Options are longer and would require additional resources. Interfaces with CRN on Coonamble line to be resolved to minimise impacts on grain operations. No significant differentiators between options Following Eunungerie Road and using the existing rail corridor will reduce impacts. Increased visual impacts from Newell Hwy and Oxley Hwy grade separations in Gilgandra Increased number of receptors on longer route, especially Option 101 through Gilgandra Option 109 has marginal reduce risk from potential environmental and heritage impacts. No significant differentiators between options No significant differentiators between options Increased impacts on properties from longer route and using Coonamble line through Gilgandra, Option 112 bypasses Gilgandra, potentially reduced impacts. 2 additional grade separations of the Newell Hwy. Grade seps in Gilgandra disruptive. Increased impacts through Gilgandra (101). Offset by bypass (112) No significant differentiators between options No significant differentiators between options Interfaces with CRN on Coonamble line to be resolved by ARTC. Options through Gilgandra unlikely to be supported. Bypass preferred. No significant differentiators between options No significant differentiators between options
		Impact on PUP and other assets	20%	0				0								
		Geotechnical conditions	20%	-5	-15	-2.25	-0.39375	5	10	2.00	0.35	-5	-15	-2.25	-0.39375	
		Impacts on existing road and rail networks	15%	-5				0				-5				
		Flood immunity/ hydrology	20%	5				5				5				
		Future proofing	10%	-5				0				-5				
Safety assessment of the proposed alignment	17.5%	Operational safety	25%	0			0				0					
		Public safety	10%	-5			0				0					
		Road safety interfaces	25%	-10	-20	-4.00	-0.7	0	0	0.00	0	-10	-15	-3.50	-0.6125	
		Emergency response	20%	0			0				0					
Operational approach, including opex	15.0%	Construction safety	20%	-5			0				-5					
		Effect/ Impact on travel time	33%	-10			0				-10					
		Effect on reliability and availability	33%	-5	-25	-8.325	-1.24875	0	0	0	0	-15	-4.995	-0.74925		
Constructability and schedule	12.5%	Network interoperability and connectivity	33%	-10			0				-10					
		Construction duration	20%	-10			0				-10					
		Construction access	15%	0			0				0					
		Construction complexity	15%	-5	-30	-5.5	-0.6875	0	5	0.75	0.09375	-5	-30	-5.5	-0.6875	
		Resources/ material sources	15%	-5			5				-5					
		Interface with operational railway	20%	-10			0				-10					
Environmental and heritage impacts	12.5%	Staging opportunities	15%	0			0				0					
		Ecological impacts (flora, fauna and habitats)	20%	5			0				5					
		Visual impacts	15%	-5			0				0					
		Noise and vibration impacts	15%	-10	-10	-1.25	-0.15625	0	5	1	0.125	-5	0	0.25	0.03125	
		Flooding and waterway impacts	20%	0			5				0					
		Effect on air quality	15%	0			0				0					
Community and property impacts	12.5%	Effect on greenhouse gas emissions	15%	0			0				0					
		Property impacts	20%	10			0				5					
		Heritage	20%	0			0				5					
		Impact on community e.g. road	20%	-10	-5	-1	-0.125	0	0	0	0	15	3	0.375		
Approvals and stakeholder risk	12.5%	Community response (community stakeholder risk)	20%	-5			0				5					
		Current and future land use impacts	20%	0			0				0					
		Planning and approval timescale	20%	0			0				0					
		State/ Federal agency buy in	20%	-5			0				-5					
		Local government buy in	20%	-5	-10	-2	-0.25	5	5	1	0.125	5	0	0	0	
		Other statutory and regulatory approvals	20%	0			0				0					
Service authorities (utilities/ other)	20%	0			0				0							
				TOTAL SCORE			-3.56	TOTAL SCORE			0.69	TOTAL SCORE			-2.04	

Summary/ Recommendation

- Compliance with MBIR Service Offering: Options comply with the Service Offering
- Comparative Capex and opex: No detailed comparison of CAPEX. Opex marginally more for options 101 / 112 due to increased length.
- Multi criteria Analysis: Option 109 scored 0.69, indicating marginal preference to the 2016 Concept Alignment. Options 101 and 112 were negative, indicating not preferred.

Consideration of cumulative and indirect impacts

Option Assessment

Provide information in the pale blue cells

Adjustments for local areas of importances can be added with confirmation by ARTC eg tunnels

Package	Narromine to Narrabri
Option Reference	Collie Road Option (Combined 111 and 206)
Drawing/ sketch reference (if applicable)	
Option Description	Follows Collie Road to Oxley Highway and then crosses to Gulargambone to join Option 206 along Box Ridge Road.
Option Assessment Framework	
1. Compliance with MBIR service offering	Option complies with the Service Offering
2. Comparative capex and opex	No capex estimates during this MCA phase
Comment(s) on comparative capex and opex	

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub Criteria Weighting	Option 111/206 (Purple dash)				Comments (relating to the score)
				Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score	Weighted score	
Technical viability	17.5%	Alignment	20%	0				No significant differentiators between options
		Impact on PUP and other assets	20%	0				No significant differentiators between options
		Geotechnical conditions	20%	-10	-15	-3.00	-0.525	Anticipated increase in "black" soils on more western alignment.
		Impacts on existing road and rail networks	15%	0				No significant differentiators between options
		Flood immunity/ hydrology	20%	-5				Anticipated increase in flooding further west in the catchment.
		Future proofing	10%	0				No significant differentiators between options
Safety assessment of the proposed alignment	17.5%	Operational safety	25%	0				No significant differentiators between options
		Public safety	10%	0				No significant differentiators between options
		Road safety interfaces	25%	0	0	0.00	0	No significant differentiators between options
		Emergency response	20%	0				No significant differentiators between options
		Construction safety	20%	0				No significant differentiators between options
Operational approach, including opex	15.0%	Effect/ Impact on travel time	33%	-10				Collie road option is longer than the 2016 Concept Alignment.
		Effect on reliability and availability	33%	0	-10	-3.33	-0.4995	No significant differentiators between options
		Network interoperability and connectivity	33%	0				No significant differentiators between options
Constructability and schedule	12.5%	Construction duration	20%	-10				Longer option. Increased risk of poor geotechnical conditions.
		Construction access	15%	0				No significant differentiators between options
		Construction complexity	15%	-5	-20	-3.5	-0.4375	Increased risk of poor geotechnical conditions further to the west
		Resources/ material sources	15%	-5				Increased likelihood of deeper black soils with less opportunity to find fill material.
		Interface with operational railway	20%	0				No significant differentiators between options
		Staging opportunities	15%	0				No significant differentiators between options
Environmental and heritage impacts	12.5%	Ecological impacts (flora, fauna and habitats)	20%	-5				Longer option with increased risk of ecological impacts.
		Visual impacts	15%	0				No significant differentiators between options
		Noise and vibration impacts	15%	0	-10	-2	-0.25	No significant differentiators between options
		Flooding and waterway impacts	20%	-5				Increased impact on waterways, being further downstream in catchments
		Effect on air quality	15%	0				No significant differentiators between options
		Effect on greenhouse gas emissions	15%	0				No significant differentiators between options
Community and property impacts	12.5%	Property impacts	20%	-10				96 Lots impacted on Collie Road option, compared to 64 for 2016 Concept Alignment.
		Heritage	20%	0				No significant differentiators between options
		Impact on community e.g. road	20%	0	-10	-2	-0.25	No significant differentiators between options
		Community response (community stakeholder risk)	20%	0				No significant differentiators between options
		Current and future land use impacts	20%	0				No significant differentiators between options
Approvals and stakeholder risk	12.5%	Planning and approval timescale	20%	0				No significant differentiators between options
		State/ Federal agency buy in	20%	0				No significant differentiators between options
		Local government buy in	20%	0	0	0	0	No significant differentiators between options
		Other statutory and regulatory approvals	20%	0				No significant differentiators between options
		Service authorities (utilities/ other)	20%	0				No significant differentiators between options
TOTAL SCORE							-1.96	

Summary/ Recommendation

1. Compliance with MBIR Service Offering
2. Comparative Capex and opex
3. Multi criteria Analysis

Consideration of cumulative and indirect impacts

Option

Provide information in the pale blue cells

Adjustments for local areas of importances can be added with confirmation by ARTC eg tunnels

Package	Narromine to Narrabri
Option Reference	Curban to Mt Tenandra
Drawing/ sketch reference (if applicable)	
Option Description	Use Coonamble line from Curban and then follow Box Ridge Road to join 2016 Concept Alignment at Mt Tenandra

Option Assessment Framework

1. Compliance with MBIR service offer: Option complies with the Service Offering
2. Comparative capex and opex: No capex estimates during this MCA phase
Comment(s) on comparative capex and opex

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub Criteria Weighting	Option 206 (Purple)			Comments (relating to the score)	
				Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score		
Technical viability	17.5%	Alignment	20%	0			No significant differentiators between options	
		Impact on PUP and other assets	20%	0			No significant differentiators between options	
		Geotechnical conditions	20%	-5	-10	-1.75	-0.30625	Risk of poorer geotechnical conditions further to the west.
		Impacts on existing road and rail networks	15%	-5				Option 206 interfaces with CRN line and would require interfaces with Inland Rail to be managed.
		Flood immunity/ hydrology	20%	0				No significant differentiators between options
		Future proofing	10%	0				No significant differentiators between options
Safety assessment of the proposed alignment	17.5%	Operational safety	25%	0			No significant differentiators between options	
		Public safety	10%	0			No significant differentiators between options	
		Road safety interfaces	25%	0	0	0.00	0	No significant differentiators between options
		Emergency response	20%	0				No significant differentiators between options
		Construction safety	20%	0				No significant differentiators between options
Operational approach, including opex	15.0%	Effect/ Impact on travel time	33%	-10			Option is approximately 15km longer than 2016 Concept Alignment.	
		Effect on reliability and availability	33%	0	-10	-3.33	-0.4995	No significant differentiators between options
		Network interoperability and connectivity	33%	0				Assuming triangle at Gulargambone, no significant differentiators.
Constructability and schedule	12.5%	Construction duration	20%	-10			Working under track possessions for existing line. Option is 15km longer.	
		Construction access	15%	5			Access from Castlereagh Highway and Box Ridge Road.	
		Construction complexity	15%	-5	-25	-4.75	-0.59375	Option involves modifications to existing track formation and structures under track possessions.
		Resources/ material sources	15%	-5				Risk of poorer construction materials further to the west.
		Interface with operational railway	20%	-10				Splits control of Coonamble line for CRN network.
		Staging opportunities	15%	0				No significant differentiators between options
Environmental and heritage Impacts	12.5%	Ecological impacts (flora, fauna and habitats)	20%	0			No significant differentiators between options	
		Visual impacts	15%	0			No significant differentiators between options	
		Noise and vibration impacts	15%	0	0	0	0	No significant differentiators between options
		Flooding and waterway impacts	20%	0				No significant differentiators between options
		Effect on air quality	15%	0				No significant differentiators between options
		Effect on greenhouse gas emissions	15%	0				No significant differentiators between options
Community and property impacts	12.5%	Property impacts	20%	10			Option uses existing rail corridor and road reserve corridors, therefore mitigates property impacts.	
		Heritage	20%	0			No significant differentiators between options	
		Impact on community e.g. road	20%	5	35	7	0.875	Fewer level crossings for local access tracks.
		Community response (community stakeholder risk)	20%	10				Option supported by local community as it avoids impact on high value agricultural land.
		Current and future land use impacts	20%	10				Option supported by local community as it avoids impact on high value agricultural land.
Approvals and stakeholder risk	12.5%	Planning and approval timescale	20%	0			No significant differentiators between options	
		State/ Federal agency buy in	20%	-5				Expected that there will be issues with managing CRN interfaces
		Local government buy in	20%	10	5	1	0.125	Option strongly supported by Gilgandra Council.
		Other statutory and regulatory approvals	20%	0				No significant differentiators between options
		Service authorities (utilities/ other)	20%	0				No significant differentiators between options
						TOTAL SCORE		-0.40

Summary/ Recommendation

1. Compliance with MBIR Service Offering: Option complies the Service Offering
2. Comparative Capex and opex: No detailed comparison of CAPEX. Opex marginally more for option due to increased length.
3. Multi criteria Analysis: MCA analysis scored Option 206 at -0.40 indicating that there is a marginal preference for the 2016 Concept Alignment.

Consideration of cumulative and indirect impacts

Melbourne to Brisbane Inland Rail

Option Assessment

Provide information in the pale blue cells

Adjustments for local areas of importances can be added with confirmation by ARTC eg tunnels

Package	Narromine to Narrabri
Option Reference Drawing/ sketch reference (if applicable)	Baradine to Narrabri
Option Description	Multiple route options between Baradine and Narrabri, passing through the Pilliga State Forest
Option Assessment Framework	
1. Compliance with MBIR service offering	All options comply with the Service Offering
2. Comparative capex and opex Comment(s) on comparative capex and opex	No capex estimates during this MCA phase

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub Criteria Weighting	403a/404a (Blue + dash) Sub criteria Score	Option 408/409 (Blue+) Sub criteria Score	Option 413 (Blue + Brown) Sub criteria Score	Comments (relating to the score)
Technical viability	17.5%	Alignment	20%	0	0	0	No significant differentiators between options
		Impact on PUP and other assets	20%	0	0	0	No significant differentiators between options
		Geotechnical conditions	20%	10	10	5	Sandstone subgrade, CBR anticipated > 8%. Improves with height.
		Impacts on existing road and rail networks	15%	10	10	5	Pilliga options have less interfaces with Wee Waa line.
		Flood immunity/ hydrology	20%	10	10	0	Options are higher in catchment and therefore flooding impacts reduced.
		Future proofing	10%	5	5	0	Potential future development less constrained along options.
Safety assessment of the proposed alignment	17.5%	Operational safety	25%	0	0	0	No significant differentiators between options
		Public safety	10%	0	0	0	No significant differentiators between options
		Road safety interfaces	25%	0	0	0	No significant differentiators between options
		Emergency response	20%	5	-5	5	Emergency response easier along existing public roads.
		Construction safety	20%	0	0	0	No significant differentiators between options
Operational approach, including opex	15.0%	Effect/ Impact on travel time	33%	10	10	0	Pilliga options are shorter than the 2016 Concept Alignment
		Effect on reliability and availability	33%	0	0	0	No significant differentiators between options
		Network interoperability and connectivity	33%	0	0	0	No significant differentiators between options
Constructability and schedule	12.5%	Construction duration	20%	10	10	5	Options shorter with better geotech conditions. Fewer landowner permissions required.
		Construction access	15%	5	-5	5	Better access on existing forest roads. 408/409 would need new road.
		Construction complexity	15%	10	0	5	403a/404a access on Forest Way. Good potential for balanced cut to fill.
		Resources/ material sources	15%	10	10	5	Significantly better geotechnical conditions in Pilliga.
		Interface with operational railway	20%	0	0	0	No significant differentiators between options
		Staging opportunities	15%	0	0	0	No significant differentiators between options
Environmental and heritage Impacts	12.5%	Ecological impacts (flora, fauna and habitats)	20%	-5	-10	-5	Expected higher impacts on flora and fauna than 2016 Concept Alignment.
		Visual impacts	15%	5	5	5	Higher length of options screened by State Forest.
		Noise and vibration impacts	15%	5	5	5	Options have fewer nearby residential receptors re. noise and vibration.
		Flooding and waterway impacts	20%	10	10	5	Options higher in catchment, cross smaller and fewer waterways. Smaller culverts.
		Effect on air quality	15%	5	5	5	Marginal benefits due to greater distance from potential receptors.
		Effect on greenhouse gas emissions	15%	0	0	0	No significant differentiators between options
Community and property impacts	12.5%	Property impacts	20%	10	10	5	Fewer properties impacted. Single land owner through State Forest.
		Heritage	20%	-10	-10	-10	Anticipated higher potential for aboriginal heritage impacts through State Forest.
		Impact on community e.g. road	20%	5	5	0	Options through State Forest will have lower impacts on local community.
		Community response (community stakeholder risk)	20%	10	5	5	Positive feedback from stakeholders and local community - private land vs state forest
		Current and future land use impacts	20%	5	5	0	IR through State Forest will have fewer restrictions on future development of private land.
Approvals and stakeholder risk	12.5%	Planning and approval timescale	20%	0	0	0	No significant differentiators between options
		State/ Federal agency buy in	20%	5	5	0	No significant differentiators between options
		Local government buy in	20%	10	5	5	Consultation with local councils has supported options through the State Forest.
		Other statutory and regulatory approvals	20%	0	0	0	No significant differentiators between options
		Service authorities (utilities/ other)	20%	0	0	0	No significant differentiators between options

Summary/ Recommendation

- Compliance with MBIR Service Offering: All options comply with the Service Offering
- Comparative Capex and opex: Options 403a/404a and 408/409 are approx 15km shorter and have better geotechnical conditions. Would therefore be expected that these would be less cost than 2016 Concept Alignment.
- Multi criteria Analysis: MCA scored Options 403a/404a at 3.72, indicating that, on balance, these options offer significant improvements over the 2016 Concept Alignment. Options 409/409 and 413 also provided potential improvement to the

Consideration of cumulative and indirect impacts: Potential perception of cumulative impacts in State Forest through Santos CSG development beign planned concurrently with Inland Rail. Local benefits is construction access through the Pilliga can be sealed road that can be transferred to Council / State Forests on completion.

Option Assessment

Provide information in the pale blue cells

Adjustments for local areas of importances can be added with confirmation by ARTC eg tunnels

Package	Narromine to Narrabri
Option Reference Drawing/ sketch reference (if applicable)	Options around / through Narrabri
Option Description	Several route options exist through Narrabri, broadly grouped Central and East (2016 Concept Alignment is West)
Option Assessment Framework	
1. Compliance with MBIR service offering	East option complies with Service Offering. Central Option does not comply due to track curvature and speed restrictions.
2. Comparative capex and opex Comment(s) on comparative capex and opex	No capex estimates during this MCA phase

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub Criteria Weighting	Narrabri East (Pink)				Comments (relating to the score)
				Sub criteria Score	Unweighted sub criteria score	Weighted sub criteria score	Weighted score	
Technical viability	17.5%	Alignment	20%	0				Non-conforming curves with tight radii in Narrabri. Speed restrictions on existing track. Higher residential and commercial density for options. Greater risk of impacts on public utilities. No significant differentiators between options Central option has significant impacts on Narrabri. Eastern option would result in more level crossings. Eastern option is upstream of Narrabri and therefore has lower risk of flooding impacts. Option constrained by subdivision developments and airport.
		Impact on PUP and other assets	20%	-10				
		Geotechnical conditions	20%	0	-20	-3.00	-0.525	
		Impacts on existing road and rail networks	15%	-10				
		Flood immunity/ hydrology	20%	5				
		Future proofing	10%	-5				
Safety assessment of the proposed alignment	17.5%	Operational safety	25%	-5				Additional road interfaces Additional road interfaces Additional road interfaces, especially crossing of Kamilaroi Hwy and rail line. No significant differentiators between options Additional 2 x grade separation of Newell Hwy No significant differentiators between options
		Public safety	10%	-5				
		Road safety interfaces	25%	-10	-25	-5.25	-0.91875	
		Emergency response	20%	0				
		Construction safety	20%	-5				
Operational approach, including opex	15.0%	Effect/ Impact on travel time	33%	0				Interface with Hunter Valley rail network to be resolved. Difficult to provide connectivity with existing rail line due to grade separation with Kamilaroi Hwy.
		Effect on reliability and availability	33%	-5	-15	-4.995	-0.74925	
		Network interoperability and connectivity	33%	-10				
Constructability and schedule	12.5%	Construction duration	20%	0				No significant differentiators between options No significant differentiators between options 2 x additional grade separations of Newell Highway. No significant differentiators between options Connectivity to be resolved. Potential grade separation with IR over existing road and rail No significant differentiators between options
		Construction access	15%	0				
		Construction complexity	15%	-5	-15	-2.75	-0.34375	
		Resources/ material sources	15%	0				
		Interface with operational railway	20%	-10				
		Staging opportunities	15%	0				
Environmental and heritage impacts	12.5%	Ecological impacts (flora, fauna and habitats)	20%	0				No significant differentiators between options Increased number of receptors affected with eastern option. Increased number of receptors affected with eastern option. No significant differentiators between options No significant differentiators between options No significant differentiators between options
		Visual impacts	15%	-5				
		Noise and vibration impacts	15%	-10	-15	-2.25	-0.28125	
		Flooding and waterway impacts	20%	0				
		Effect on air quality	15%	0				
		Effect on greenhouse gas emissions	15%	0				
Community and property impacts	12.5%	Property impacts	20%	-10				Increased number of properties affected. Potential to impact on rural-residential subdivision areas Potential reduced risk of aboriginal heritage impacts for option. Higher impacts on roads including 2 x grade separations of Newell Highway. Negative response to eastern option from information sessions and Narrabri Council Higher impact on areas zoned for rural-residential subdivisions.
		Heritage	20%	5				
		Impact on community e.g. road	20%	-10	-35	-7	-0.875	
		Community response (community stakeholder risk)	20%	-10				
		Current and future land use impacts	20%	-10				
Approvals and stakeholder risk	12.5%	Planning and approval timescale	20%	0				No significant differentiators between options No significant differentiators between options Option not supported by Narrabri Council. No significant differentiators between options Expected higher impact on public utilities leading into Narrabri.
		State/ Federal agency buy in	20%	0				
		Local government buy in	20%	-10	-15	-3	-0.375	
		Other statutory and regulatory approvals	20%	0				
		Service authorities (utilities/ other)	20%	-5				
TOTAL SCORE								-4.07

Summary/ Recommendation

1. Compliance with MBIR Service Offering	East option complies with Service Offering. Central option on existing alignment through Narrabri does not comply.
2. Comparative Capex and opex	No detailed comparison of CAPEX. Eastern option has 2 x additional grade separations of Newell Highway.
3. Multi criteria Analysis	Eastern option scored -4.07 indicating that the 2016 Concept Alignment is preferable.

Consideration of cumulative and indirect impacts