8. Curban Junction

8.1 General

No alternative route options have been identified for Inland Rail at Curban. This sub-section of the Study Area was not however assessed in the Stage 1 Focus Area Definition report as arrangements for the Junction between Inland Rail and the CRN Dubbo Coonamble Railway has not been resolved.

The Study Area in this location has been refined to a Focus Area allowing for a grade separated junction with full functionality.

The Phase 2 Study Area provides flexibility for Curban junction configuration to the west of Berida Road Level crossing ref Section 1.3 above.

8.2 Property impacts

The Focus Area at Curban makes provision for a fully functional junction between Inland Rail and the Dubbo to Coonamble Railway. Property impacts are illustrated in Figure 8-2.

As a result of the junction position there are limited opportunities to align with existing property boundaries.

8.3 Flooding impacts

The Curban Junction area is prone to flooding. Most of the Study Area is impacted by the 1% AEP. These impacts are constant across the Study Area.

As the flooding impacts extend uniformly across the Study Area, there is no location for the Focus Area within the Study Area that results in a smaller flooding impact.

Preliminary 1% AEP flooding with the Study Area and Focus Area is shown in Figure 8-3.

Potential opportunities to reduce flooding impacts further within the Focus Area will be further defined through the progression of the design, consultation and environmental assessment processes.

8.4 Indigenous cultural heritage

The majority of the Study Area is located within medium to high culturally sensitive area as defined by publicly available data (Aboriginal Sites Decision Support Tool) published by the Office of Environment and Heritage. A culturally sensitive area has been identified in the south of the Study Area where there are a number of AHIMS registered sites. A Potential Archaeological Deposit, 2 scarred trees and an artefact scatter have also been identified in the vicinity of the Castlereagh River in the north of the Study Area (Figure 8-4).

Any alignment within the Study Area will cross these areas and therefore, there are no locations for the Focus Area within the Study Area that results in reduced impact to culturally sensitive areas.

Potential opportunities to avoid and reduce cultural heritage impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

8.5 Ecology

Within the Study Area there are four native plant community types as shown on Figure 8-5. Crops and introduced grasslands are the most extensive plant community type within the Study Area. Native plant community types are:

- Partly derived Windmill Grass - Copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion.
- Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion.
- Poplar Box - Belah woodland on clay-loam soils on alluvial plains on north central NSW.
- River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion.

There are no Endangered Ecological Communities within the Study Area. Four threatened fauna species were identified in the vicinity of the Castlereagh River during surveys. The Castlereagh River is also mapped as key fish habitat.

The majority of the Focus Area does not impact the native plant communities and there is limited opportunity to reduce ecological impacts due to the occurrence of them within the Study Area. There is limited opportunity to avoid or minimise impacts to native plant communities without increasing impacts to properties. Therefore, there are no significant ecological differentiators within the Study Area.

Potential opportunities to avoid and reduce ecological impacts further within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

8.6 Sensitive receivers (noise, vibration, visual impacts)

There are two residential and one commercial / industrial sensitive receivers within the Study Area (Figure 8-6). There are a number of other sensitive receivers located in proximity to the Study Area.

Opportunities to reduce noise, vibration and/or visual disturbances within the Focus Area will be investigated further during design, consultation and environmental assessment processes.

8.7 Geotechnical conditions

The underlying geology is illustrated in Figure 8-7. The Study Area crosses predominately alluvial, colluvial and vertisol soils, all of which are considered poor ground conditions that require more complex bulk earthworks construction methodology.

Based on the information available in this assessment, geotechnical conditions will be the same (or similar) regardless of where the Focus Area is within the Study Area.

While there are locations within the Study Area that may result in a marginal improvement in geotechnical conditions there is no location for the Focus Area within the Study Area that results in a significantly improved geotechnical conditions.

Therefore, there are no material advantages with regards to geotechnical conditions within the Study Area.

Potential opportunities to reduce geotechnical impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

8.8 Constructability and earthworks balance

Construction at Curban Junction would require fill material to be imported for the rail embankment,. This shortfall in fill material would have to be won from cuts along the alignment or offsite sources.

There are no significant differentiators with regards to constructability and earthworks balance within the Study Area.

8.9 Road Rail interfaces

The Study Area crosses the following public roads at Curban (Figure 8-1), specifically:

- Castlereagh Highway
- Wyuna Road
- Bardens Road
- Forans Road

Note, East Coonamble Road is included in report 2-0001-250-CAL-00-RP-0004.

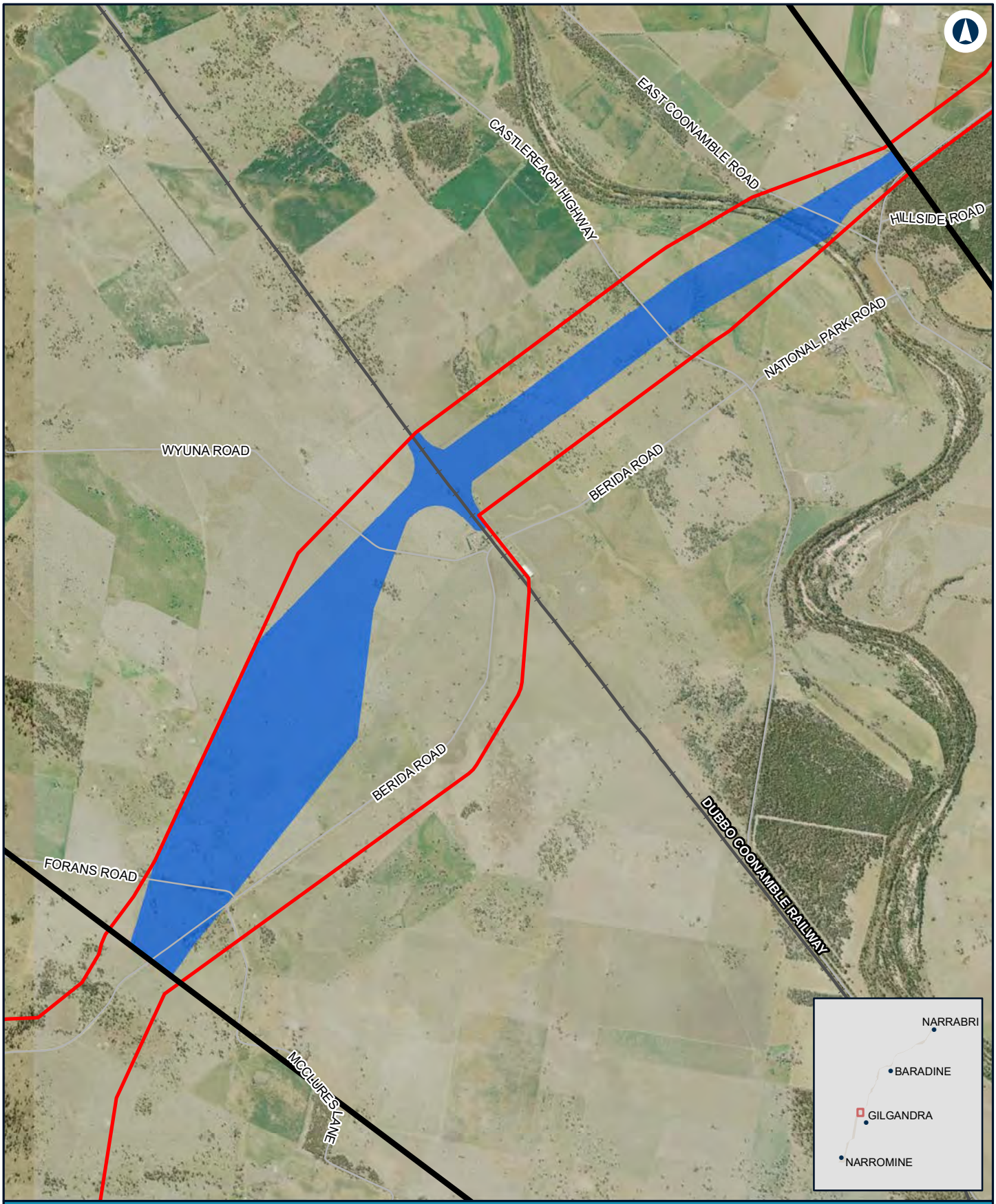
The Study Area crosses these roads and there is no opportunity to remove the road rail interface. There are no significant differentiators relating to road safety interfaces within the Study area.

Opportunities to improve road safety interfaces impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

8.10 Recommended Focus Area – Curban Junction

The recommended Focus Area at Curban Junction is as presented in Figure 8-1 based on the following:

- The Focus Area currently achieves the requirements of the Cuban Junction without impacting the existing Berida Road level crossing.
- Based on current data, adjusting the Focus Area to reduce impacts relating to geotechnical conditions, flooding, road safety or environmental would not result in an overall improvement, as these features are similar throughout the Study Area.
- The Focus Area appropriately balances property impacts with engineering and environmental constraints while meeting the basis of design and enabling the Service Offering objectives to be achieved.



NARROMINE TO NARRABRI Curban Junction Study and Focus Areas Figure 8-1

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Phase 2 study area
- Sub section break

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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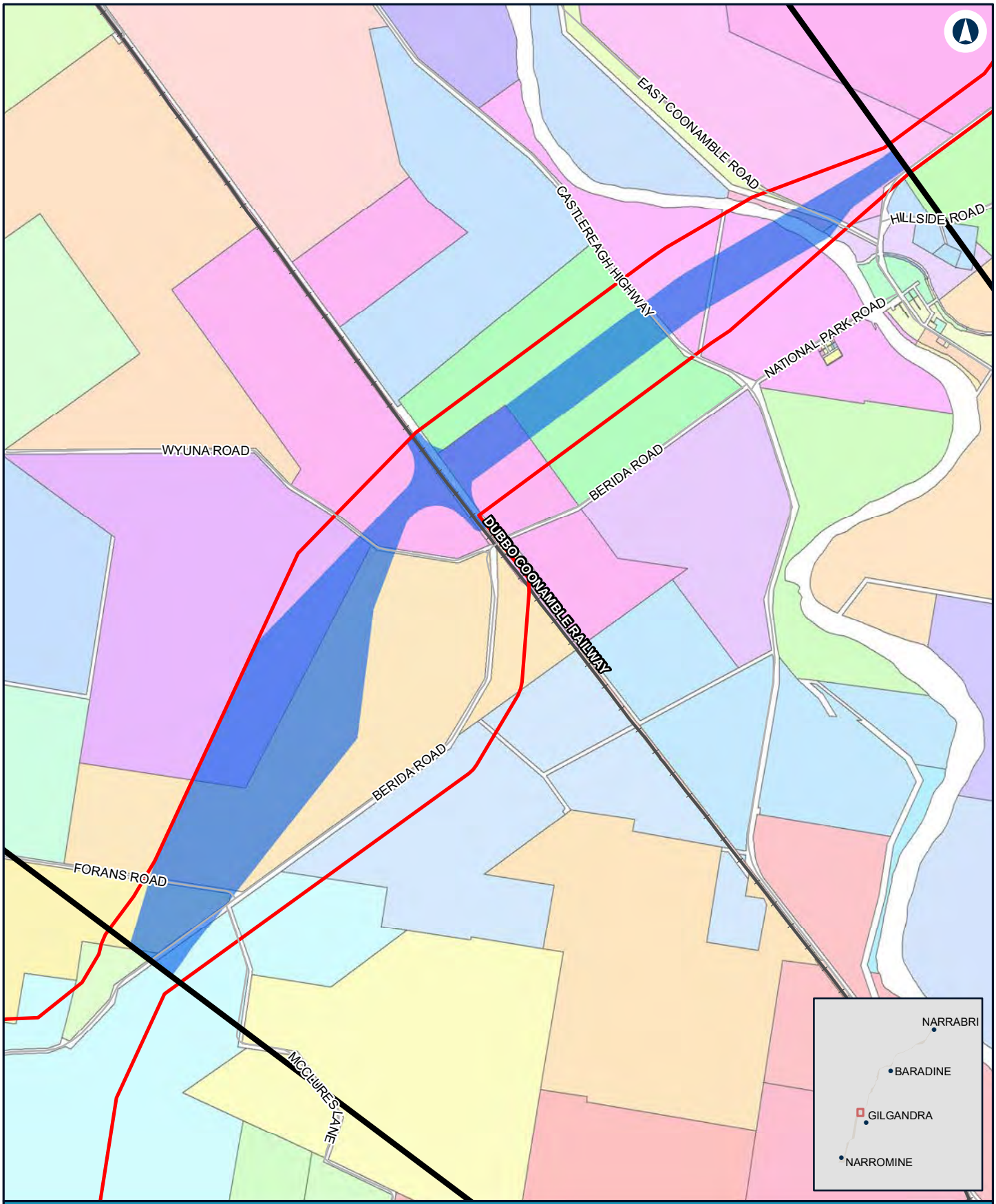

NARROMINE TO NARRABRI Curban Junction Property impacts Figure 8-2

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000
Data Sources: Road names: NSW Spatial Services; property; ARTC; all other layers: JacobsGHD

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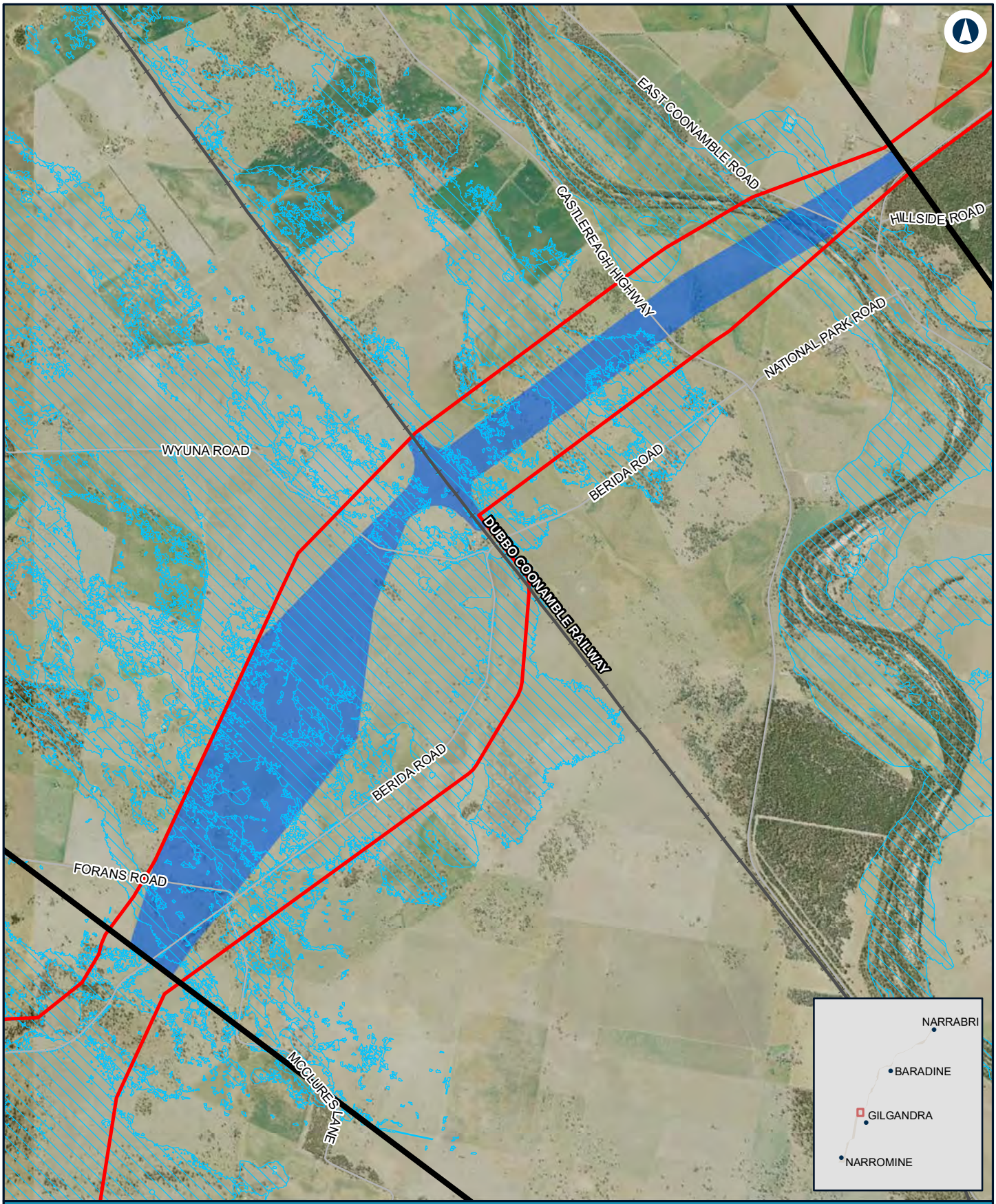

NARROMINE TO NARRABRI Curban Junction Preliminary Flood Mapping 1% AEP Figure 8-3

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Flood extent - 1% AEP

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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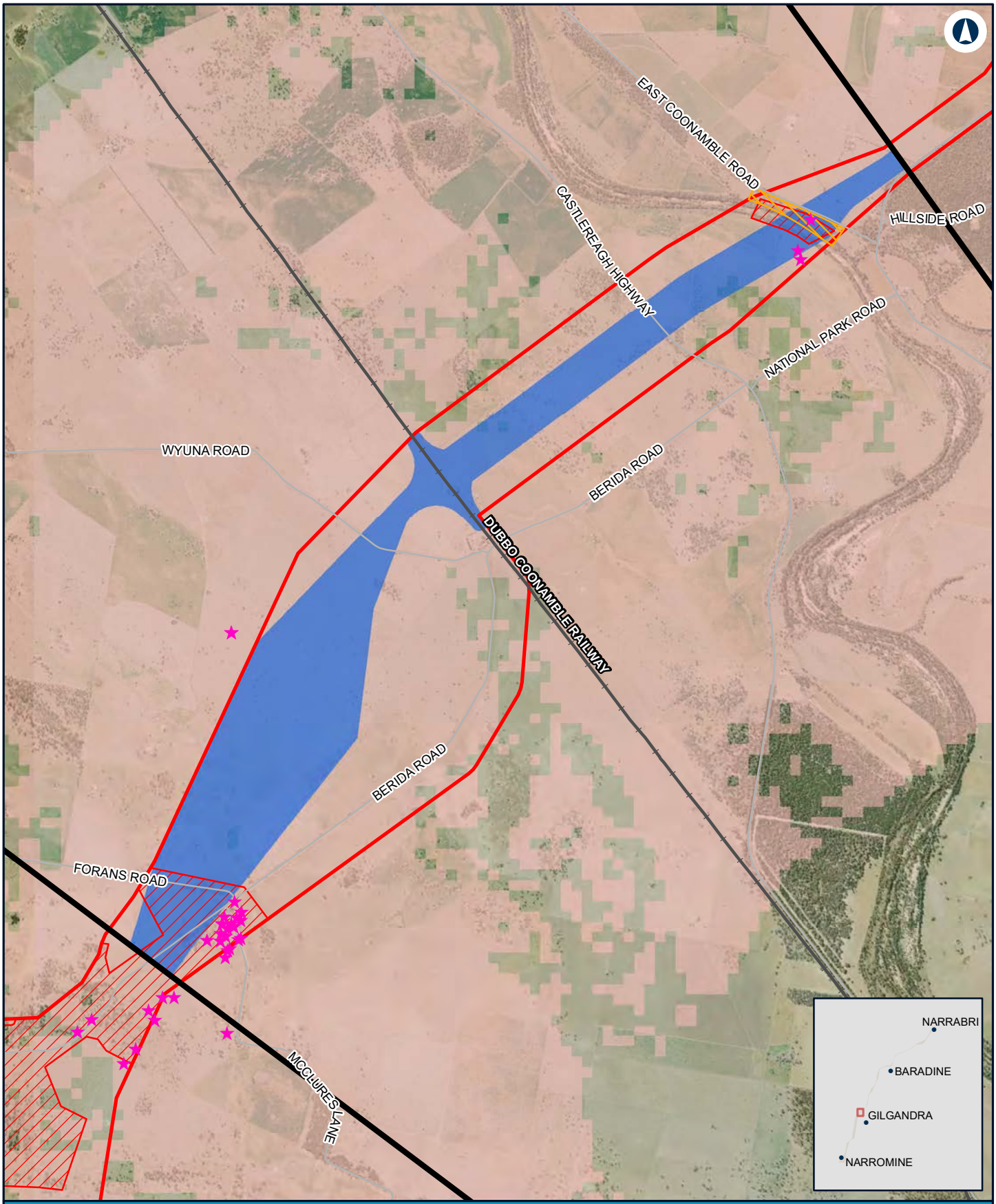

NARROMINE TO NARRABRI Curban Junction Culturally sensitive areas Figure 8-4

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000

Data Sources: Road names: NSW Spatial Services; AHIMS sites, ASDT data: OEH; all other layers: JacobsGHD

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Cultural heritage site
- Potential archaeological deposit
- Culturally sensitive area
- Medium to high sensitivity areas (ASDT - DECCW)

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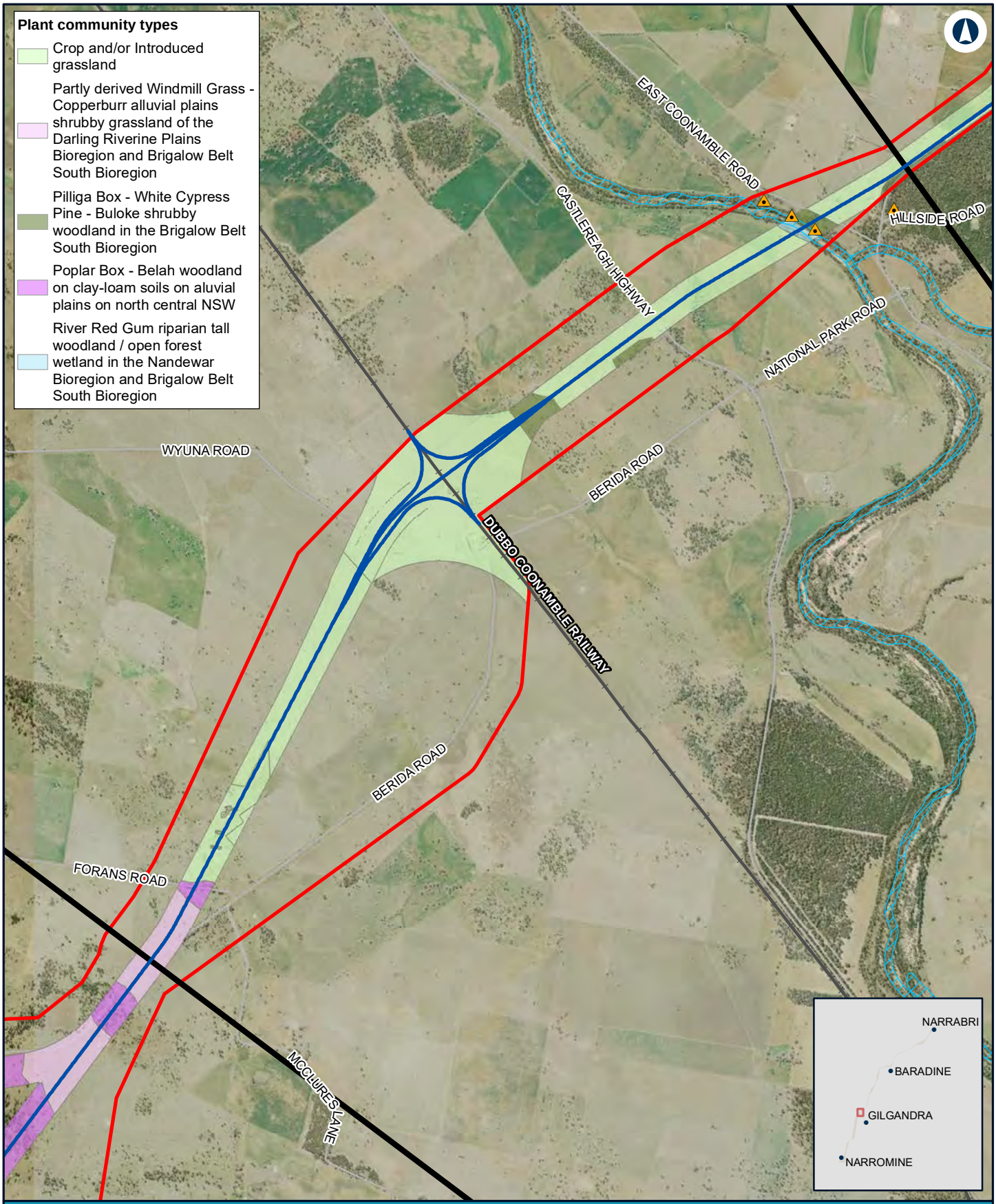

NARROMINE TO NARRABRI Curban Junction Ecologically Sensitive Communities Figure 8-5

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Alignment
- Sub section break
- Phase 2 study area
- Threatened fauna sighting
- Key fish habitat

Date: 16/08/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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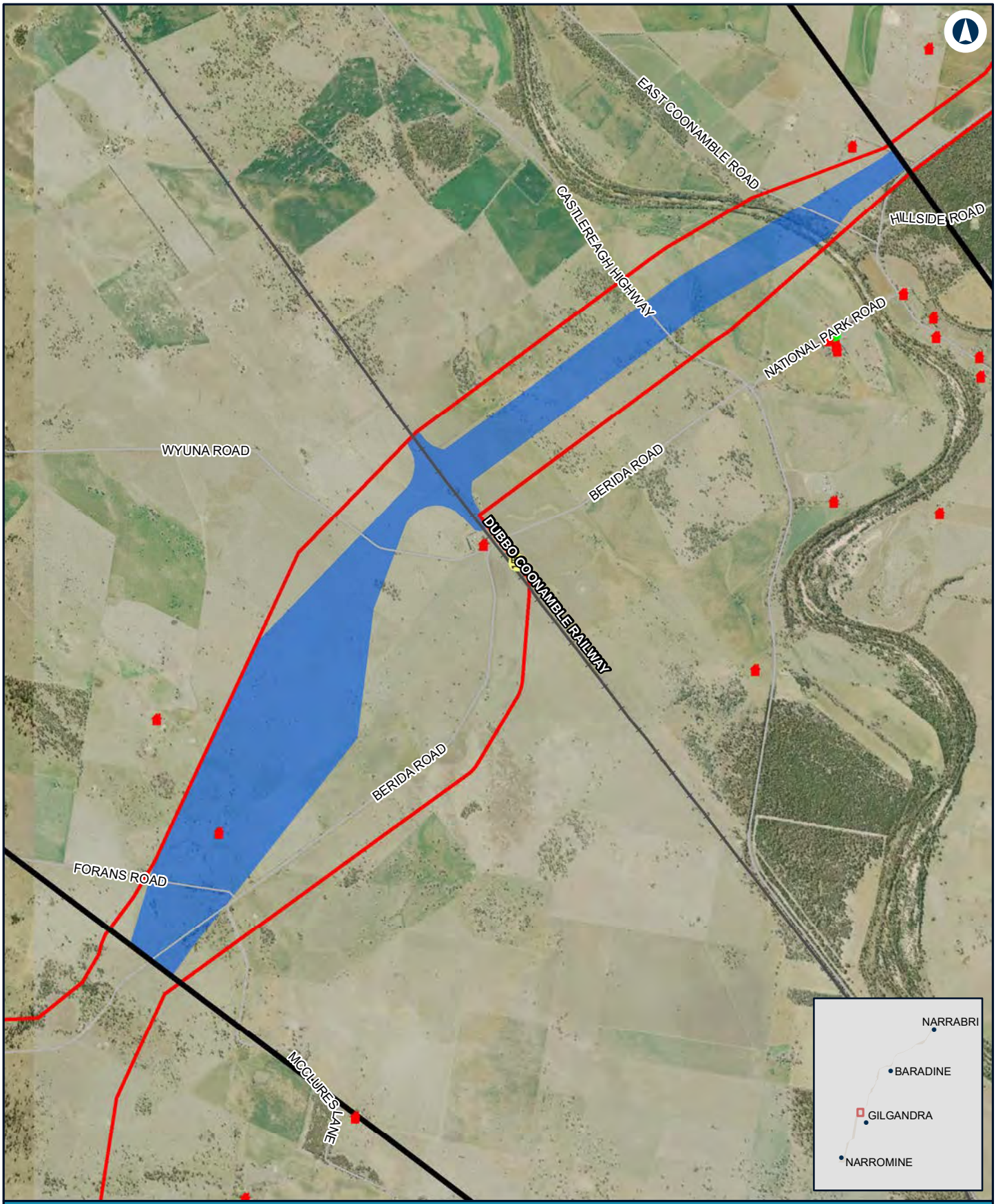

NARROMINE TO NARRABRI Curban Junction Sensitive Receivers Figure 8-6

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

LEGEND

- Focus area
- Sub section break
- Phase 2 study area

Sensitive Receiver

- Commercial
- Community
- Residence

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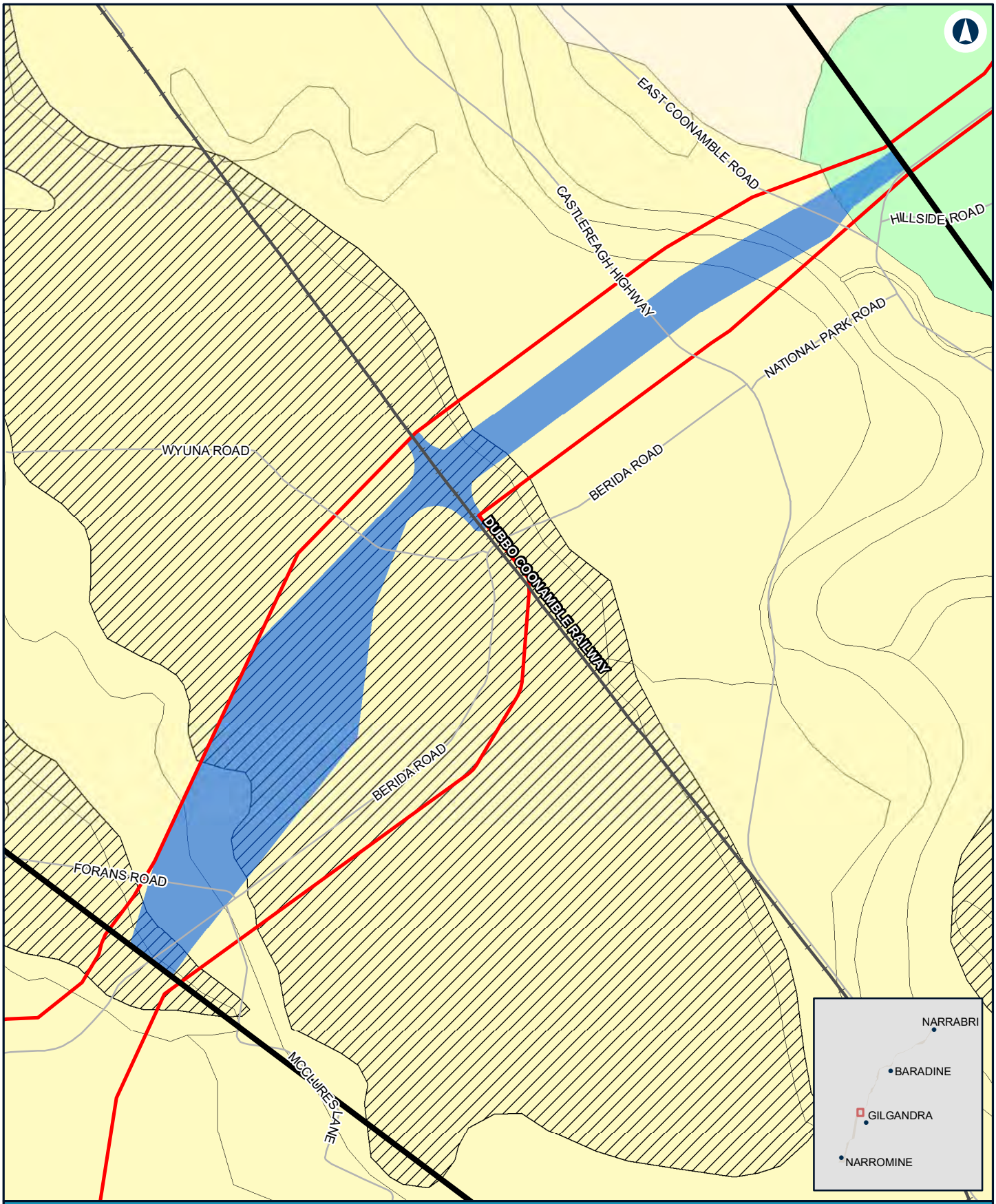

NARROMINE TO NARRABRI Curban Junction Geology Figure 8-7

0 0.7 1.4 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Vertosols
- Quaternary - alluvial
- Quaternary - colluvial
- Great Australian Basin - Surat Basin sediments

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:50,000
Data Sources: Road names: NSW Spatial Services; geology, soils; Dept Industry Resources and Energy; all other layers: JacobsGHD

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9. Newell Highway

9.1 General

No alternative route options have been identified along the Newell Highway. This sub-section between Pilliga East and South of Narrabri could not however be completed as part of Stage 1 Focus Area definition as the preferred options for the adjoining sections had not been determined.

The key driver for determining the Focus Area within the Study Area is the proximity to the Newell Highway and Bohena Creek and to align with property boundaries in order to minimise land severance. The Study Area and Focus Area are shown in Figure 9-1.

9.2 Property impacts

The Focus Area is aligned with property boundaries, paper roads and road reserves where practical, as illustrated in Figure 9-2, to minimise properties impacted and minimise property severance.

9.3 Flooding impacts

The Newell Highway area is prone to flooding. Consultations with local residents indicate overland flows outside of creeks are common. Bohena Creek is located adjacent to the Newell Highway in the area and the majority of length of the Study Area is impacted by the 1% AEP. These impacts are constant across the Study Area.

As the flooding impacts extend uniformly across the Study Area, there is no location for the Focus Area within the Study Area that results in a smaller flooding impact.

Preliminary 1% AEP flooding with the Study Area and Focus Area is shown in Figure 9-3.

Potential opportunities to reduce flooding impacts further within the Focus Area will be further defined through the progression of the design, consultation and environmental assessment processes.

9.4 Indigenous cultural heritage

Most of the Study Area is located within medium to high culturally sensitive area as defined by publicly available data (Aboriginal Sites Decision Support Tool) published by the Office of Environment and Heritage. Bohena Creek has been identified as a culturally sensitive area and extends along the length of the Study Area. Field surveys have identified a stone artefact scatter and 2 Potential Archaeological Deposits near Bohena Creek in the north of the Study Area (Figure 9-4).

Any other location of the alignment that would avoid these areas would result in greater property impacts.

Potential opportunities to avoid and reduce cultural heritage impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

9.5 Ecology

Within the Study Area there are eight native plant community types as shown on Figure 9-5. The majority of native vegetation occurs along the Newell Highway and Bohena Creek, but also extends across the Study Area in locations. Crops and introduced grasslands are widespread in the western parts of the Study Area. Native plant community types are:

- Brigalow - Belah open forests / woodland on alluvial often gilgaied clay from piliga scrub to Gondiwindi, Brigalow Belt South Bioregion.
- Buloke - White Cypress Pine woodland on outwash plains in the Piliga Scrub and Narrabri regions, Brigalow Belt South Bioregion.
- Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion.
- Dirty Gum - Buloke – White cypress pine – ironbark shrubby woodland of the deep sandy soils on the Liverpool Plains Region of the Brigalow Belt South Bioregion.
- Pilliga Box - White Cypress Pine - Buloke shrubby woodland in the Brigalow Belt South Bioregion.
- Red gum - Rough-barked Apple +/- tea tree sandy creek woodland (wetland) in the Pilliga - Goonoo sandstone forests, Brigalow Belt South Bioregion.
- Red gum - Rough-barked Apple - Narrow-leaved Ironbark - cypress pine grassy open forest on flats and drainage lines in the Goonoo and surrounding forests, southern Brigalow Belt South Bioregion.
- River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion.

One Endangered Ecological Community (Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions) listed under the BC Act and EPBC Act was identified along the Newell Highway in the north of the Study Area. Three threatened fauna species were identified in the vicinity of the Newell Highway during surveys. Bohena Creek is also mapped as key fish habitat. The majority of the Focus Area would impact native vegetation however it would largely avoid the Endangered Ecological Community along the Newell Highway in the north of the Study Area. Any other location of the alignment that would minimise impacts to native vegetation along the Newell Highway would result in greater property impacts and still impact native vegetation in other parts of the Study Area.

Potential opportunities to avoid and reduce ecological impacts further within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

9.6 Sensitive receivers (noise, vibration, visual impacts)

There is one residential sensitive receiver within the Study Area (Figure 9-6). There are a number of other sensitive residential receivers located in proximity to the Study Area. Efforts have been made to locate the Focus Area as far away from residential receivers as possible while minimising property severance.

Opportunities to reduce noise, vibration and/or visual disturbances within the Focus Area will be investigated further during design, consultation and environmental assessment processes.

9.7 Geotechnical conditions

The underlying geology is illustrated in Figure 9-7. The Study Area crosses predominately alluvial outwash, colluvial and vertisol soils, all of which are considered poor ground conditions that require more complex bulk earthworks construction methodology.

Based on the information available in this assessment, geotechnical conditions will be the same (or similar) regardless of where the Focus Area is within the agreed Study Area.

While there are locations within the Study Area that may result in a marginal improvement in geotechnical conditions there is no location for the Focus Area within the Study Area that results in a significantly improved geotechnical conditions.

Therefore, there are no significant differentiators with regards to geotechnical conditions within the Study Area.

Potential opportunities to reduce geotechnical impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

9.8 Constructability and earthworks balance

Construction along the Newell highway section would require fill material to be imported for the rail embankment, regardless of the Focus Area within the Study Area. This shortfall in fill material would have to be won from cuts along the alignment or offsite sources.

There are no significant differentiators with regards to constructability and earthworks balance within the Study Area.

9.9 Road Rail interfaces

The Study Area crosses 2 public roads in the Newell Highway section (Figure 9-1), namely Cains Crossing Road (two crossing points) and Glenwood Lane.

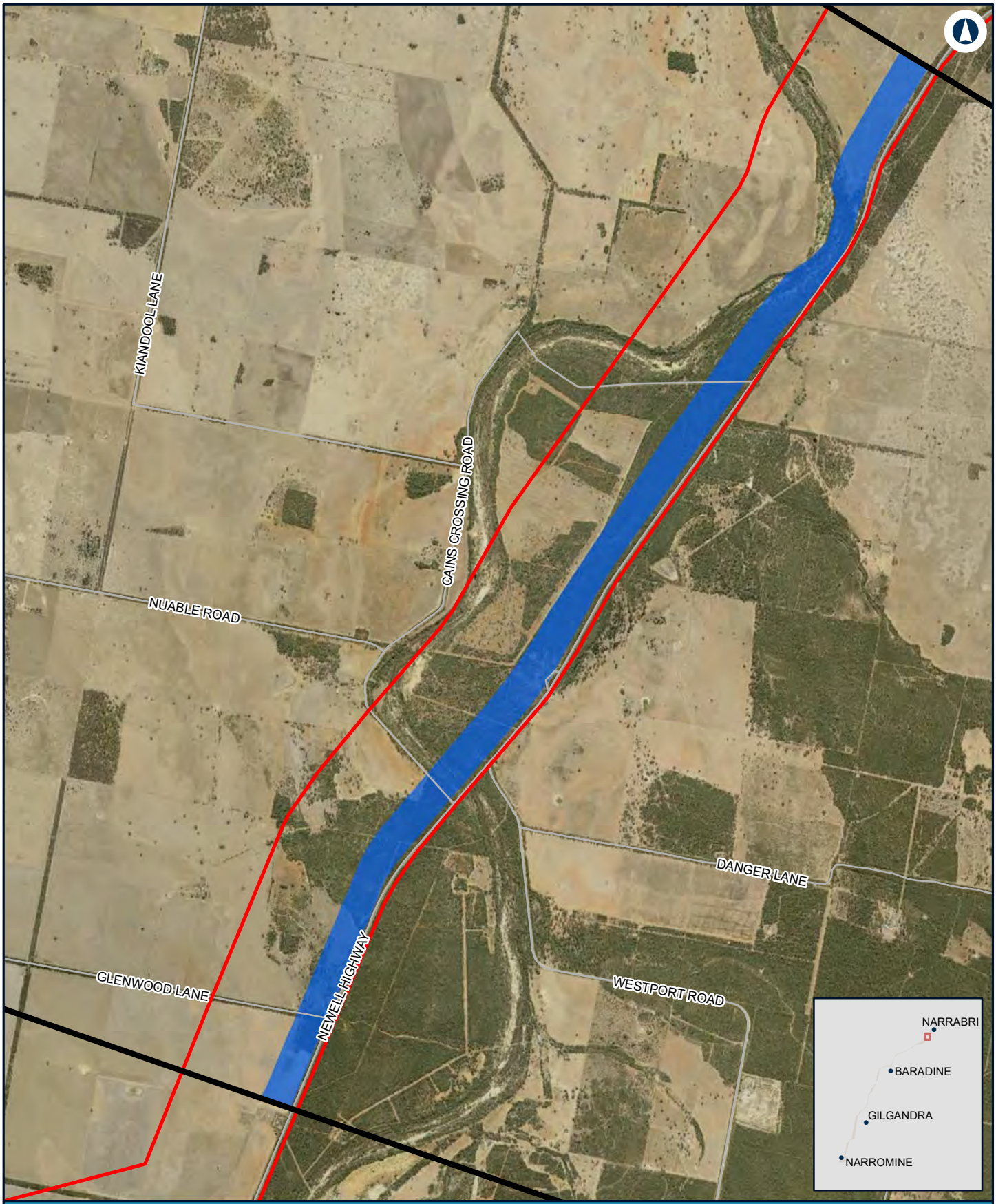
There is no opportunity to remove these road rail interface. There are no significant differentiators relating to road safety interfaces within the Study area.

Opportunities to improve road safety interfaces impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

9.10 Recommended Focus Area – Newell Highway

The recommended Focus Area along the Newell Highway is as presented in Figure 9-1 based on the following:

- The Focus Area currently minimises impacts on properties and limits property severance by following boundaries and road reserves.
- Based on current data, adjusting the Focus Area to reduce impacts relating to geotechnical conditions, flooding or road safety would not result in an overall improvement, as these features are similar throughout the Study Area and would increase impacts to properties.
- The Focus Area appropriately balances property impacts with engineering and environmental constraints while meeting the basis of design and enabling the Service Offering objectives to be achieved.



NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Study and Focus Areas Figure 9-1

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Phase 2 study area
- Sub section break

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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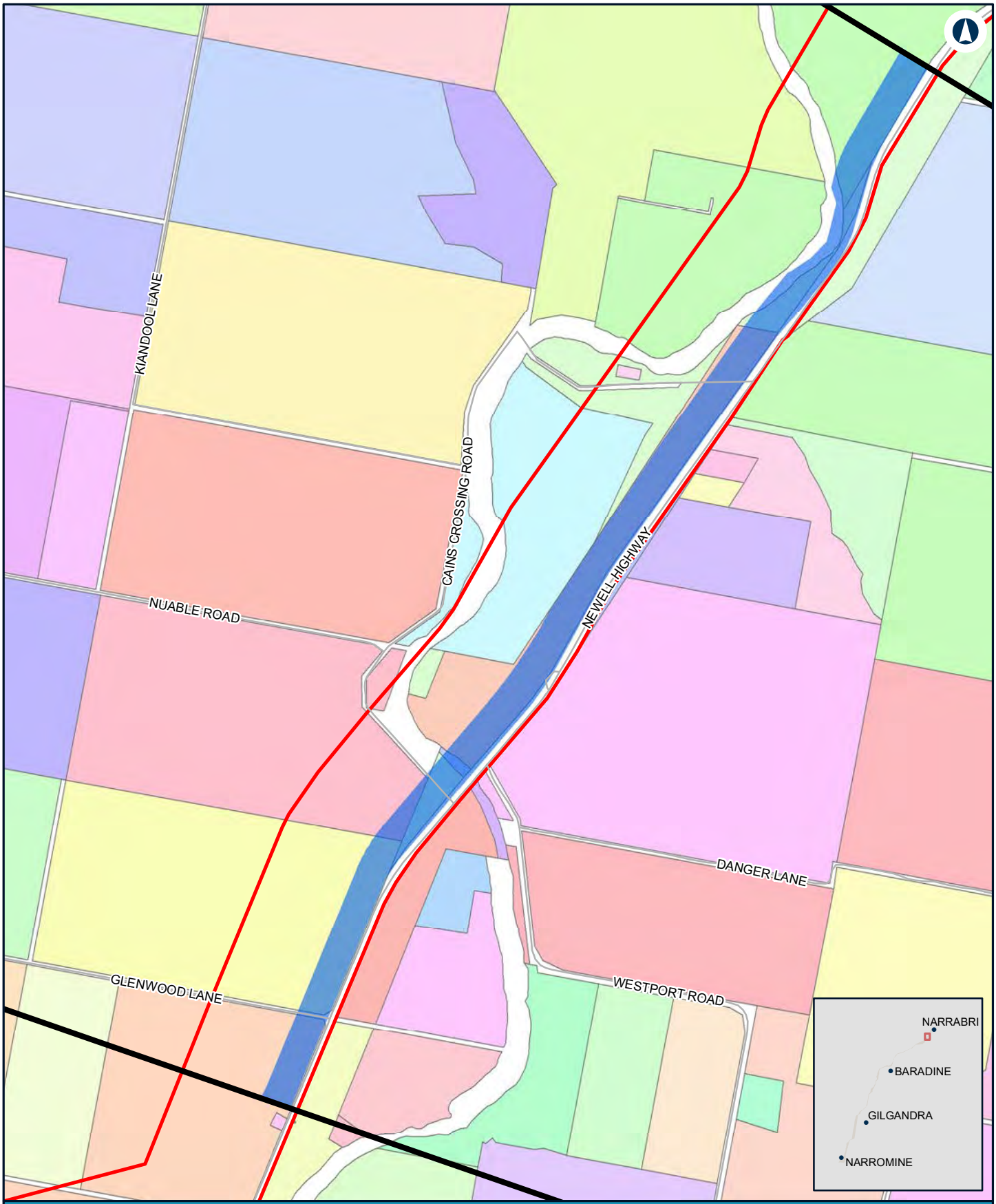

NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Property impacts Figure 9-2

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000
Data Sources: Road names: NSW Spatial Services; property; ARTC; all other layers: JacobsGHD

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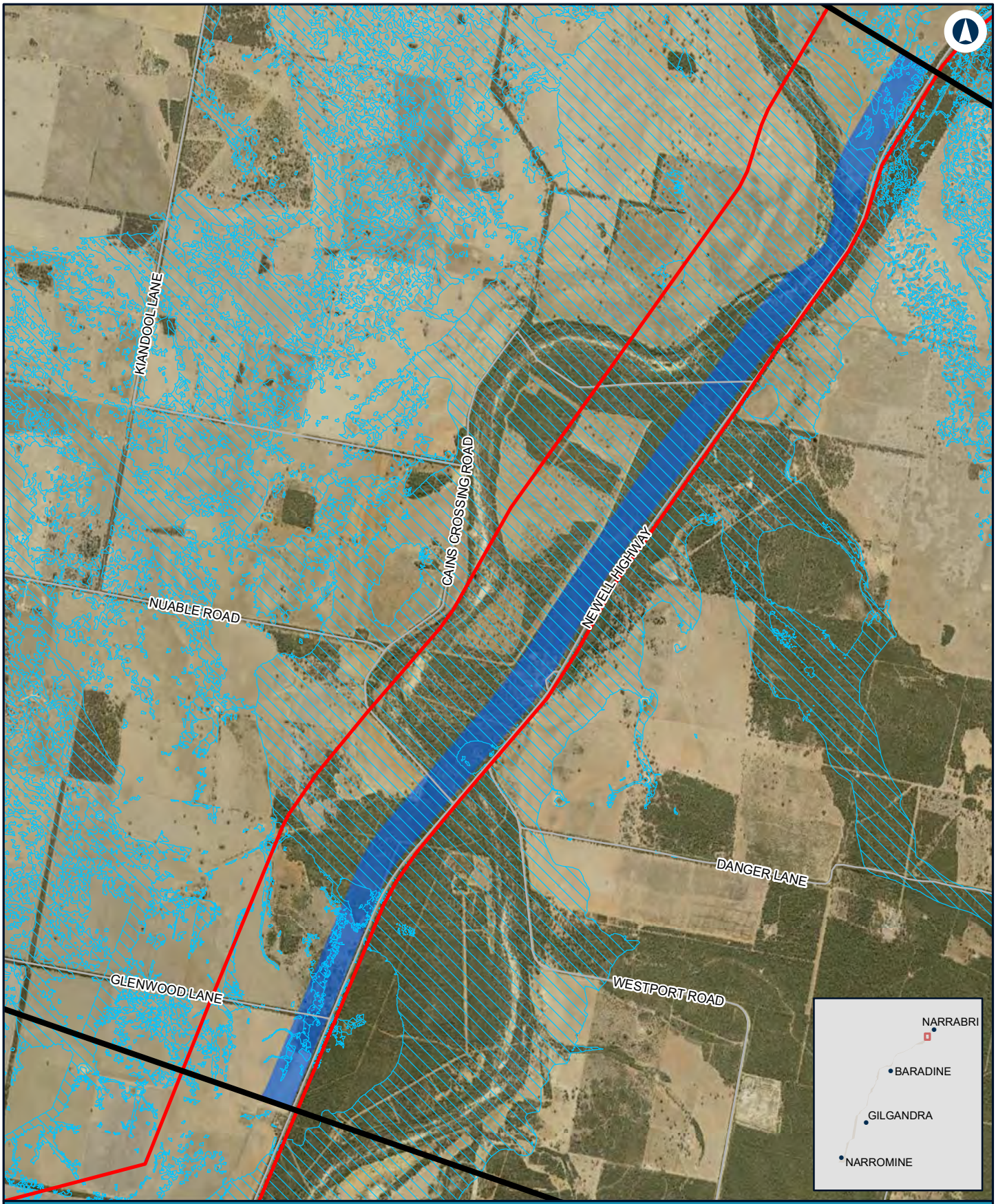

NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Preliminary Flood Mapping 1% AEP Figure 9-3

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Flood extent - 1% AEP

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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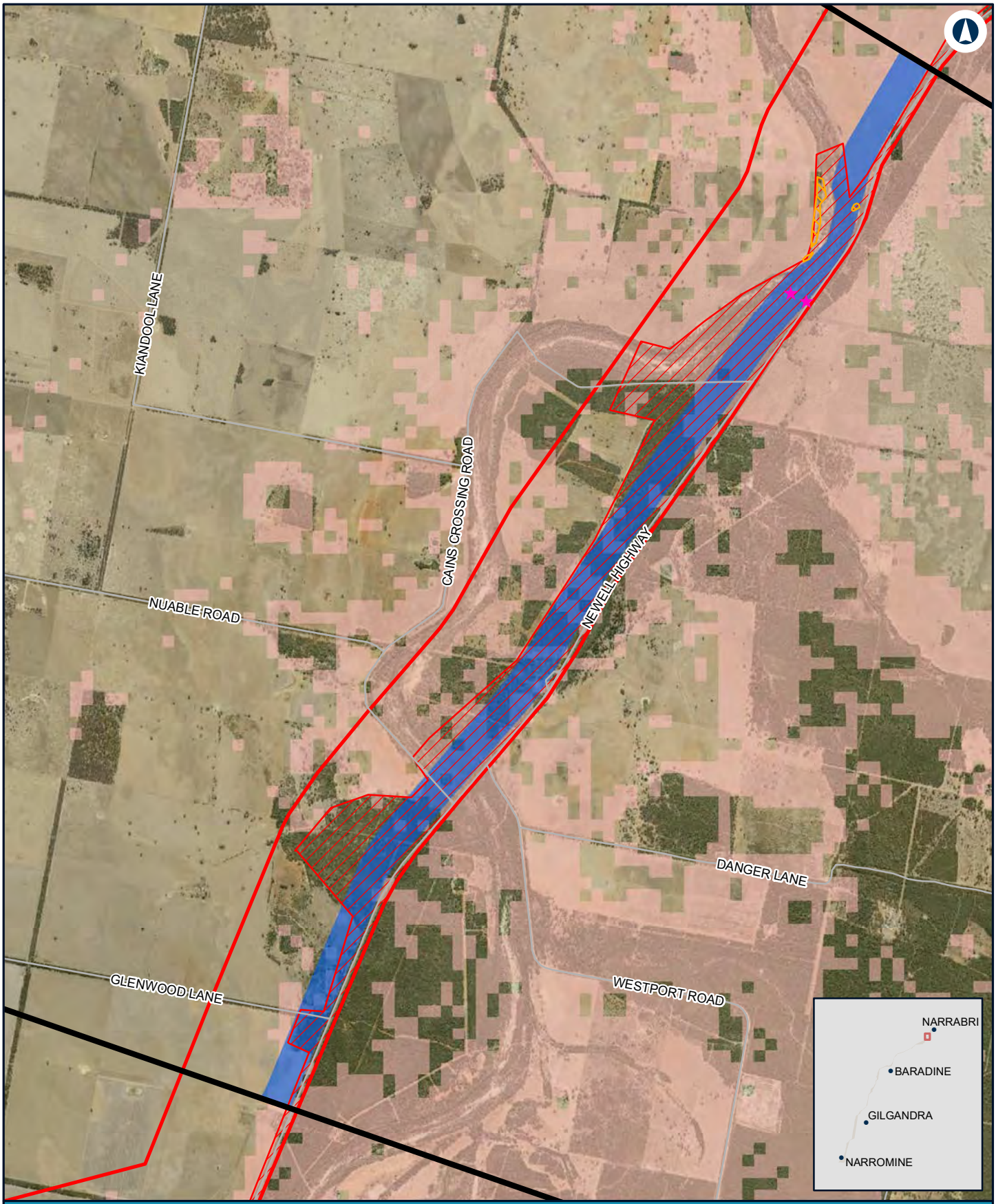

NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Culturally sensitive areas Figure 9-4

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000

Data Sources: Road names: NSW Spatial Services; AHIMS sites, ASDT data: OEH; all other layers: JacobsGHD

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Cultural heritage site
- Potential archaeological deposit
- Culturally sensitive area
- Medium to high sensitivity areas (ASDT - DECCW)

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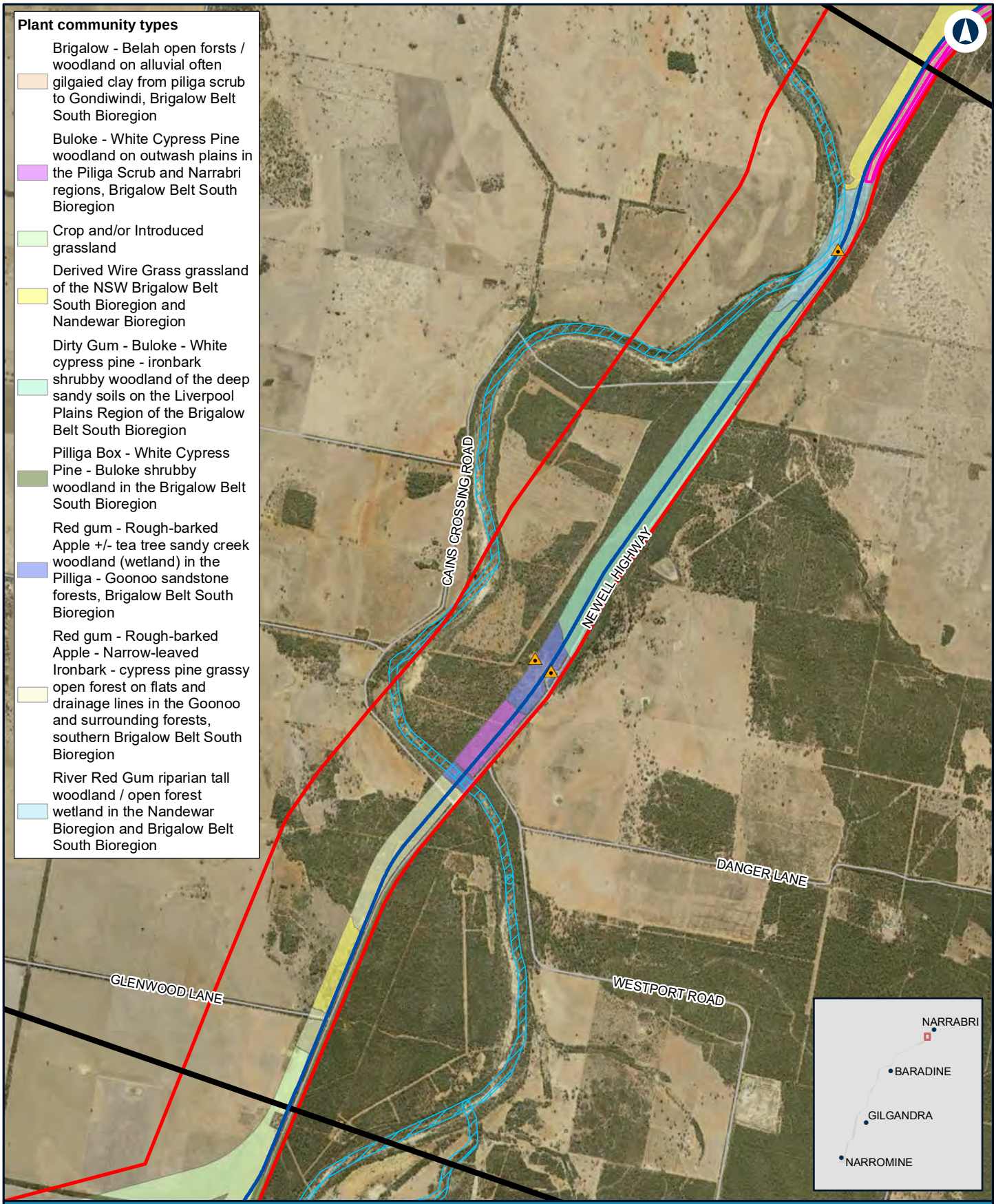

NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Ecologically Sensitive Communities Figure 9-5

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 16/08/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

LEGEND

- Alignment
- Sub section break
- Phase 2 study area
- Threatened fauna sighting
- Key fish habitat
- Potential EEC

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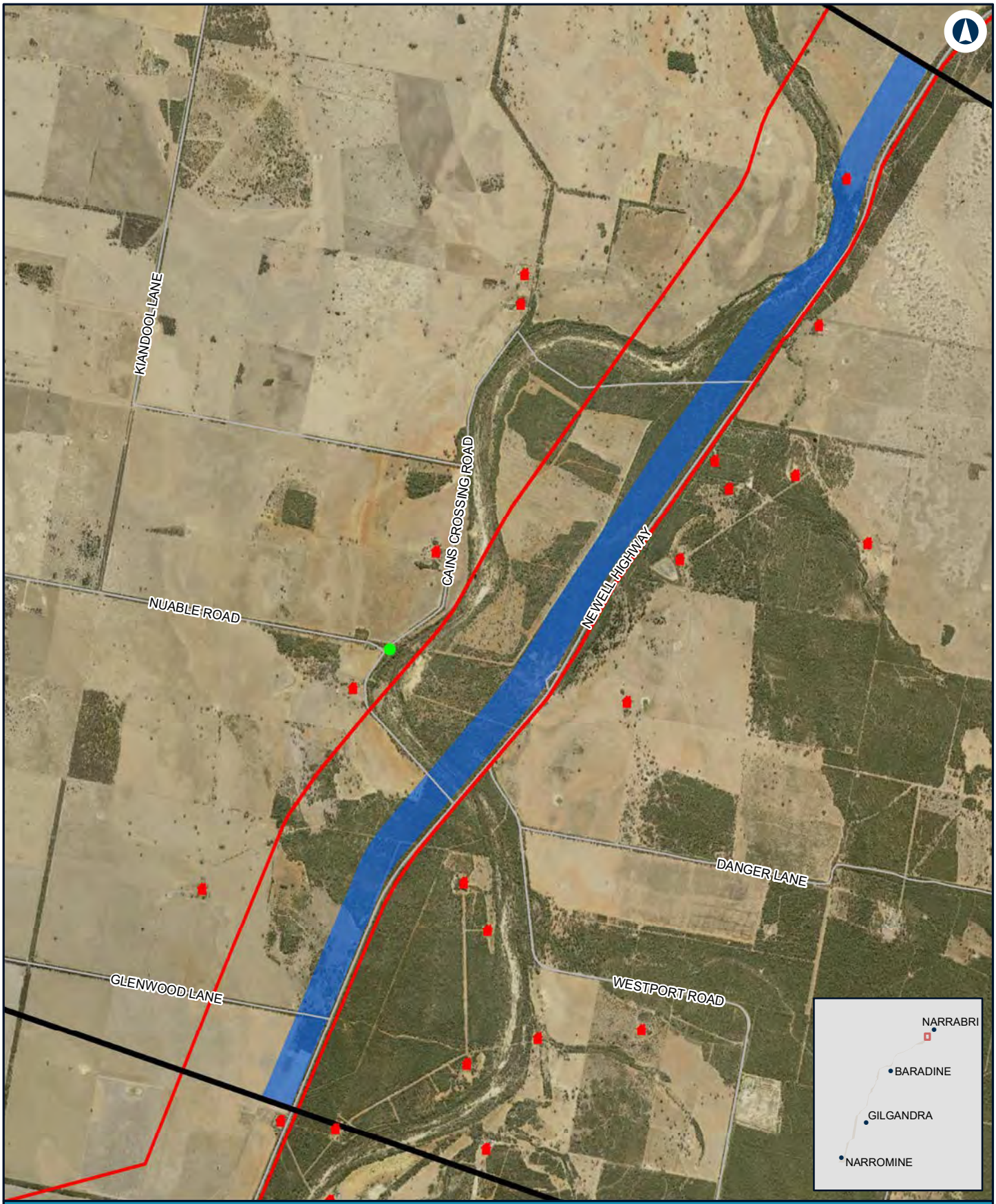

NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Sensitive Receivers Figure 9-6

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area

Sensitive Receiver

- Community
- Residence

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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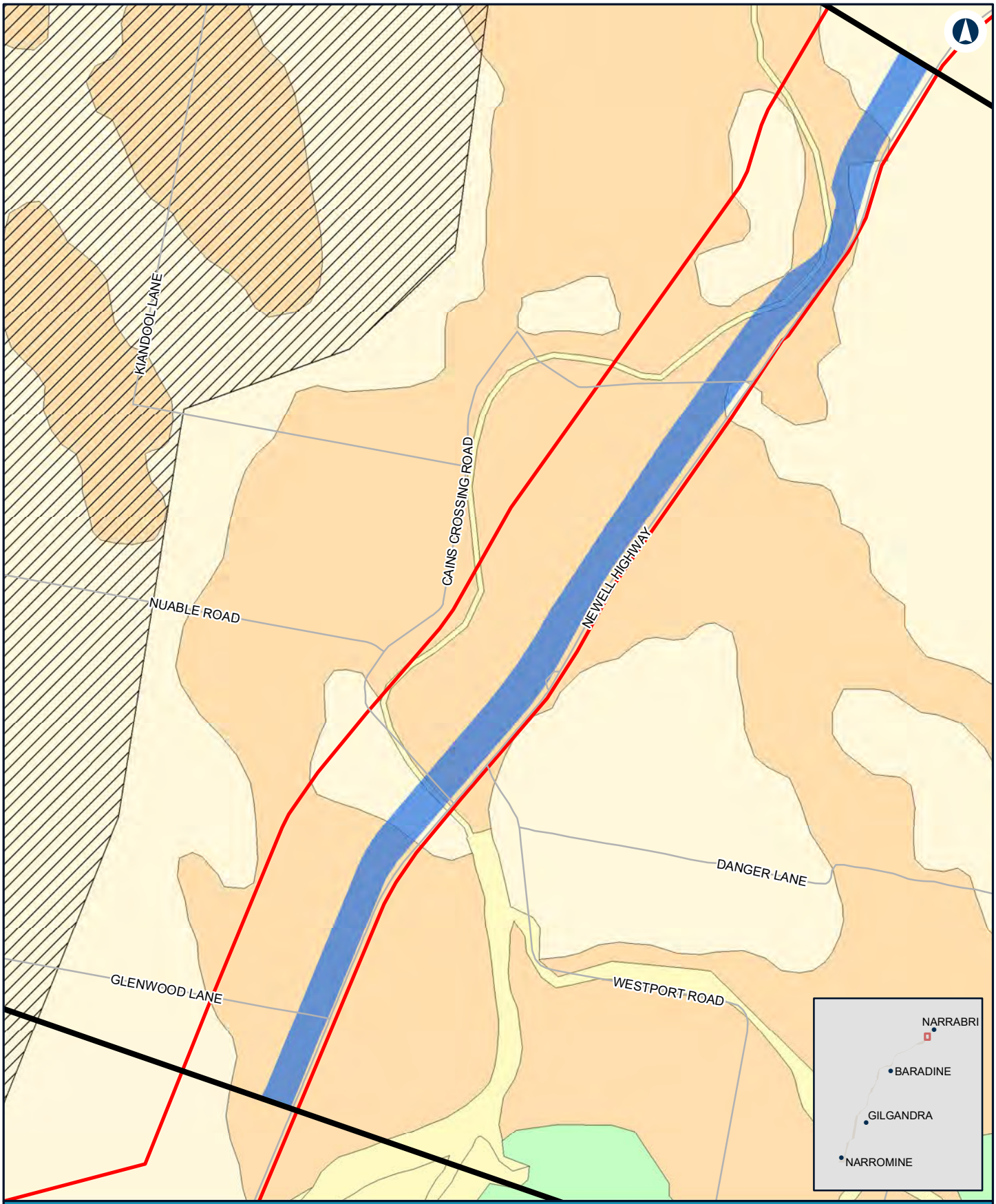

NARROMINE TO NARRABRI Baradine to Narrabri - Newell Highway Geology Figure 9-7

0 0.6 1.2 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Vertosols
- Quaternary - alluvial
- Quaternary - piedmont
- Quaternary - colluvial
- Great Australian Basin - Surat Basin sediments

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:45,000
Data Sources: Road names: NSW Spatial Services; geology, soils; Dept Industry Resources and Energy; all other layers: JacobsGHD

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10. Narrabri North

10.1 General

No alternative route options have been identified at Narrabri North. This sub-section of the Study Area was not however addressed in the Stage 1 Focus Areas Definition report as the preferred option to the west of Narrabri had not been determined.

The Phase 2 Study Area extends from the preferred options at Narrabri identified in Section 7.6 at the Kamilaroi Highway to the connection with the Narrabri to Moree rail line.

While there are no alternatives for the Focus Area in this section the connection point to the south of Narrabri needed to be identified to complete the Focus Area. The connection with the Narrabri to Moree rail line is defined by the train shunting operation requirements.

There are a number of constraints in this area including motor sports track, grain storage facilities with existing rail sidings and irrigation facilities. The southern end of the Focus Area has been determined by the viaduct location identified in Section 7.7 above. To connect with the existing Narrabri to Moree railway line, Focus Area within the Study Area has been selected to minimise land severance and align with existing property boundaries. The Study Area and Focus Area are shown in Figure 10-1.

10.2 Property impacts

The Focus Area is aligned with property boundaries, paper roads and road reserves where practical, as illustrated in Figure 10-2, to minimise properties impacted and minimise property severance.

10.3 Flooding impacts

The Narrabri North area is prone to flooding. Preliminary 1% AEP flooding with the Study Area and Focus Area is shown in Figure 10-3.

Flooding impacts extend widely across the Study Area, there are no alignment options that reduce the extent of the track in flood prone land without larger property severance impacts.

Potential opportunities to reduce flooding impacts further within the Focus Area will be further defined through the progression of the design, consultation and environmental assessment processes.

10.4 Indigenous cultural heritage

The majority of the Narrabri North Study Area is located within low to medium culturally sensitive areas as defined by publicly available data (Aboriginal Sites Decision Support Tool) published by the Office of Environment and Heritage (Figure 10-4). There are no known or potential cultural heritage sites identified to date within the Study Area.

Therefore, there are no significant differentiators with regards to Indigenous cultural heritage within the Study Area.

Potential opportunities to avoid and reduce cultural heritage impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

10.5 Ecology

Within the Study Area there is only one native plant community types (Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion) as shown on Figure 10-5. Crops and introduced grasslands are the most extensive plant community type within the Study Area.

There are no Endangered Ecological Communities within the Study Area.. Narrabri Creek and its tributaries are mapped as key fish habitat in the vicinity of the Study Area.

The majority of the Focus Area does not impact the native plant communities. There is limited opportunity to reduce ecological impacts and any advantages would be minimal while increasing impacts to properties. Therefore, there are no significant ecological differentiators within the Study Area.

Potential opportunities to avoid and reduce ecological impacts further within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

10.6 Sensitive receivers (noise, vibration, visual impacts)

There are a number of residential, commercial / industrial and non-residential (recreational) sensitive receivers within the Study Area (Figure 10-6). There are a number of other sensitive receivers located in proximity to the Study Area. Efforts have been made to locate the Focus Area as far away from residential receivers as possible while minimising property impacts and severance.

Opportunities to reduce noise, vibration and/or visual disturbances within the Focus Area will be investigated further during design, consultation and environmental assessment processes.

10.7 Geotechnical conditions

The underlying geology is illustrated in Figure 10-7. The Study Area crosses predominately alluvial, colluvial and vertisol soils, all of which are considered poor ground conditions that require more complex bulk earthworks construction methodology.

Based on the information available in this assessment, geotechnical conditions will be the same (or similar) regardless of where the Focus Area is within the agreed Study Area.

While there are locations within the Study Area that may result in a marginal improvement in geotechnical conditions there is no location for the Focus Area within the Study Area that results in a significantly improved geotechnical conditions.

Therefore, there are no significant differentiators with regards to geotechnical conditions within the Study Area.

Potential opportunities to reduce geotechnical impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

10.8 Constructability and earthworks balance

Construction at Narrabri North would require fill material to be imported for the rail embankment, regardless of the Focus Area within the Study Area. This shortfall in fill material would have to be won from cuts along the alignment or offsite sources.

There are no significant differentiators with regards to constructability and earthworks balance within the Study Area.

10.9 Road Rail interfaces

The Study Area crosses the Kamilaroi Highway a RMS road at Narrabri North.

The study area crosses one other public road. The unnamed road provides access to the Narrabri water treatment works.

There is no opportunity to remove the road rail interface from the Kamilaroi Highway. There are no options to avoid impacting the Narrabri water works access road without greater property severance impacts and a greater number of properties impacted.

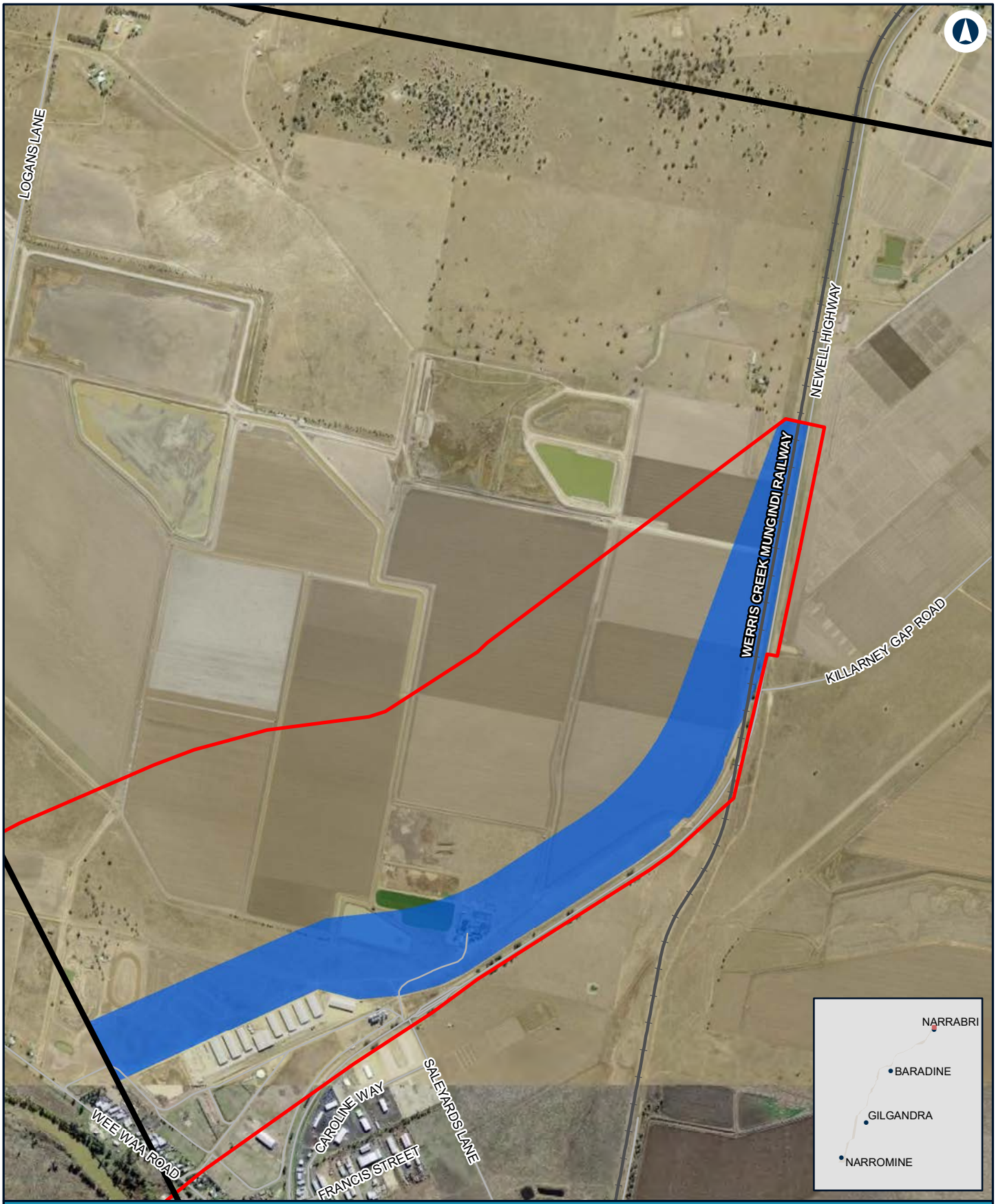
There are no material advantages relating to road safety interfaces within the Study area.

Opportunities to improve road safety interfaces impacts within the Focus Area will be defined through the progression of the design, consultation and environmental assessment processes.

10.10 Recommended Focus Area – Narrabri North

The recommended Focus Area at Narrabri North is as presented in Figure 10-1 based on the following:

- The Focus Area currently minimises impacts on properties and limits property severance by following boundaries and road reserves.
- Based on current data, adjusting the Focus Area to reduce impacts relating to geotechnical conditions, flooding, road safety or environmental would not result in an overall improvement, as these features are similar throughout the Study Area and would increase impacts to properties and residents.
- The Focus Area appropriately balances property impacts with engineering and environmental constraints whilst meeting the basis of design and enabling the Service Offering objectives to be achieved.



NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Study and Focus Areas Figure 10-1

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Phase 2 study area
- Sub section break

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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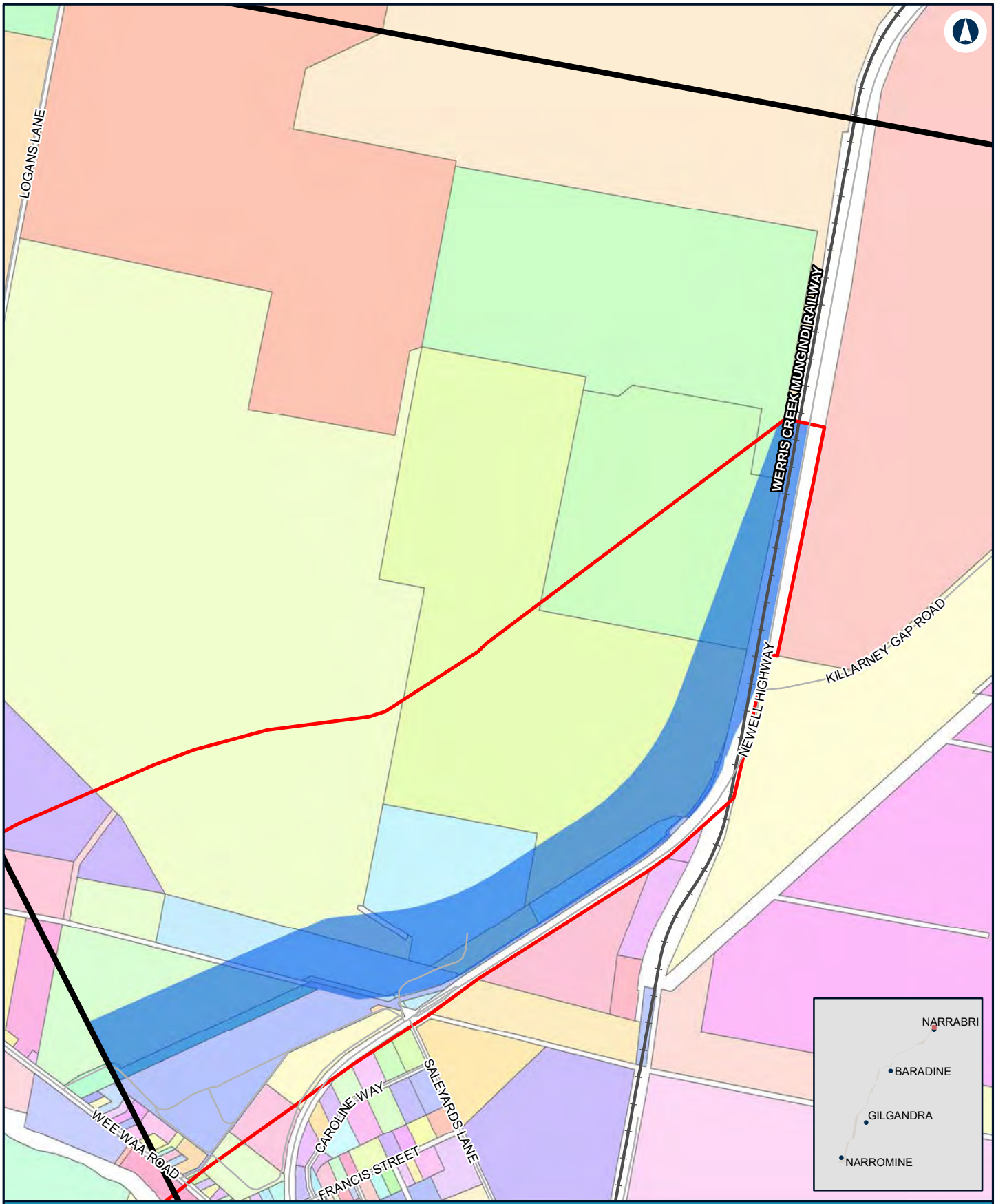

NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Property impacts Figure 10-2

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Road names: NSW Spatial Services; property; ARTC; all other layers: JacobsGHD

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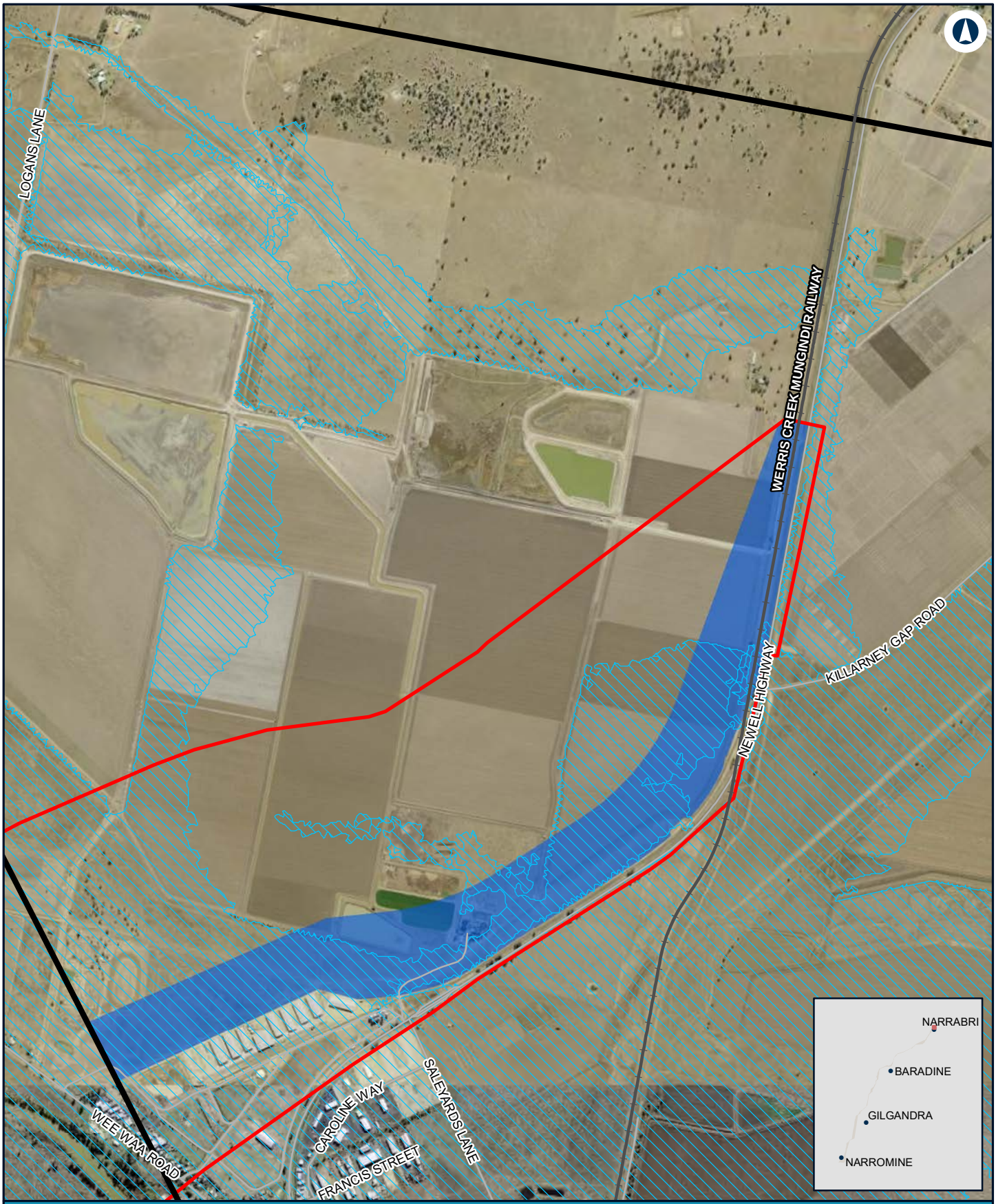

NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Preliminary Flood Mapping 1% AEP Figure 10-3

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Flood extent - 1% AEP

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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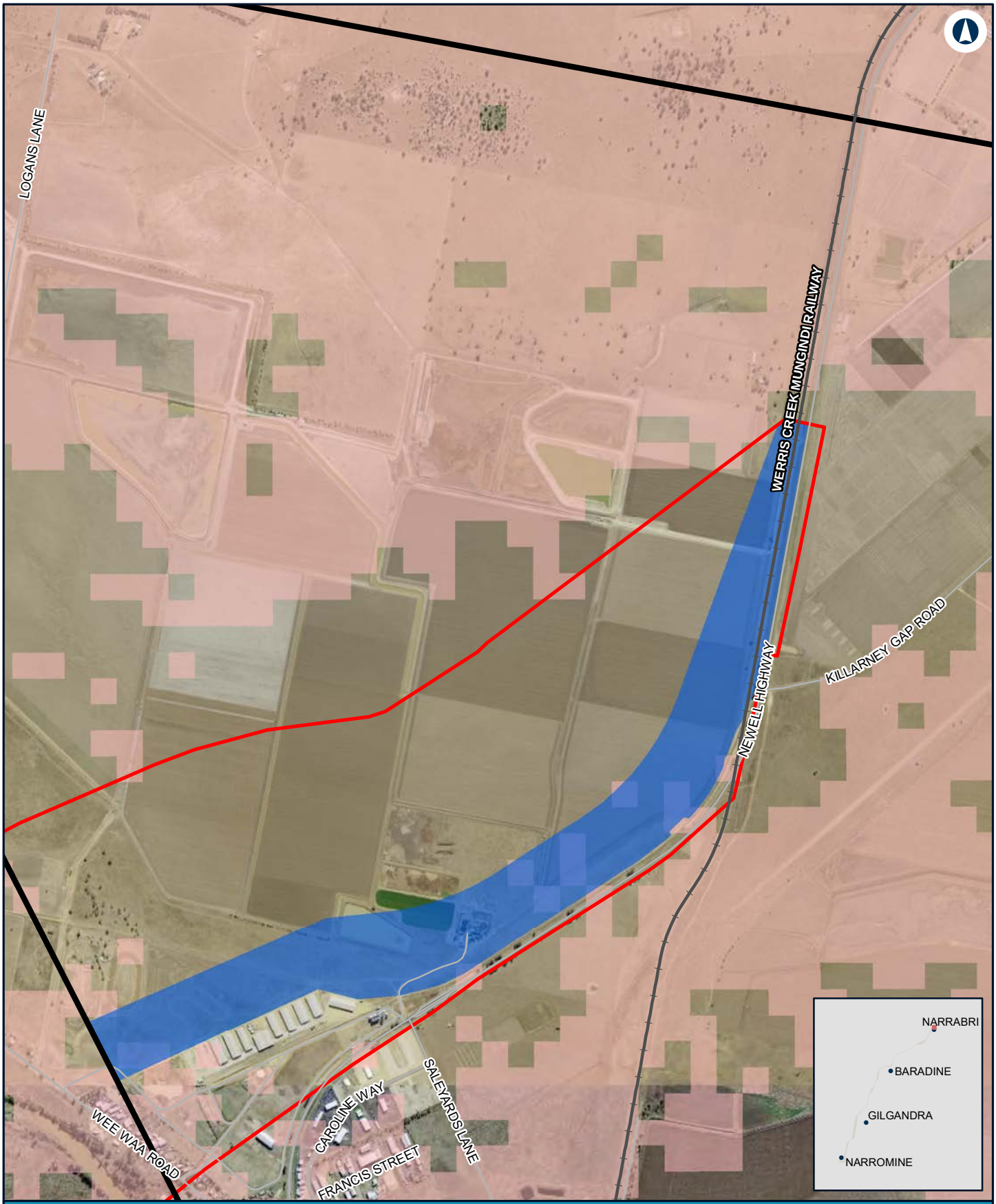

NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Culturally sensitive areas Figure 10-4

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Medium to high sensitivity areas (ASDT - DECCW)

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Road names: NSW Spatial Services; AHIMS sites, ASDT data: OEH; all other layers: JacobsGHD

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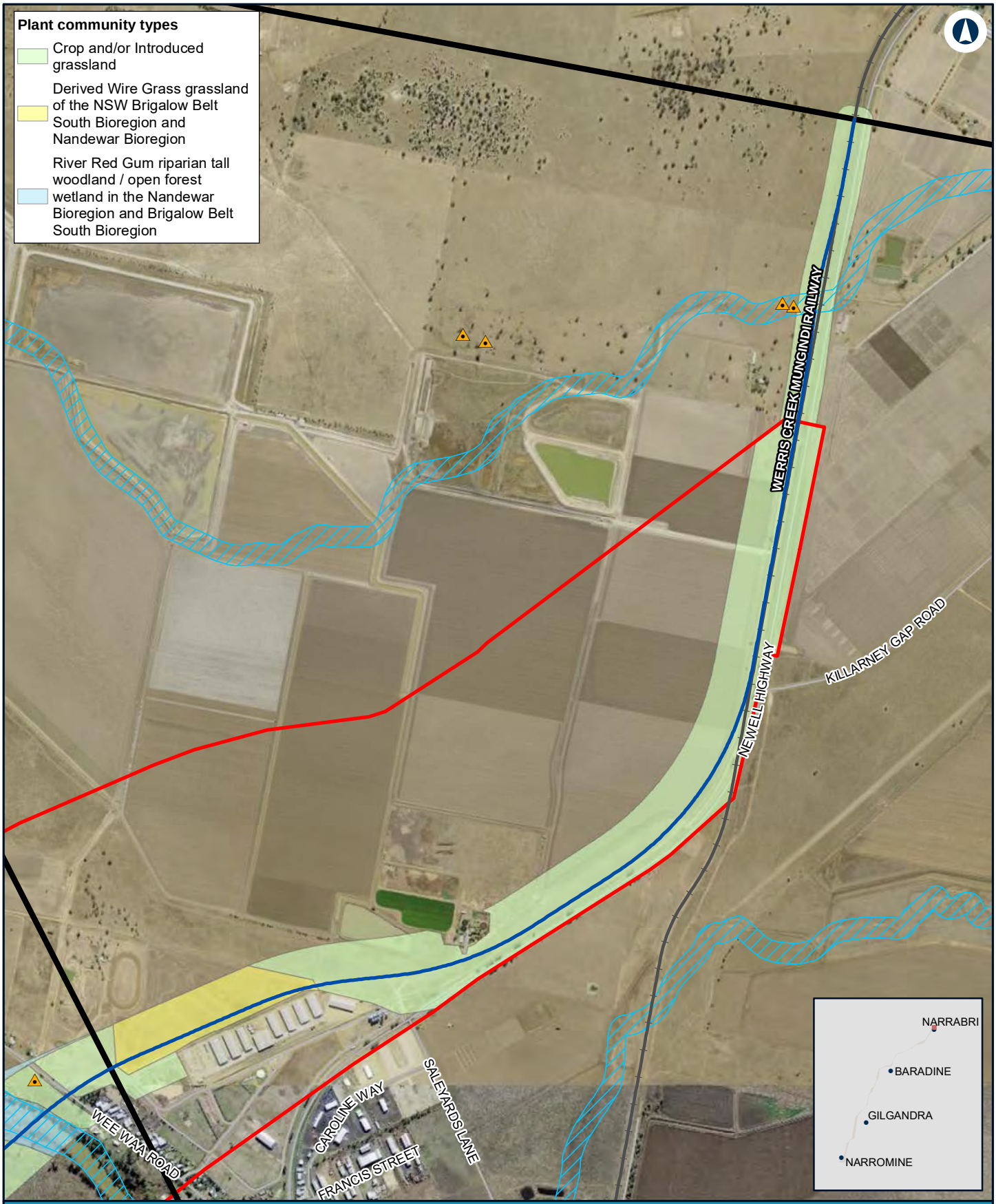

NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Ecologically Sensitive Communities Figure 10-5

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Alignment
- Sub section break
- Phase 2 study area
- Threatened fauna sighting
- Key fish habitat

Date: 16/08/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

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NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Sensitive Receivers Figure 10-6

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Imagery, road names: NSW Spatial Services; all other layers: JacobsGHD

LEGEND

- Focus area
- Sub section break
- Phase 2 study area

Sensitive Receiver

- Commercial
- Recreation
- Residence

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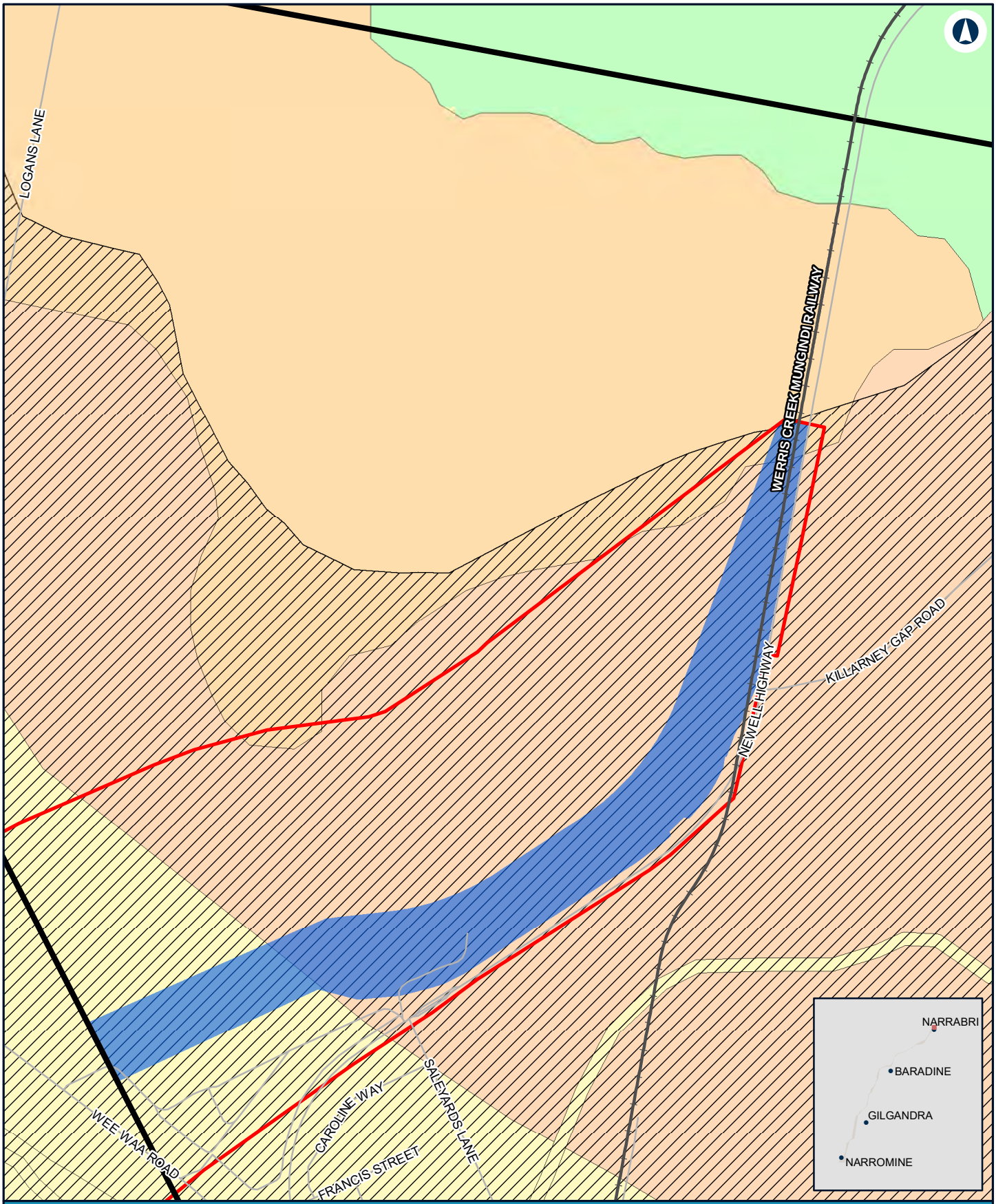

NARROMINE TO NARRABRI Baradine to Narrabri - Narrabri North Geology Figure 10-7

0 0.25 0.5 Km

Coordinate System: GDA 1994 MGA Zone 55

LEGEND

- Focus area
- Sub section break
- Phase 2 study area
- Vertosols
- Quaternary - alluvial
- Quaternary - fan / floodout
- Quaternary - piedmont
- Great Australian Basin - Surat Basin sediments

Date: 3/09/2019 Paper: A4
Author: GM (GHD) Scale: 1:20,000
Data Sources: Road names: NSW Spatial Services; geology, soils; Dept Industry Resources and Energy; all other layers: JacobsGHD

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Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

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Appendices

Appendix A – Sub-Criteria Definition and Scoring Rationale

Table A-1 - Inland Rail Narromine to Narrabri MCA Assessment Criteria

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Alignment</td><td>
Comparison of changes to alignment geometry (grade, curves, ability to provide consistency of operation speed, etc.) Sub-criteria can reflect not only compliance with BOD ESSENTIAL criteria but also performance against DESIRABLE.

For “greenfield” options, all works have been designed in accordance with the Services Brief and Basis of Design.
All options meet the design standards and are not subject to speed restrictions.
The key differentiators between the Base Case and options are:
Number of 1200m radii curves (1200m is the minimum curve radius and whilst it is preferable to have straight track when designing a railway, 1200m radii curves are in accordance with the standards and do not result in speed restrictions).
Materiality factors are a comparison against the base case and have been taken to be:
<table>
<tr><th>MCA Score</th><th>Curves</th></tr>
<tr><td>10</td><td>8 less curves of 1200m radius</td></tr>
<tr><td>5</td><td>4 less curves of 1200m radius</td></tr>
<tr><td>0</td><td>Similar impacts between Base Case and options considered (± 4 No. 1200m radii curves)</td></tr>
<tr><td>-5</td><td>4 additional curves of 1200m radius</td></tr>
<tr><td>-10</td><td>8 additional curves of 1200m radius</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Impact on Public Utility Providers (PUP) and other assets</td><td>
Comparative consideration of:

Changes required to significant (HV/trunk/distribution) utilities
Changes required to local utilities networks

Impacts on utilities have considered the significance of the utility and the number of crossings.
Utility changes involving High Voltage transmission lines, High Pressure gas and large diameter water mains and or are Non Contestable are considered to be higher significance.
In some instances, utilities are parallel to the alignment and could potentially run within the rail corridor. In these instances, a more detailed assessment has been made and the score adjusted.
Materiality factors are a comparison against the base case and have been taken to be:
<table>
<tr><th>MCA Score</th><th>Relocation of utility assets</th></tr>
<tr><td>10</td><td>Number of relocations less than the base case:
1 x 132kV electricity
4 x 66kV or 22kV electricity
1 x high pressure gas main
1 x fibre optic telecommunications cable
8 x other telco services</td></tr>
<tr><td>5</td><td>Number of relocations less than the base case:
1 x 66kV electricity, or
1 x 22kV electricity
4 x 11kV electricity or lower voltage
4 x other telco services</td></tr>
<tr><td>0</td><td>Number of relocations is within the limits noted for scores 5 and -5 in this table.</td></tr>
<tr><td>-5</td><td>Number of relocations greater than the base case:
1 x 66kV electricity, or
1 x 22kV electricity
4 x 11kV electricity or lower voltage
4 x other telco services</td></tr>
<tr><td>-10</td><td>Number of relocations greater than the base case:
1 x 132kV electricity
4 x 66kV or 22kV electricity
1 x high pressure gas main
1 x fibre optic telecommunications cable
8 x other telco services</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Geotechnical Conditions</td><td>

Comparison of geotechnical conditions.

Underlying geotechnical conditions have been inferred from the published BBSB geological mapping, completed in 2002.

Geological conditions mapped as Cretaceous sedimentary rocks (sandstone) have been assumed to have a track formation with 500 mm of structural fill. (ARTC Standard ETM-08-01, Section 3.5) (Type A formation).

Geological conditions mapped as quaternary alluvium and colluvial outwash (alluvial deposits and “black soils”) have been assumed to have a track formation 1000 mm of structural fill (ARTC Standard ETM-08-01, Section 3.5) (Type B formation).

For areas mapped as quaternary alluvium and colluvial outwash, reference was also made to soil mapping maps to check for vertisols “black soils”. Where practical, track alignment over black soil areas has been minimised to reduce potential construction difficulties and shrink/swell issues during operation or Inland Rail.

Geotechnical conditions will have a significant impact on the construction and maintenance cost for Narromine to Narrabri. Good ground conditions will result in reduced track formation and will reduce construction risks associated with haul roads and vehicle movements.

A materiality factor has been taken to be an increment of 10% of the section length over quaternary alluvium and colluvial outwash deposits, including vertisols.

<table>
<tr><th>MCA Score</th><th>Length of alignment over quaternary alluvium and colluvial outwash when compared to base case</th></tr>
<tr><td>10</td><td>> 20% less length</td></tr>
<tr><td>5</td><td>> 10% less length</td></tr>
<tr><td>0</td><td>+or – 10%</td></tr>
<tr><td>-5</td><td>> 10% additional length</td></tr>
<tr><td>-10</td><td>>20% additional length</td></tr>
</table>

</td></tr>
</table>

Sub-Criteria	Rationale
Impacts on existing road and rail networks	***Comparative consideration of impact of the alignment to road and rail networks (note road/rail crossings are included in safety below).*** Impacts on existing rail networks apply to connections to the Parkes to Narromine railway and Narrabri to Moree railway only. Interfaces with the Coonamble Line at Curban and the Walgett Line at Narrabri have been taken to be grade separated. It is however noted that future design development could result in at grade junctions at Curban. There would therefore be some advantages for options that allow for both grade separated and an at-grade junction at Curban. Scoring for options crossing the Walgett Line should also consider the ease of a future southern connection to Inland Rail. Impacts from level crossings are considered under Safety and are not included within this sub-criteria. Impacts on roads have been considered to be road realignments of greater than 100 m. These have been divided into realignment of State Roads, managed by RMS, and Council Roads, managed by the respective local Councils. The scoring of roads interfaces considered significance and quantity of crossing. State roads are considered to have higher significance due to their strategic importance, higher number of vehicles using the road and the higher complexity of safety during construction compared to the based. Scoring of rail interfaces is based on the complexity of meeting the required junction functionality compared to the base case. Options are considered comparatively against the base case. Materiality factors are a comparison against the base and have been taken to be:

	Existing Roads	Existing Rail
10	2 less State Road or 4 less Council Road realignments	Full flexibility retained for grade separated or at-grade junctions.
5	1 less State Road or 2 less Council Road realignments	Flexibility retained for grade separated or at grade junctions, but design does not fully comply with standards and waiver required.
0	Similar impacts between Base Case and options considered	Similar impacts between Base Case and options considered.
-5	1 more State Road or 2 more Council Road realignments	No flexibility for alternative junction configurations.
-10	2 more State Road or 4 more Council Road realignments	No flexibility for alternative junction configurations, grade separation results in impacts on other assets.

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Flood Immunity / Hydrology</td><td>
Comparative consideration of ability to deliver desired rail infrastructure flood immunity (impacts to hydrology, environment captured under environment and impacts landowners is captured under community and property).
Top of formation and track for all options will be above the 1% AEP flood level, in accordance with the Basis of Design.
Materiality factors are a comparison to base case and have been taken to be an increment of 10% of the section length in the 1% AEP flood area. Scores are shown in the table below.
Measurements have been based on flood models developed as part of the feasibility design. Scoring rationale includes length and depth of flooding. At the time of the MCA, length of flooding was only available.
<table>
<tr><th>MCA Score</th><th>Top of track/formation over 1% AEP flood area when compared to base case</th></tr>
<tr><td>10</td><td>>20% less length</td></tr>
<tr><td>5</td><td>>10% less length</td></tr>
<tr><td>0</td><td>+or – 10%</td></tr>
<tr><td>-5</td><td>>10% additional length</td></tr>
<tr><td>-10</td><td>>20% additional length</td></tr>
</table>
Consideration of flood depth concluded that there is no available data that can be readily used for comparison purposes.
</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Future Proofing</td><td>
Comparative consideration of the ability to readily upgrade the rail infrastructure in the future e.g.

Complexity of accommodating extended loops for 3600m trains
New structure capable of 30 tonne axle load @ 80 km/h min
Formation on new track suitable for 30 tonne axle load @ 80 km/h

Qualitative assessment scored by MCA Workshop.
Structures will be designed in accordance with the Basis of Design. There are therefore no significant differentiators for the second bullet point.
All options will consider 30 TAL at 80km/h in accordance with the Basis of Design. There are therefore no significant differentiators for the third bullet point.
Scoring for future proofing is therefore based on a qualitative assessment for loop extensions for 3600 m trains. It is noted that this is a qualitative assessment. Guidelines for scoring are provided below.
Materiality factors are a comparison against the base case and have been taken to be:
<table>
<tr><th>Score</th><th>Future Proofing</th></tr>
<tr><td>10</td><td>Significant additional advantages to loop extensions i.e. out of flood plain, avoiding additional bridges.</td></tr>
<tr><td>5</td><td>Advantages of loop extensions i.e. avoiding crossing road with active level crossing.</td></tr>
<tr><td>0</td><td>Neutral.</td></tr>
<tr><td>-5</td><td>Disadvantages of loop extensions i.e. avoiding crossing road with active level crossing.</td></tr>
<tr><td>-10</td><td>Significant disadvantages to loop extensions i.e. in flood plain, requiring additional bridges.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Operational Safety</td><td>

Comparison of appropriate metrics that influence operational safety such as:

- **Track geometry**
- **Height of rail above natural surface**
- **Conflict points e.g. connections to other rail infrastructure (not including level crossings which is covered in other sub-criteria)**

Qualitative assessment scored by MCA Workshop.

Scoring based on value judgements when comparing options. To be validated by MCA workshop attendees.

Factors considered include length of bridges and sighting distance to critical infrastructure.

Materiality factors are a comparison against the base case and have been taken to be:

<table>
<tr><th>Score</th><th>Operational Safety</th></tr>
<tr><td>10</td><td>Significantly better operational safety</td></tr>
<tr><td>5</td><td>Better operational safety</td></tr>
<tr><td>0</td><td>Neutral</td></tr>
<tr><td>-5</td><td>Worse operational safety</td></tr>
<tr><td>-10</td><td>Significantly worse operational safety</td></tr>
</table>

</td></tr>
<tr><td>Public Safety</td><td>

Risk of trespass e.g. rural locations, overpasses. Responses to this criteria should factor in feedback from stakeholder engagement with consideration of CPTED principles (Crime Prevention Through Environmental Design).

Qualitative assessment scored by MCA Workshop.

Materiality factors are a comparison against the base case and have been taken to be:

<table>
<tr><th>Score</th><th>Public Safety</th></tr>
<tr><td>10</td><td>Significantly better public safety</td></tr>
<tr><td>5</td><td>Better public safety</td></tr>
<tr><td>0</td><td>Neutral</td></tr>
<tr><td>-5</td><td>Worse public safety</td></tr>
<tr><td>-10</td><td>Significantly worse public safety</td></tr>
</table>

</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Road Safety Interfaces</td><td>
Comparative assessment of crossings including:

Road crossings
Local and property access crossings

Road safety interfaces have been assessed based on the number of road / rail interfaces classified as level crossings.
Grade separated crossings have not been included.
It should be noted that this assessment does not include potential road realignments.
Level crossings have been classified as:

State Roads, managed by RMS, plus Eumungerie Road and Tomingley Road that are designated heavy vehicle routes.
Council roads.
Private roads / property access.
Level crossing numbers are prior to any consolidation of crossings.

The materiality factor used for level crossings has been taken to be the equivalent of:

One crossing on a State Road (assumed active crossing with boom gates), or
Two crossings on Council Roads (assumed passive crossing), or
Three crossings on Private Roads (assumed passive crossing)

Materiality factors are a comparison against the base case and have been taken to be:
<table>
<tr><th>Score</th><th>Road Safety Interfaces</th></tr>
<tr><td>10</td><td>2 less State Road crossings
4 or more less Council Road crossings
6 or more less Private road crossings</td></tr>
<tr><td>5</td><td>1 less State Road crossings
2 less Council Road crossings
3 less Private road crossings</td></tr>
<tr><td>0</td><td>No State Road or 1 less Council or Private Road crossing</td></tr>
<tr><td>-5</td><td>1 extra State Road crossings
2 extra Council Road crossings
3 extra Private road crossings</td></tr>
<tr><td>-10</td><td>2 extra State Road crossings
4 or more extra Council Road crossings
6 or more extra Private road crossings</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Emergency Response</td><td>Comparative assessment of access to site for emergency services, including in the scenario of a rail incident (Note – Impact to emergency services is discussed under construction access and impact on community such as changes to road network).
Ability for emergency services vehicles to access the rail corridor in the event of a rail accident.
If route is parallel to an existing public road, the access for emergency response crews is taken to be good.
This sub criteria has been assessed on the basis of the percentage of the alignment that is not within 500 m of an access point or parallel to an existing local road or better.
Note that for this report, this criteria is not applicable.

<table><tr><th>core</th><th>Road Safety Interfaces</th></tr><tr><td>10</td><td>>21% of the alignment within 500m of an access point, or parallel to an existing road</td></tr><tr><td>5</td><td>Between 11% - 20% of the alignment within 500 m of an access point, or parallel to an existing road</td></tr><tr><td>0</td><td></td></tr><tr><td>-5</td><td>Between 6% - 10% of the alignment within 500m of an access point, or parallel to an existing road</td></tr><tr><td>-10</td><td><5% of the alignment within 500m of an access point, or parallel to an existing road</td></tr></table></td></tr>
<tr><td>Construction Safety</td><td>Comparative assessment of higher risk construction activities e.g. large cuttings, working in waterway areas. Could also include consideration for bridge works and earthworks volumes.
Qualitative assessment scored by MCA Workshop considering features of an option that represent an increase in construction safety risk such as deep cutting, working over water and working at heights.</td></tr>
<tr><td>Effect / Impact on travel time</td><td>Comparison of travel time between base case and proposed option.
The impact on travel time has been assessed based on the calculated travel time for a section.
A materiality factor of greater than 1 minute has been adopted.
At a design speed of 115km/h, this equates to 1.9km in track length.
Materiality factors are a comparison against the base case and have been taken to be:

<table><tr><th>Score</th><th>Travel time</th></tr><tr><td>10</td><td>>2 minutes less</td></tr><tr><td>5</td><td>>1 minute less</td></tr><tr><td>0</td><td>Neutral (less than a minute)</td></tr><tr><td>-5</td><td>>1 minute additional</td></tr><tr><td>-10</td><td>>2 minutes additional</td></tr></table></td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Effect on reliability and availability</td><td>Comparison of reliability between the base case and proposed option.
Qualitative assessment scored by MCA Workshop.
Note other differentiators that may impact on reliability and availability are considered elsewhere:
Impacts of number of curves considered in Alignment.
Impacts of level crossings considered in Road Safety Interfaces.
Turnouts are only provided at loops and interfaces with existing rail and are consistent between options.
Also, comparison of options where both are greenfield construction are unlikely to be a differentiator. Design standards and constructions standards mean that options will be designed to achieve a common reliability and availability performance.</td></tr>
<tr><td>Network interoperability and connectivity</td><td>Qualitative assessment of interoperability and connectivity to the existing network and effect on existing/ new customers.
Qualitative assessment scored by MCA Workshop.
The required network interoperability and connectivity is defined in the services brief and is consistent for all options.
Note, in the event of a change to the required connectivity, some options may be preferred, however this has not been considered at this stage as it is necessary to consider known requirements only.</td></tr>
<tr><td>Construction duration</td><td>Assessment of the comparative difference in construction duration between the option and base case. Appropriate metrics may include earthwork volumes, complexity and size of structures.
Quantitative assessment.
The source of fill is not considered in the criteria as it assumed that a competent contractor will provide sufficient plant to move fill from source location to site. Other elements not included as they are not defined at this point in time are (for example) pier lengths, bridge height. Ratio of earthworks, cut to fill, is considered. This applies to constrained sites only.
Options are evaluated in comparison to the base case option. A positive score indicates an option is superior in regard to construction duration.
<table><tr><th></th><th>Earthworks Volumes</th><th>Complexity and size of structures</th></tr><tr><td>10</td><td>>20% less cut to spoil
>20% less fill</td><td>> 20% less rail bridge length</td></tr><tr><td>5</td><td>>10% less cut to spoil
>10% less fill</td><td>>10% less rail bridge length</td></tr><tr><td>0</td><td>Neutral</td><td>Neutral</td></tr><tr><td>-5</td><td>> 10% additional cut to spoil
> 10% additional fill</td><td>>10% additional rail bridge length</td></tr><tr><td>-10</td><td>> 20% additional cut to spoil
> 20% additional fill</td><td>> 20% additional rail bridge length</td></tr></table></td></tr>
</table>

Sub-Criteria	Rationale
Construction access	***Assessment of locations for site access during construction including:*** • ***Adjacent road access*** • ***Access from existing railway corridors*** • ***Access from properties*** Access to the proposed rail corridor will be a factor to consider in the siting of construction compounds, materials stockpile areas and planning haul routes. Greenfield sites are similar for all options and are unlikely to be a differentiator. Construction access should only trigger circumstances where there is some major difference in access between options. Qualitative assessment scored by MCA Workshop.
Construction complexity	***Assessment of the construction complexity and specialisation of workforce or equipment.*** ***(Note - impact on local access covered under separate sub-criteria).*** Qualitative assessment scored by MCA Workshop.
Resources/ material sources	• ***Assessment of material sources for granular materials (including quarries, fill).*** • ***Assessment of construction water availability (and suitability- based on source type and consideration of environmental constraints).*** • ***Potential for beneficial reuse of spoil (from this or other IR projects or projects in the region).*** Qualitative assessment scored by MCA Workshop: Also include consideration of locally won fill from within alignment, rather than import from borrow pit outside of rail corridor.
Remediation/ contamination	***Comparative consideration of known or potential extent of contaminated materials i.e. existing rail corridors, other sites on registers or suspected due to historic use.*** ***(Note - focus on constructability impacts as opposed to environmental).*** • Qualitative assessment scored by MCA Workshop.
Interface with operational railway	***Qualitative assessment of the number of interfaces with existing operational railway. This may also be used to consider possession times for enhancement/upgrade projects if a differentiators or interface with non-ARTC railway corridors.*** Qualitative assessment scored by MCA Workshop.
Staging opportunities	***Assessment of staging opportunities (construction and operation).*** Qualitative assessment scored by MCA Workshop.

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Ecological impacts (flora, fauna and habitats)</td><td>Assessment of the impact of construction and operation on:
Flora and vegetation communities (by type and level of protection, including local, State, EPBC).
Fauna and habitats (by type and level of protection, including local, State, EPBC).
Reserves, state forest, national parks, protected areas including existing designated or protected offset areas.
Database searches and targeted field inspections from Phase 1 investigations as well as other investigations completed during Phase 2 have been used to define potentially environmentally significant areas.
The materiality factor has been taken to be a 10% difference in length through a potential environmentally significant area, when compared to the Base Case.
For route options comparisons relating to areas with restricted property access, no additional site investigations are available to further inform the results of desktop studies.</td></tr>
<tr><td>Offset liability</td><td>Calculation of the area (in hectares) impacted triggering an offset requirement, and expected offset liability under State or EPBC offset policy requirements.
Qualitative assessment scored by MCA Workshop.
Database searches and targeted field inspections from Phase 1 investigations as well as other investigations completed during Phase 2 have been used to define potentially environmentally significant areas.
A qualitative assessment of the offset liability has therefore been made by comparing options to the Base Case with respect to the vegetation impacted and land use types.</td></tr>
<tr><td>Visual impacts</td><td>Comparative description of the extent to which the option would result in a landscape or visual change to sensitive receptors/ viewers (generally residential residences, conservation areas, open space and road users). This is from the overall perspective, impacts to amenity are also captured below more generally under Community, property and heritage.
Qualitative assessment scored by MCA Workshop. An indication of scoring criteria is provided below.
Options are evaluated in comparison to the base case option. A positive score indicates an option is superior in regard to visual impacts.
<table><tr><th>Score</th><th>Operational Safety</th></tr><tr><td>10</td><td>Elevated structures screened from residential properties/residences, open space and public roads.</td></tr><tr><td>5</td><td>Railway screened from residential properties/residences, open space and public roads by existing trees and vegetation.</td></tr><tr><td>0</td><td>Neutral.</td></tr><tr><td>-5</td><td>Greater extents of railway embankment visible from residential properties/residences, open space and public roads.</td></tr><tr><td>-10</td><td>Greater extents of elevated structures visible from residential properties/residences, open space and public roads.</td></tr></table></td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Noise and vibration impacts</td><td>
Total number of:

Residential receptors within 200 m of the corridor.
Sensitive receptors within 200 m of the corridor.
Commercial/ industrial receptors within 200 m of the corridor.
This metric should be adjusted where necessary to reflect more or less built up areas, with input from environment or noise specialist. The sub-criteria should account for potential impacts during construction and operation.

The number of receptors has been derived from aerial photography.
In rural areas, the materiality factor has been taken to be two residential residences or four commercial premises.
In urban areas, principally Narrabri, the materiality factor has been taken to be four residential residences or eight commercial premises.
Options are evaluated in comparison to the base case option. A positive score indicates an option is superior in regard to noise and vibration impacts.
<table>
<tr><th>Score</th><th>Rural Areas</th><th>Urban Areas</th></tr>
<tr><td>10</td><td>≥ 3 less residences, or
≥ 8 less commercial residences</td><td>≥ 8 less residential residences, or
≥ 16 commercial residences</td></tr>
<tr><td>5</td><td>≤ 2 less residences, or
≥ 4 less commercial residences</td><td>≤ 4 less residential residences, or
≥ 8 commercial residences</td></tr>
<tr><td>0</td><td>Neutral</td><td>Neutral</td></tr>
<tr><td>-5</td><td>≤ 2 additional residences, or
≥ 4 additional commercial residences</td><td>≤ 4 additional residential residences, or
≥ 8 additional commercial residences</td></tr>
<tr><td>-10</td><td>≥ 3 additional residences, or
≥ 8 additional commercial residences</td><td>≥ 8 additional residential residences, or
≥ 16 additional commercial residences</td></tr>
</table>
A qualitative assessment will be made on the potential impacts from construction noise. For example, works in cuttings may involve rock hammering or blasting. Where additional noise from construction is considered likely for a particular option, this will be discussed as part of the MCA workshop and the scoring adjusted to reflect the impact.
</td></tr>
<tr><td>Flooding and waterway impacts</td><td>
Consideration of:

Flooding on the natural environment (Note - impact to property is addressed under community and property impacts) waterway crossings and impacts.

Qualitative assessment scored by MCA Workshop.
</td></tr>
</table>

<table>
<tr><th>Sub-Criteria</th><th>Rationale</th></tr>
<tr><td>Effect on air quality</td><td>
Total number of:

Residential receptors within 200 m of the corridor.
Sensitive receptors within 200 m of the corridor (in some cases this can include agricultural land uses).
Commercial/ industrial receptors within 200 m of the corridor.

This metric should be adjusted where necessary to reflect more or less built up areas, with input from environment specialist. The sub-criteria should account for potential impacts during construction and operation.
The number of receptors has been derived from aerial photography.
In rural areas, the materiality factor has been taken to be two residential residencies or four commercial premises.
In urban areas, principally Narrabri, the materiality factor has been taken to be four residential residences or eight commercial premises.
Options are evaluated in comparison to the base case option. A positive score indicates an option is superior in regard to the effect on air quality.
<table>
<tr><th>Score</th><th>Rural Areas</th><th>Urban Areas</th></tr>
<tr><td>10</td><td>≥ 3 less residences, or
≥ 8 less commercial residences</td><td>≥ 8 less residential residences, or
≥ 16 commercial residences</td></tr>
<tr><td>5</td><td>≤ 2 less residences, or
≥ 4 less commercial residences</td><td>≤ 4 less residential residences, or
≥ 8 commercial residences</td></tr>
<tr><td>0</td><td>Neutral</td><td>Neutral</td></tr>
<tr><td>-5</td><td>≤ 2 additional residences, or
≥ 4 additional commercial residences</td><td>≤ 4 additional residential residences, or
≥ 8 additional commercial residences</td></tr>
<tr><td>-10</td><td>≥ 3 additional residences, or
≥ 8 additional commercial residences</td><td>≥ 8 additional residential residences, or
≥ 16 additional commercial residences</td></tr>
</table>
A qualitative assessment will be made on the potential impacts from construction noise. For example, works in cuttings may involve rock hammering or blasting. Where additional noise from construction is considered likely for a particular option, this will be discussed as part of the MCA workshop and the scoring adjusted to reflect the impact.
</td></tr>
<tr><td>Effect on greenhouse gas emissions</td><td>
Comparative consideration of construction emissions and other operational factors such as lighting, ventilation, and design grades.
Scoring of construction emissions should consider the potential for materials, transport and construction activities to vary between options.
Qualitative assessment scored by MCA Workshop.
</td></tr>
</table>

Sub-Criteria	Rationale
Property impacts	***Comparative consideration of the number and type of impact to:*** • ***Residential residences*** • ***Rural properties*** • ***Commercial/ industrial residences*** • ***Civic/ other residences*** • ***Severance of properties*** ***The assessment should include the following additional details where available:*** • ***Property ownership type (family/ multi-generational family/ corporate / government).*** • ***Viability of the property/ies severed/ left adjacent/ impacted in other way – i.e. if severed, is the remaining portion viable?*** • ***Does the impact affect the ongoing use of the property into the future, either by impacting its current use or potential future uses?*** ***Where not available, highlight the risks, including impact to dwellings/ structures, impact to infrastructure (including irrigation, drainage, dams, fencing).*** ***Potential impacts from flooding on property could also be considered.*** ***Note - environmental protection areas are captured under ecological impacts, but should be included as part of property calculations).*** Construction of Inland Rail through a “greenfield” environment will impact on properties. Ecological impacts and noise and vibration have been assessed above. This sub-criteria has been used to assess the direct impacts on properties crossed by the Inland Rail corridor, when compared to the Base Case. The materiality of the impact has considered: Options are evaluated in comparison to the base case option. A positive score indicates an option is superior in regard to property impacts.

Sub-Criteria	Rationale

	Number of properties crossed	No. properties severed / Impact on operations*	Qualitative assessment (where applicable)
10	≥ 3 less farms/rural properties, or ≥ 3 less urban properties	>4 less farms/rural properties	Significantly better than Base Case
5	≤ 2 less farms/rural properties, or ≤ 2 less urban properties	>2 less farms/rural properties	Moderately better than Base Case
0	Neutral	Neutral	Similar to Base Case
-5	≤ 2 additional farms/rural properties, or ≤ 2 additional urban properties	>2 additional farms/rural properties	Moderately worse than Base Case
-10	≥ 3 additional farms/rural properties, or ≥ 3 additional urban properties	>4 additional farms/rural properties	Significantly worse than Base Case

The number of properties crossed has been defined by a count of the unique property identifier.

Whilst this sub-criteria is defined as quantitative, it is recognised that measurements of area and severance do not necessarily capture all impacts. The criteria information within the MCA Procedure lists other factors such as ownership type, impacts on infrastructure, such as dams etc. A qualitative criteria has therefore also been included to allow an adjustment of the scoring as part of the MCA workshop to take account of situations where other factors override a count of the number of properties and severance impacts.

Sub-Criteria	Rationale
Indigenous cultural heritage	***Comparative consideration of the potential for impacts to Indigenous heritage, including sites, values (recorded, potential based on predictive assessments or engagement with relevant Aboriginal representatives).*** Qualitative assessment scored by MCA Workshop based on information available from desktop studies and publicly available data published by the Office of Environment and Heritage.
Non-indigenous heritage	***Comparative consideration of the potential for impacts to:*** • ***Non-indigenous heritage*** • ***Natural heritage*** Qualitative assessment scored by MCA Workshop based on information available from desktop studies and publicly available data published by the Office of Environment and Heritage.
Impact on community e.g. road	***Comparative consideration 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*** ***Impact to emergency services provision*** Qualitative assessment scored by MCA Workshop. The principal consideration is Emergency Vehicle access route changes during level crossing use by trains increase response time. Property and land use impacts are covered in other criteria.
Community response (community stakeholder risk)	***Comparative consideration of:*** • ***Feedback provided through community engagement activities.*** • ***Issued raised through community and stakeholder engagement associated with that option.*** • ***Anticipated community response (e.g. positive, negative, neutral) where sufficient consultation is yet to be completed - This should be based on qualitative assessment of the suite of community, property and heritage impacts.*** Community Response information is typically minutes of meeting and meeting notes from face to face meeting and community drop in sessions and stored on Consultation Manager. Community response is comparative to the base case alignment, a zero score indicates no significant differentiators in terms of community response. Qualitative assessment scored by MCA Workshop.
Current and future land use impacts	***Comparative consideration of:*** • ***Supports long term assessment of region*** • ***Impact on existing development*** • ***Impact on existing use (e.g. agricultural viability)*** • ***Impact on future development*** Note, Property acquisition and severance are included in Property Impacts above and Qualitative assessment scored by MCA Workshop.

Sub-Criteria	Rationale
Impact on business and agricultural viability	***Comparative consideration of the type of property impacts, and implications for the ongoing viability of agricultural holdings, businesses, communities or townships.*** ***This sub-criteria should directly capture feedback from stakeholder engagement processes.*** Qualitative assessment scored by MCA Workshop with consideration to property statistics and information on impacts to business operation and agribusiness viability collected by community engagement activities and stored in Consultation Manager.
Statutory and regulatory approvals	***Assessment of other approvals required (complexity, stakeholders involved, timescales).*** ***Certainty of other approvals required***. Qualitative assessment scored by MCA Workshop, considering EPBC, EP&A, BC Act, and, other approvals that may be required.
Alignment with State/ Federal agency objectives	***Identification of key issues or concerns that government agencies may require to be addressed associated with an option***. Qualitative assessment scored by MCA Workshop.
Alignment with Local government objectives	***Identification of key issues or concerns that local government may require to be addressed associated with an option (e.g. impact to local road, requiring access reprovision elsewhere or compensation).*** Qualitative assessment scored by MCA Workshop consider Council LPA.
Service authorities (utilities/ other)	***Comparative consideration of complexity of approval process (third parties, is it included as part of Primary Approval scope).*** Qualitative assessment scored by MCA Workshop with consideration of Service Authorities that require multiple applications and have Non Contestable works arrangements.

Appendix B – Narromine South Options Statistics and MCA Scores

Option															
Package		Narromine to Narrabri													
Option Reference		Narromine South													
3. Multi criteria analysis				NB-NS-CLL			NB-NS-PR			NB-NS-CE			NB-NS-PE			
Criteria	**Criteria Weighting**	**Sub-criteria**	**Sub-criteria enables differentiation between options?**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Comments (relating to the score)**
Technical viability		Alignment	Yes	-			-			-			-			No significant differentiators in track length or geometry
		Impact on PUP and other assets	Yes	-			5			-			5			Green and yellow option have 2 fewer 22 kV crossings, all options have similar numbers of communications crossings
		Geotechnical conditions	Yes	10			10			10			10			Current geotechnical data indicates all options are better than the base case.
	17.0%	Impacts on existing road and rail networks	Yes	-	1.667	0.283	-	2.500	0.425	-	1.667	0.283	-	2.500	0.425	All options including base case require similar number of grade separations and crossing to interface with existing infrastructure.
		Flood immunity/ hydrology	Yes	-			-			-			-			Based on current flood data, all options are within the flood zones of the Macquarie River and Backwater Cowal, options further south are better than base case but not enough to score.
		Future proofing	Yes	-			-			-			-			No significant differentiators.
Safety assessment		Operational safety	Yes	-			-			-			-			All options including the base case have viaducts. Length of viaducts not considered a differentiator
		Public safety	Yes	-			-			-			-			No significant differentiator to public safety
	16.5%	Road safety intefaces	Yes	-	-	-	-	-	-	-	-1.000	-0.165	-	-1.000	-0.165	All options have similar number of interfaces, base case has slightly more interfaces but not enough to score alternatives higher.
		Emergency response	Yes	-			-			-			-			No significant differentiators to emergency response amongst options.
		Construction safety	Yes	-			-			-5			-5			Bridge structure considered higher risk works. All options require construction of large structures over the Macquarie River. The blue and yellow options requiring the longest structures.
Operational approach		Effect/ Impact on travel time	Yes	-			-			-			-			Less than 1 minute difference for all options.
	16.5%	Effect on reliability and availability	Yes	-	-	-	-	-	-	-	-	-	-	-	-	No significant differentiators.
		Network interoperability and connectivity	Yes	-			-			-			-			No significant differentiators.
Constructability and schedule		Construction duration	Yes	-10			-10			-10			-10			Alternatives to base case all have greater earthworks extent and longer structures than base case.
		Construction access	Yes	-			-			-			-			Construction access similar for all options. No significant differentiators.
	12.5%	Construction complexity	Yes	-	-0.714	-0.089	-	-1.429	-0.179	-5	-1.429	-0.179	-5	-2.143	-0.268	Bridge structures most complex construction element, blue and yellow options require significantly longer structures than base case.
		Resources/ material sources	Yes	5			-			5			-			Structural fill available and more accessible along Craigie Lee Lane (orange and blue options)
		Remediation/ contamination	Yes	-			-			-			-			No significant differentiators.
		Interface with operational railway	Yes	-			-			-			-			All options interface with one existing railway line. No significant differentiators.
		Staging opportunities	Yes	-			-			-			-			No significant differentiators.
Environmental		Ecological impacts (flora, fauna and habitats)	Yes	-10			-10			-10			-10			All options have more length in ecologically sensitive areas than base case
		Offset liability	Yes	-10			-10			-10			-10			All options have more length in ecologically sensitive areas than base case, requiring offset.
		Visual impacts	Yes	5			5			10			10			Base case is the closest to the volume of receivers. Orange and green option closer than yellow and blue to higher number of receivers in the north. The further south the options are the fewer receivers they impact on.
	12.5%	Noise and vibration impacts	Yes	10	0.714	0.089	10	0.714	0.089	10	1.429	0.179	10	1.429	0.179	Base case is the closest to the volume of receivers. The further south the options are the fewer receivers they impact on.
		Flooding and waterway impacts	Yes	-			-			-			-			Based on current flood data, all options are within the flood zones of the Macquarie River and Backwater Cowal, options further south are better than base case but not enough to score.
		Effect on air quality	Yes	10			10			10			10			Base case is the closest to the volume of receivers. The further south the options are the fewer receivers they impact on.
		Effect on greenhouse gas emissions	Yes	-			-			-			-			No significant difference to track geometry or construction methodology to differentiate effect on greenhouse gas emissions.

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub-criteria enables differentiation between options?	NB-NS-CLL Sub criteria Score	NB-NS-CLL Criteria Score	NB-NS-CLL Weighted score	NB-NS-PR Sub criteria Score	NB-NS-PR Criteria Score	NB-NS-PR Weighted score	NB-NS-CE Sub criteria Score	NB-NS-CE Criteria Score	NB-NS-CE Weighted score	NB-NS-PE Sub criteria Score	NB-NS-PE Criteria Score	NB-NS-PE Weighted score	Comments (relating to the score)
Community, property, heritage	12.5%	Property impacts	Yes	-	2.143	0.268	-	2.143	0.268	-5	1.429	0.179	-5	2.143	0.268	Base case, orange ands green options impact similar numbers of properties. Blue and yellow options impact slightly more properties than base case.
		Indigenouse cultural heritage	Yes	-			-			-			-			All options including the base case pass through indigenous heritage sites along the Macquarie River. No significant differentiators among options.
		Non-indigenous heritage	Yes	-			-			-			-			All options including base case have minimal impact on non-indigenous cultural items with potential corridor.
		Impact on community e.g. road	Yes	-			-			-			-			No significant differentiators amongst options.
		Community response (community stakeholder risk)	Yes	5			5			5			10			Community consultation currently on-going. Preliminary ARTC consultation indicates the options further to the south are preferable.
		Current and future land use impacts	Yes	5			5			5			5			Alternatives to base case slightly better as base case impacts on 3 pivot irrigators.
		Impact on business and agricultural viability	Yes	5			5			5			5			Base case impacts on irrigator near substation
Approvals and stakeholder risk	12.5%	Other statutory and regulatory approvals	Yes	-	1.250	0.156	-	1.250	0.156	-	1.250	0.156	-	1.250	0.156	No significant differentiators.
		Alignment with State/ Federal agency objectives	Yes	-			-			-			-			No significant differentiators.
		Alignment with Local government objectives	Yes	5			5			5			5			Preliminary feedback from council is preference for alternatives to the base case.
		Service authorities (utilities/ other)	Yes	-			-			-			-			No significant differentiators.
				TOTAL SCORE		**0.707**	**TOTAL SCORE**		**0.760**	**TOTAL SCORE**		**0.453**	**TOTAL SCORE**		**0.595**	

Criteria	Programme Weighting	Sensitivity Weightings							Raw Scores				Sensitivity Scoring: Even weighting				Sensitivity Scoring: Programme weighting				Sensitivity Scoring: Technical				Sensitivity Scoring: Safety			
		Technical	Safety	Operations	Constructability	Enviro	Community	Approvals	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
Technical viability	17%	40%	10%	10%	10%	10%	10%	10%	1.67	2.50	1.67	2.50	0.24	0.36	0.24	0.36	0.28	0.43	0.28	0.43	0.67	1.00	0.67	1.00	0.17	0.25	0.17	0.25
Safety assessment	16.5%	10%	40%	10%	10%	10%	10%	10%	0.00	0.00	-1.00	-1.00	0.00	0.00	-0.14	-0.14	0.00	0.00	-0.17	-0.17	0.00	0.00	-0.10	-0.10	0.00	0.00	-0.40	-0.40
Opertational approach	16.5%	10%	10%	40%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constructability and schedule	12.5%	10%	10%	10%	40%	10%	10%	10%	-0.71	-1.43	-1.43	-2.14	-0.10	-0.20	-0.20	-0.31	-0.09	-0.18	-0.18	-0.27	-0.07	-0.14	-0.14	-0.21	-0.07	-0.14	-0.14	-0.21
Environment	12.5%	10%	10%	10%	10%	40%	10%	10%	0.71	0.71	1.43	1.43	0.10	0.10	0.20	0.20	0.09	0.09	0.18	0.18	0.07	0.07	0.14	0.14	0.07	0.07	0.14	0.14
Community, property, heritage	12.5%	10%	10%	10%	10%	10%	40%	10%	2.14	2.14	1.43	2.14	0.31	0.31	0.20	0.31	0.27	0.27	0.18	0.27	0.21	0.21	0.14	0.21	0.21	0.21	0.14	0.21
Approvals and stakeholders	12.5%	10%	10%	10%	10%	10%	10%	40%	1.25	1.25	1.25	1.25	0.18	0.18	0.18	0.18	0.16	0.16	0.16	0.16	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
													0.72	0.74	0.48	0.60	0.71	0.76	0.45	0.59	1.01	1.27	0.83	1.17	0.51	0.52	0.03	0.12
													2	1	4	3	2	1	4	3	3	1	4	2	2	1	4	3

Criteria	Programme Weighting	Sensitivity Weightings							Operations				Sensitivity Scoring: Constructability				Sensitivity Scoring: Enviro				Sensitivity Scoring: Community				Sensitivity Scoring: Approvals			
		Technical	Safety	Operations	Constructability	Enviro	Community	Approvals	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE	NB-NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
Technical viability	17%	40%	10%	10%	10%	10%	10%	10%	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25	0.17	0.25
Safety assessment	16.5%	10%	40%	10%	10%	10%	10%	10%	0.00	0.00	-0.10	-0.10	0.00	0.00	-0.10	-0.10	0.00	0.00	-0.10	-0.10	0.00	0.00	-0.10	-0.10	0.00	0.00	-0.10	-0.10
Opertational approach	16.5%	10%	10%	40%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constructability and schedule	12.5%	10%	10%	10%	40%	10%	10%	10%	-0.07	-0.14	-0.14	-0.21	-0.29	-0.57	-0.57	-0.86	-0.07	-0.14	-0.14	-0.21	-0.07	-0.14	-0.14	-0.21	-0.07	-0.14	-0.14	-0.21
Environment	12.5%	10%	10%	10%	10%	40%	10%	10%	0.07	0.07	0.14	0.14	0.07	0.07	0.14	0.14	0.29	0.29	0.57	0.57	0.07	0.07	0.14	0.14	0.07	0.07	0.14	0.14
Community, property, heritage	12.5%	10%	10%	10%	10%	10%	40%	10%	0.21	0.21	0.14	0.21	0.21	0.21	0.14	0.21	0.21	0.21	0.14	0.21	0.86	0.86	0.57	0.86	0.21	0.21	0.14	0.21
Approvals and stakeholders	12.5%	10%	10%	10%	10%	10%	10%	40%	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.50	0.50	0.50	0.50
									0.51	0.52	0.33	0.42	0.29	0.09	-0.09	-0.23	0.72	0.73	0.76	0.85	1.15	1.16	0.76	1.06	0.88	0.89	0.71	0.79
									2	1	4	3	1	2	3	4	4	3	2	1	2	1	4	3	2	1	4	3

Title: N2N Options MCA Data: Narromine South

Updated

Category	Criteria	Metric	Qualitative or Quantitative	Base case NB-NS-BCA	NB- NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
Technical viability	**Alignment**		Quantitative					
		Total Track length		18.7km	20.4km	20.2km	20.5km	20.3km
		Greenfield		15.1km	19.4km	20.2km	19.5km	20.3km
		Brownfield		3.6km	1.0km	0.0km	1.0km	0.0km
		No R1200 curves		3	4	4	3	3
		Avg grade		-	-	-	-	-
					1 more 1200 m curves	1 more 1200 m curves	Same number of 1200 m curves, no significant differentiators	Same number of 1200 m curves, no significant differentiators
		Sub-criteria score			0	0	0	0
	Impact on PUP and other assets		Qualitative					
		Electricity - 132kV crossings		2	2	2	2	2
		Electricity - 66kV crossings		-	-	-	-	-
		Electricity - 22kV crossings		6	6	4	6	4
		Electricity - 11kVcrossings		-	-	-	-	-
		Electricity - <11kV crossings		-	-	-	-	-
		Gas - crossings		1	1	1	1	1
		Telecommunications - services crossings		8	9	9	8	7
		Telecommunications - fibre optic cable crossing		-	-	-	-	-
		Sub-criteria score			0	5	0	5
	Geotechnical conditions		Qualitative					
		Length formation over Sedimentary and volcanic rocks		3.5km	14.6km	13.6km	12.7km	11.7km
		Length formation over alluvium and colluvial		11.6km	4.8km	6.6km	6.8km	8.6km
		% length alluvium & colluvial		62%	24%	33%	33%	42%
		Difference from base case		-	39%	29%	29%	20%
		Sub-criteria score			10	10	10	10
	Impacts on existing road and rail networks (realignments)		Quantitative					
		State road realignments		-	-	-	-	-
		Council road realignments		Dappo Road Closure	Dappo Road Closure	Dappo Road Closure	Dappo Road Closure	Dappo Road Closure
		Existing rail flexibility		-	North fork to P2N impacts on Cragie Lea Lane	-	North fork to P2N impacts on Cragie Lea Lane	-
		Sub-criteria score			0	0	0	0
	Flood immunity/ hydrology		Qualitative					
		Track length in 1% AEP flood extent		10.3km	9.9km	9.5km	11.3km	10.6km
		% length		55%	49%	47%	55%	52%
		Difference from base case		-	7%	8%	0%	3%
		Comment		-	Less than 10% difference	Less than 10% difference	Less than 10% difference	Less than 10% difference
		Sub-criteria score			0	0	0	0
	Future proofing		Qualitative					
		Loop & 30TAL		-	-	-	-	-

Category	Criteria	Metric	Qualitative or Quantitative	Base case NB-NS-BCA	NB- NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
		Sub-criteria score			0	0	0	0
Safety assessment of the proposed alignment	**Operational safety**		Qualitative					
		Track geometry, height of rail above natural surfaces, conflict point with existing lines / sidings / grain traffic				-	-	-
		Sub-criteria score			0	0	0	0
	Public safety		Qualitative					
		Risk of trespass			Further from town	Further from town	Further from town	Further from town
		Sub-criteria score			0	0	0	0
	Road safety intefaces		Quantitative					
		State road interfaces		1	1	1	1	1
		Council road interfaces		3	2 (+1 for Cragie Lea Lane)	2	2 (+1 for Cragie Lea Lane)	2
		Private Road interfaces (based on number of properties crossed)		15	13	14	13	14
		Sub-criteria score			0	0	0	0
	Emergency response		Qualitative					
		Length > 500m from local road access		13.9	12	13.8	12.1	13.9
		% of length		-	-	-	-	-
				-	-	-	-	-
		Difference from base case		-	-	-	-	-
		Comment		Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant
		Sub-criteria score			0	0	0	0
	Construction safety		Qualitative					
		Higher risk construction activities		-	-	-	-	-
		Any differentiators		-	-	-	-	-
		Sub-criteria score			0	0	-5	-5
Operational approach, including opex	**Effect/ Impact on travel time**		Quantitative					
		Transit time (minutes) (assuming 115 km/hr)		9.8	10.6	10.6	10.7	10.6
		Comment			0.8 minute difference to base case, no significant differentiators	0.8 minute difference to base case, no significant differentiators	0.9 minute difference to base case, no significant differentiators	0.8 minute difference to base case, no significant differentiators
		Sub-criteria score			0	0	0	0
	Effect on reliability and availability		Qualitative					
		Interfaces with existing lines / sidings / grain traffic		-	-	-	-	-
		% of alignment with brownfield flooding requirement		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Network interoperability and connectivity		Qualitative					
		Interfaces with existing lines / sidings / grain traffic		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Construction duration		Quantitative					
		Estimated fill volume (m3)		290,000.00	380,000.00	390,000.00	350,000.00	370,000.00
		% different from base case		-	31%	34%	21%	28%
		Bridge length (m)		1180	1180	1180	2400	2400
		% different from base case		-	0%	0%	103%	103%

Category	Criteria	Metric	Qualitative or Quantitative	Base case NB-NS-BCA	NB- NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
Constructability and schedule		Comment		-	Construction duration expected to be impacted by poor soils and structures length	Construction duration expected to be impacted by poor soils and structures length	Construction duration expected to be impacted by poor soils and structures length	Construction duration expected to be impacted by poor soils and structures length
		Sub-criteria score			-10	-10	-10	-10
	Construction access		Qualitative					
		Length with poor access		13.9	12	13.8	12.1	13.9
		% different from base case		-	14%	1%	13%	0%
		Comment		-	Less than 20% better than base case	Less than 20% better than base case	Less than 20% better than base case	Less than 20% better than base case
		Sub-criteria score			0	0	0	0
	Construction complexity		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	1km longer viaduct	1km longer viaduct
		Sub-criteria score			0	0	-5	-5
	Resources/ material sources		Qualitative					
		Comment		-	Structural fill available along Craigie Lea Lane	No significant differentiators	Structural fill available along Craigie Lea Lane	No significant differentiators
		Sub-criteria score			5	0	5	0
	Remediation/ contaimination		Qualitative					
		Known or potential for contamination of site		-	-	-	-	-
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Interface with operational railway		Qualitative					
		Number of interfaces with existing railways		-	1	1	1	1
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Staging opportunities		Qualitative					
		Detailed information not available. Assume similar impacts		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Ecological impacts (flora, fauna and habitats)		Quantitative					
		Length through potentially significant area (native vegetation & EEC)		3.8km	5.1km	5.1km	5.4km	5.4km
		% different from base case		-	34%	34%	42%	42%
		Sub-criteria score			-10	-10	-10	-10
	Offset liability		Quantitative					
		Native vegetation impacted triggering offset requirements		-	-	-	-	-
		Comment		-	As per ecological impacts	As per ecological impacts	As per ecological impacts	As per ecological impacts
		Sub-criteria score			-10	-10	-10	-10
	Visual impacts		Qualitative					

Category	Criteria	Metric	Qualitative or Quantitative	Base case NB-NS-BCA	NB- NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
Environmental		Comparitive change in landscape		-	Partially follows established road corridor	-	Partially follows established road corridor	-
		Receivers (within 1000 m)		46	22	18	15	12
		Sub-criteria score			5	5	10	10
	Noise and vibration impacts		Quantitative					
		Number of residences / commercial / worships within 200 m of the corridor		4	1	1	0	0
		Sub-criteria score			10	10	10	10
	Flooding and waterway impacts		Qualitative					
		Waterway crossings		4	7	7	7	7
		Comment		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Effect on air quality		Quantitative					
		Residences within 200m		4	1	1	0	0
		Sub-criteria score			10	10	10	10
	Effect on greenhouse gas emissions		Qualitative					
		Detailed information not available. Assume similar impacts		-	-	-	-	-
		Sub-criteria score			0	0	0	0
Community, property, heritage	**Property impacts**		Quantitative					
		No. of properties impacted		11	11	11	12	12
		Difference in number of properties		0	0	0	1	1
		Properties severecd		9	8	9	8	9
		Difference in properties severed		0	1	0	1	0
		Comment		Potentially 1 residence removed	1 less property severed	Similar impact	1 less property impacted, 1 less property severed	1 less property impacted
		Sub-criteria score			0	0	-5	-5
	Indigeneous cultural heritage		Qualitative					
		Indigenous heritage impact: items within 80m		13	18	20	12	14
		Comments		crosses sensitive areas - Macquarie River	crosses very sensitive areas - Macquarie River & Tomingley Road	crosses very sensitive areas - Macquarie River & Tomingley Road	crosses very sensitive areas - Macquarie River & Tomingley Road	crosses very sensitive areas - Macquarie River & Tomingley Road
		Sub-criteria score			0	0	0	0
	Non-indigenous cultural heritage		Qualitative					
		Non-indigenous heritage impact: items within 80m		nil	nil	nil	nil	nil
		Natural heritage impact: items crossed within 80 m		nil	nil	nil	nil	nil
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Impact on community e.g. road		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Community response (community stakeholder risk)		Qualitative					

Category	Criteria	Metric	Qualitative or Quantitative	Base case NB-NS-BCA	NB- NS-CLL	NB-NS-PR	NB-NS-CE	NB-NS-PE
		Comment		-	ARTC input required from consultation activities	ARTC input required from consultation activities	ARTC input required from consultation activities	ARTC input required from consultation activities
		Sub-criteria score			5	5	5	10
	Current and future land use impacts		Qualitative					
		Comment		Impacts pivot irrigation areas	Impacts proposed solar farm & residential subdivision	Impacts proposed solar farm & residential subdivision	Impacts proposed solar farm & residential subdivision	Impacts proposed solar farm & residential subdivision
		Sub-criteria score			5	5	5	5
	Impact on business and agricultural viability		Qualitative					
		Comment		Impacts pivot irrigation areas	-	-	-	-
		Sub-criteria score			5	5	5	5
Approvals and stakeholder risk	**Other statutory and regulatory approvals**		Qualitative					
		Comment		-	differentiators	differentiators	differentiators	differentiators
		Sub-criteria score			0	0	0	0
	Alignment with State/ Federal agency objectives		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Alignment with local government objectives		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			5	5	5	5
	Service authorities (utilities/ other)		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0

Appendix C – Eumungerie Road Options Statistics and MCA Scores

Option										
Package	Narromine to Narrabri									
Option Reference	Eumungerie Road									
3. Multi criteria analysis				NB-ER-E			NB-ER-BB			
Criteria	**Criteria Weighting**	**Sub-criteria**	**Sub-criteria enables differentiation between options?**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Comments (relating to the score)**
Technical viability		Alignment	Yes	-			-			No significant differentiators in track length or geometry
		Impact on PUP and other assets	Yes	-			5			Similar utility impacts for base case and pink option. 1 less 22 kV and 7 less communications crossings for purple option
		Geotechnical conditions	Yes	-			-			Current geotechnical investigations indicate no significant differentiators between options.
	17.0%	Impacts on existing road and rail networks	Yes	-	-	-	-	0.833	0.142	No significant differentiators to public road or rail network between options.
		Flood immunity/ hydrology	Yes	-			-			All options similar for length in the 1% AEP flood extent (<10% deviation). No significant differentiators
		Future proofing	Yes	-			-			No significant differentiators. All options allow for same expansion of loops for 3.6 km capacity
Safety assessment		Operational safety	Yes	-			-			No significant differentiators.
		Public safety	Yes	-			-			No significant differentiators.
	16.5%	Road safety intefaces	Yes	-5	-1.000	-0.165	-	-	-	Pink option has 2 more council road interfaces
		Emergency response	Yes	-			-			No significant differentiators to emergency response amongst options.
		Construction safety	Yes	-			-			No significant difference to construction methodology.
Operational approach		Effect/ Impact on travel time	Yes	-			-			Difference in travel times within 1 minute. No significant differentiators.
	16.5%	Effect on reliability and availability	Yes	-	-	-	-	-	-	No significant differentiators.
		Network interoperability and connectivity	Yes	-			-			No significant differentiators.
Constructability and schedule		Construction duration	Yes	-			-			No significant difference to construction methodology.
		Construction access	Yes	-			-			Marginally better construction access closer to Eumungerie road. Not significant enough to differentiate.
	12.5%	Construction complexity	Yes	-	-	-	-	-	-	No significant difference to construction methodology.
		Resources/ material sources	Yes	-			-			No significant differentiators.
		Remediation/ contamination	Yes	-			-			No significant differentiators.
		Interface with operational railway	Yes	-			-			No interface with existing operational railway.
		Staging opportunities	Yes	-			-			No significant differentiators.
Environmental		Ecological impacts (flora, fauna and habitats)	Yes	5			-5			purple option crosses more ecologically sensitive areas than base case, pink option crosses less ecologically sensitive areas than base case.
		Offset liability	Yes	5			-5			purple option crosses more ecologically sensitive areas than base case, pink option crosses less ecologically sensitive areas than base case.
		Visual impacts	Yes	-			5			Purple option has less visual impact on receivers however other options run along already existing transport corridor potentially blending in with current infrastructure.
	12.5%	Noise and vibration impacts	Yes	-10	-1.429	-0.179	-5	-1.429	-0.179	Pink option impacts 2 additional receivers, purple option impacts 1 additional receiver than base case.
		Flooding and waterway impacts	Yes	-			-			All options similar for length in the 1% AEP flood extent (<10% deviation). No significant differentiators
		Effect on air quality	Yes	-10			-			Pink option impacts higher number of receivers than base case.
		Effect on greenhouse gas emissions	Yes	-			-			No significant difference to track geometry or construction methodology to differentiate effect on greenhouse gas emissions.
Community, property, heritage		Property impacts	Yes	10			-10			Purple option severs greater number of properties than base case, pink impacts and severs less properties than base case.

3. Multi criteria analysis				NB-ER-E			NB-ER-BB			
Criteria	**Criteria Weighting**	**Sub-criteria**	**Sub-criteria enables differentiation between options?**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Comments (relating to the score)**
	12.5%	Indigenouse cultural heritage	Yes	-	1.429	0.179	-	-0.714	-0.089	No options significantly impact on indigenous cultural heritage. No significant differentiators.
		Non-indigenous heritage	Yes	-			-			No options significantly impact on non-indigenous cultural heritage. No significant differentiators.
		Impact on community e.g. road	Yes	-			-			No significant differentiators.
		Community response (community stakeholder risk)	Yes	-			-			Community consultation on-going. Preliminary ARTC consultation indicates community divided near 50/50 on preferred option.
		Current and future land use impacts	Yes	-			5			Purple option would have less impact on potential future subdivisions.
		Impact on business and agricultural viability	Yes	-			-			No significant differentiators.
Approvals and stakeholder risk	12.5%	Other statutory and regulatory approvals	Yes	-	-	-	-	-	-	No significant differentiators.
		Alignment with State/ Federal agency objectives	Yes	-			-			No significant differentiators.
		Alignment with Local government objectives	Yes	-			-			No significant differentiators.
		Service authorities (utilities/ other)	Yes	-			-			No significant differentiators.
				TOTAL SCORE		**-0.165**	**TOTAL SCORE**		**-0.126**	

Criteria	Programme Weighting	Sensitivity Weightings							Raw Scores		Sensitivity Scoring															
											Even weighting		Programme weighting		Technical		Safety		Operations		Constructability		Enviro		Community		Approvals	
		Technical	Safety	Operations	Constructability	Enviro	Community	Approvals	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB	NB-ER-E	NB-ER-BB
Technical viability	17%	40%	10%	10%	10%	10%	10%	10%	0.00	0.83	0.00	0.12	0.00	0.14	0.00	0.33	0.00	0.08	0.00	0.08	0.00	0.08	0.00	0.08	0.00	0.08
Safety assessment	16.5%	10%	40%	10%	10%	10%	10%	10%	-1.00	0.00	-0.14	0.00	-0.17	0.00	-0.10	0.00	-0.40	0.00	-0.10	0.00	-0.10	0.00	-0.10	0.00	-0.10	0.00
Opertational approach	16.5%	10%	10%	40%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constructability and schedule	12.5%	10%	10%	10%	40%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environment	12.5%	10%	10%	10%	10%	40%	10%	10%	-1.43	-1.43	-0.20	-0.20	-0.18	-0.18	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.57	-0.57	-0.14	-0.14
Community, property, heritage	12.5%	10%	10%	10%	10%	10%	40%	10%	1.43	-0.71	0.20	-0.10	0.18	-0.09	0.14	-0.07	0.14	-0.07	0.14	-0.07	0.14	-0.07	0.14	-0.07	0.57	-0.29
Approvals and stakeholders	12.5%	10%	10%	10%	10%	10%	10%	40%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
											-0.14	-0.19	-0.17	-0.13	-0.10	0.12	-0.40	-0.13	-0.10	-0.13	-0.10	-0.13	-0.53	-0.56	0.33	-0.35
											3	2	3	2	3	1	3	2	3	2	3	2	3	2	1	3

Title: N2N Options MCA Data: Eumungerie Road

Category	Criteria	Metric	Qualitative or Quantitative	Base case	NB-ER-E	NB-ER-BB
Technical viability	**Alignment**		Quantitative			
		Total Track length		28.1km	27.7km	28.6km
		Greenfield		28.1km	27.7km	28.6km
		Brownfield		0.0km	0.0km	0.0km
		No R1200 curves		15	15	12
		Avg grade		-	-	-
		Comment		-	No significant differentiators	3 less curves, no significant differentiators
		Sub-criteria score			0	0
	Impact on PUP and other assets		Qualitative			
		Electricity - 132kV crossings		1	1	1
		Electricity - 66kV crossings		-	-	-
		Electricity - 22kV crossings		4	4	3
		Electricity - 11kVcrossings		-	-	-
		Electricity - <11kV crossings			1	1
		Gas - crossings		-	-	-
		Telecommunications - services crossings		11	14	7
		Telecommunications - fibre optic cable crossing		-	-	-
		Sub-criteria score			0	5
	Geotechnical conditions		Qualitative			
		Length formation over Sedimentary and volcanic rocks		26.2km	25.4km	28.5km
		Length formation over alluvium and colluvial		1.9km	2.3km	0.1km
		% length alluvium & colluvial		7%	8%	0%
		Difference from base case		-	2%	6%
		Sub-criteria score			0	0
	Impacts on existing road and rail networks		Quantitative			
		State road realignments		-	-	-
		Council road realignments		-	-	-
		Existing rail flexibility		-	-	-
		Sub-criteria score			0	0
	Flood immunity/ hydrology		Qualitative			
		Track length in 1% AEP flood extent		5.0km	4.8km	4.1km
		% length		18%	17%	14%
		% different from base case		-	0%	3%

Category	Criteria	Metric	Qualitative or Quantitative	Base case	NB-ER-E	NB-ER-BB
		Comment		-	Less than 10% difference	Less than 10% difference
		Sub-criteria score			0	0
	Future proofing		Qualitative			
		Loop & 30TAL		-	-	-
		Sub-criteria score			0	0
Safety assessment of the proposed alignment	**Operational safety**		Qualitative			
		Track geometry, height of rail above natural surfaces, conflict point with existing lines / sidings / grain traffic			-	-
		Sub-criteria score			0	0
	Public safety		Qualitative			
		Risk of trespass		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Road safety intefaces		Quantitative			
		State road interfaces		-	-	-
		Council road interfaces		5	7	5
		Private Road interfaces (based on number of properties crossed)		17	14	16
		Sub-criteria score			-5	0
	Emergency response		Qualitative			
		Comment		Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant
		Sub-criteria score			0	0
	Construction safety		Qualitative			
		Higher risk construction activity		-	-	-
		Comment		-	-	-
		Sub-criteria score		0	0	0
tional approach, including opex	**Effect/ Impact on travel time**		Quantitative			
		Transit time (minutes) (assuming 115 km/hr)		14.7	14.5	14.9
		Comment		-	0.2 minute difference to base case. No significant differentiators	0.2 minute difference to base case. No significant differentiators
		Sub-criteria score			0	0
	Effect on reliability and availability		Qualitative			
		Interfaces with existing lines / sidings / grain traffic		-	-	-
		% of alignment with brownfield flooding requirement		-	-	-
		Sub-criteria score			0	0

Category	Criteria	Metric	Qualitative or Quantitative	Base case	NB-ER-E	NB-ER-BB
Opera	**Network interoperability and connectivity**		Qualitative			
		Interfaces with existing lines / sidings / grain traffic		-	-	-
		Sub-criteria score			0	0
Constructability and schedule	**Construction duration**		Quantitative			
		Estimated fill volume (m3)		580,000.00	570,000.00	590,000.00
		% difference from base case		-	2%	2%
		Bridge length (m)		-	-	-
		% different from base case		-	-	-
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Construction access		Qualitative			
		Length with poor access		7.5	7.9	21.6
		% different from base case		-	5%	188%
		Comment		-	Similar to base case (within 20%), no significant differentiators	Significantly more than base case
		Sub-criteria score			0	0
	Construction complexity		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Resources/ material sources		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Remediation/ contamination		Qualitative			
		Known or potential for contamination of site		-	-	-
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Interface with operational railway		Qualitative			
		Number of interfaces with existing railways		-	-	-
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Staging opportunities		Qualitative			
		Detailed information not available. Assume similar impacts		-	-	-

Category	Criteria	Metric	Qualitative or Quantitative	Base case	NB-ER-E	NB-ER-BB
		Sub-criteria score			0	0
Environmental and heritage Impacts	**Ecological impacts (flora, fauna and habitats)**		Quantitative			
		Length through potentially significant area (native vegetation & EEC)		6.3km	4.5km	8.8km
		% different from base case		-	29%	40%
		Sub-criteria score			5	-5
	Offset liability		Qualitative			
		Native vegetation impacted triggering offset requirements		-	-	-
		Comment		-	As per ecological impacts	As per ecological impacts
		Sub-criteria score			10	-10
	Visual impacts		Qualitative			
		Comparitive change in landscape		Follows exiting road	Follows exiting road	New corridor
		Receivers (within 1000 m)		17	17	6
		Sub-criteria score		0	0	5
	Noise and vibration impacts		Quantitative			
		Number of residences / commercial / worships within 200 m of the corridor		1	3	2
		Sub-criteria score			-10	0
	Flooding and waterway impacts		Qualitative			
		Waterways crossings		2	4	7
		Comment		-	-	-
		Sub-criteria score			0	0
	Effect on air quality		Quantitative			
		Residences within 200 m		1	3	1
		Sub-criteria score			-10	0
	Effect on greenhouse gas emissions		Qualitative			
		Detailed information not available. Assume similar impacts		-	-	-
		Sub-criteria score			0	0
	Property impacts		Quantitative			
		No. of properties impacted		17	14	17
		Difference in number of properties		-	3	0
		Properties severecd		4	3	12
		Difference in number of properties severed		-	1	8
		Comment		-	3 fewer properties crossed and 1 less severed	Same number of properties crossed, 8 more severed, Potentially 2 residences removed
		Sub-criteria score			10	-10

Category	Criteria	Metric	Qualitative or Quantitative	Base case	NB-ER-E	NB-ER-BB
Community and property impacts	**Indigenous cultural heritage**		Qualitative			
		Indigenous heritage impact: items within 80m		0	0	0
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Non-indigenous heritage		Qualitative			
		Non-indigenous heritage impact: items within 80m		0	0	0
		Natural heritage impact: items crossed within 80 m		0	0	0
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Impact on community e.g. road		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Community response (community stakeholder risk)		Qualitative			
		Comment		-	ARTC input required from consultation	ARTC input required from consultation activities
		Sub-criteria score			0	0
	Current and future land use impacts		Qualitative			
		Comment		Potential impact on future subdivisions	Potential impact on future subdivisions	less impact on potential future subdivisions
		Sub-criteria score			0	5
	Impact on business and agricultural viability		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
vals and stakeholder risk	**Other statutory and regulatory approvals**		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Alignment with State/ Federal agency approvals		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Alignment with Local government objectives		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators

Category	Criteria	Metric	Qualitative or Quantitative	Base case	NB-ER-E	NB-ER-BB
Appro		Sub-criteria score			0	0
	Service authorities (utilities/ other)		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0

Appendix D – Pilliga East Options Statistics and MCA Scores

Option										
Package		Narromine to Narrabri								
Option Reference		Pilliga East								
3. Multi criteria analysis				BN-PE-S			BN-PE-SPB			
Criteria	**Criteria Weighting**	**Sub-criteria**	**Sub-criteria enables differentiation between options?**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Comments (relating to the score)**
Technical viability		Alignment	Yes	-			-			Green and purple options have 2 and 1 less 1200 curves respectively.
		Impact on PUP and other assets	Yes	-			-5			All options require similar utilities crossings. Purple options crosses more communication lines.
		Geotechnical conditions	Yes	-10			-10			Green and purple options encounter worse geotechnical conditions than base case (>20% on worse geotechnical conditions)
	17.0%				-1.667	-0.283		-3.333	-0.567	
		Impacts on existing road and rail networks	Yes	-			-			minimal impact to existing road and rail networks across all options. No significant differentiators.
		Flood immunity/ hydrology	Yes	-			-5			Based on current flood modelling, all areas within 1% AEP, purple option contains marginally longer area in 1% AEP flood area.
		Future proofing	Yes	-			-			No significant differentiators.
Safety assessment		Operational safety	Yes							No significant differentiators.
		Public safety	Yes	-			-			No significant differentiators.
	16.5%	Road safety intefaces	Yes	-	-	-	-	-	-	No significant differentiators.
		Emergency response	Yes	-			-			No significant differentiators to emergency response amongst options.
		Construction safety	Yes							No significant difference to construction methodology.
Operational approach		Effect/ Impact on travel time	Yes	5			-			Green option has 1 less minute travel time compared to base case.
	16.5%	Effect on reliability and availability	Yes	-	1.667	0.275	-	-	-	No significant differentiators.
		Network interoperability and connectivity	Yes	-			-			No significant differentiators.
Constructability and schedule		Construction duration	Yes	5			-			Green option has potentially shorter construction duration as >10% less fill required.
		Construction access	Yes	-5			-5			Green and purple options partly reduced construction access as not adjacent to existing roads.
	12.5%	Construction complexity	Yes	-	-	-	-	-0.714	-0.089	No significant difference to construction methodology.
		Resources/ material sources	Yes	-			-			No significant differentiators.
		Remediation/ contamination	Yes	-			-			No significant differentiators.
		Interface with operational railway	Yes	-			-			No significant differentiators.
		Staging opportunities	Yes	-			-			No significant differentiators.
Environmental		Ecological impacts (flora, fauna and habitat	Yes	5			-			The Green option crosses less ecologically sensitive area. The purple option is similar to the base case.
		Offset liability	Yes	5			-			The Green option crosses less ecologically sensitive area. The purple option is similar to the base case.
		Visual impacts	Yes	-			-			No significant differentiators.
	12.5%	Noise and vibration impacts	Yes	-	1.429	0.179	-	-	-	Impact on receivers are similar, as most in the northern portion of proposed routes.
		Flooding and waterway impacts	Yes	-			-			Based on current flood modelling, all areas within 1% AEP, No significant differentiators.
		Effect on air quality	Yes	-			-			No significant differentiators.
		Effect on greenhouse gas emissions	Yes	-			-			No significant difference to track geometry or construction methodology to differentiate effect on greenhouse gas emissions.
Community, property, heritage		Property impacts	Yes	-5			5			Greater number of properties serverd by green option, 2 less properties severed by the purple option.
		Indigenouse cultural heritage	Yes	-			-			No significant differentiators.
		Non-indigenous heritage	Yes	-			-			No significant differentiators.
	12.5%	Impact on community e.g. road	Yes	-	-0.714	-0.089	-	2.143	0.268	No significant differentiators.

3. Multi criteria analysis				BN-PE-S			BN-PE-SPB			
Criteria	**Criteria Weighting**	**Sub-criteria**	**Sub-criteria enables differentiation between options?**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Sub criteria Score**	**Criteria Score**	**Weighted score**	**Comments (relating to the score)**
		Community response (community stakehol	Yes	-			5			Preliminary consultation by ARTC indicates purple option preferable to the base case and green options.
		Current and future land use impacts	Yes	-			-			No significant differentiators
		Impact on business and agricultural viabilit	Yes	-			5			Green option and base case impact on current olive farm.
Approvals and stakeholder risk	12.5%	Other statutory and regulatory approvals	Yes	-	-	-	-	-	-	No significant differentiators.
		Alignment with State/ Federal agency obje	Yes	-			-			No significant differentiators.
		Alignment with Local government objective	Yes	-			-			No significant differentiators.
		Service authorities (utilities/ other)	Yes	-			-			No significant differentiators.
				TOTAL SCORE		**0.081**	**TOTAL SCORE**		**-0.388**	

Criteria	Programme Weighting	Sensitivity Weightings							Raw Scores		Even weighting		Programme weighting		Technical		Safety		Operations		Constructability		Enviro		Community		Approvals	
		Technical	Safety	Operations	Constructability	Enviro	Community	Approvals	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB	BN-PE-S	BN-PE-SPB
Technical viability	17%	40%	10%	10%	10%	10%	10%	10%	-1.67	-3.33	-0.24	-0.48	-0.28	-0.57	-0.67	-1.33	-0.17	-0.33	-0.17	-0.33	-0.17	-0.33	-0.17	-0.33	-0.17	-0.33	-0.17	-0.33
Safety assessment	16.5%	10%	40%	10%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opertational approach	16.5%	10%	10%	40%	10%	10%	10%	10%	1.67	0.00	0.24	0.00	0.28	0.00	0.17	0.00	0.17	0.00	0.67	0.00	0.17	0.00	0.17	0.00	0.17	0.00	0.17	0.00
Constructability and schedule	12.5%	10%	10%	10%	40%	10%	10%	10%	0.00	-0.71	0.00	-0.10	0.00	-0.09	0.00	-0.07	0.00	-0.07	0.00	-0.07	0.00	-0.29	0.00	-0.07	0.00	-0.07	0.00	-0.07
Environment	12.5%	10%	10%	10%	10%	40%	10%	10%	1.43	0.00	0.20	0.00	0.18	0.00	0.14	0.00	0.14	0.00	0.14	0.00	0.14	0.00	0.57	0.00	0.14	0.00	0.14	0.00
Community, property, heritage	12.5%	10%	10%	10%	10%	10%	40%	10%	-0.71	2.14	-0.10	0.31	-0.09	0.27	-0.07	0.21	-0.07	0.21	-0.07	0.21	-0.07	0.21	-0.07	0.21	-0.29	0.86	-0.07	0.21
Approvals and stakeholders	12.5%	10%	10%	10%	10%	10%	10%	40%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
									Total		0.10	-0.27	0.08	-0.39	-0.43	-1.19	0.07	-0.19	0.57	-0.19	0.07	-0.40	0.50	-0.19	-0.14	0.45	0.07	-0.19
									Rank		1	2	1	2	1	2	1	2	1	2	1	2	1	2	2	1	1	2

Title: N2N Options MCA Data: East Pilliga

Category	Criteria	Metric	Qualitative or Quantitative	Base Case	BN-PE-S	BN-PE-SPB
Technical viability	**Alignment**		Quantitative			
		Total Track length		21.7km	19.4km	20.0km
		Greenfield		21.7km	19.4km	20.0km
		Brownfield		0.0km	0.0km	0.0km
		No R1200 curves		6	4	5
		Avg grade		-	-	-
		Comment			2 less 1200 m curves	1 less 1200 m curves
		Sub-criteria score			0	0
	Impact on PUP and other assets		Qualitative			
		Electricity - 132kV crossings		-	-	-
		Electricity - 66kV crossings		-	-	-
		Electricity - 22kV crossings		-	-	-
		Electricity - 11kVcrossings		1	1	1
		Electricity - <11kV crossings		1	1	1
		Gas - crossings		1	1	1
		Telecommunications - services crossings		2	2	7
		Telecommunications - fibre optic cable crossing		-	-	-
		Sub-criteria score			0	-5
	Geotechnical conditions		Qualitative			
		Length formation over Sedimentary and volcanic rocks		15.5km	9.5km	9.7km
		Length formation over alluvium and colluvial		6.2km	9.9km	10.3km
		% length alluvium & colluvial		29%	51%	52%
		Difference from base case			22%	23%
		Sub-criteria score			-10	-10
	Impacts on existing road and rail networks		Quantitative			
		State road realignments		-	-	-
		Council road realignments		-	-	-
		Existing rail flexibility		-	-	-
		Sub-criteria score			0	0
	Flood immunity/ hydrology		Qualitative			
		Track length in 1% AEP flood extent		8.4km	9.4km	11.7km
		% length		39%	48%	59%
		% difference from base case			10%	20%
		Comment			10% difference	20% more than base case
		Sub-criteria score			0	-5
	Future proofing		Qualitative			
		Loop & 30TAL		-	-	-
		Sub-criteria score			0	0
ignment	**Operational safety**		Qualitative			
		Track geometry, height of rail above natural surfaces, conflict point with existing lines / sidings / grain tr		-	-	-
		Sub-criteria score			0	0
	Public safety		Qualitative			
		Risk of trespass		No significant differentiators	No significant differentiators	No significant differentiators

Category	Criteria	Metric	Qualitative or Quantitative	Base Case	BN-PE-S	BN-PE-SPB
Safety assessment of the proposed a		Sub-criteria score			0	0
	Road safety intefaces		Quantitative			
		State road interfaces		-	-	-
		Council road interfaces		3	2	2
		Private Road interfaces (based on number of properties crossed)		5	5	6
		Sub-criteria score			0	0
	Emergency response		Qualitative			
		Length > 500m from local road access		9.2	15.8	18.8
		% of length		42%	81%	94%
		Comment		Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant
		Sub-criteria score			0	0
	Construction safety		Qualitative			
		Higher risk construction activity		-	-	-
		Comment		-	-	-
		Sub-criteria score			0	0
Operational approach, including opex	**Effect/ Impact on travel time**		Quantitative			
		Transit time (minutes) (assuming 115 km/hr)		11.3	10.1	10.4
		Comment			1.2 less than base case	0.9 minute difference to base case
		Sub-criteria score			5	0
	Effect on reliability and availability		Qualitative			
		Interfaces with existing lines / sidings / grain traffic		-	-	-
		% of alignment with brownfield flooding requirement		-	-	-
		Sub-criteria score			0	0
	Network interoperability and connectivity		Qualitative			
		Interfaces with existing lines / sidings / grain traffic		-	-	-
		Sub-criteria score			0	0
ability and schedule	**Construction duration**		Quantitative			
		Estimated fill volume (m3)		450,000.00	400,000.00	410,000.00
		% different from base case		-	11%	9%
		Bridge length (m)		-	-	-
		% different from base case		-	-	-
		Comment			>10% less fill required	<10% difference in fill required.
		Sub-criteria score		0	5	0
	Construction access		Qualitative			
		Length with poor access		9.1	16.3	14.6
		% different from base case		-	44%	38%
		Comment		-	Significantly more than base case	Significantly more than base case
		Sub-criteria score			-5	-5
	Construction complexity		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Resources/ material sources		Qualitative			

Category	Criteria	Metric	Qualitative or Quantitative	Base Case	BN-PE-S	BN-PE-SPB
Construct		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Remediation / contamination		Qualitative			
		Known or potential for contamination of site		-	-	-
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Interface with operational railway		Qualitative			
		Number of interfaces with existing railways		-	0	0
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Staging opportunities		Qualitative			
		Detailed information not available. Assume similar impacts		-	-	-
		Sub-criteria score			0	0
Environmental and heritage impacts	**Ecological impacts (flora, fauna and habitats)**		Quantitative			
		Length through potentially significant area (native vegetation & EEC)		18.80	16.50	18.90
		% different from base case		-	12%	1%
		Sub-criteria score			5	0
	Offset liability		Quantitative			
		Native vegetation impacted triggering offset requirements		-	-	-
		Comment		-	As per ecological impacts	As per ecological impacts
		Sub-criteria score			5	0
	Visual impacts		Qualitative			
		Comparitive change in landscape		Partially follows established corridor	-	-
		Receivers (within 1000 m)		2	3	2
		Sub-criteria score			0	0
	Noise and vibration impacts		Quantitative			
		Number of residences / commercial / worships within 200 m of the corridor		0	0	0
		Sub-criteria score			0	0
	Flooding and waterway impacts		Qualitative			
		Waterways crossings		2	3	4
		Comment				
		Sub-criteria score			0	0
	Effect on air quality		Quantitative			
		Residences within 200 m		0	0	0
		Sub-criteria score			0	0
	Effect on greenhouse gas emissions		Qualitative			
		Detailed information not available. Assume similar impacts		-	-	-

Category	Criteria	Metric	Qualitative or Quantitative	Base Case	BN-PE-S	BN-PE-SPB
		Sub-criteria score			0	0
Community and property impacts	**Property impacts**		Quantitative			
		No. of properties impacted		5	5	5
		Difference in number of properties		-	0%	0%
		Properties severed		2	3	0
		Difference in number of properties severed		-	1	2
		Comment		Potentially 1 residence removed	1 additional properties severed, Potentially 1 residence removed	2 less properties severed, Potentially 1 residence removed
		Sub-criteria score			-5	5
	Indigenous cultural heritage		Qualitative			
		Indigenous heritage impact: items within 80m		0	0	1
		Comments		-	-	Burial site - Newell Hwy
		Sub-criteria score			0%	0%
	Non-indigenous heritage		Qualitative			
		Non-indigenous heritage impact: items within 80m		1 potential	1 potential	1 potential
		Natural heritage impact: items crossed within 80 m		0	0	0
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Impact on community e.g. road		Qualitative			
		Comment		No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Community response (community stakeholder risk)		Qualitative			
		Comment		-	-	Preliminary consultation by ARTC indicates purple option preferred over base case and green option
		Sub-criteria score			0	5
	Current and future land use impacts		Qualitative			
		Comment		-	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Impact on business and agricultural viability		Qualitative			
		Comment		Impacts olive plantation	Impacts olive farm	-
		Sub-criteria score			0%	500%
nd stakeholder risk	**Other statutory and regulatory approvals**		Qualitative			
		Comment		No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Alignment with State/ Federal agency approvals		Qualitative			
		Comment		No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Alignment with Local government objectives		Qualitative			

Category	Criteria	Metric	Qualitative or Quantitative	Base Case	BN-PE-S	BN-PE-SPB
Approvals a		Comment		No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0
	Service authorities (utilities/ other)		Qualitative			
		Comment		No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score		0	0	0

Appendix E – Narrabri Options Statistics and MCA Scores

Option Assessment

Package Narromine to Narrabri

Option Reference Narrabri

3. Multi criteria analysis

				BN-N-C			BN-N-W			BN-N-D			BN-N-CRN			
Criteria	Criteria Weighting	Sub-criteria	Sub-criteria enables	Sub criteria Score	Criteria Score	Weighted score	Sub criteria Score	Criteria Score	Weighted score	Sub criteria Score	Criteria Score	Weighted score	Sub criteria Score	Criteria Score	Weighted score	Comments (relating to the score)
Technical viability	17.0%	Alignment	Yes	-	0.833	0.142	5	-0.833	-0.142	-	-0.833	-0.142	-	1.667	0.283	Green option has 4 fewer 1200m radius curves. No significant differentiators in track length or geometry with other options.
		Impact on PUP and other assets	Yes	5			-5			-			10			All options have similar number of HV electricity crossing, orange has one less than base case and green has 2 more, the pink option has 2 less 22kv crossings and 9 less telecommunications crossings.
		Geotechnical conditions	Yes	-			-			-			-			Geotech results indicate all options encounter similar geotechnical conditions to the base case.
		Impacts on existing road and rail networks	Yes	-			-			-			-			All options have similar impacts. No significant differentiators.
		Flood immunity/ hydrology	Yes	-			-5			-5			-			Green and purple options have greater length in the 1% AEP flood extent
		Future proofing	Yes	-			-			-			-			Considerations with regard to future proofing not signicant enough to differentiate in scoring.
Safety assessment	16.5%	Operational safety	Yes	-	-	-	-	-	-	-	-	-	-	-	-	Purple has longer viaduct by 0.6km, therefore greater length working/operating at heights. This was discussed and agreed that it was not a significant differentiator.
		Public safety	Yes	-			-			-			-			All options have similar impacts. No significant differentiators.
		Road safety intefaces	Yes	-			-			-			-			All options have similar impacts. No significant differentiators.
		Emergency response	Yes	-			-			-			-			No significant differentiators to emergency response amongst options.
		Construction safety	Yes	-			-			-			-			Purple option has longer viaduct however no significant difference to construction methodology.
Operational approach	16.5%	Effect/ Impact on travel time	Yes	-	-	-	-	-	-	-	-	-	-	-	-	Difference in travel times within 1 minute. No significant differentiators.
		Effect on reliability and availability	Yes	-			-			-			-			No significant differentiators.
		Network interoperability and connectivity	Yes	-			-			-			-			Differences in connectivity to Walgett Line not cosidered significant enough to score between options.
Constructability and schedule	12.5%	Construction duration	Yes	-	-	-	-	-	-	-5	-1.429	-0.179	-	-	-	Purple has longer viaduct by 0.6km, 17% longer than base case, therefore longer construction duration.
		Construction access	Yes	-			-			-			-			All options have similar access constraints. No significant differentiators.
		Construction complexity	Yes	-			-			-			-			All options require viaducts, and similar construction methodologies. Longer length of viaduct for purple option scored in 'Construction duration'.
		Resources/ material sources	Yes	-			-			-			-			No significant differentiators.
		Remediation/ contamination	Yes	-			-			-5			-			Purple traverses Narrabri tip, likely contamination and leachate issues
		Interface with operational railway	Yes	-			-			-			-			All options similar, no significant differentiators.
		Staging opportunities	Yes	-			-			-			-			All options similar, no significant differentiators.
Environmental	12.5%	Ecological impacts (flora, fauna and habitats)	Yes	-5	1.429	0.179	-10	-	-	-	4.286	0.536	-	2.857	0.357	Orange and green options traverse the most ecologically sensitive area. Other options all similar.
		Offset liability	Yes	-5			-10			-			-			Orange and green options traverse the most ecologically sensitive area. Other options all similar
		Visual impacts	Yes	-			-			10			-			Viaduct for the purple option is significantly further from the centre of town and receivers.
		Noise and vibration impacts	Yes	10			10			10			10			All options better than the base case as base case impacts highest numbers of residential receivers.
		Flooding and waterway impacts	Yes	-			-			-			-			No significant differentiators
		Effect on air quality	Yes	10			10			10			10			All options better than based case as base case closer to higher number of residences.
		Effect on greenhouse gas emissions	Yes	-			-			-			-			No significant differentiators.
Community, property, heritage	12.5%	Property impacts	Yes	5	1.429	0.179	5	-	-	-5	0.714	0.089	-5	-	-	Orange and Green options impact slightly less properties compared to the base case, purple and pink options sever 1 more property than base case.
		Indigenouse cultural heritage	Yes	-			-			-			-			All options cross potentially sensitive areas near Narrabri creek. No significant differentiators.
		Non-indigenous heritage	Yes	-			-			-			-			No significant differentiators.
		Impact on community e.g. road	Yes	-			-			-			-			Purple option impacts Narrabri tip, however ARTC advised initial consultation with Narrabri council indicates this is acceptable.
		Community response (community stakeholder risk)	Yes	5			-5			10			5			Preliminary consultation by ARTC indicates all options other than green preferable to base case, purple most preferable as furthest from centre of town.
		Current and future land use impacts	Yes	-			-			-			-			No significant differentiators.
		Impact on business and agricultural viability	Yes	-			-			-			-			No significant differentiators.
Approvals and stakeholder risk	12.5%	Other statutory and regulatory approvals	Yes	-	-	-	-	-	-	-	-	-	-	-	-	No significant differentiators.
		Alignment with State/ Federal agency objectives	Yes	-			-			-			-			No significant differentiators.

3. Multi criteria analysis

Criteria	Criteria Weighting	Sub-criteria	Sub-criteria enables	BN-N-C Sub criteria Score	BN-N-C Criteria Score	BN-N-C Weighted score	BN-N-W Sub criteria Score	BN-N-W Criteria Score	BN-N-W Weighted score	BN-N-D Sub criteria Score	BN-N-D Criteria Score	BN-N-D Weighted score	BN-N-CRN Sub criteria Score	BN-N-CRN Criteria Score	BN-N-CRN Weighted score	Comments (relating to the score)
		Alignment with Local government objectives	Yes	-			-			-			-			Purple option impacts Narrabri tip, however ARTC advised initial consultation with Narrabri council indicates this is acceptable.
		Service authorities (utilities/ other)	Yes	-			-			-			-			No significant differentiators.
					TOTAL SCORE	0.499		TOTAL SCORE	-0.142		TOTAL SCORE	0.305		TOTAL SCORE	0.640	

Criteria	Programme Weighting	Sensitivity Weightings							Raw Scores				Sensitivity Scoring: Even weighting				Sensitivity Scoring: Programme weighting				Sensitivity Scoring: Technical				Sensitivity Scoring: Safety			
		Technical	Safety	Operations	Constructability	Enviro	Community	Approvals	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Technical viability	17%	40%	10%	10%	10%	10%	10%	10%	0.83	-0.83	-0.83	1.67	0.12	-0.12	-0.12	0.24	0.14	-0.14	-0.14	0.28	0.33	-0.33	-0.33	0.67	0.08	-0.08	-0.08	0.17
Safety assessment	16.5%	10%	40%	10%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opertational approach	16.5%	10%	10%	40%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constructability and schedule	12.5%	10%	10%	10%	40%	10%	10%	10%	0.00	0.00	-1.43	1.67	0.00	0.00	-0.20	0.24	0.00	0.00	-0.18	0.21	0.00	0.00	-0.14	0.17	0.00	0.00	-0.14	0.17
Environment	12.5%	10%	10%	10%	10%	40%	10%	10%	1.43	0.00	4.29	2.86	0.20	0.00	0.61	0.41	0.18	0.00	0.54	0.36	0.14	0.00	0.43	0.29	0.14	0.00	0.43	0.29
Community, property, heritage	12.5%	10%	10%	10%	10%	10%	40%	10%	1.43	0.00	0.71	0.00	0.20	0.00	0.10	0.00	0.18	0.00	0.09	0.00	0.14	0.00	0.07	0.00	0.14	0.00	0.07	0.00
Approvals and stakeholders	12.5%	10%	10%	10%	10%	10%	10%	40%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
									Total				0.53	-0.12	0.39	0.88	0.50	-0.14	0.30	0.85	0.62	-0.33	0.02	1.12	0.37	-0.08	0.27	0.62
									Rank				2	4	3	1	2	4	3	1	2	4	3	1	2	4	3	1

Criteria	Programme Weighting	Sensitivity Weightings							Sensitivity Scoring: Operations				Sensitivity Scoring: Constructability				Sensitivity Scoring: Enviro				Sensitivity Scoring: Community				Sensitivity Scoring: Approvals			
		Technical	Safety	Operations	Constructability	Enviro	Community	Approvals	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Technical viability	17%	40%	10%	10%	10%	10%	10%	10%	0.08	-0.08	-0.08	0.17	0.08	-0.08	-0.08	0.17	0.08	-0.08	-0.08	0.17	0.08	-0.08	-0.08	0.17	0.08	-0.08	-0.08	0.17
Safety assessment	16.5%	10%	40%	10%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opertational approach	16.5%	10%	10%	40%	10%	10%	10%	10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constructability and schedule	12.5%	10%	10%	10%	40%	10%	10%	10%	0.00	0.00	-0.14	0.17	0.00	0.00	-0.57	0.67	0.00	0.00	-0.14	0.17	0.00	0.00	-0.14	0.17	0.00	0.00	-0.14	0.17
Environment	12.5%	10%	10%	10%	10%	40%	10%	10%	0.14	0.00	0.43	0.29	0.14	0.00	0.43	0.29	0.57	0.00	1.71	1.14	0.14	0.00	0.43	0.29	0.14	0.00	0.43	0.29
Community, property, heritage	12.5%	10%	10%	10%	10%	10%	40%	10%	0.14	0.00	0.07	0.00	0.14	0.00	0.07	0.00	0.14	0.00	0.07	0.00	0.57	0.00	0.29	0.00	0.14	0.00	0.07	0.00
Approvals and stakeholders	12.5%	10%	10%	10%	10%	10%	10%	40%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
									0.37	-0.08	0.27	0.62	0.37	-0.08	-0.15	1.12	0.80	-0.08	1.56	1.48	0.80	-0.08	0.49	0.62	0.37	-0.08	0.27	0.62
									2	4	3	1	2	3	4	1	3	4	1	2	1	4	3	2	2	4	3	1

Title: N2N Options MCA Data: Narrabri

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Technical viability	**Alignment**		Quantitative					
		Total Track length		11.19km	11.18km	11.23km	11.75km	11.12km
		Greenfield		11.19km	11.18km	11.23km	11.75km	11.12km
		Brownfield		0.00km	0.00km	0.00km	0.00km	0.00km
		Length of Walgett connection - greenfield		1.36km	2.56km	2.48km	1.78km	1.96km
		No R1200 curves		7	4	3	6	6
		Avg grade		-	-	-	-	-
		Comment		-	3 fewer 1200 m curves	4 fewer 1200 m radius curves	1 less 1200 m curve	2 less 1200 m curve
		Sub-criteria score			0	5	0	0
	Impact on PUP and other assets		Qualitative					
		Electricity - 132kV crossings		-	-	-	-	-
		Electricity - 66kV crossings		-	-	-	-	-
		Electricity - 22kV crossings		6	5	8	8	4
		Electricity - 11kVcrossings		-	-	-	-	-
		Electricity - <11kV crossings		-	-	-	-	1
		Gas - crossings		-	-	-	-	-
		Telecommunications - services crossings		18	13	17	10	9
		Telecommunications - fibre optic cable crossing		-	-	-	-	-
		Sub-criteria score			5	-5	0	10
	Geotechnical conditions		Qualitative					
		Length formation over Sedimentary and volcanic rocks		0.1km	3.3km	5.2km	4.4km	2.3km
		Length formation over alluvium and colluvial		11.1km	7.9km	6.1km	7.3km	8.8km
		% length alluvium & colluvial		99%	70%	54%	62%	79%
		Difference from base case			29%	45%	37%	20%
		Sub-criteria score			0	0	0	0
	Impacts on existing road and rail networks		Quantitative					
		State road realignments		-	-	-	-	-
		Council road realignments		-	-	-	-	-
		Existing rail flexibility		-	0.4 km Walgett line connection	1.4 km Walgett line connection	1.6 km Walgett line connection	0.8 km Walgett line connection
		Sub-criteria score			0	0	0	0
	Flood immunity/ hydrology		Qualitative					
		Track length in 1% AEP flood extent		6.6km	8.4km	9.6km	9.9km	6.4km
		% length		59%	75%	86%	85%	58%

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
		% difference from base case		-	16%	26%	25%	2%
		Comment		-	Less than 10% more than base case	Less than 20% more than base case	Less than 20% more than base case	Less than 10% more than base case
		Sub-criteria score			0	-5	-5	0
	Future proofing		Qualitative					
		Loop & 30TAL. Future proofing to Walgett Line		-	-	-	-	-
		Sub-criteria score		0	0	0	0	0
assessment of the proposed alignment	**Operational safety**		Qualitative					
		Track geometry, height of rail above natural surfaces, conflict point with existing lines / sidings / grain traffic		-	-	-	Purple has longer viaduct by 0.6km, therefore greater length working/operating at heights	-
		Sub-criteria score		0	0	0	0	0
	Public safety		Qualitative					
		Risk of trespass		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Road safety intefaces		Quantitative					
		State road interfaces		1	1	1	1	1
		Council road interfaces		3	2	2	4	3
		Private Road interfaces (based on number of properties crossed)		18	17	17	20	19
		Sub-criteria score			0	0	0	0
	Emergency response		Qualitative					
		Length > 500m from local road access		5.9	8.2	8.3	7.1	8.2
		% of length		53%	73%	74%	60%	74%
		Comment		Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant	Criteria no longer relevant
		Sub-criteria score			0	0	0	0
	Construction safety		Qualitative					
		Higher risk construction activity		-	-	-	-	-

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Safety								
		Comment		-	-	-	Longer viaduct by 0.6km, therefore greater length of construction complexity, alignment traverses dump site with likely contamination and settlement issues	-
		Sub-criteria score			0	0	0	0
Operational approach, including opex	**Effect/ Impact on travel time**		Quantitative					
		Transit time (minutes) (assuming 115 km/hr)		5.8	5.8	5.9	6.1	5.8
		Comment		-	< 1 minute difference to base case, no significant differentiators	< 1 minute difference to base case, no significant differentiators	< 1 minute difference to base case, no significant differentiators	< 1 minute difference to base case, no significant differentiators
		Sub-criteria score			0	0	0	0
	Effect on reliability and availability		Qualitative					
		Interfaces with existing lines / sidings / grain traffic		-	-	-	-	-
		% of alignment with brownfield flooding requirement		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Network interoperability and connectivity		Qualitative					
		Interfaces with existing lines / sidings / grain traffic						
		Sub-criteria score			0	0	0	0
	Construction duration		Quantitative					
		Estimated fill volume (m3)		150,000.00	150,000.00	160,000.00	160,000.00	150,000.00
		% different from base case		-	0%	7%	7%	0%
		Bridge length (m)		3.7km	3.7km	3.7km	4.2km	3.8km
		% different from base case		-	0%	0%	12%	3%
		Comment		-	No significant differentiators	No significant differentiators	Has longer viaduct by 0.6km, 17% longer than base case, therefore longer construction	No significant differentiators
		Sub-criteria score			0	0	-5	0

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Constructability and schedule	**Construction access**		Qualitative					
		Length with poor access		4.9	7.2	7.4	6.1	7.1
		% different from base case		-	47%	51%	24%	45%
				-	Significantly more than base case	Significantly more than base case	More than base case	Significantly more than base case
		Sub-criteria score			0	0	0	0
	Construction complexity		Qualitative					
		Comment		-	All options require viaducts, and similar construction methodologies. Longer length of viaduct for purple option scored in 'Construction duration'.			
		Sub-criteria score			0	0	0	0
	Resources/ material sources		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Remediation / contamination		Qualitative					
		Known or potential for contamination of site		-	-	-	-	-
		Comment		-	No significant differentiators	No significant differentiators	Purple traverses Narrabri tip, likely contamination and leachate issues	No significant differentiators
		Sub-criteria score			0	0	-5	0
	Interface with operational railway		Qualitative					
		Number of interfaces with existing railways		1	1	1	1	1
		Comment		All options similar, no significant differentiators.	All options similar, no significant differentiators.	All options similar, no significant differentiators.	All options similar, no significant differentiators.	All options similar, no significant differentiators.
		Sub-criteria score			0	0	0	0
	Staging opportunities		Qualitative					
		Detailed information not available. Assume similar impacts						
		Sub-criteria score			0	0	0	0
	Ecological impacts (flora, fauna and habitats)		Quantitative					
		Length through potentially significant area (native vegetation & EEC)		9.0km	10.4km	10.9km	9.7km	8.4km
		% different from base case		-	16%	21%	8%	7%
		Sub-criteria score			-5	-10	0	0
	Offset liability		Quantitative					

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Environmental and heritage Impacts		Native vegetation impacted triggering offset requirements		-	-	-	-	-
		Comment		-	As per ecological impacts	As per ecological impacts	As per ecological impacts	As per ecological impacts
		Sub-criteria score			-5	-10	0	0
	Visual impacts		Qualitative					
		Comparitive change in landscape		Better alignment with roads/boundaries	-	-	significantly less no. of receivers impacted compared to base	-
		Receivers (within 1000 m)		281	296	280	149	221
		Sub-criteria score			0	0	10	0
	Noise and vibration impacts		Quantitative					
		Number of residences / commercial / worships within 200 m of the corridor		19	11	15	6	13
		Sub-criteria score			10	10	10	10
	Flooding and waterway impacts		Qualitative					
		Waterways crossings		10	8	8	10	8
		Comment		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Effect on air quality		Quantitative					
		Residences within 200 m		19	11	15	6	13
		Sub-criteria score			10	10	10	10
	Effect on greenhouse gas emissions		Qualitative					
		Detailed information not available. Assume similar impacts		-	-	-	-	-
		Sub-criteria score			0	0	0	0
	Property impacts		Quantitative					
		No. of properties impacted		18	16	17	18	19
		Difference in number of properties		-	2	1	0	1
		Properties severed		12	12	12	13	13
		Number of properties severed		-	0	0	1	1
		Comment		Potentially 1 residence removed	2 less properties impacted, potentially 1 residence removed	1 less property impacted, potentially 1 residence removed	1 more property severed	1 more property impacted and 1 more severed.
		Sub-criteria score			5	5	-5	-5
	Indigenous cultural heritage		Qualitative					
		Indigenous heritage impact: items within 80m		0	0	0	2	0
		Comment		Crosses significant area near Narrabri Creek	Crosses significant area near Narrabri Creek	Crosses significant area near Narrabri Creek	Cemetery location - not confirmed yet	Crosses significant area near Narrabri Creek
		Sub-criteria score			0	0	0	0

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Community and property impacts	**Non-indigenous heritage**		Qualitative					
		Non-indigenous heritage impact: items within 80m		nil	nil	nil	nil	nil
		Natural heritage impact: items crossed within 80 m		nil	nil	nil	nil	nil
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Impact on community e.g. road		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	Purple option impacts Narrabri tip, a key community asset.	No significant differentiators
		Sub-criteria score			0	0	0	0
	Community response (community stakeholder risk)		Qualitative					
		Comment		-	Based on ARTC preliminary consultation, general consensus to keep away from town.	Owners along green option have provided representations against this option	Based on ARTC preliminary consultation, general consensus to keep away from town.	Based on ARTC preliminary consultation, general consensus to keep away from town.
		Sub-criteria score			5	-5	10	5
	Current and future land use impacts		Qualitative					
		Comment		-				
		Sub-criteria score			0	0	0	0
	Impact on busines and agriculture viability		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
keholder risk	**Other statutory and regulatory approvals**		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Alignment with State/ Federal agency approvals		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0
	Alignment with Local government objectives		Qualitative					

Category	Criteria	Metric	Qualitative or Quantitative	Base case	BN-N-C	BN-N-W	BN-N-D	BN-N-CRN
Approvals and stak		Comment		-	No significant differentiators	No significant differentiators	Purple option impacts Narrabri Tip, requiring additional consultation with council	No significant differentiators
		Sub-criteria score			0	0	0	0
	Service authorities (utilities/ other)		Qualitative					
		Comment		-	No significant differentiators	No significant differentiators	No significant differentiators	No significant differentiators
		Sub-criteria score			0	0	0	0

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\Projects\22\19593 - ARTC IR N2N Feasibility Design & EIS\DESIGN DOCUMENTS\


JACOBS
GHD

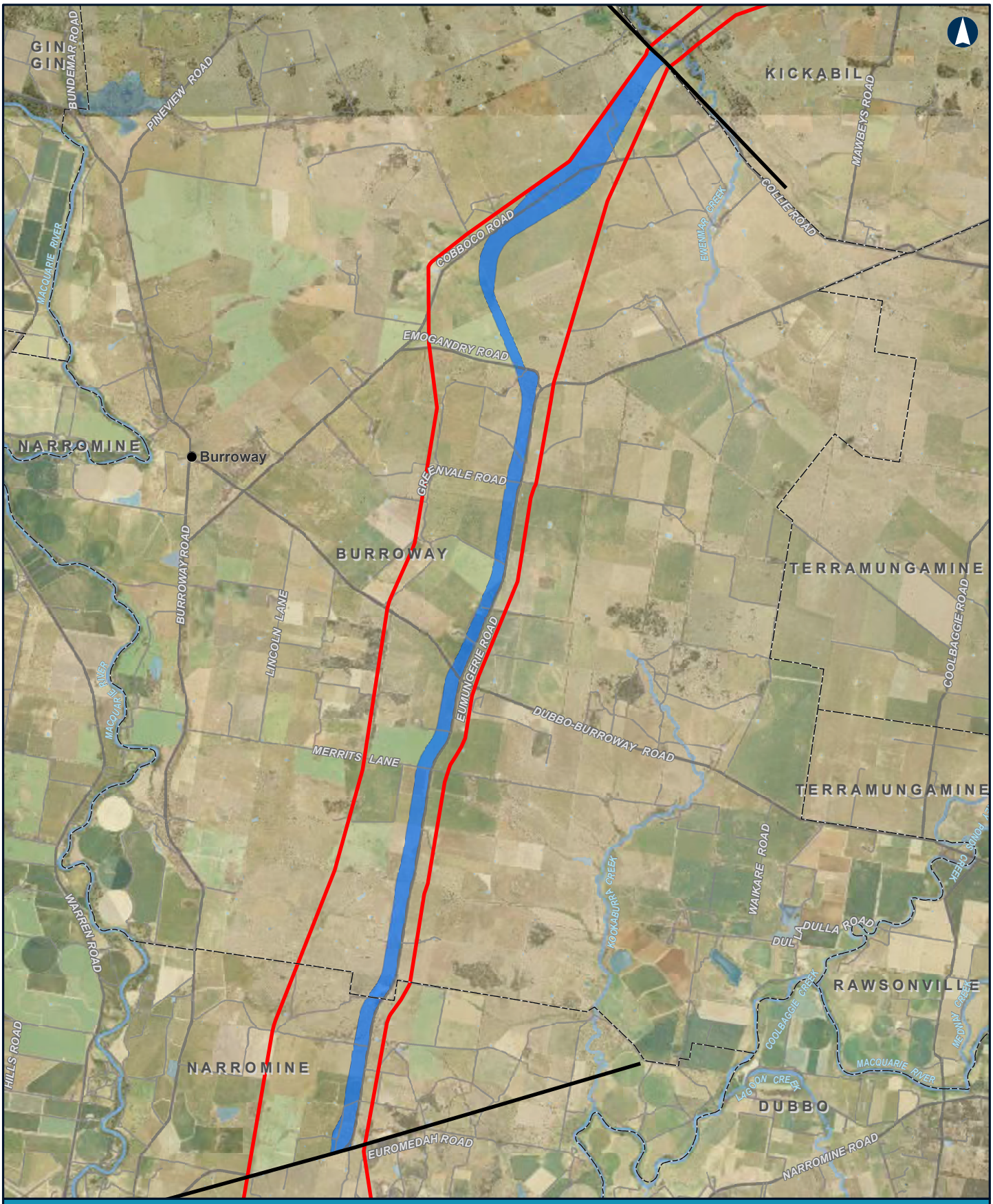
1 Addendum

Following the approval of the N2N stage 3 MCA report (2-0001-250-CAL-00-RP-0008), refinement process of the final corridor within the Focused Area of Investigation (FAoI) commenced. As a result, it was identified that in some areas the FAoI needed to be slightly modified. Due to the small magnitude of the change, and the fact that no new alignment alternative had been identified, a new MCA workshop and report was not necessary.

The modified sections are:

- Eumungerie Rd: wider FAoI around Cobboco Rd, to allow better crossing point for rail.
- Curban junction: preliminary corridor moved to the western side of the study area, between Forans and Wyuna Rd, to avoid direct impact to existing residence. FAoI narrowed to give more certainty on impacts to landowners in the area.
- Narrabri North: FAoI narrowed to remove possible impact to Narrabri Council´s water treatment plant.

Updated maps are shown below. These changes were already included in the FAoI released to the public and published in N2N project web page on 06/03/2020.



NARROMINE TO NARRABRI | Study and Focus Area - Eumungerie Road | Addendum

0 2.5 5 Km

Coordinate System: GDA 1994 MGA Zone 55

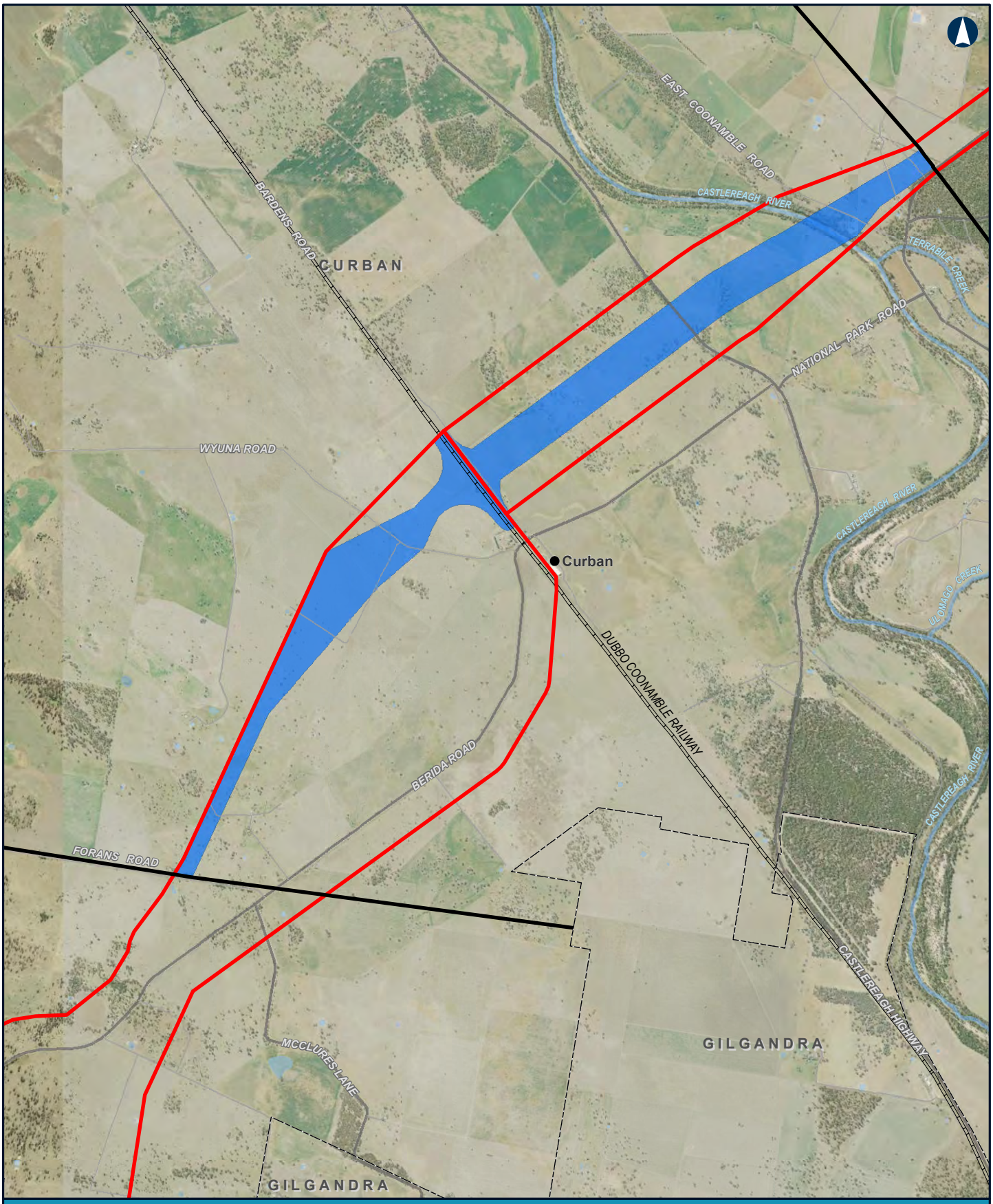
Date: 19/03/2020 Paper: A4
Author: IR.GIS Scale: 1:120,000
Data Sources:

- Sub-section break
- Focused area
- Study area - Phase 2
- Locality

INLAND RAIL ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

G:\03_GIS_SYSTEM\05_TASKS\IR\2500_N2N\20200316_T0289_N2N_FocusAreaMCAReport\2500 N2N_DESN_FocusedAreaMCAReportEumungerie.mxd



NARROMINE TO NARRABRI Study and Focus Area - Curban Junction Addendum

0 1 2 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 19/03/2020 Paper: A4
Author: IR.GIS Scale: 1:50,000
Data Sources:

- Existing railway
- Subsection break
- Focused area
- Study area - Phase 2
- Locality

INLAND RAIL ARTC

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NARROMINE TO NARRABRI

Study and Focus Area - Baradine to Narrabri - Narrabri North

Addendum

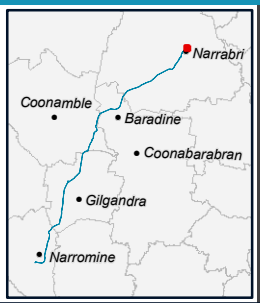
0 0.5 1 Km

Coordinate System: GDA 1994 MGA Zone 55

Date: 19/03/2020
Author: IR.GIS
Data Sources:

Paper: A4
Scale: 1:20,000

- Existing railway
- Sub-section break
- Focused area
- Study area - Phase 2
- Locality



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G:\03_GIS_SYSTEM\05_TASKS\IR\2500_N2N\20200316_T0289_N2N_FocusAreaMCAReport\2500 N2N_DESN_FocusedAreaMCAReportNarrabri.mxd