Australian Government

BUILDING OUR FUTURE

NSW GOVERNMENT

M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Executive summary

Transport for NSW | July 2021

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Executive summary

Transport for NSW (Transport) proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). Approval is sought under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Part 9, Division 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This environmental impact statement (EIS) has been prepared to describe the project, provide an assessment of all potential environmental and community impacts that could occur as a result of its construction and operation, and identify measures that would be implemented to avoid and minimise those impacts.

What is proposed?

The project would connect the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace within the City of Newcastle and Port Stephens Council local government areas (LGAs). The project would provide regional benefits and substantial productivity benefits on a national scale.

The project would include the following key features (refer to **Figure E-1**):

- A 15 kilometre motorway comprised of a four lane divided road (two lanes in each direction)
- Motorway access to/from the existing road network via four new interchanges at:
  - Black Hill: connection to the M1 Pacific Motorway
  - Tarro: connection and upgrade (six lanes) to the New England Highway between John Renshaw Drive and the existing Tarro interchange at Anderson Drive
  - Tomago: connection to the Pacific Highway and Old Punt Road
  - Raymond Terrace: connection to the Pacific Highway.
- A 2.6 kilometre viaduct over the Hunter River and floodplain, the Main North Rail Line, and the New England Highway
- Bridge structures over local waterways at Tarro and Raymond Terrace, and an overpass for Masonite Road in Heatherbrae
- Connections and modifications to the adjoining local road network
- Traffic management facilities and features
- Roadside furniture including safety barriers, signage, fauna fencing and crossings, and street lighting
- Adjustment of waterways, including at Purgatory Creek at Tarro and a tributary of Viney Creek
- Environmental management measures including surface water quality control measures
- Adjustment, protection and/or relocation of existing utilities
- Walking and cycling considerations, allowing for existing and proposed cycleway route access
- Permanent and temporary property adjustments and property access refinements
- Construction activities, including establishment and use of temporary ancillary facilities, temporary access tracks, haul roads, batching plants, temporary wharves, soil treatment and environmental controls.

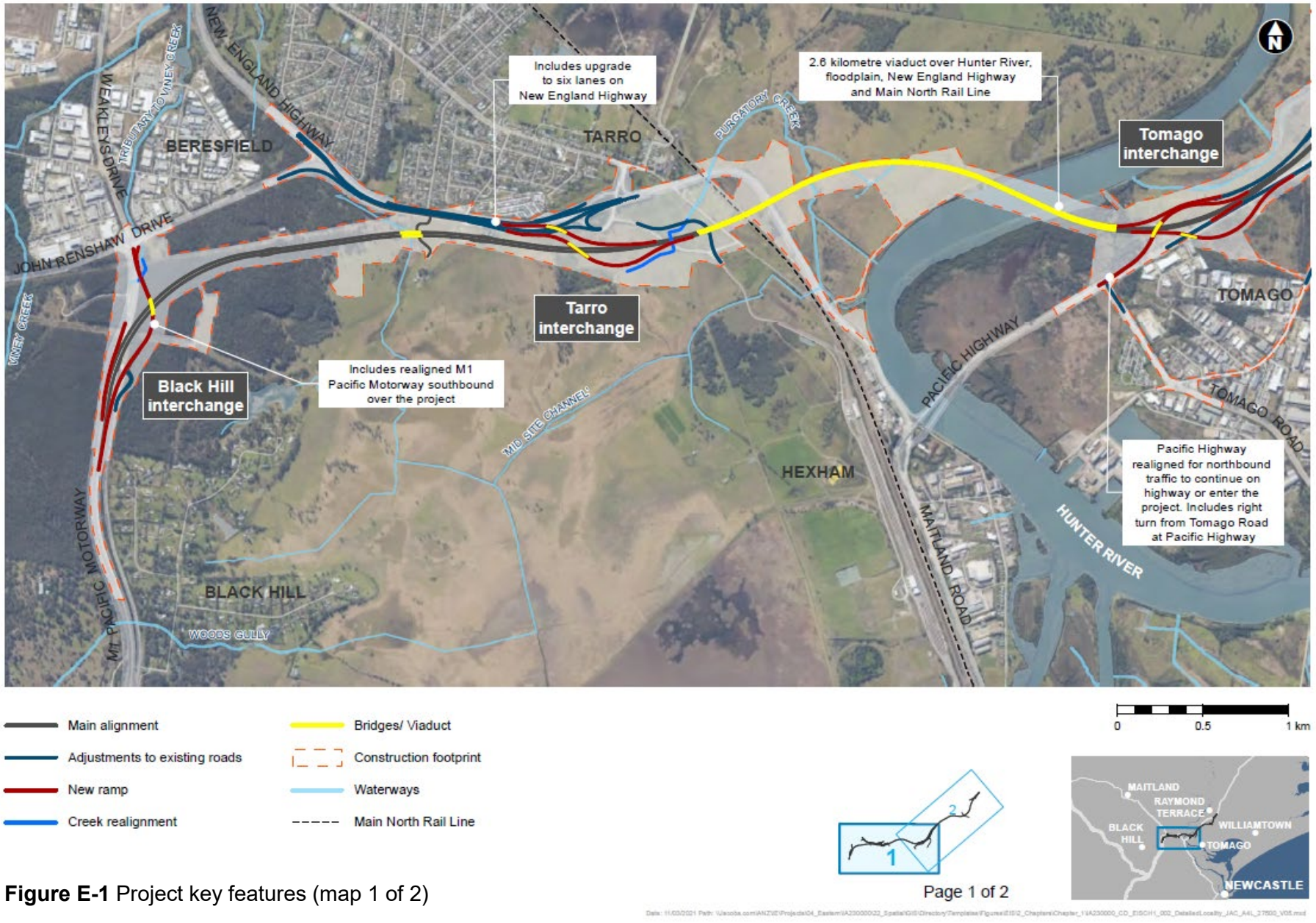

Figure E-1 Project key features (map 1 of 2)

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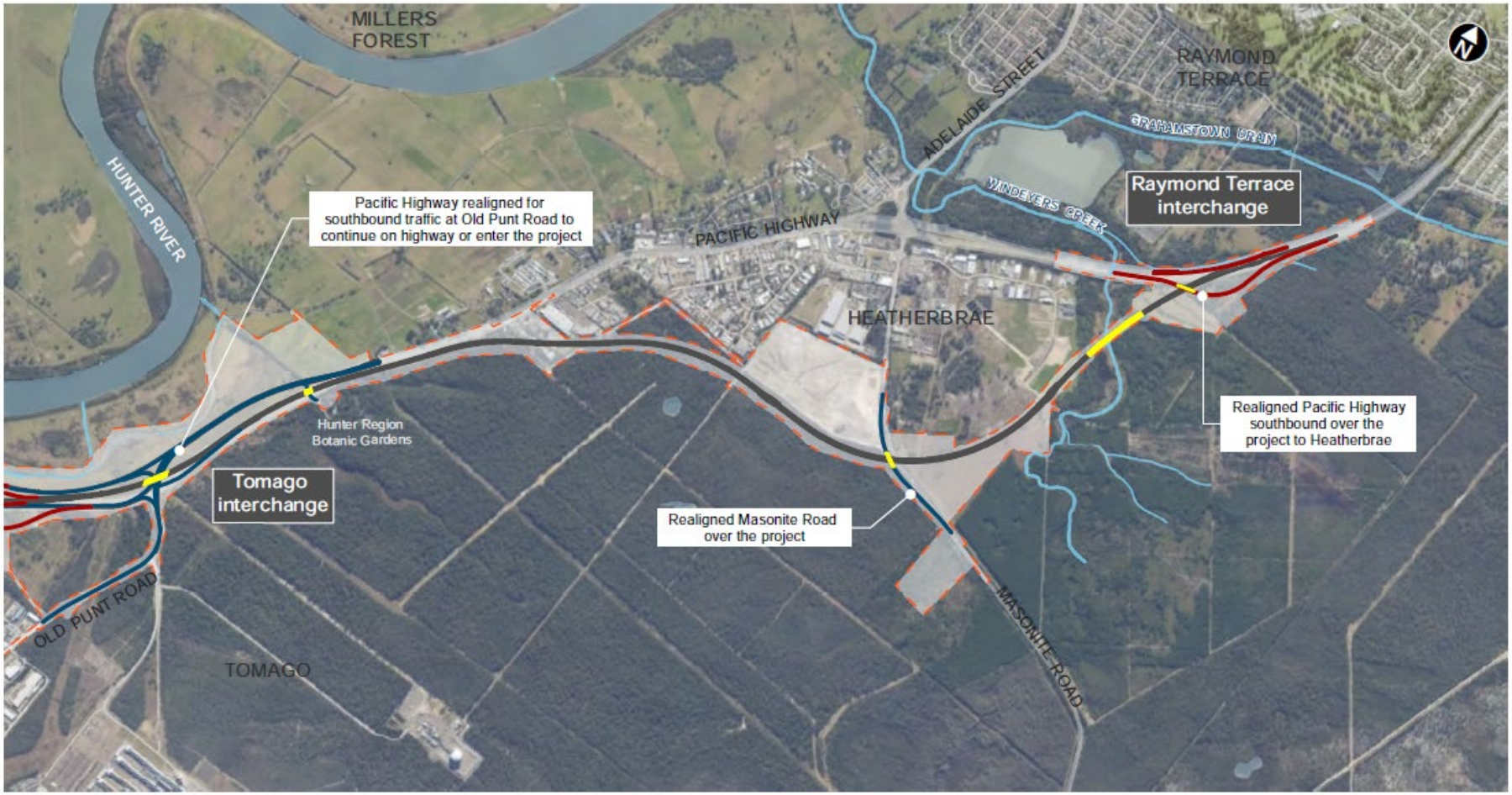

Figure E-2 Project key features (map 2 of 2)

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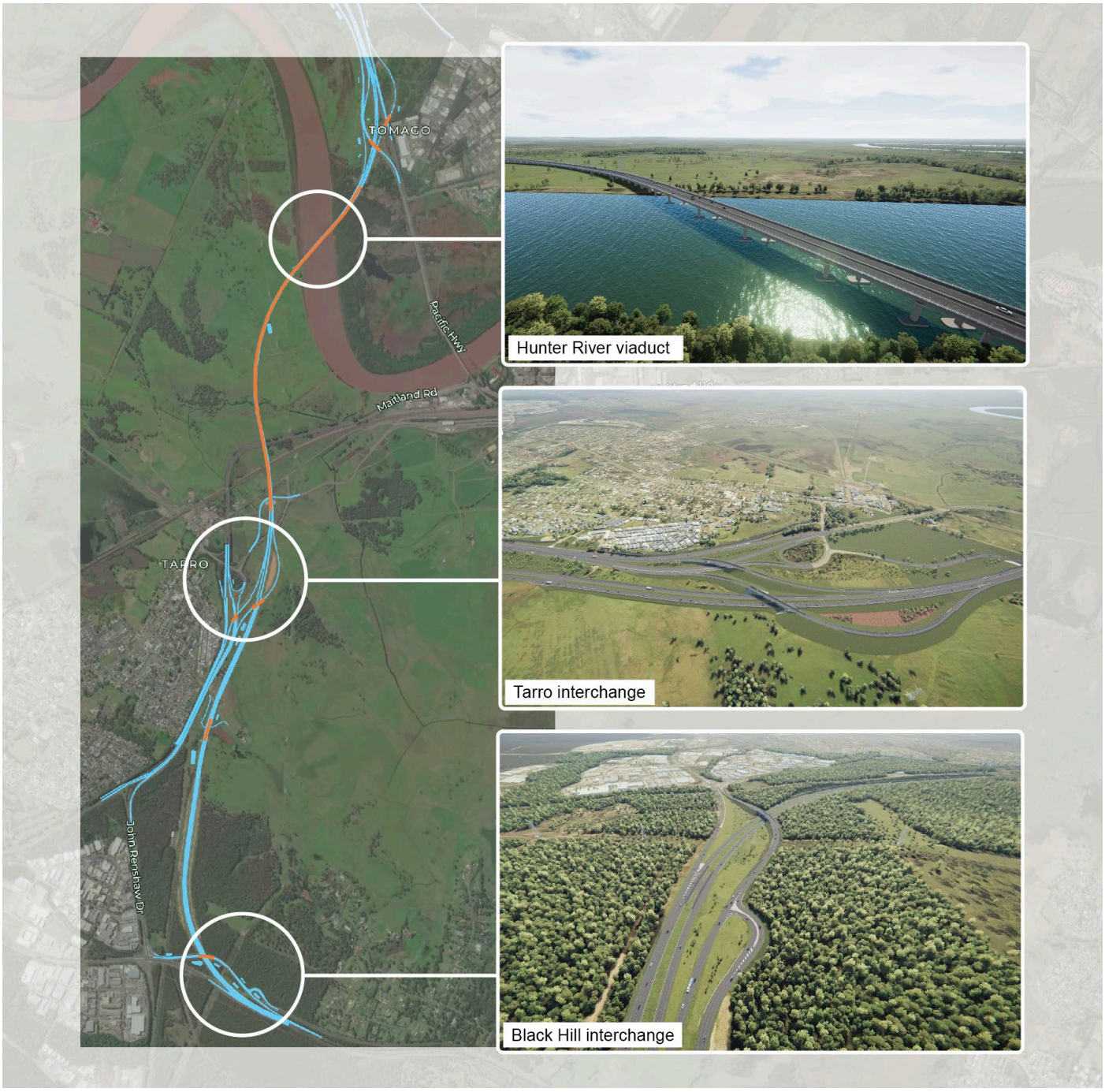
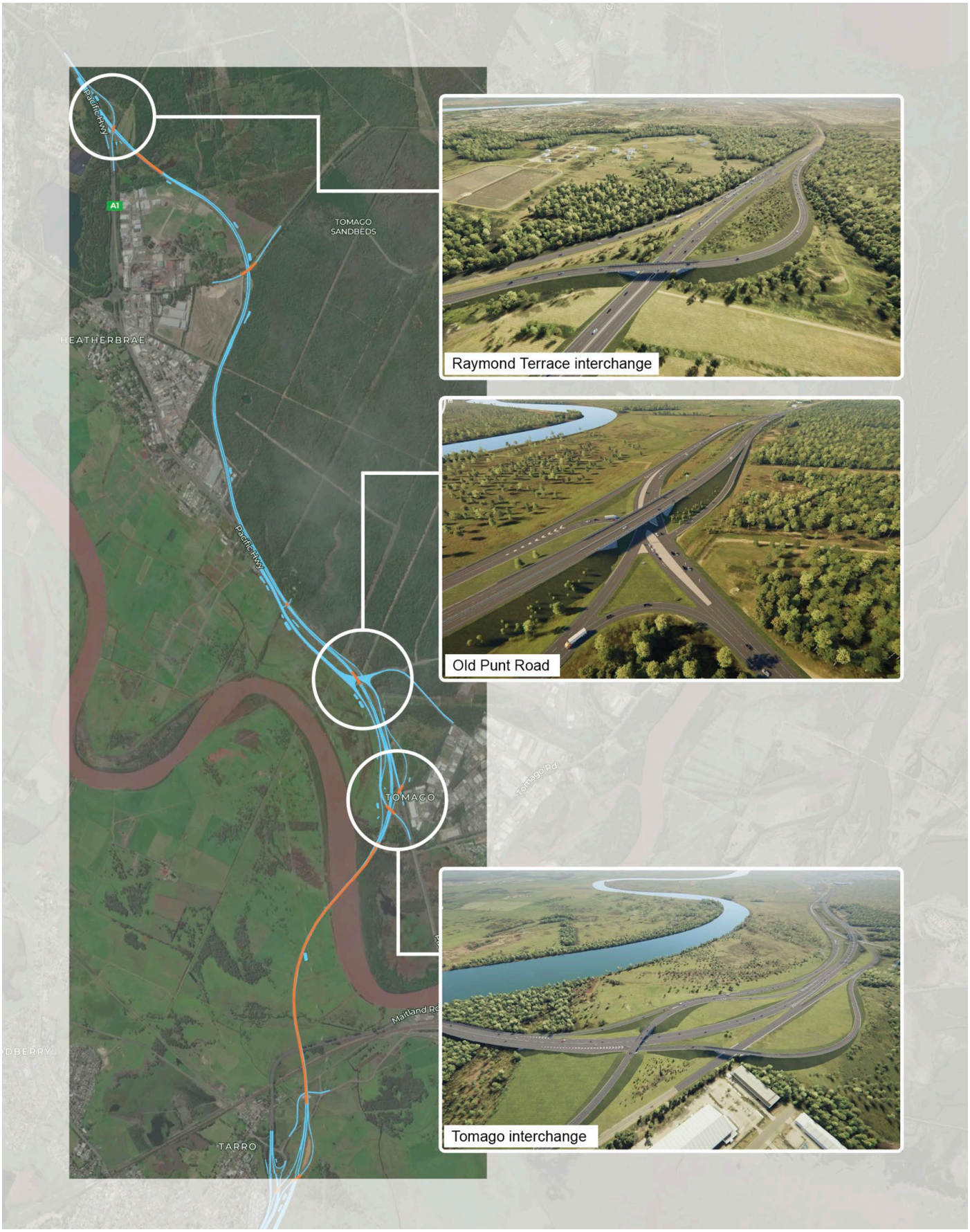
What are the project objectives?

Transport is targeting achievement of the following project objectives:

- Improve travel time and road network efficiency for freight and commuters on the National Land Transport Network (NLTN) at the key strategic junction of the M1 Pacific Motorway, the New England Highway and Pacific Highway
- Provide improved long term route reliability along the M1 Pacific Motorway corridor, particularly in relation to congestion reduction, flood immunity and high demand holiday peak travel
- Improve road safety for all road users
- Provide more efficient access to facilitate economic growth for the Lower Hunter and key regional employment areas such as the Port of Newcastle, Newcastle Airport, Tomago, Beresfield and Black Hill.




Pacific Hwy
A1
TOMAGO SANDBEDS
HEATHERBRAE
Pacific Hwy
TOMAGO
Tomago Rd
TARRO
Raymond Terrace interchange
Old Punt Road
Tomago interchange

Why is the project needed?

The NLTN is a network of nationally important road and rail infrastructure links. Within the project area the NLTN facilitates substantial interstate freight movements between NSW, Victoria and Queensland, and particularly freight movements between Sydney, the Hunter region, northern NSW and Queensland.

There is currently no direct motorway connection between Black Hill and Raymond Terrace. The north-south corridor at this location currently travels along lower standard routes, including John Renshaw Drive, the New England Highway and the Pacific Highway. The existing NLTN, linking the M1 Pacific Motorway at Black Hill with the Pacific Highway at Raymond Terrace, is in one of the most highly-trafficked areas of the road network in the region and is more heavily congested than nearby high standard sections of the M1 Pacific Motorway and Pacific Highway corridors.

Following the completion of NorthConnex and the duplication of the Pacific Highway in 2020, Coffs Harbour Bypass and the project are the two remaining major upgrades required to complete a free flowing dual carriageway NLTN route along the east coast.

Additionally, this area of the road network is a key strategic junction as it is located centrally within the Hunter Region, serving commuting traffic from Newcastle, Maitland, Port Stephens and Cessnock to access key locations of employment and education, such as the Port of Newcastle and University of Newcastle.

Key issues along the existing road network include:

- High commuter and freight traffic volumes on the New England and Pacific Highways, the M1 Pacific Motorway and John Renshaw Drive
- Major delays caused by multiple (five) signalised intersections, a roundabout, several merge/diverge locations and speed limits ranging from 60km/h to 90km/h
- Road safety
- Restrictions on heavy vehicle movements, notably for southbound traffic on the existing Hexham Bridge over the Hunter River (caused by weight and height restrictions)
- Accessibility for freight to major nearby existing and future employment areas
- Flood immunity of existing road corridors.

Growth is continuing to occur throughout the Hunter Region and the existing constraints to the road network would continue and deteriorate in the future without improved infrastructure.

How would the project satisfy this need?

The project would provide an integrated response to the needs of the regional, state and national road network, and would improve traffic efficiency, route reliability, connectivity and road safety. The project would satisfy the needs of the road network by:

- Providing a motorway standard bypass of the existing congested road network, avoiding multiple (five) signalised intersections, a roundabout and several high traffic demand merge points
- Decreasing traffic demand on existing key routes across the road network. On project opening (2028), the project is expected to achieve the following:
  - About a 50 per cent reduction in traffic on the Pacific Highway south of Masonite Road during morning (AM) and evening (PM) peaks
  - About a 45 per cent reduction in traffic flows on the Pacific Highway east of the Hexham Bridge
  - About a 25 per cent reduction in traffic flows on the New England Highway west of the Hexham Bridge.

- Improving travel time. On project opening (2028), the project is expected to achieve the following:
  - About a nine minute saving for traffic travelling from the M1 Pacific Motorway at Black Hill to the Pacific Highway at Raymond Terrace in both the morning and evening peak periods
  - About a seven minute and a nine minute saving for traffic travelling from the Pacific Highway at Raymond Terrace to the M1 Pacific Motorway at Black Hill during the morning and evening peak periods respectively
  - About a five minute saving for traffic travelling between the Pacific Highway at Raymond Terrace and the New England Highway at Beresfield in both directions during the morning peak period
  - About a four minute saving for northbound traffic and about a seven minute saving for southbound traffic travelling between the Pacific Highway at Raymond Terrace and the New England Highway at Beresfield during the evening peak period.
- Providing significant improvement in flood immunity along the route with a minimum 5% annual exceedance probability (AEP) (1 in 20 year flood event) immunity between Black Hill and Raymond Terrace improving the reliability of the corridor
- Greatly improving the reliability of travel times during holiday peak periods, reducing delays on the existing congested network by avoiding existing signalised intersections and reducing congestion during high demand periods
- Improving road safety by providing a higher standard of road that would:
  - Reduce congestion on the New England Highway and the Pacific Highway, which is expected to reduce rear-end and lane-change crashes and improve conditions for pedestrians and cyclists
  - Reduce potential points of conflict between road vehicles on the network, minimising the risk of congestion-related incidents
  - Provide an improved road alignment, including wider lanes and shoulders with barriers, minimising the risk and impact of any off-road crashes.
- Offering an alternate route to the existing, constrained road network, bypassing the existing Hexham Bridge and enabling end to end access by higher productivity freight vehicles along the M1 Pacific Motorway corridor between Sydney and Brisbane.

What are the main benefits expected?

The main benefits of the project include:

- Improving travel time and road network efficiency for freight and commuters on the NLTN at the key strategic junction of the M1 Pacific Motorway, the New England Highway and Pacific Highway
- Bypassing a major constraint to freight movements along the NLTN (the existing Hexham Bridge)
- Providing improved, long-term route reliability along the M1 Pacific Motorway corridor, particularly in relation to reducing congestion, improving flood immunity and reducing congestion during high demand, holiday peak travel periods
- Improving road safety for all road users by providing a motorway standard bypass of the existing congested road network
- Improving conditions for pedestrians and cyclists by reducing traffic volumes along the existing road network
- Providing more efficient access to facilitate economic growth for the Lower Hunter and key regional employment areas such as the Port of Newcastle, Newcastle Airport, Tomago, Beresfield and Black Hill.

What alternatives were considered?

The project development process considered possible alternatives to the project that could achieve the project objectives and avoid or minimise adverse impacts to the environment.

Between 2004 and 2005, route option workshops identified 14 possible routes as alternative options. Two of these options were progressed as feasible route options and were split into three sections each which were placed on display for community comment in 2005. Following a value management workshop which evaluated engineering, environmental, social and economic matters, further route option investigations were carried out. After further refinement of the options, a route options workshop was held in 2006 which identified a preferred route for the project. This preferred route was placed on public display in August 2006. Following consideration of community and stakeholder feedback, the preferred route design was progressed into a concept design which was placed on public display in 2008. A submissions report responding to issues raised by the community was published in December 2010 and a road corridor was then reserved in the Newcastle and Port Stephens Council Local Environmental Plans (LEPs).

In 2014, a review of the 2010 Preferred Route design was carried out to identify and investigate potential improvements to the project. The majority of the alignment improvements considered were for the central section of the project, between Tarro and Heatherbrae, as this was the area of the project that provided the greatest scope for minimising environmental impact. The review also considered options to improve road network connectivity and accessibility and develop a more cost-effective project solution.

Following this review, alignment options were progressed for further investigation to address the issues raised and to better meet the project objectives. In April 2015, a value management workshop resulted in the selection of a preferred alignment, which was announced in October 2015.

The concept design was then revised in consideration of feedback received from the community and stakeholders, as well as the outcomes of field investigations carried out in 2015 and 2016. Further community consultation was carried out in 2016 to communicate changes to the design. Feedback and ongoing consultation with landowners, utility providers and key stakeholders has resulted in further investigation to produce the project design which highlighted some key changes at Tomago in a November 2020 Community Update and is included in this EIS.

Overall, the project development process has ensured that the project best meets the project objectives, has been evaluated against the functional, social and economic and natural environment and culture considerations identified for the project and ultimately provides value for money.

How did the community participate in selecting the preferred project?

An extensive consultation program has been carried out since project initiation in 2004, including community updates, media releases, public displays and community feedback sessions to support project development including the preferred route, concept design and environmental assessment.

Community consultation activities carried out during project development has included:

- 2004-2005: Project initiation – community notification and stakeholder meetings
- 2005: Public display of route options
- 2005-2010: Development and display of the 2010 Preferred Route design – including formalisation of the project corridor into Newcastle and Port Stephens LEPs
- 2014-2015:
  - Public display of the revised concept design in October 2015
  - Publication of the State significant infrastructure application on the Department of Planning website
  - Aboriginal heritage focus groups
  - Consultation with business owners
  - Flood focus group meeting.

- 2016-2017:
  - Public display of concept design changes in August 2016
  - Aboriginal heritage focus groups.
- 2018-present:
  - Engagement with property owners and major stakeholders for the environmental assessment
  - Aboriginal heritage focus groups
  - Community update, published in November 2020, describing changes to the project design.

Community consultation has been extensive and has driven many of the design revisions. Issues raised during consultation periods have been investigated and considered as part of the development of the concept design, including incorporating design elements to reduce potential environmental impacts.

Transport will continue to provide opportunities for the community to participate in the design process. Comments received in response to the EIS exhibition will be considered and the project would be refined as appropriate.

What are the expected key impacts?

The project has sought to avoid or minimise environmental and social impacts through evaluation of alternatives, development of route options and design refinements. However, given the project's size, setting and complexity, there would be impacts on the environment and community during construction and operation. Where impacts are expected, a range of environmental management measures have been developed to manage these impacts. The key impacts of the project, including measures to manage these impacts, are summarised below.

Biodiversity

The concept design was developed to avoid and minimise impacts on biodiversity. A key decision to realign the project was made in 2015 to minimise impacts to wetland areas on the Hunter River floodplain. Where possible, the project has been aligned with existing infrastructure, already-cleared land and along the edges of existing developed land, resulting in minimal impacts to vegetation connectivity. Notwithstanding, the following impacts have been identified:

- Removal of about 174 hectares of native vegetation, including 136 hectares of threatened ecological communities (TEC) listed under the *Threatened Species Conservation Act 1999* (TSC Act)
- Removal of 0.55 hectares of Subtropical and Temperate Coastal Saltmarsh TEC, listed under the EPBC Act
- Impacts to four threatened flora species, including *Diuris arenaria*, *Callistemon linearifolius*, *Eucalyptus parramattensis subsp. decadens* and *Persicaria elatior*, as well as the loss of fauna habitat features which are known to support locally occurring threatened fauna species
- Targeted and opportunistic surveys carried out in 2015, 2016 and 2019 did not identify any evidence of koalas or koala activity within the construction footprint, including within areas identified as potential koala habitat. While the project has avoided impacts to vegetation connectivity where feasible by following the edge of existing vegetation, particularly north of Tomago Road, around 51.12 hectares of vegetation types which contain koala feed tree species would be removed by the project at Tomago and Heatherbrae. With consideration of the broader Port Stephens koala population, the impact of potential koala habitat loss arising from the project is considered low. As the project is located close to existing roads and industrial areas, only minimal impacts on koala movements are expected. Given the position of the project, the findings from the background review, spatial review and field surveys, and the outcomes of the Assessment of Significance, the project is not expected to significantly impact on the Koala.

The assessment has identified all reasonable measures and strategies to avoid and minimise impacts to biodiversity associated with the project. Mitigation measures proposed include the provision of fauna

connectivity structures, fencing to prevent fauna accessing the motorway and revegetation of disturbed areas in accordance with relevant guidelines.

Residual impacts would be offset in accordance with the NSW Biodiversity Offsets Policy for Major Projects and the Framework for Biodiversity Assessment (FBA). Offsets for impacts to marine vegetation have been calculated in accordance with the Fisheries NSW policy and guidelines for saline wetlands vegetation formations. A Biodiversity Offset Strategy has been prepared that outlines how Transport intends to offset the residual impacts of the project.

Noise and vibration

The project is closely aligned to existing infrastructure, including road and rail. Accordingly, sensitive receivers at locations such as Black Hill, Tarro, Tomago and Heatherbrae, are subject to existing noise impacts from existing infrastructure. The project would realign some sections of the existing road network to be located further from some sensitive receivers, particularly around Tarro.

The following key noise and vibration impacts of the project have been identified:

- Construction: Highly intrusive noise impacts are predicted for up to 13 residential receivers closest to the construction work in Tarro during most construction periods when noise intensive plant and equipment are operating. Up to 24 residential receivers in total may be subject to construction noise levels above the Highly Noise Affected threshold (greater than 75 dB(A)). These receivers are all located directly north of the New England Highway in Tarro
- Operation: A total of 189 sensitive receiver buildings (out of 1671 receiver buildings assessed) were identified as being eligible for consideration for additional noise mitigation treatment. The final extent of treatment would be confirmed during detailed design and may include the implementation of quieter pavements, additional noise barriers and at-property mitigation treatment.

A Construction Noise and Vibration Management Plan would be prepared to manage noise and vibration impacts during project construction. The management plan would include consideration of different plant and equipment, scheduling of noise intensive equipment to less sensitive periods (i.e. standard construction hours), noise and vibration monitoring and building surveys.

Hydrology and flooding

To minimise the impacts of the project on hydrology and flooding, the project incorporates a 2.6 kilometre viaduct over the Hunter River floodplain (rather than an embankment), which includes new bridge crossings over the Hunter River and smaller waterways. However, the project would result in some changes to the existing hydrological and flooding characteristics.

The project would improve the trafficability of the road network for all road users, in comparison to the existing case. Modelling of the existing road network indicates that in the 10% AEP event, the New England Highway is cut off at Hexham, while the Pacific Highway is cut off at Hexham and Tomago. Beneficial outcomes from the project include provision of a new flood emergency and evacuation access route (the project itself) between Black Hill and Raymond Terrace with a minimum 5% AEP flood immunity.

Currently, flood depths on the Hunter River floodplain are typically two to 2.5 metres in the 5% AEP event. During construction, the project is expected to result in the following impacts:

- Generally, increases in flood level of between 0.02 and 0.1 metres in the 5% AEP event
- Nineteen lots, with no habitable buildings, have been identified as experiencing increased flood levels above criteria (0.1 metres)
- Five habitable buildings have been identified as experiencing an increase in flood levels of up to 0.08 metres, marginally exceeding the adopted criteria (0.05 metres).

Currently flood depths on the Hunter River floodplain are typically three to 4.5 metres in the 1% AEP event. During operation, the project is expected to result in the following impacts:

- Flood levels in the 1% AEP event generally increase by up to 0.07 metres in some localised areas near Tarro
- Ten lots, with no habitable buildings, have been identified as experiencing increased flood levels above criteria (0.1 metres)
- One habitable building has been identified as experiencing an increase in flood level of up to 0.06 metres, marginally exceeding the adopted criteria (0.05 metres).

The large majority of existing flood-affected residential, commercial and industrial properties would experience a negligible change in flood depth (defined as a 0.01 metre change), flood hazard (combination of depth and velocity) and time of inundation (defined as a change of up to three hours) during operation of the project.

Broadly, the project meets the criteria for flooding impacts and achieves the flood management objectives, which include impacts to afflux (increases in flood levels), flood hazard and flood duration. The assessment has generally targeted maximum afflux of 0.05 metres for impacts to habitable floor levels of buildings and sensitive infrastructure, and 0.1 metres for other land uses.

Prior to construction, environmental management measures would be implemented to manage hydrological impacts, including the preparation of a Flood Management Plan, detailed construction staging plans to minimise flood risk during construction and further refining temporary and permanent works.

Should changes in the detailed design require further flood assessment and continue to show flooding impacts to buildings, Transport would consult with landowners about appropriate management measures to be implemented in relation to each individual property impacted by the project.

Surface and groundwater quality

Generally, existing water quality in waterways and wetlands to which the project would discharge does not meet the nominated NSW water quality objectives (WQOs). Waterways and wetlands surrounding the project are typically high in nutrients and heavy metal concentrations and are representative of a catchment that has been impacted by urbanisation, industrial and commercial use, and land clearing.

During construction, the project is expected to have only minor to negligible impacts on existing water quality. To minimise impacts to surface water and groundwater quality during construction, water quality control measures, such as temporary sediment basins, have been incorporated into the design of the project.

During operation, the project is expected to either be compliant with the NSW WQO Default Guideline values, or be better than existing water quality of the receiving waterways, which would contribute towards achieving the values over time. To minimise impacts to the Tomago Sandbeds, the design includes lined water quality controls in this location to avoid infiltration of road runoff. The project has also been designed so runoff drains outside of the area of influence of the drinking water borefields.

Further, an assessment of the likely construction and operational water quality impacts at the Hunter Estuary Wetlands Ramsar site at Kooragang Island has confirmed the project is not likely to present any long-term risk to the health of the site. In most events, the NSW WQOs are met as the relatively small contribution of water from basin discharges would be diluted in the Hunter River.

A surface water and ground water monitoring program will be implemented as an environmental management measure to observe any changes in surface water and groundwater quality that may be attributable to the project and inform appropriate management responses.

Aboriginal heritage

Extensive engagement with the local Aboriginal community, including archaeological investigations, was carried out during project development and has improved the knowledge of Aboriginal cultural heritage in the locality of the project. The project would impact 26 Aboriginal sites across the construction footprint, comprising both whole and partial impacts. Management measures to control impacts to Aboriginal sites have been developed in consultation with the local Aboriginal community and include the collection of surface artefacts, salvage excavation, exclusion fencing, artefact analysis and long term management of collected artefacts.

Soils and contamination

Historical and existing contamination within and adjacent to the project footprint was identified through database and literature reviews, field investigations and laboratory analysis. The key soils and contamination impacts of the project are generally applicable to the construction phase, with no ongoing impacts expected during operation. The key issues identified are:

- Exposure of potential and actual acid sulfate soils, especially within the low lying floodplain areas next to the Hunter River and Windeyers Creek
- Erosion and sedimentation through vegetation removal and disturbance of the ground surface
- Disturbance of existing contamination, including four high risk areas of potential contamination identified within the construction footprint (these being asbestos waste at Tarro, the former mineral sands processing facility at Tomago, potentially contaminated Hunter River sediments and locations where construction works may disturb acid sulfate soils)
- Issues associated with naturally occurring radioactive material at the former mineral sands processing facility located in Tomago.

A range of environmental management measures are proposed to manage the impacts of the project on soils and contamination, including measures to control soil disturbance, including acid sulfate soils. To manage impacts at the former mineral sands processing facility, a remediation action plan will be developed in consultation with EPA and an independent site auditor prior to construction on the site.

How would the expected impacts be managed?

This EIS identifies a comprehensive range of environmental management measures to avoid, manage, mitigate, offset and/or monitor impacts during construction and operation of the project. These include construction and environmental management plans, noise mitigation measures, water quality controls (such as basins) and urban design and landscaping treatments. Further opportunities to minimise the environmental and social impacts of the project are likely to be identified during detailed design, construction planning and in consultation with the community and relevant stakeholders. The conditions of approval for the project may also identify additional management measures to be implemented by the project.

Why is an EIS required?

The project is declared to be critical State significant infrastructure (CSSI) under Section 5.13 of the EP&A Act as it is considered essential for the State for economic, environmental or social reasons.

In October 2015, a State Significant Infrastructure application was submitted to the former Department of Planning and Environment (DPE), now the Department of Planning, Industry and Environment (DPIE), for the project. In November 2015, the Secretary's Environmental Assessment Requirements (SEARs) for the project were issued (and re-issued in December 2017).

The SEARs were then revised on 20 March 2019 to reflect the Commonwealth decision that the project is a controlled action under the EPBC Act. This EIS has been prepared to address the specific matters raised in the revised SEARs.

Why is a referral to the Australian Government required?

Under the EPBC Act, proposed 'actions' that have the potential to significantly impact on matters of national environmental significance (MNES) or the environment of Commonwealth land, or are being carried out by a Commonwealth agency, must be referred to the Australian Government. If the Australian Minister for the Environment determines that a referred project is a 'controlled action', the approval of that Minister is required for the project, in addition to the approval from the NSW Minister for Planning and Public Spaces.

The project was referred to the former Commonwealth Department of the Environment (now the Department of Agriculture, Water and the Environment) and determined on 14 January 2019 to be a controlled action by the Australian Minister for the Environment (under Section 75 of the EPBC Act) due to its potential for significant impact on listed threatened species and communities (Sections 18 and 18A of the EPBC Act).

The NSW Government confirmed the action will be assessed under the "Bilateral agreement made under Section 45 of the EPBC Act relating to environmental assessment between Commonwealth of Australia and the State of New South Wales" (Bilateral Agreement) (2015). This agreement accredits the assessment process under Division 5.2 of the EP&A Act. If approved by the NSW Government, the Australian Minister for the Environment would then need to issue a separate approval for the project.

How can I comment on the EIS?

DPIE will make the EIS publicly available for a minimum period of 28 days in accordance with the Environmental Planning and Assessment Regulation (2000). During the public exhibition period, government agencies, project stakeholders and community members will be able to review the EIS and provide feedback via a written submission to DPIE for consideration in its assessment of the project.

Advertisements will be placed in newspapers to advise the community of the public exhibition and other relevant information. This will include locations where the EIS can be viewed and details of planned consultation activities and information sessions.

Electronic copies of the EIS will be made available for viewing and download from the DPIE website at **https://planningportal.nsw.gov.au/major-projects**.

A project information phone line will also be available throughout the exhibition period to answer questions from the community relating to the project – **1800 094 895** (toll free). Questions can also be sent by email to **M1RT@jacobs.com**

To provide feedback on the project a person may make a written submission to the Secretary of the DPIE during the exhibition period. All submissions received will be placed on the DPIE website. Submissions should be made to **https://www.planningportal.nsw.gov.au/major-projects/project/10471**.

Written submissions may also be directed to:

Attention: Director – Transport Assessments
Planning & Assessment, Department of Planning, Industry and Environment
Locked Bag 5022, Parramatta NSW 2124

If you post your submission, it needs to be received by DPIE before the close of the exhibition period and include the following:

- Your name and address, at the top of the cover letter only
- If you want DPIE to withhold your personal information before publication, make this clear at the top of your cover letter and do not include personal details in your attached submission
- The name of the application and the application number: **SSI-7319**
- Your submission as a separate attachment
- In your submission include a statement on whether you support or object to the proposal and the reasons why you support or object to the proposal
- A declaration of any reportable political donations made in the previous two years.

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NSW GOVERNMENT

M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Chapter 1: Introduction

Transport for NSW | July 2021

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1. Introduction

This chapter introduces the project, providing a brief outline of its need, scope, and location. It also outlines the structure of this environmental impact statement (EIS).

1.1 The proposed project

Transport for NSW (Transport) proposes to construct the M1 Pacific Motorway extension to Raymond Terrace (the project). Approval is sought under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Part 9, Division 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The project would connect the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace within the City of Newcastle and Port Stephens Council local government areas (LGAs). The project would provide regional benefits and significant productivity benefits on a national scale. The project location is shown in **Figure 1-1** within its regional context.

The project would include the following key features (refer to **Figure 1-2**):

- A 15 kilometre motorway comprised of a four lane divided road (two lanes in each direction)
- Motorway access from the existing road network via four new interchanges at:
  - Black Hill: connection to the M1 Pacific Motorway
  - Tarro: connection and upgrade (six lanes) to the New England Highway between John Renshaw Drive and the existing Tarro interchange at Anderson Drive
  - Tomago: connection to the Pacific Highway and Old Punt Road
  - Raymond Terrace: connection to the Pacific Highway.
- A 2.6 kilometre viaduct over the Hunter River flood plain including new bridge crossings over the Hunter River, the Main North Rail Line, and the New England Highway
- Bridge structures over local waterways at Tarro and Raymond Terrace, and an overpass for Masonite Road in Heatherbrae
- Connections and modifications to the adjoining local road network
- Traffic management facilities and features
- Roadside furniture including safety barriers, signage, fauna fencing and crossings and street lighting
- Adjustment of waterways, including Purgatory Creek at Tarro and a tributary of Viney Creek
- Environmental management measures including surface water quality control measures
- Adjustment, protection and/or relocation of existing utilities
- Walking and cycling considerations, allowing for existing and proposed cycleway route access
- Permanent and temporary property adjustments and property access refinements
- Construction activities, including establishment and use of temporary ancillary facilities, temporary access tracks, haul roads, batching plants, temporary wharves, soil treatment and environmental controls.

A detailed project description and the proposed construction methodology is provided in **Chapter 5**.

The project is one of the last major upgrades required to complete a free flowing dual carriageway route between Sydney and Brisbane along the coastal road route of the National Land Transport Network (NLTN). The other remaining major upgrade proposed along the Pacific Highway corridor is the Coffs Harbour Bypass.

The benefits of the project to the NLTN and the road network in the Hunter Region include:

- Greater road network capacity and improved traffic flow
- Provision of infrastructure for higher productivity vehicles along the NLTN
- Improved flood immunity and accessibility along the NLTN
- Improved route reliability and improvements to major holiday peak flows
- Improved road safety
- Improved accessibility to major employment and commercial centres in the Hunter Region including the City of Newcastle, the Port of Newcastle, Hunter Valley, Newcastle Airport, Tomago, Beresfield and Port Stephens.

The need for the project and project objectives are described in **Chapter 3**.

The project would be funded by the Australian and NSW governments. Subject to project approval and funding availability, construction of the project is proposed to start in 2023 and would take about four to five years to complete, weather permitting.

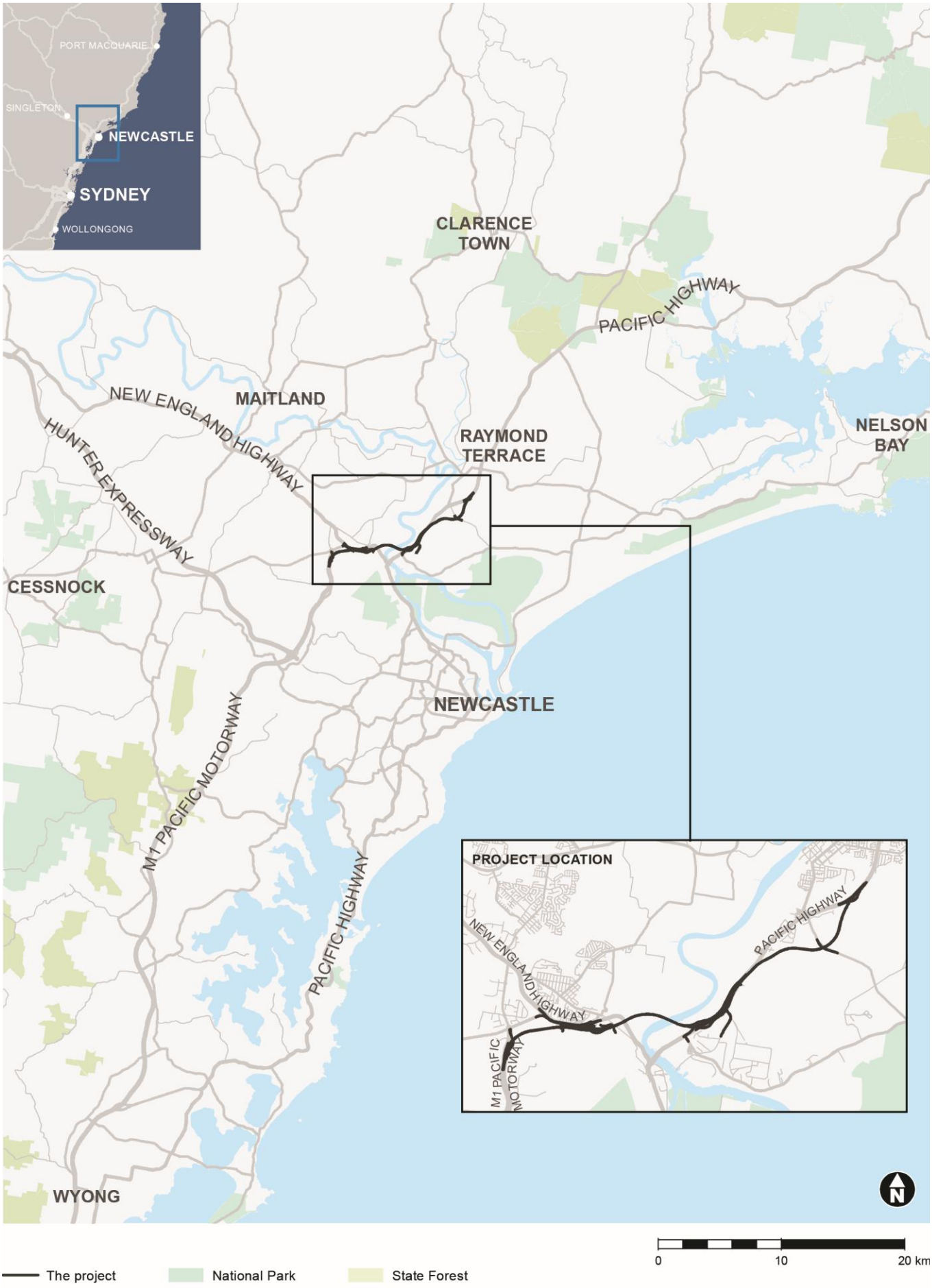

Figure 1-1 Regional context of the project

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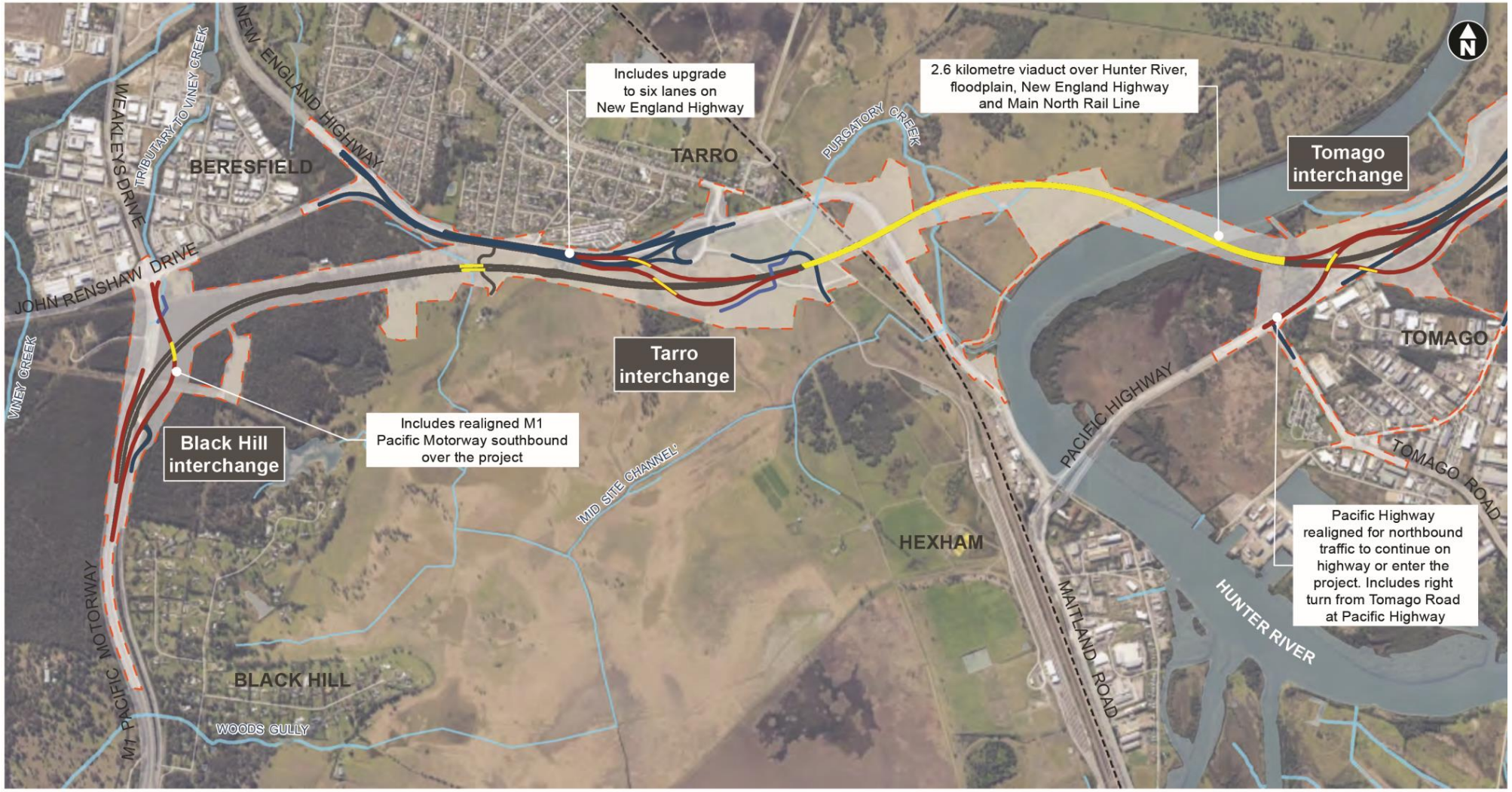

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Figure 1-2 Project key features (map 1 of 2)

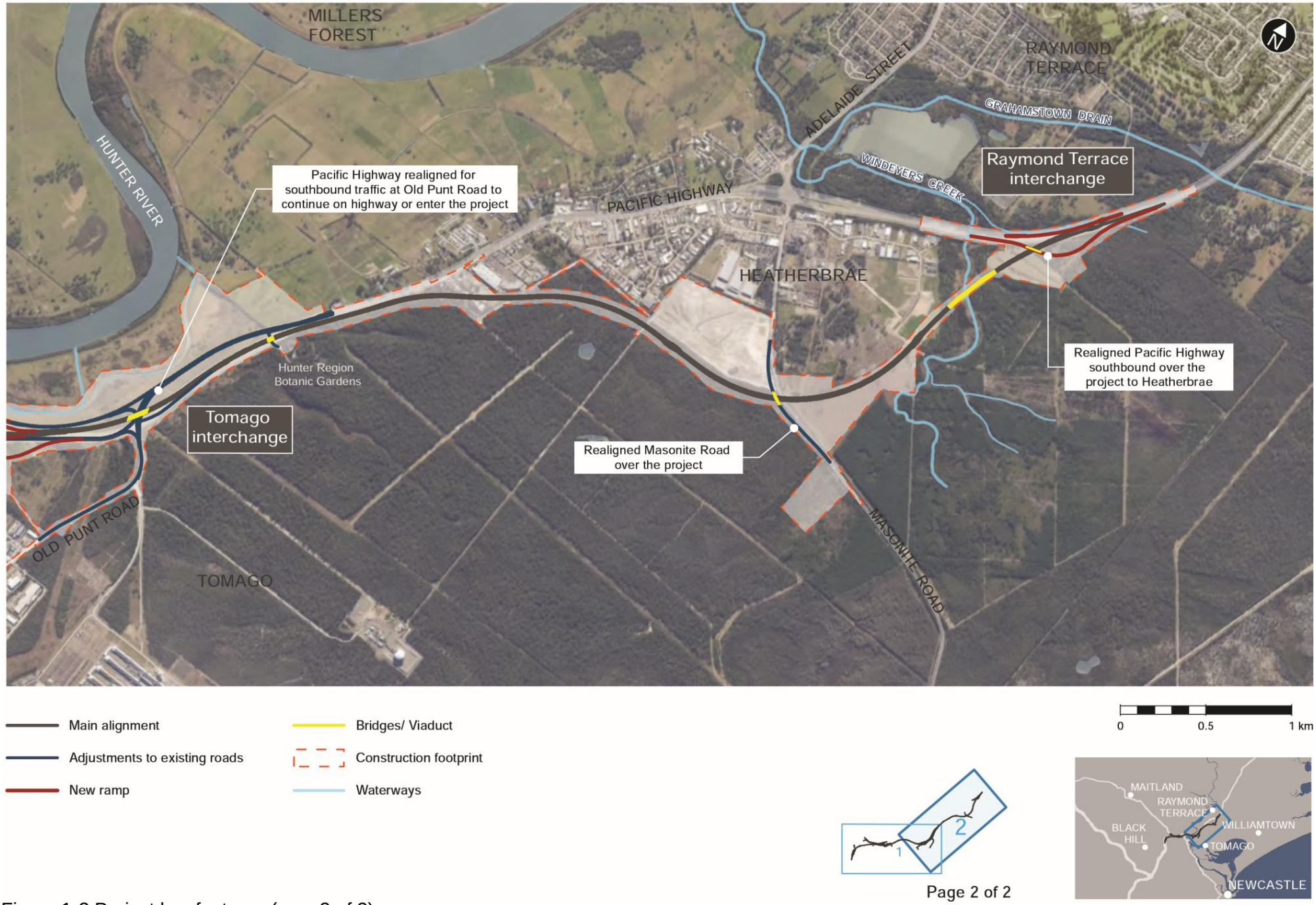

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Figure 1-2 Project key features (map 2 of 2)

1.2 Project location

The project is located in the NSW Lower Hunter region, north of Newcastle as shown in . The southern extent of the project is located about two kilometres south of the John Renshaw Drive and Weakleys Drive intersection and the northern extent of the project is located about 2.3 kilometres north-east of the Masonite Road and Pacific Highway roundabout at Raymond Terrace.

The project is located within the City of Newcastle and Port Stephens Council LGAs and traverses the suburbs of Black Hill, Beresfield, Tarro, Tomago, Heatherbrae and Raymond Terrace.

As shown in **Figure 1-2**, the project is predominantly located in greenfield areas, generally aligning with existing infrastructure and development.

The topography in and around the project includes low rolling hills to the south, the Hunter River and associated flood plain through the central section of the project and sandy, vegetated areas in the northern extent.

Existing features within or surrounding the project include:

- Major roads of state importance, including the M1 Pacific Motorway, John Renshaw Drive, Weakleys Drive, Hunter Expressway (via John Renshaw Drive), New England Highway, Pacific Highway and Tomago Road
- Areas of native vegetation listed as Threatened Ecological Communities (TEC) under the *Biodiversity Conservation Act 2016* (BC Act) and EPBC Act
- Tomago Sandbeds, which form part of the Hunter Water Corporation drinking water catchment and the Tomago Groundwater Management Area, located to the east of Heatherbrae
- Hunter River, associated tributaries and extensive areas of floodplain
- Hunter Region Botanic Gardens at Heatherbrae
- Residential areas of Black Hill, Beresfield, Tarro, Heatherbrae and Raymond Terrace
- Semi-rural and urban areas of Black Hill, Tarro and Heatherbrae
- Light industrial, heavy industrial and commercial areas of Beresfield, Hexham, Tomago and Heatherbrae
- The Hunter Estuary Wetlands Ramsar site and Hunter Wetlands National Park, located to the south of the project.

1.3 Structure of this environmental impact statement

This EIS was prepared to address the requirements issued by the Secretary of the Department of Planning, Industry and Environment (DPIE) (the Secretary) on 20 March 2019 and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

The main EIS is divided into the following chapters:

- **Glossary**: provides a list of terms and abbreviations used throughout this document
- **Executive summary**: provides a summary of the project, overview of key environmental issues and next steps
- **Chapter 1**: **Introduction**: provides a broad overview of the project and where it is located
- **Chapter 2**: **Assessment process**: outlines the statutory requirements and explains the steps in the assessment and approval process
- **Chapter 3**: **Strategic justification and project need**: provides the strategic context, explains the need for the project and identifies the project objectives
- **Chapter 4**: **Project development and alternatives**: reviews the alternatives and options considered in developing the project including the consequences of not proceeding
- **Chapter 5**: **Project description**: provides a detailed description of the project including the project alignment, design standards, key design features and construction methods
- **Chapter 6**: **Consultation**: outlines the consultation activities carried out, the issues raised and how these were addressed
- **Assessment of key issues**: identifies the key environmental issues, assesses the impacts and proposes environmental management measures
  - **Chapter 7**: Traffic and transport
  - **Chapter 8**: Noise and vibration
  - **Chapter 9**: Biodiversity
  - **Chapter 10**: Hydrology and flooding
  - **Chapter 11**: Surface water and groundwater quality
  - **Chapter 12**: Aboriginal cultural heritage
  - **Chapter 13**: Socio-economic
  - **Chapter 14**: Land use and property
  - **Chapter 15**: Urban design, landscape and visual amenity
  - **Chapter 16**: Soils and contamination
  - **Chapter 17**: Non-Aboriginal heritage
  - **Chapter 18**: Air quality
  - **Chapter 19**: Waste
  - **Chapter 20**: Sustainability
  - **Chapter 21**: Climate change risk
  - **Chapter 22**: Safety and risk
  - **Chapter 23**: Cumulative impacts.
- **Chapter 24**: **Summary of environmental management measures**: collates all of the environmental management measures for the project identified through the impact assessment
- **Chapter 25**: **Environmental risk analysis**: details the risk analysis process by which the potential environmental issues for assessment were identified
- **Chapter 26**: **Project justification and conclusion**: presents the justification for the project, including consideration of the principles of ecologically sustainable development and the objects of the EP&A Act
- **Chapter 27**: **Project synthesis**: provides a summary of the project including a compilation of impacts, proposed management measures and justifications for the project
- **Chapter 28**: **References**.

The following appendices are included and support the EIS:

- **Appendix A**: Secretary's environmental assessment requirements and checklist
- **Appendix B**: Environmental Planning and Assessment Regulation 2000 checklist
- **Appendix C**: Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (Commonwealth) checklist
- **Appendix D**: Transport Environment and Sustainability Policy
- **Appendix E**: Community Consultation Framework
- **Appendix F**: Environmental record of proponent
- **Appendix G**: Traffic and Transport Working Paper
- **Appendix H**: Noise and Vibration Working Paper
- **Appendix I**: Biodiversity Assessment Report
- **Appendix J**: Hydrology and Flooding Working Paper
- **Appendix K**: Surface Water and Groundwater Quality Working Paper
- **Appendix L**: Aboriginal Cultural Heritage Assessment Report
- **Appendix M**: Socio-economic Working Paper
- **Appendix N**: Land Use and Property Working Paper
- **Appendix O**: Urban Design, Landscape Character and Visual Amenity Working Paper
- **Appendix P**: Soils and Contamination Working Paper
- **Appendix Q**: Non-Aboriginal Heritage Working Paper
- **Appendix R**: Air Quality Working Paper
- **Appendix S**: Waste Working Paper
- **Appendix T**: Sustainability Working Paper
- **Appendix U**: Climate Change Risk Working Paper.

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2. Assessment process

This chapter describes the planning approval process for the project as well as other relevant environmental planning and statutory approval requirements. **Table 2-1** outlines the Secretary's Environmental Assessment Requirements (SEARs).

Table 2-1 SEARs (assessment process)

Secretary's requirement	Where addressed in EIS
1. Environmental Impact Assessment Process	
1. The Environmental Impact Statement (EIS) must be prepared in accordance with Part 3 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (the Regulation).	The approvals framework, discussion of the EP&A Act and the EP&A Regulation are provided in **Section 2.1**.
2. The project will impact matters of national environmental significance (MNES) protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed in accordance with the NSW Bilateral Agreement (2015). The Proponent must assess impacts to MNES protected under the EPBC Act. The assessment must be in accordance with the requirements listed in Attachment A.	MNES of relevance to the project are listed threatened species and communities (Section 18 and 18A of the EPBC Act). Impacts are discussed in **Chapter 9** (biodiversity). Impacts have been assessed in accordance with the requirements listed in Attachment A of the SEARs (EPBC Act Requirements). Commonwealth legislative requirements are discussed in **Section 2.2.2**.
3. The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	Relevant NSW legislative requirements and how they are addressed are discussed in **Section 2.1.1** and **Section 2.2.1**. Commonwealth legislative requirements are discussed in **Section 2.2.2**.
2. Environmental Impact Statement	
1. The EIS must include, but not necessarily be limited to, the following:	
(p) statutory context of the project as a whole, including:	The approvals framework and statutory context is discussed in **Section 2.1**. The statutory context is further discussed in **Section 2.2**.
– how the project meets the provisions of the EP&A Act and EP&A Regulation;	The provisions of the EP&A Act and EP&A Regulation are discussed in **Section 2.1.1**, **Chapter 26** (project justification and conclusion) and **Appendix B**.
– a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out;	NSW planning approvals are discussed in **Section 2.1.1** and **Section 2.2.1**. The relevance of Commonwealth approvals is discussed in **Section 2.2.2** and **Appendix C**.

2.1 Approval framework

2.1.1 Environmental Planning and Assessment Act 1979

Transport is seeking project approval for the project under Division 5.2 of the EP&A Act.

The project is State Significant Infrastructure (SSI) under Section 5.12 of the EP&A Act and does not require consent under Part 4 of the EP&A Act. The project is also declared to be critical State significant infrastructure (CSSI) under Section 5.13 of the EP&A Act, by virtue of clause 16 and Schedule 5, clause 1(a) of State Environmental Planning Policy (State and Regional Development) (SEPP) 2011.

The project is, therefore, subject to assessment under Division 5.2 of the EP&A Act and requires the approval of the Minister for Planning and Public Spaces under Section 5.14 of the EP&A Act.

In October 2015, an SSI application was submitted to the former Department of Planning and Environment (DPE, now DPIE) for the project. In November 2015, the SEARs for the project were issued (and re-issued in December 2017). The SEARs were then revised on 20 March 2019 to reflect the Commonwealth decision that the project is a controlled action under the EPBC Act. This is discussed further in **Section 2.2.2**. A copy of the SEARs (2019) and an indication of where each requirement is addressed in the EIS is provided in **Appendix A**. SEARs relevant to each key issue are also summarised at the start of each chapter.

This EIS was prepared in accordance with the SEARs (2019) and Part 3 of Schedule 2 of the EP&A Regulation. This includes the project description, alternative options, likely environmental impacts and mitigation measures, and relevant environmental planning approvals and permits. **Appendix B** outlines where each relevant environmental element listed in the EP&A Regulation is discussed within the EIS.

This EIS will be publicly exhibited for at least 28 calendar days, during which time any person (including a public authority) may make a written submission to the Secretary. Once the exhibition period has concluded, the Secretary will provide copies of submissions received or a report of the issues raised in the submissions to Transport and any other public authority the Secretary considers appropriate. The Secretary may then require Transport to submit a response to the issues raised in a Submissions Report and, if required, a Preferred Infrastructure Report (PIR).

The approval process under Division 5.2 of the EP&A Act is illustrated on **Figure 2-1**. Further information on the assessment process is available on the DPIE website (**www.planning.nsw.gov.au**).

Figure 2-1 Approval process under Part 5, Division 5.2 of the EP&A Act and the EPBC Act

2.2 Other legislation

2.2.1 NSW legislation

Legislation that applies to the project

NSW legislation that applies to the project is detailed in **Table 2-2**. Under Section 5.24 of the EP&A Act, certain statutory approvals cannot be refused and must be issued substantially consistent with the CSSI approval, including an Environmental Protection Licence (EPL) under the *Protection of Environment Operations Act 1997* (POEO Act).

Table 2-2 NSW legislation applicable to the project

NSW legislation	Relevance to the project
Threatened Species Conservation Act 1995 (TSC Act) and *Biodiversity Conservation Act 2016* (BC Act)	Prior to August 2017, the TSC Act provided for the protection of biodiversity, including requirements for the protection of threatened species, populations and ecological communities. The TSC Act was repealed and replaced by the BC Act on 25 August 2017. Under clause 28(1) of the Biodiversity Conservation (Savings and Transitional) Regulation 2017, former planning provisions continue to apply to the project as a "pending or interim planning application" as the application for planning approval was made before the commencement of the BC Act. Therefore, in accordance with the SEARs, the TSC Act still applies and the project assessment has applied the Framework for Biodiversity Assessment (FBA). Land clearing, threatened species, and biodiversity offsetting are further discussed in **Chapter 9** (biodiversity).
Native Title (New South Wales) Act 1994	This Act applies to the project on land affected by native title claims in NSW. The Act requires notification to native title claimants affected by the project. Notification was sent to the relevant affected parties on 13 January 2015. This is further discussed in **Chapter 12** (Aboriginal cultural heritage).
Water Management Act 2000 (WM Act)	The WM Act provides for the sustainable and integrated management of the water sources of NSW. An approval under Section 256 (1)(a) of the WM Act is required as the project involves construction of a structure in, on, or adjacent to, a levee bank. An aquifer interference approval under the WM Act would also be required if construction requires intersection of a groundwater source. This is further discussed in **Chapter 10** (hydrology and flooding).
Hunter Water Act 1991	This Act applies to land within the Tomago Sandbeds Catchment Area (special area). The Act specifies the circumstances in which a public agency may exercise its functions within the special area. The regulations prohibit certain activities within the special area except with the approval of the Secretary. Transport has and will continue to consult with Hunter Water Corporation with regard to access and project activities on Hunter Water Corporation land, as discussed in **Chapter 6**.
Protection of the Environment Operations Act 1997 (POEO Act)	An EPL for road construction is required as per Schedule 1 of the POEO Act. In accordance with Section 5.24 of the EP&A Act, such a licence cannot be refused for an approved project and is to be substantially consistent with the Division 5.2 approval.
Land Acquisition (Just Terms Compensation) Act 1991 (Land Acquisition Act)	The Land Acquisition Act relates to acquisition of land by an authority of the State. Under Section 20 of the Act, any land compulsory acquired would be 'freed and discharged from all estates, interests, trusts, restrictions, dedications, reservations, easements, rights, charges, rates and contracts in, over or in connection with the land'. Acquisitions are further discussed in **Chapter 14** (land use and property).

NSW legislation	Relevance to the project
Contaminated Land Management Act 1997 (CLM Act)	The CLM Act outlines the circumstances in which notification to the NSW Environment Protection Authority (EPA) is required in relation to the contamination of land. Contaminated land is further discussed in **Chapter 16** (soils and contamination).
Coastal Management Act 2016	The main objective of the Act is to manage the coastal environment consistently with the principles of ecologically sustainable development. According to the Act, the coastal zone is defined as an area of land comprised of coastal wetlands and littoral rainforests, coastal vulnerability areas, coastal environment areas, and coastal use areas. The considerations of this policy are addressed in **Chapter 10** (hydrology and flooding) and **Chapter 11** (surface water and groundwater quality).
Crown Land Management Act 2016	The Act provides for the ownership, use and management of Crown land in NSW. Ministerial approval is required to grant a 'lease, licence, permit, easement or right of way over dedicated or reserved Crown land'. Crown land is further discussed in **Chapter 14** (land use and property).
Fisheries Management Act 1994	The Act requires written notification to the Minister for any dredging or reclamation works. Refer to **Chapter 11** (hydrology and flooding).

Approvals not required for the project

Section 5.22 of the EP&A Act specifies that environmental planning instruments, including State Environmental Planning Policies (SEPPs), do not apply to projects that are declared SSI. As a result, relevant SEPPs have been considered throughout this EIS but do not strictly apply to the project.

In addition, a number of approvals are not required for a project approved under Part 5, Division 5.2 of the EP&A Act (Section 5.23). Approvals not required for the project include:

- Permits under Section 201, 205 or 219 of the *Fisheries Management Act 1994* (FM Act)
- Approval under Part 4, or an excavation permit under Section 139 of the *Heritage Act 1977* (Heritage Act)
- Aboriginal heritage permit under Section 90 of the *National Parks and Wildlife Act 1974* (NP&W Act)
- A bushfire safety authority under Section 100B of the *Rural Fires Act 1997*
- Water use approvals under Section 89, water management work approvals under Section 90, and activity approvals (other than aquifer interference approvals) under Section 91 of the WM Act.

Section 5.23(2) of Division 5.2 of the EP&A Act precludes the following being made to prevent or interfere with the carrying out of the project once approved:

- Order restricting harm to buildings, works, relics or places that are not the subject of an interim heritage order or listing under the State Heritage Register under Division 8 of Part 6 of the Heritage Act.

Section 5.23(3) of Division 5.2 of the EP&A Act precludes the following being made to prevent or interfere with the carrying out of a CSSI project once approved:

- Interim protection order within the meaning of the NP&W Act
- Order under Division 1 (Stop work orders) of Part 6A of the NPW Act, or Division 7 (Stop work orders) of Part 7A of the FM Act
- Remediation direction under Division 3 of Part 6A of the NP&W Act
- Order or direction under Part 11 of the BC Act
- Environmental protection notice under Chapter 4 of the POEO Act
- Order under Section 124 of the *Local Government Act 1999*.

2.2.2 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act proposed 'actions' that have the potential to impact on MNES or the environment of Commonwealth land, or are being carried out by a Commonwealth agency, must be referred to the Australian Government. If the Australian Minister for the Environment determines that a referred project is a 'controlled action', the approval of that Minister is required for the project in addition to the approval from the NSW Minister for Planning and Public Spaces.

Transport's decision to refer the project to the Australian Government Department of Agriculture, Water and the Environment (DoAWE) was based on the potential impacts to listed threatened species and communities (Sections 18 and 18A of the EPBC Act), specifically the Koala (*Phascolarctos cinereus*) and Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland. Accordingly, the project was referred (EPBC Reference 2018/8288) to the DoAWE on 2 November 2019.

On 14 January 2019, the delegate for the Australian Minister for the Environment confirmed the project is a controlled action (under Section 75 of the EPBC Act) due to its potential for significant impact on listed threatened species and communities (Section 18 and 18A of the EPBC Act). As such, the project requires assessment and approval under the EPBC Act.

The NSW Government confirmed the action will be assessed under the "Bilateral agreement made under Section 45 of the EPBC Act relating to environmental assessment between Commonwealth of Australia and the State of New South Wales" (Bilateral Agreement) (2015). This agreement accredits the assessment process under Division 5.2 of the EP&A Act. The Australian Minister for the Environment would then need to issue a separate approval for the project.

In March 2019, the SEARs were revised to reflect the project being a controlled action (**Appendix A**).

The approval process under the EPBC Act is illustrated on **Figure 2-1**. Further information on the assessment process is available on the DoAWE website (**https://www.environment.gov.au/epbc**).

Native Title Act 1993

One of the main objectives of the *Native Title Act 1993* is to recognise and protect native title. Section 8 states that the Act is not intended to affect the operation of any law of a State or Territory that is capable of operating concurrently with the Act. Searches of the register maintained by the National Native Title Tribunal indicate that there was one native title claim registered with respect to land within the area of the project, however this claim has now been withdrawn.

In the event of a registered claim, notification requirements under Section 24KA of the *Native Title Act 1993* apply where construction work is required on Crown land and where the land has not been acquired by Transport. Notification in accordance with this section will occur concurrently with the public display of the EIS. This is further discussed in **Chapter 12** (Aboriginal cultural heritage).

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3. Strategic justification and project need

This chapter outlines the relationship of the project and the strategic planning framework. It also identifies the need for the project and the project objectives. A statement of strategic need concludes the chapter.

Table 3-1 sets out the SEARs that relate to the strategic context and need for the project and identifies where these SEARs are addressed in this EIS.

Table 3-1 SEARs (strategic justification and project need)

Secretary's requirement	Where addressed in EIS
2. Environmental Impact Statement	
1. The EIS must include, but not necessarily be limited to, the following:	
(c) a statement of the objective(s) of the project	The primary objectives of the project are provided in **Section 3.3**
(d) a summary of the strategic need for the project with regard to its State significance and relevant State Government policy	The strategic need for the project with relevance to NSW and Australian strategic planning and policy framework is discussed throughout **Chapter 3**. An overall statement of strategic need is provided in **Section 3.4**.

3.1 NSW and Australian strategic planning and policy framework

This section describes the strategic justification for the project, considering the consistency of the project with key strategic planning and policy documents.

3.1.1 NSW State Infrastructure Strategy 2018-2038

The NSW State Infrastructure Strategy 2018-2038 (Infrastructure NSW 2018) (the SIS) sets out the NSW Government's priorities for the next 20 years, and combined with the Future Transport Strategy 2056, the Greater Sydney Region Plan and the Regional Development Framework, brings together infrastructure investment and land-use planning for NSW cities and regions.

The SIS identifies a number of key actions to connect people and places, including a number of recommendations designed to improve the efficiency of regional and interstate transport connections. The project aligns with the SIS by providing benefits such as improving travel times and improving road safety. The SIS identifies Hexham and Heatherbrae as a priority area of the National Land Transport Network (NLTN), and identifies the project as one of the last major upgrades required along the Pacific Highway to compete a high-quality, free flowing route. The NLTN is a national network of important road and rail infrastructure determined under the Commonwealth *National Land Transport Act 2014*. Roads within the project which form part of the NLTN are identified on **Figure 3-1**.

The SIS identifies key restrictions across the NLTN, including restricted access for high productivity freight vehicles, flood immunity issues, and narrow bridges, road shoulder, and clear zones. Recommendation 41 of the SIS highlights the need for investment towards freight productivity upgrades on key routes linking the NLTN. The project would enable access by high productivity vehicles (HPVs) along the project and along the M1 Pacific Motorway and the Pacific Highway corridor from Sydney to Brisbane, providing significant productivity benefits to freight operators. The project is considered a critical link in the NLTN, particularly for the coastal Sydney to Brisbane corridor.

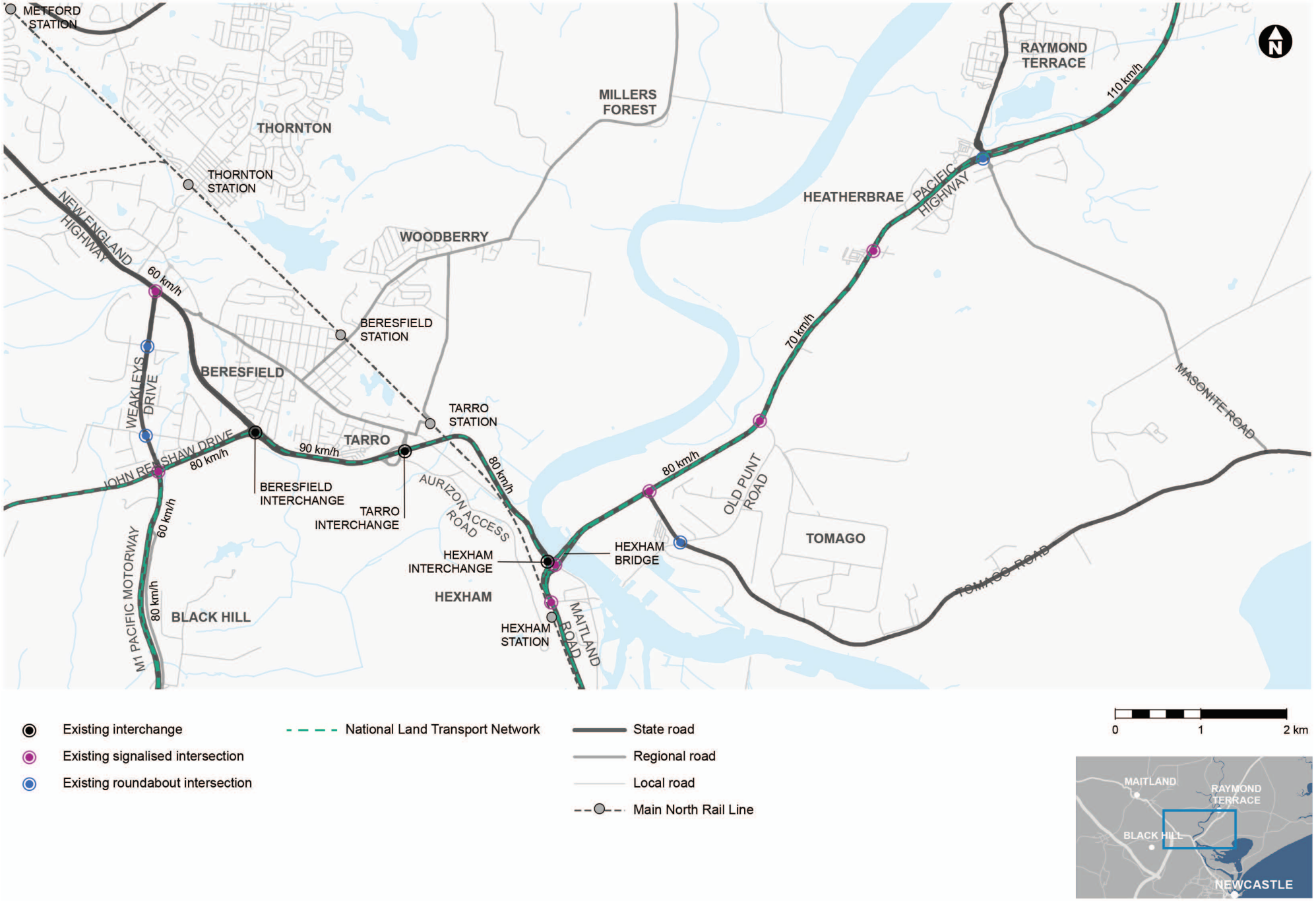


Figure 3-1 Existing road and rail infrastructure

3.1.2 Future Transport Strategy 2056

The Future Transport Strategy 2056 (Transport for NSW 2018a) underpins and supports the SIS and sets the 40-year vision, strategic directions and outcomes for customer mobility in NSW. It is delivered through a series of supporting plans, including the Regional NSW Services and Infrastructure Plan which is further underpinned by supporting plans. The relevant supporting plans include the Greater Newcastle Future Transport Plan, Road Safety Plan 2021, NSW Freight and Ports Plan 2018-2023 and Tourism and Transport Plan.

To support these outcomes, the strategy contains policy, service and infrastructure (road, rail, active) improvements and potential initiatives. The project is identified in the Greater Newcastle Future Transport Plan as a committed initiative over the next 10 years. The project will help meet a number of outcomes including:

- Growing the economy, by helping connecting people and places in growing regions
- Safety and performance, by helping to safely, efficiently and reliably move people and goods
- Sustainability, by making the best use of available resources and assets.

3.1.3 NSW Freight and Ports Plan 2018-2023

With NSW freight task set to grow by 28 per cent by 2036, a continued focus is required on the freight sector. The NSW Freight and Ports Plan 2018-2023 (Transport for NSW 2018b), as a supporting plan to the Future Transport Strategy 2056, is central to the NSW Government's long-term vision for freight transport to be more efficient, more accessible, safer and more sustainable for the benefit of producers, operators, customers and communities across NSW.

The NSW Freight and Ports Plan 2018-2023 identifies the freight routes between the M1 Pacific Motorway and Raymond Terrace, as well as the New England Highway at Hexham as key initiatives to improve the capacity of the freight network in the next five to10 years (between 2023 and 2028).

One of the key objectives of the plan is to increase efficiency, connectivity and access by improving the efficiency of existing infrastructure and ensuring greater connectivity and access along key freight routes. The project has been identified in the plan as one of the NSW Government's actions to address this objective. The project would provide a more efficient route between the M1 Pacific Motorway and the Pacific Highway and provide better access for HPV's to key employment areas such as Tomago, Beresfield, Black Hill and the Port of Newcastle.

Moving More with Less (Transport for NSW 2018c) is a policy framework established to support the NSW Freight and Ports Plan 2018-2023. The framework outlines the strategic approach for implementing HPV's on the road network and identifies the necessary network upgrades required. Moving More with Less states that it is desired to have the state-wide freight network gazetted as of right access to Performance Based Standard (PBS) 2B vehicles within the next five to10 years (between 2023 and 2028). Currently the road network in the Hexham/ Sandgate/ Tomago area is not able to cater for HPV's due to the height and weight restrictions imposed by the Pacific Highway southbound bridge crossing the Hunter River. The load carrying capacity of the bridge is limited to B-Doubles at higher mass limits of up to 68 tonnes. High productivity vehicles such as PBS 2B A-Doubles of up to 91.5 tonnes are not permitted to use the bridge. The project is consistent with the key policy outcomes of the framework as it would provide an alternative route to the existing, constrained road network, allowing free movement of HPVs (including PBS 2B vehicles) and offering improved freight connectivity.

3.1.4 Road Safety Plan 2021

The Road Safety Plan 2021 (Transport for NSW 2018d) details the NSW Government's commitment to improving safety on NSW roads. The key target relevant to the project is road safety, with road safety targets for:

- 2021: Reduce road fatalities by at least 30 per cent from 2008‑2010 levels (State Priority Target)
- 2056: Zero fatalities and serious injuries on roads.

The delivery of the project is consistent with the goals of the Road Safety Plan 2021. The project is expected to reduce casualty crash rates on the existing, surrounding state road network (refer to **Section 3.2.6**), as discussed in **Chapter 7** (traffic and transport).

3.1.5 Regional NSW Services and Infrastructure Plan

The Regional NSW Services and Infrastructure Plan (NSW Government 2018) is a supporting study to the Future Transport Strategy 2056 which focuses on regional centres throughout NSW. The Regional NSW Services and Infrastructure Plan aims to produce a modern multi-modal freight transport network and identify the need to lift freight productivity above previous results as a key objective. This was to be achieved through enabling the use of HPV's throughout the regional network. Currently the road network in the Hexham/Sandgate/Tomago area is not able to cater for HPV's due to the height and weight restrictions imposed by the Pacific Highway southbound bridge crossing the Hunter River, as discussed in **Section 3.1.3**. The project would enable the use of high productivity vehicles through this section of the network.

3.1.6 Australian Infrastructure Plan and Priority List

The Australian Infrastructure Plan (the Plan) (Infrastructure Australia 2016) sets out the infrastructure challenges and opportunities that Australia faces over the next 15 years and the solutions required. The Plan was informed by a comprehensive review of existing and required infrastructure over the coming decades. The Plan has four main themes:

- Productive cities, productive regions
- Efficient infrastructure markets
- Sustainable and equitable infrastructure
- Better decisions and better delivery.

The Infrastructure Priority List (Infrastructure Australia 2021), which is part of the Plan, is designed to give guidance to decision makers and provide transparency for industry and the community. It is a 'rolling' list that is updated periodically as proposals move through development and delivery and in response to emerging challenges and opportunities.

The 2021 Infrastructure Priority List identifies the project as a priority initiative. The priority list identifies that the existing network consists of at-grade intersections that stifles the network speeds, thereby reducing economic performance. It also notes that the existing network does not cater for HPVs. The priority list provided an indicative timeframe for this project as zero to five years.

The 2021 Infrastructure Priority List is available on the Infrastructure Australian website: **https://www.infrastructureaustralia.gov.au/publications/Infrastructure_Priority_List_2021**.

3.1.7 National Freight and Supply Chain Strategy

The National Freight and Supply Chain Strategy (Transport and Infrastructure Council 2019) is the national approach to Australia's freight and supply chains. This strategy builds on the foundation laid through the National Ports Strategy (Australian Government 2012) and National Land Freight Strategy (Australian Government 2013), and expands freight and supply chain networks as an integrated whole. The strategy sets an agenda for government and industry action across all freight modes over the next 20 years and beyond and is supported by the National Action Plan which details key actions to be delivered by government to achieve the goals of the Strategy. The strategy commits to action in four critical areas:

- Smarter and targeted infrastructure
- Enable improved supply chain efficiency
- Better planning, coordination and regulation
- Better freight location and performance data.

The project would improve access to major freight gateways to support the critical area of smarter and targeted infrastructure investment. The project has been designed to accommodate heavy vehicles and will increase efficiency in freight movements between Sydney and Brisbane.

3.1.8 National Road Safety Strategy 2011-2020

The National Road Safety Strategy 2011–2020 aims to identify initiatives to improve the safety of Australia's roads (Australian Transport Council 2011). The strategy aims to reduce the annual number of road crash fatalities and serious road crash injuries by at least 30 per cent by the end of 2020.

The project would provide the opportunity to reduce crashes, as it would improve the design of the existing M1 Pacific Motorway, including a dual carriageway with a median, an improved road alignment, wider lanes and shoulders and grade separated interchanges, and would reduce traffic volumes on the existing road network. By improving road safety, the project would directly support the aims of the National Road Safety Strategy 2011–2020.

3.1.9 Lower Hunter Regional Strategy 2006-2031

The Lower Hunter Regional Strategy (NSW Department of Planning 2006) represents an agreed NSW Government position on the future of the Lower Hunter. It is the primary planning document for the Lower Hunter Region and has been prepared to complement and inform other relevant State planning instruments.

The project aligns with the Lower Hunter Regional Strategy by improving traffic movement through the lower Hunter to facilitate the increase in traffic anticipated due to growth in housing and employment lands in the area.

3.1.10 Hunter Regional Plan 2036

The Hunter Regional Plan 2036 (DPE 2016) is the NSW Government's strategy for guiding land use planning decisions for the Hunter Region for a period of 20 years from 2016.

The Hunter Regional Plan's vision recognises that infrastructure investment is an important factor for economic development across the Hunter. It supports freight, health and education services, agribusiness and tourism, as well as building resilience to global economic cycles and climate change.

The plan sets four goals and a number of directions to achieve the vision 'to create a leading regional economy in Australia, with a vibrant metropolitan city at the heart'. Direction 4 (enhance inter-regional linkages to support economic growth) specifically recognises the need to extend the M1 Pacific Motorway to Raymond Terrace.

3.1.11 Hunter Regional Transport Plan

The Hunter Regional Transport Plan (NSW Government 2014a) and Hunter Regional Transport Plan Update (NSW Government 2016a) identify the need to ensure the efficient movement of freight within the Hunter region. Key transport challenges identified in the Hunter Regional Transport Plan which are relevant to the project include:

- Accessibility to regional facilities, such as education, health, jobs and Newcastle Airport
- Road congestion and safety
- Freight capacity constraints on the road and rail networks
- Impact of freight transport on towns
- Improving connections between smaller towns to regional centres.

The project would address these challenges by improving access to facilities within the Lower Hunter region, including to the Newcastle Airport and key employment areas. The project would also improve access for HPV's and heavy vehicles within the road network and improve road safety. The Hunter Regional Transport Plan identifies the project as a medium to long-term initiative which would provide an important link for freight. In addition, the Hunter Regional Transport Plan identifies a commitment to maintaining a high quality road corridor between Sydney and Brisbane to support anticipated growth. The project is one of the last major upgrades required to complete a high quality route between Sydney and Brisbane.

The Hunter Regional Transport Plan notes that the M1 Pacific Motorway and the Pacific Highway can experience congestion associated with daily peak periods and holiday periods and identifies a commitment to plan for the project to ensure efficient freight movement. The project will substantially reduce travel times in both the morning and evening peaks, including during holiday periods. The project will also provide a route which reduces the overall freight transport time and cost for heavy vehicles along the major north-south and east-west connections.

3.1.12 Greater Newcastle Future Transport Plan

The Greater Newcastle Future Transport Plan (Transport 2018e) is a supporting study to the Future Transport Strategy 2056 (Transport 2018a) and provides the overarching strategic transport network and vision that will guide future transport planning for the Greater Newcastle area. The plan builds on the platform being established to increase liveability in Greater Newcastle through more sustainable travel behaviour.

The plan identifies that the population within the metropolitan Newcastle area is expected to increase over the next forty years. Transport service planning is required to respond to this population change, with one of the key outcomes of the Plan being to improve connection to jobs, services and recreation. The project would support this objective by increasing the connection, travel time and safety of key roads within the Greater Newcastle area, including the M1 Pacific Motorway, which the plan identifies as important in providing through connections within Greater Newcastle.

The project would also support expansion of Newcastle Airport, which the plan identifies as currently expanding. The project improves access, and the movement of freight through Greater Newcastle, which the Plan identifies as important to the economic function and development of the Hunter region and New South Wales.

Upgrades to the strategic network of primary freight routes comprising the New England Highway, M1 Pacific Motorway through to the Pacific Highway at Raymond Terrace and the strategic junction with the New England Highway and Hexham Straight are identified as committed initiatives within this plan.

3.1.13 City of Newcastle Local Strategic Planning Statement

The City of Newcastle Local Strategic Planning Statement (City of Newcastle 2020) is the City of Newcastle's plan to guide land use planning from 2020 to 2040. The Beresfield to Black Hill area is classified as a catalyst area under this plan, as it is ideally positioned to be a leading freight and logistics hub with easy access to the M1 Pacific Motorway, Hunter Expressway, Newcastle Port and Newcastle Airport. The project would support this by providing improved road conditions and connections between Black Hill and Beresfield.

3.1.14 Raymond Terrace and Heatherbrae Strategy 2015-2031

The Raymond Terrace and Heatherbrae Strategy 2015-2031 (Port Stephens Council 2015) provides a series of goals and actions for Raymond Terrace. Port Stephens Council's vision for Raymond Terrace is for it to be a 'strong regional centre and a great place to live, work and play'.

Goal 1 of the Raymond Terrace and Heatherbrae Strategy is to achieve a 'competitive economy with regional services, including transport, health, justice, government, commercial, retail, industrial and entertainment'. Direction 1.2 of the strategy is to enhance 'transport and mode connectivity, including road, public transport, footpath and cycleway connections within Raymond Terrace and Heatherbrae'.

The project is consistent with these goals and directions as it would provide road infrastructure which would improve accessibility and connectivity between the M1 Pacific Motorway at Beresfield and the Pacific Highway at Raymond Terrace. The project would reduce congestion within the local road network and improve connections for public transport, pedestrians and cyclists.

3.2 Project need

This section provides a description of the strategic context and a summary of the existing transport conditions which demonstrate the need for the project.

3.2.1 Overview

The M1 Pacific Motorway was constructed to provide access between Sydney and Newcastle, and was completed in 1998. Construction of the Pacific Highway bypass of Raymond Terrace was also completed in 1998.

The Pacific Highway and New England Highway between the M1 Pacific Motorway at Black Hill and Raymond Terrace form part of the NLTN. The project is located along this key freight route facilitating substantial interstate freight movements between NSW, Victoria and Queensland, and particularly the freight task between Sydney, the Hunter region, northern NSW and Queensland.

The project is in one of the most highly trafficked areas of the road network in the region and is more heavily congested than adjacent high standard sections of the M1 Pacific Motorway and Pacific Highway corridor. Key issues along the M1 Pacific Motorway, Pacific Highway, and New England Highway corridors applicable to the project include:

- High traffic volumes on the New England and Pacific Highways, the M1 Pacific Motorway and John Renshaw Drive and congestion on these highly-trafficked routes
- Major delays caused at controlled intersections and merge/diverge locations combined with high traffic demand
- Road safety
- Restrictions on heavy vehicle movements
- Accessibility for freight to major nearby existing and future employment areas
- Flood immunity of existing road corridors.

The project would help integrate the needs of the Hunter Region's road network with those of the broader NLTN. By providing one of the last major upgrades required to complete a free flowing dual carriageway route between Sydney and Brisbane, the project would improve traffic efficiency and congestion caused by the interaction of high volumes of National, interstate, regional and local traffic on the currently constrained road network. The project would further promote connectivity between key residential and employment areas, improve road safety and improve flood immunity in this section of the road network (refer to **Section 3.3** and **Chapter 26** (project justification and conclusion)).

3.2.2 National context

The New England Highway and the Pacific Highway between the M1 Pacific Motorway at Black Hill and Raymond Terrace form part of the NLTN (refer to **Figure 3-1**), which is a defined national network of important road and rail infrastructure links.

The two roads facilitate significant interstate freight movements between NSW, Victoria and Queensland, and intrastate movements between Sydney, the Hunter region and northern NSW.

The project is one of the last remaining major upgrades required to complete a free flowing dual carriageway route between Sydney and Brisbane along the coastal route of the NLTN. The other remaining major upgrade proposed along the Pacific Highway corridor is the Coffs Harbour Bypass (currently in the pre-construction phase).

3.2.3 Pacific Highway upgrade program

The upgrade of the Pacific Highway is one of the largest road infrastructure programs in NSW. The Pacific Highway forms part of the NLTN, connecting Sydney and Brisbane, and is a major contributor to Australia's economic activity. The Australian and NSW governments have been jointly upgrading the Pacific Highway to provide a four-lane divided road from Hexham to Queensland since 1996. By the end of 2020, the majority of the Pacific Highway north and south of Coffs Harbour will be upgraded to a posted speed limit of 100 or 110 kilometre per hour.

Although the project will not be delivered under the Pacific Highway upgrade program, completion of the project will contribute to fully realising the benefits of the program. As outlined in **Section 3.2.2**, there are only two locations on the east coast corridor linking Sydney to Brisbane where the route is an urban road with traffic signals – at Coffs Harbour and at Black Hill, Hexham, Tomago and Heatherbrae. The project, together with Coffs Harbour bypass, would provide the remaining major upgrades to complete a free flowing dual carriageway route between Sydney and Brisbane.

3.2.4 Existing road network conditions and performance

The M1 Pacific Motorway is a key north-south corridor linking Sydney to the Central Coast, Newcastle and Hunter region. It is a dual carriageway road with two lanes in each direction and a 110 kilometre per hour speed limit.

Existing road infrastructure surrounding the project is shown on **Figure 3-1**. The current alignment between the M1 Pacific Motorway at John Renshaw Drive and the Raymond Terrace Bypass is not free flowing, does not meet motorway standards and is a congestion point on the NLTN. Constraints to the safe and effective operation of the road network are shown on **Figure 3-1** and include:

- Traffic lights along the route at the following intersections:
  - M1 Pacific Motorway, Weakleys Drive and John Renshaw Drive
  - New England Highway, Maitland Road and Pacific Highway
  - Pacific Highway and Tomago Road
  - Pacific Highway and Old Punt Road
  - Pacific Highway and Hank Street.
- The roundabout at the Pacific Highway and Masonite Road intersection
- Geometric constraints, including undesirable merging arrangements from John Renshaw Drive onto the New England Highway at Beresfield, and tight curves northbound on the existing bridge over the Hunter River
- Varied speed limits along the route
- Adjoining land use development with direct access.

Traffic volumes

Demand on the existing NLTN (shown on **Figure 3-1**), linking the M1 Pacific Motorway with the Pacific Highway and the New England Highway, is very high. The key routes with the highest traffic volumes are the New England Highway, Pacific Highway, M1 Pacific Motorway and John Renshaw Drive (east of the M1 Pacific Motorway). Traffic volumes recorded along these roads were:

- M1 Pacific Motorway: about 40,000 vehicles per day, south of John Renshaw Drive
- Pacific Highway: about 52,000 vehicles per day, north of Hexham Bridge
- New England Highway: about 61,000 vehicles per day, north-west of the Pacific Highway
- John Renshaw Drive: about 32,000 vehicles per day, east of the M1 Pacific Motorway.

The project location is one of the most highly trafficked areas of the road network in the region and along the Sydney to Brisbane corridor. The regional road network, serving the broader Newcastle and Hunter Valley areas from the project location, also experiences high traffic demand. The current road network requires long distance freight travel and commuting regional traffic to interact and travel on the same road network.

The Pacific Highway north of the Hunter River has its highest peak flows between the Hunter River and Tomago. This area of the network is constrained and congested due to capacity constraints at the older southbound bridge and traffic signals at the intersection with the New England Highway.

Traffic volumes at the northern end of the M1 Pacific Motorway at its junction with John Renshaw Drive and Weakleys Drive exhibit constrained capacity due to the high demand from all intersection directions, which causes substantial queueing and delay. This intersection was upgraded to traffic signals under the M1 Productivity Package (funded by the Australian and NSW Governments) as part of a separate project, to improve the operational performance of the former roundabout. The Weakleys Drive and John Renshaw Drive intersection upgrade was completed in March 2019.

It is anticipated with continued economic growth in the immediate vicinity of the project and that this part of the network is affected from growth across a broad area that traffic volumes will continue to grow into the future. Refer to **Section 3.2.7** for further discussion on future economic growth.

Traffic volumes across the road network are shown on **Figure 3-2** and are discussed in further detail in **Chapter 7** (traffic and transport) and the Traffic and Transport Working Paper (**Appendix G**).

Travel times

The existing road network has controlled intersections (traffic signals and roundabouts) and speed limits lower than the desirable motorway speeds of 100 to 110 kilometres per hour. These factors decrease the performance for travel time through the area, including freight movements. There are currently six controlled intersections along the Pacific Highway corridor between Black Hill and Raymond Terrace.

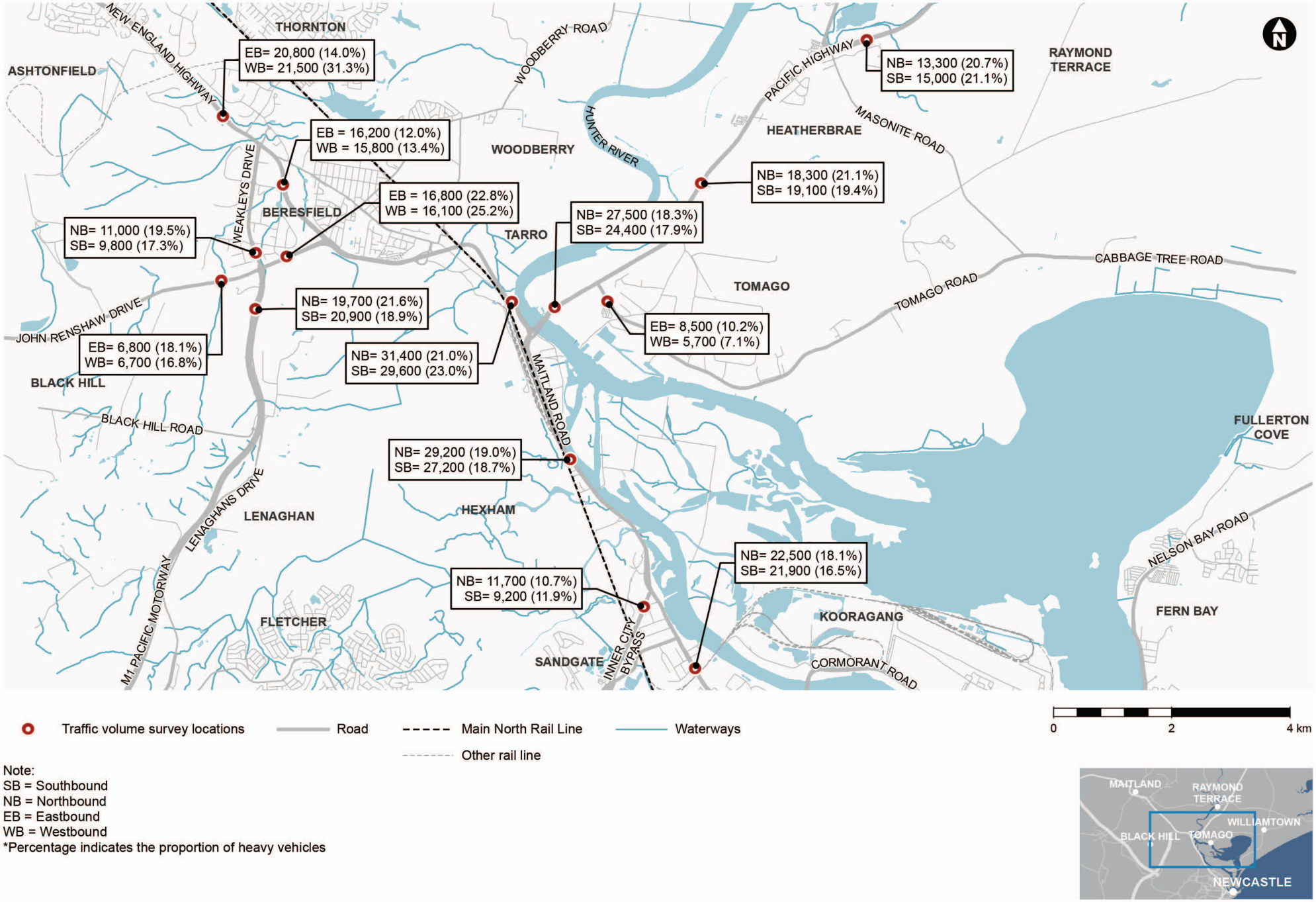
Existing peak period travel times are presented in **Table 3-2**.

Table 3-2 Existing travel times during peak periods

Route		Distance (km)	Average travel time (min:sec)		Average travel speed (km/h)	
From	To		Morning peak	Evening peak	Morning peak	Evening peak
New England Highway	Maitland Road	12.5	14:55	11:59	50	63
	Pacific Highway	16.3	13:26	13:26	73	73
M1 Pacific Motorway		20.7	16:52	16:52	74	74
John Renshaw Drive		18.0	15:13	15:13	71	71
Pacific Highway	New England Highway	16.6	16:26	16:26	61	61
	M1 Pacific Motorway	20.9	19:31	19:31	64	64
	John Renshaw Drive	18.2	17:24	17:24	63	63
	Maitland Road	16.0	14:06	13:46	56	57
Maitland Road	Pacific Highway	16.0	13:25	14:45	59	54
	New England Highway	13.5	12:24	13:11	61	57

Along the routes, the posted speed limit is generally 80 kilometres per hour with a section through Heatherbrae at 70 kilometres per hour and the New England Highway west of Tarro interchange at 90 kilometres per hour. **Table 3-2** indicates that current travel times are substantially below the posted speed limit (about 15 kilometres per hour) for southbound movements along the corridor.

Further information regarding existing travel times is provided in **Chapter 7** (traffic and transport) and the Traffic and Transport Working Paper (**Appendix G**).



Note:
SB = Southbound
NB = Northbound
EB = Eastbound
WB = Westbound
*Percentage indicates the proportion of heavy vehicles

Figure 3-2 Existing traffic volumes

Intersection performance

Key intersections within the project area and current performance issues include:

- M1 Pacific Motorway/John Renshaw Drive/Weakleys Drive: During peak periods, there is high demand from all legs of the intersection
- New England Highway/Pacific Highway (Maitland Road): During peak periods major delays occur on all legs of the intersection due to very high traffic demand along the New England Highway and Pacific Highway corridors. Congestion is caused by the high right-turn demand from the Pacific Highway, causing all New England Highway traffic to be stopped
- Pacific Highway/Tomago Road: The intersection has high traffic demand along the Pacific Highway and is impacted by the industrial peak traffic demand to/from Tomago industrial area
- John Renshaw Drive/New England Highway: A major merge point where northbound and eastbound traffic from the M1 Pacific Motorway and the New England Highway traffic merge. It currently performs poorly due to the unconventional nature of the right to left merge and the high traffic demand.

Further information regarding existing intersection performance is provided in the Traffic and Transport Working Paper (**Appendix G**) and **Chapter 7** (traffic and transport).

3.2.5 Network freight efficiency and capacity

The existing rail and road network provides important links for freight transport through the project. Major freight activity precincts and routes located near the project are shown on **Figure 3-3**.

The Pacific Highway, New England Highway and the Hunter Expressway form part of the NLTN. In addition to facilitating substantial interstate freight movements between Victoria, NSW and Queensland, these roads provide the primary access to the City of Newcastle, Port of Newcastle, Newcastle Airport, Upper Hunter Valley mining developments, Maitland and other major employment and commercial centres in the Hunter Region. The NLTN in the location of the project plays an important role in the movement of freight in the region, NSW and Australia.

Access to the Pacific Highway southbound is currently provided via the heritage listed Hexham Bridge over the Hunter River. The Hexham Bridge is height limited (with a maximum clearance of 5.2 metres), limited in capacity to two undersized lanes, widening only at the immediate approach to the Pacific Highway/Maitland Road intersection. The southbound Hexham Bridge also has a weight limitation which does not allow for vehicles over 68 tonnes. As a result, the southbound Hexham Bridge does not provide for HPV's PBS Class 2B vehicles of up to 30 metres and 90.5 tonnes in mass, or oversize overmass (OSOM) vehicles from the major Tomago industrial area and areas further away. Larger heavy vehicles require contra flow movements under restricted conditions to be made in the reverse direction across the northbound Hexham Bridge.

By removing restrictions to southbound traffic with the provision of a high quality four lane motorway, the project would reduce traffic volumes on the existing road network and provide local improvements to facilitate HPV's and OSOM loads, as well as enable efficient movement of these heavy vehicles along the M1 Pacific Motorway / Pacific Highway, to surrounding areas of heavy industry and to the Hunter Valley. The completion of the project, along with the recently completed Pacific Highway upgrade program and Coffs Harbour Bypass, would remove all other remaining restrictions for the adoption of HPV's and movement of larger OSOM loads between Hexham and the Brisbane. The project would enable the full benefit of the substantial investment by both State and Australian governments, together with the completion of the Pacific Highway upgrade program, to be realised.

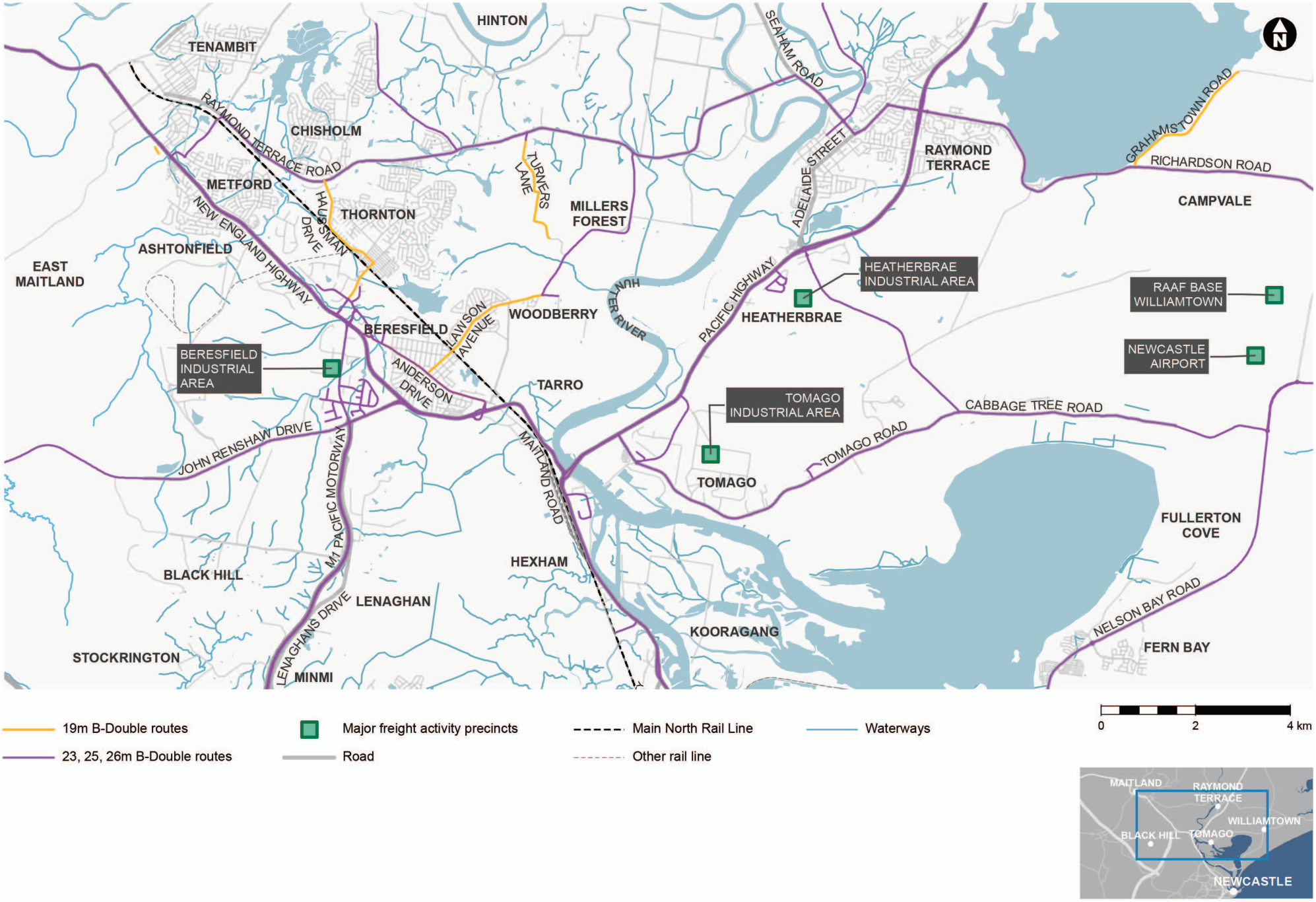


Figure 3-3 Major freight activity precincts in the vicinity of the project

3.2.6 Road safety

One of the key objectives of the project is to improve road safety. The number of crashes recorded within the traffic and transport study area during the five year reporting period from October 2014 to September 2019 is shown in **Table 3-3**. The New England Highway and the Pacific Highway recorded the highest number of crashes in the area, as they are the longest lengths and have higher traffic volumes compared to the other sections. Tomago Road and Old Punt Road recorded the lowest number of crashes.

Impacts of the project on road safety are further discussed in **Chapter 7** (traffic and transport) and the Traffic and Transport Working Paper (**Appendix G**).

Table 3-3 Crashes recorded within the traffic and transport study area during the five year reporting period between October 2014 and September 2019

Road	Section	Fatal	Injury	Non-casualty (tow-away)	Total	Casualty crash rate (per 100 million vehicles travelled)
John Renshaw Drive	500m west of M1 Pacific Motorway to New England Highway	1	3	4	8	6.09
M1 Pacific Motorway	North of Black Hill to John Renshaw Drive	1	24	23	48	14.74
New England Highway	West of Thornton Rd to Old Maitland Road	1	70	50	121	8.37
Old Punt Road	Tomago Road to Pacific Highway	0	2	1	3	19.93
Pacific Highway	New England Highway to Richardson Road	2	55	36	93	6.07
Tomago Road	500m west of Tomago Aluminium to Pacific Highway	0	5	2	7	13.66
Weakleys Drive	John Renshaw Drive to New England Highway	1	4	4	9	6.62

3.2.7 Future growth

The Hunter Region has the largest share of both regional population and regional employment and is located in the State's fastest growing corridor – from the northern edge of Sydney to Newcastle. The projected population along this corridor is estimated to be 1.1 million by 2036. (Hunter Regional Plan 2036, DPE 2016).

The Hunter Regional Plan 2036 estimates that by 2036 there will be an increase in population of approximately 130,000 people and 61,500 jobs. The road network in the project area is central to the functionality and catering for this predicted future growth.

The New England Highway, Pacific Highway and John Renshaw Drive form part of the NLTN through the project area and make up part of the Sydney to Brisbane coastal route. In addition to facilitating significant interstate freight movements between Victoria, NSW and Queensland, these roads provide the primary access to the City of Newcastle, Port of Newcastle, Newcastle Airport, Upper Hunter Valley mining developments, Maitland and other major employment and commercial centres in the Hunter Region. Accordingly, the road network within the project area is a critical location in the Sydney to Brisbane corridor.

Significant employment precincts have been identified at Tomago, Heatherbrae and at the convergence of the NLTN around Thornton, Beresfield and Black Hill. The Greater Newcastle Metropolitan Plan (DPE 2018) also identifies Beresfield, Black Hill and Tomago as major employment precincts and trading hubs within Greater Newcastle.

Beresfield and Black Hill are proposed to be a freight and logistics hub, with complementary manufacturing and light industrial activity. Three precincts are identified within this location, including:

- Beresfield Precinct, which will support freight and logistics, manufacturing and other light industrial uses
- Emerging Black Hill Precinct, located west of the M1 Pacific Motorway, which will support employment lands, freight and logistic uses
- Thornton Precinct, which is proposed to support expanded business and light industrial uses.

Tomago is proposed to be an advanced manufacturing and industrial area. Local planning for the Tomago Industrial Precinct will look to enable the efficient movement of goods by protecting freight routes connecting Tomago to Newcastle Airport and the Port of Newcastle.

Historically, traffic growth in the area has varied across the network. Trends of traffic growth in some locations such as the Pacific Highway, north of Hexham Bridge, have experienced traffic growth of about 1.5 per cent increase per year. As an example of major employment and traffic growth in proximity to the project area, the proposed Emerging Black Hill Precinct has been anticipated to generate in the order of 3,000 peak trips on the network when full development potential is realised in the future.

Due to the expansion of these employment areas, as well as population growth within the Hunter region and immediately adjacent to the project area, the volume of vehicles on the M1 Pacific Motorway, the Pacific Highway and the New England Highway is anticipated to continue to increase with similar growth. This would place additional strain on the road network, leading to increased travel times and the potential for greater risks to safety for road users within the project area.

3.2.8 Flooding

The Hunter River traverses through the project along with numerous tributaries and other minor waterways including Purgatory Creek, Windeyers Creek, Grahamstown Drain, and an unmapped and unnamed artificial tributary of Viney Creek. The project is situated within the Hunter River floodplain, and the area is impacted during flooding events.

Recent major storm events in the Hunter Region required closure of the Pacific Highway north of Hexham Bridge due to water over the road and partial impacts along the New England Highway corridor west of Hexham Bridge, disrupting local and regional connectivity. Based on the 2015 flood event that occurred, the flood immunity of the existing key roads at these locations, on the Hunter River flood plain, is between a 20% and 10% annual exceedance probability (AEP) flood immunity. Flooding is discussed further in **Chapter 10** (hydrology and flooding).

3.3 Project objectives

Objectives for the project have been developed to be consistent with the overall objectives of the Pacific Highway upgrade program. The objectives of the project are to:

- Improve travel time and road network efficiency for freight and commuters on the NLTN at the key strategic junction of the M1 Pacific Motorway, the New England Highway and the Pacific Highway
- Provide improved long term route reliability along the M1 Pacific Motorway corridor, particularly in relation to congestion reduction, flood immunity and high demand holiday peak travel
- Improve road safety for all road users
- Provide more efficient access to facilitate economic growth for the Lower Hunter and key regional employment areas such as the Port of Newcastle, Newcastle Airport, Tomago, Beresfield and Black Hill.

A summary of how the project achieves the project objectives is provided in **Table 3-4.**

Table 3-4 Assessment of the project against the project objectives

Objective	Project outcome
Improve travel time and road network efficiency for freight and commuters on the NLTN at the key strategic junction of the M1 Pacific Motorway, the New England Highway and Pacific Highway	The project would provide an alternative route to the existing road network, improving freight and commuter connectivity and allowing free movement for freight travelling along this section of the NLTN. Travel times would be substantially reduced between Newcastle, Raymond Terrace, Maitland and other regional industrial areas, improving network efficiency for commuting and freight. The project substantially reduces travel times for both the morning and evening peak periods in future years with travel time reductions of between seven and nine minutes in both peak periods along the M1 Pacific Motorway corridor upon opening of the project.
Provide improved long term route reliability along the M1 Pacific Motorway corridor, particularly in relation to congestion reduction, flood immunity and high demand holiday peak travel	The project would provide key infrastructure for movements along the eastern coast of Australia, improving travel time and travel time reliability between Brisbane in the north and Melbourne and Sydney. The project would provide a minimum 5% AEP flood immunity between Black Hill and Raymond Terrace (including 1% AEP local flood immunity between Black Hill and Tomago), improving from the current 20% AEP flood immunity on the existing network. The project would also provide a new flood emergency and evacuation access route (the project itself). The project would provide free-flow, dual carriageway conditions and avoid existing intersections along the M1 Pacific Motorway corridor to provide improved travel time reliability during high demand holiday periods through this part of the road network.
Improve road safety for all road users	The project would have a positive impact on road safety by: • Reducing congestion on the New England Highway and the Pacific Highway, which is expected to reduce rear-end and lane-change crashes • Reducing potential points of conflict between road vehicles on the network, minimising the risk of congestion-related incidents • Providing an improved road alignment, including wider lands and shoulders with barriers, minimising the risk and impact of any off-road crashes.
Provide more efficient access to facilitate economic growth for the Lower Hunter and key regional employment areas such as the Port of Newcastle, Newcastle Airport, Tomago, Beresfield and Black Hill	The project would improve travel times and connectivity to key activity centres in the region, including the Port of Newcastle, Newcastle Airport, Tomago, Beresfield and Black Hill. The project improves accessibility for oversize and overmass freight, and enables end to end access by high productivity vehicles (PBS Class 2B heavy vehicles) along the M1 Pacific Motorway corridor across the Hunter River. The project would also improve access and connectivity to current and future employment and growth areas to and from the M1 Pacific Motorway.

3.4 Statement of strategic need

The existing NLTN (M1 Pacific Motorway corridor), between Black Hill to Raymond Terrace is a combination of John Renshaw Drive, the New England Highway and the Pacific Highway. Generally it provides two lanes in both directions with six controlled intersections and speed limits ranging from 60 kilometres per hour to 90 kilometres per hour.

This location along the M1 Pacific Motorway corridor is one of the last remaining sections not providing a free flowing dual carriageway route between Sydney and Brisbane along the coastal route of the NLTN. The other remaining major location along the corridor is the Coffs Harbour Bypass (currently in the pre-construction phase).

Increasing traffic demand, due to continued expansion of key industries, employment areas and population growth within the region, means that the volume of vehicles on the corridor will continue to place further strain on this critical junction of the NLTN. This will lead to increased travel times and the potential for greater risks for road users within the project location. The project is needed to improve connectivity and overall performance of the road network and to deliver improved travel times and safety for road users.

The project would complete one of the last remaining major upgrades required to facilitate significant interstate freight movements between NSW, Victoria and Queensland. Additionally, the project would support freight servicing the Hunter Valley mining industry, the Port of Newcastle, and interstate movements, resulting in local, regional and national economic benefits.

Route reliability of travel would improve, not only in peak times, but during holiday periods and during times of flooding as the project would remove all intersections and provide increased flood immunity along this section of the NLTN.

The new crossing over the Hunter River would remove the existing constraint for southbound movements at the Hexham Bridge, improving the opportunity for movement of high productivity vehicles in this part of the NLTN. The project would therefore not only provide local and regional benefits but would provide significant productivity benefits on a national scale.

The project would improve connectivity for the rapidly growing Lower Hunter region by improving access to key employment areas such as Tomago, Beresfield, Black Hill and the Port of Newcastle. The road network area currently experiences high traffic demand, with demand anticipated to increase as populations within the Lower Hunter and Newcastle area grow. The project would provide greater capacity on the network and provide increased connectivity for these rapidly growing regions and better access to the road network for local traffic.

As presented throughout **Section 3.1**, the project would also fulfil the goals and objectives of numerous strategic planning instruments. Further justification for the project is provided in **Chapter 26** (project justification and conclusion).

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NSW GOVERNMENT

M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Chapter 4: Project development and alternatives

Transport for NSW | July 2021

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4. Project development and alternatives

This chapter describes the various alternatives to the project that were considered as part of the project development process and explains how and why the project was selected. It then describes and analyses the different route options that were investigated and justifies why the preferred alternative (the project) was selected. Design refinements for particular elements of the project are also presented, demonstrating how the project was developed to avoid or minimise adverse impacts.

Table 4-1 outlines the SEARs that relate to the development of alternatives and options of the project. The project development process to date is illustrated in **Figure 4-1**.

Table 4-1 SEARs (project development and alternatives)

Secretary's requirement	Where addressed in EIS
2. Environmental Impact Statement	
1. The EIS must include, but not necessarily be limited to, the following:	
(e) an analysis of feasible alternatives to the project[3]	An analysis of project alternatives is provided in **Section 4.1**
(f) a description of feasible options within the project[4]	The feasible options within the project are identified and described in **Section 4.2** to **Section 4.5** An evaluation of the options is provided in **Section 4.3.5**.
(g) a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative / option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to, and option(s) within, the project were selected including: – details of the highway corridors and route options considered, and the criteria that was considered in the selection of the preferred route; and – a justification for the preferred proposal taking into consideration the objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act)	Alternatives to the project are discussed in **Section 4.1**. Route options considered for the project are discussed in **Section 4.2** to **Section 4.5**, with further discussion about alignment options provided in **Section 4.3** A justification for the project against the objects of the EP&A Act is provided in **Chapter 26** (project justification and conclusion).
(i) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts	A demonstration of how the project design has been developed to avoid or minimise potential impacts is provided in **Section 4.5.1**.

[3] Alternatives to a project are different projects which would achieve the same project objective(s) including the consequences of not carrying out the project. For example, alternatives to a road project may be a rail project in the same area and alternate routes for the road, or a combination of these alternatives.
[4] Options within the project are variations of the same project. For example, options within a road project could be design of an intersection; the location or design of a bridge; locations for a ventilation outlet.

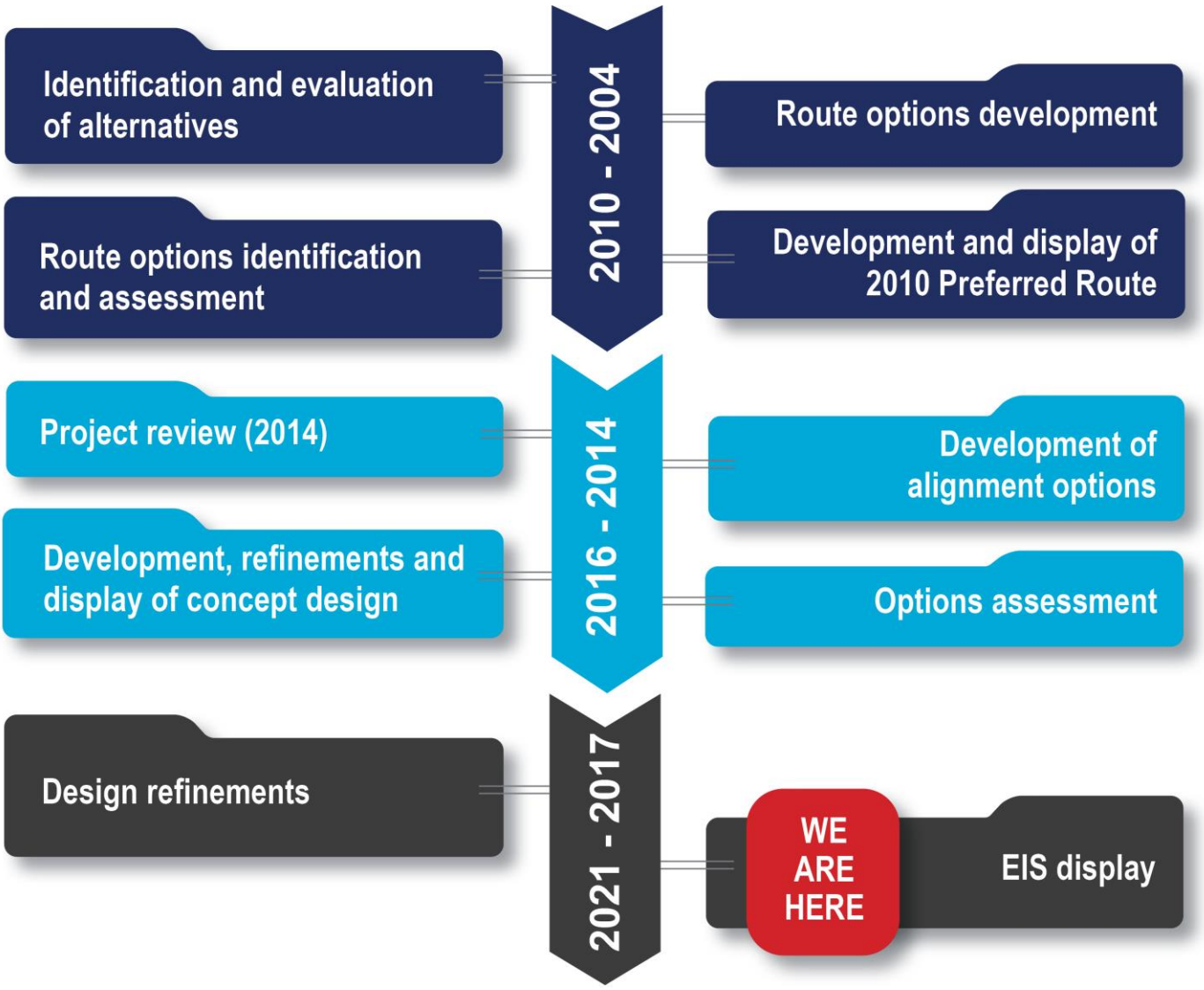

Figure 4-1 Project development process

4.1 Alternatives

The project development process considered possible alternative ways of meeting the project objectives, with the following alternatives considered:

- Alternative 1: Do nothing (base case)
- Alternative 2: Do minimum
- Alternative 3: Rail as an alternative mode of transport and freight
- Alternative 4: Establishing a primary route to the west (New England Highway)
- Alternative 5: A motorway link from the M1 Pacific Motorway at Black Hill to the Pacific Highway at Raymond Terrace (the project).

Figure 4-2 shows the alternatives to the project. The sections below discuss the above alternatives and whether they meet the project objectives.

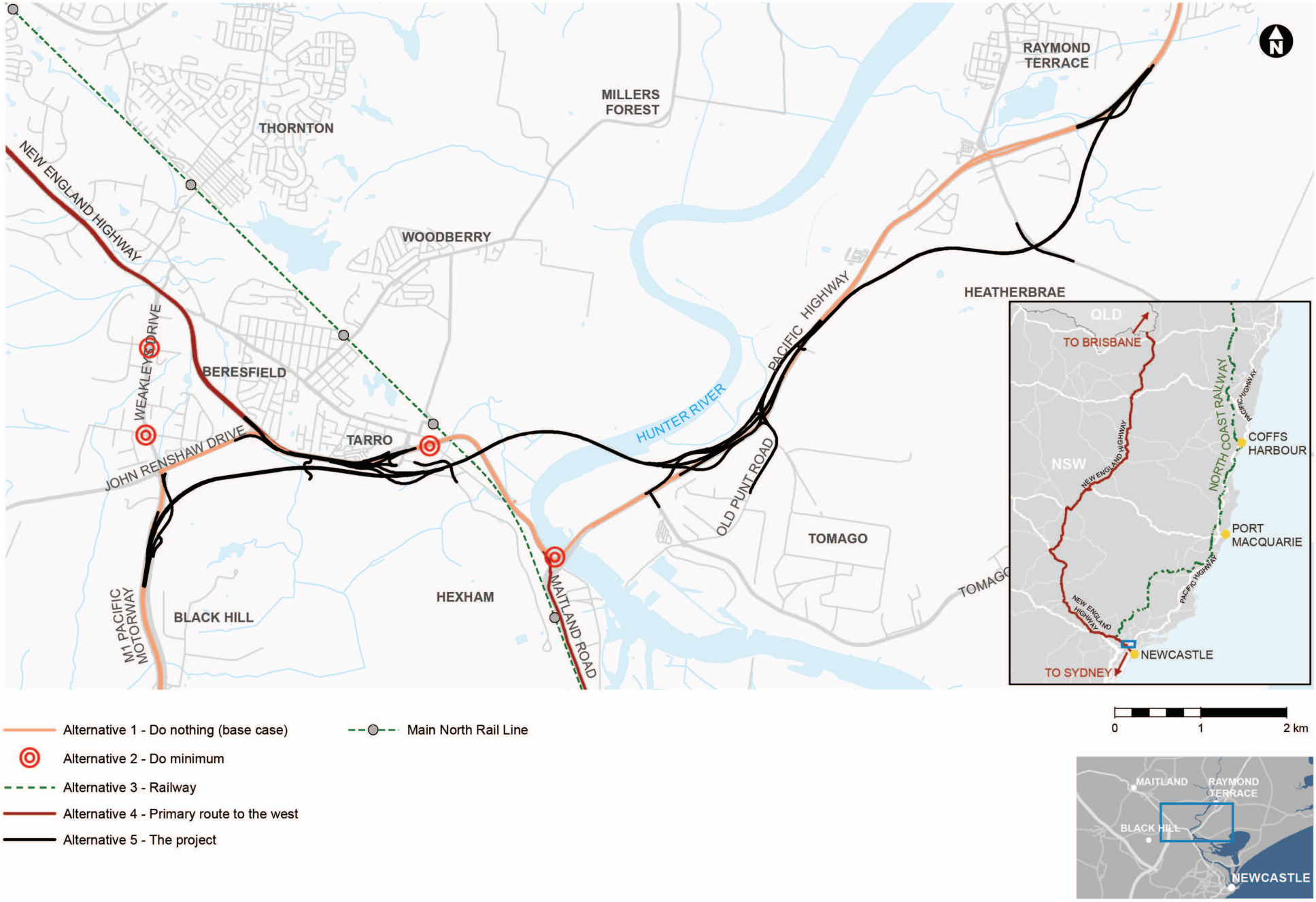

Figure 4-2 Alternatives to the project

4.1.1 Alternative 1: Do nothing (base case)

The ‘do nothing’ alternative involves retaining the existing route between the M1 Pacific Motorway and Raymond Terrace, via John Renshaw Drive, the New England Highway and the Pacific Highway. Ongoing maintenance of existing roads such as line-marking, refurbishing the road pavement surface and maintaining the verge and median would still occur.

Evaluation

The ‘do nothing’ alternative would provide no additional transport capacity in the road network. This alternative would avoid the capital cost associated with a major road project while avoiding environmental and social impacts associated with construction.

However, this alternative would have a number of drawbacks:

- It would not meet the project objectives (refer to **Table 4-2**)
- It would not meet the objectives of strategic planning and transport policies of the NSW and Australian governments, which are discussed in **Chapter 3**.

The ‘do nothing’ alternative would result in:

- A continued increase in travel times, especially on the Pacific Highway and New England Highway, resulting in reduced efficiency for freight and commuters on the National Land Transport Network (NLTN)
- Intersections would experience further congestion where local traffic conflicts with high through traffic volumes. These delays may result in economic impacts, especially related to delays in freight traffic travelling to local areas or over long distances. Further, the Hexham Bridge would remain as a key constraint to freight traffic travelling on the Pacific Highway
- No improvements to flood immunity or holiday peak travel times along the Pacific Highway, New England Highway and M1 Pacific Motorway corridor
- A likely increase in crashes, especially at major intersections along the M1 Pacific Motorway, the Pacific Highway, the New England Highway, and John Renshaw Drive. Crashes at Hexham Bridge and between local and arterial roads would also likely increase.

Increases in travel times may also result in:

- An impact on local and regional growth patterns. Increases in travel times could reduce the attractiveness of the local area to commercial traffic and the area may suffer economically. For example, the Port of Newcastle would be a less attractive option for freight shipping if access to the port is constrained
- Localised increases in noise and air pollution, which may impact on properties located close to the existing highway network.

The ‘do nothing’ alternative was, therefore, discounted as a realistic alternative and not considered further.

4.1.2 Alternative 2: Do minimum

The ‘do minimum’ alternative involves retaining the existing route between the M1 Pacific Motorway and Raymond Terrace, via John Renshaw Drive, the New England Highway and the Pacific Highway. Ongoing maintenance of existing roads such as line-marking, refurbishing the road pavement surface and maintaining the verge and median would still occur.

Other upgrades planned for the network would still be progressed including:

- Pacific Highway, Maitland Road and New England Highway intersection upgrade west of the Hexham Bridge
- Duplication of Weakleys Drive between John Renshaw Drive and New England Highway and the conversion of roundabouts to signalised intersections
- Implementation of ramp metering at the Anderson Drive eastbound onramp to the New England Highway.

Evaluation

The 'do minimum' alternative would add capacity to the road network at key pinch points, providing short to medium benefits to traffic flow. This alternative would also have safety benefits in the vicinity of the upgrades planned for the network.

However, this alternative would have a number of issues:

- It would not meet the project objectives (refer to **Table 4-2**) or the objectives of state and federal strategic planning and transport policies (including the NLTN) as discussed in **Chapter 3**
- It would not provide network wide traffic benefits. Traffic assessment carried out with 'Do Minimum' road upgrades demonstrated future delays of over 30 minutes for movements through the network.

Similar to the base case, doing the minimum would result in an increase in travel times and corresponding indirect impacts and a likely increase in crashes (refer to **Section 4.1.1**). The 'do minimum' alternative was, therefore, discounted as a realistic alternative and not considered further.

4.1.3 Alternative 3: Rail as an alternative mode of transport and freight

This alternative would involve using the existing rail network to support north-south transport and freight in this location.

Evaluation

This alternative would not meet the objectives of state and federal strategic planning and transport policies as discussed in **Chapter 3**, including completion of the broader Pacific Highway upgrade program and completing a critical link in the NLTN. Additionally, while this alternative would remove some vehicles from the existing road network, it would only partially contribute to improving travel times on key roads and road safety, therefore not meeting the project objectives (refer to **Table 4-2**).

The rail alternative was, therefore, discounted as a realistic alternative and not considered further.

4.1.4 Alternative 4: Establishing a primary route to the west

This alternative would involve using the existing inland route between the Hunter Region and the Queensland border via the New England Highway (the western route), instead of along the Pacific Highway (the coastal route). This route is currently available to road users as the alternate route to the Pacific Highway, serving a smaller number of road users and linking a smaller population base.

Evaluation

Similar to 'do nothing' (Alternative 1), this alternative would avoid the local environmental and social impacts associated with motorway construction between Black Hill and Raymond Terrace.

However, this alternative would have a number of drawbacks:

- Significant funding would be required to bring the New England Highway up to a motorway standard between the Hunter Region and the Queensland border. There are currently minimal motorway standard sections along this corridor
- It would not meet the project objectives (refer to **Table 4-2**) or the objectives of state and federal strategic planning and transport policies as discussed in **Chapter 3**
- It would not complete a critical link in the NLTN (specifically the coastal Sydney to Brisbane corridor), and would not realise the full transport benefits of the Pacific Highway upgrade program for freight movements due to the remaining Hexham Bridge restrictions
- It would not provide improvements to key strategic freight routes around the Greater Newcastle area, or improve travel time on the M1 Pacific Motorway, John Renshaw Drive, the New England Highway and Pacific Highway
- It would also increase travel times by about three hours between Sydney and Brisbane.

This alternative was therefore discounted as a realistic alternative and not considered further.

4.1.5 Alternative 5: M1 Pacific Motorway extension to Raymond Terrace (the project)

This alternative would extend the M1 Pacific Motorway at Black Hill to the Pacific Highway at Raymond Terrace. This would provide a motorway-standard road between Black Hill and Raymond Terrace.

Evaluation

This alternative would assist in developing a continuous motorway-standard route between Sydney and Brisbane by:

- Completing a critical link in the NLTN, specifically the coastal Sydney to Brisbane Corridor
- Representing the missing link required to realise the full transport benefits of the Pacific Highway upgrade program, although not part of the program (refer to **Chapter 3**).

This alternative responds to and supports the NSW and Australian Governments' strategic planning and transport policies as detailed in **Chapter 3**.

While environmental and social impacts are associated with this alternative (as assessed in this EIS), this alternative would meet the project objectives (refer to **Table 4-2**) by:

- Improving road safety for all road users due to the high standard design, including dual carriageways and controlled access conditions
- Improving travel times and transport efficiency for local and regional traffic, including freight transport
- Increasing traffic capacity and improve the level of service for the route, resulting in less congestion and fewer delays, especially during peak holiday periods.

Considering the alternatives against the project objectives and NSW and Australian Governments' strategic planning and transport policies, Alternative 1 to Alternative 4 were rejected. Alternative 5 was preferred.

4.1.6 Performance of alternatives against project objectives

Alternative 1 to Alternative 5 were reviewed against the project objectives. **Table 4-2** summarises whether each alternative meets the project objectives.

Table 4-2 Performance of alternatives against project objectives

Project objective	Meets objective?				
	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5 (the project)
Improve travel time and road network efficiency for freight and commuters on the National Land Transport Network at the key strategic junction of the M1 Pacific Motorway, the New England Highway and the Pacific Highway	No	No	Partially	No	Yes
Provide improved long term route reliability along the M1 Pacific Motorway corridor, particularly in relation to congestion reduction, flood immunity and high demand holiday peak travel	No	No	No	No	Yes
Improve road safety for all road users	No	Partially	No	No	Yes
Provide more efficient access to facilitate economic growth for the Lower Hunter and from key regional employment areas such as Port of Newcastle, Newcastle Airport, Tomago, Beresfield, Black Hill.	No	No	No	No	Yes

4.2 Route options development

Route option development commenced in 2004. At this early stage of the project, between December 2004 and January 2005, route option workshops identified 14 possible route options, with three selected for further analysis (Options A, B and C). Early stage route options are shown in **Figure 4-3**.

Following further investigation, Option C was found to be unfeasible due to the depth of the soft soil conditions within the Hunter River floodplain and the associated costs of construction. Option A and B were therefore progressed as feasible route options. These two options were split into three sections (western (1), central (2) and eastern (3)) and were named A1, A2, A3 and B1, B2, B3 (refer to **Figure 4-3**). These options were placed on public display for community comment between October 2005 and December 2005.

4.2.1 Route options assessment and identification of preferred option

The route options were evaluated within a value management process between November 2005 and February 2006. Key steps during this evaluation process included:

- Development of assessment criteria
- Value management workshop
- Further development of options as recommended at the value management workshop
- Further technical and environmental investigations
- Route selection workshop.

Prior to the value management workshop, evaluation criteria were developed. The evaluation criteria were categorised into engineering, environmental, social and economic categories and were based on the Pacific Highway upgrade program and project specific objectives, issues raised in the community involvement process, statutory requirements and policy guidelines for environmental issues.

The value management workshop in December 2005 recommended that further investigations be carried out on Option A1, B2 and A3. This included design investigations on Option A1, environmental investigations on Option B2 and social and community investigations on Option A3.

Additional technical and environmental investigations included ecology surveys, socio-economic assessment, land use and planning considerations (including cultural heritage), traffic modelling and revised cost estimates. Additional consultation with the Heatherbrae community including property owners, businesses and residents was also carried out. Following these investigations and consultation, Options A1, B2, A3 and B3 were refined and adjusted.

In February 2006, a route options workshop was held to select the better performing route option (A or B) within Sections 1, 2 and 3, with consideration of the options preferred in December 2005 (Option A1, B2 and A3). Options were assessed against the evaluation criteria previously identified in 2005 in a paired analysis. The workshop identified Option A1 and B2 as preferred for Sections 1 and 2. For Section 3, Option B3 performed better against Option A3 with regards to socio economic, technical and cost considerations (specifically properties requiring acquisition, maintaining current local access through Heatherbrae and being the best overall value for money option). Additionally, Option B3 was considered to better satisfy community expectations. Accordingly, Option A1, Option B2 and Option B3 together were identified as the preferred route for the project (as shown on **Figure 4-3**). The corridor for the preferred route was placed on public display between August and October 2006.

4.2.2 Development and display of 2010 Preferred Route design

Following selection of a preferred route and consideration of the community and stakeholder feedback, the preferred route design for the project was progressed into a concept design. This concept design was placed on public display, with feedback sought from the community between July and August 2008. Key issues raised by the community related to interchange arrangements, access to Heatherbrae and the Tomago interchange (further detail is provided in **Chapter 6**).

A submissions report responding to the issues raised was issued in December 2010. Following the submission report display, a corridor was reserved in the Newcastle and Port Stephens Local Environment Plans (LEPs). This corridor was generally consistent with the preferred route identified in 2006. The 2010 concept design (referred to as '2010 Preferred Route') and the gazetted LEP corridor are shown on **Figure 4-4**.

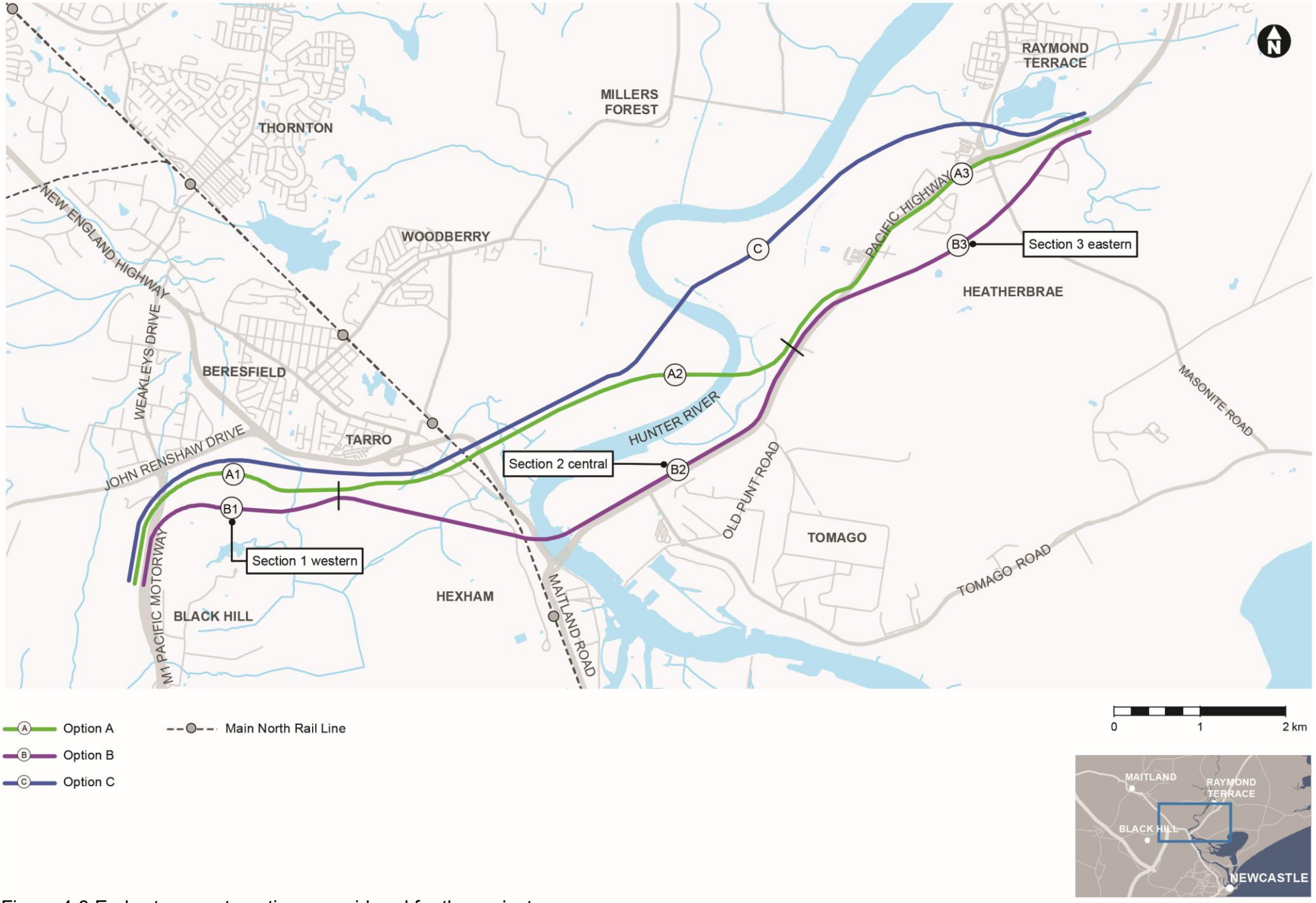

Figure 4-3 Early stage route options considered for the project

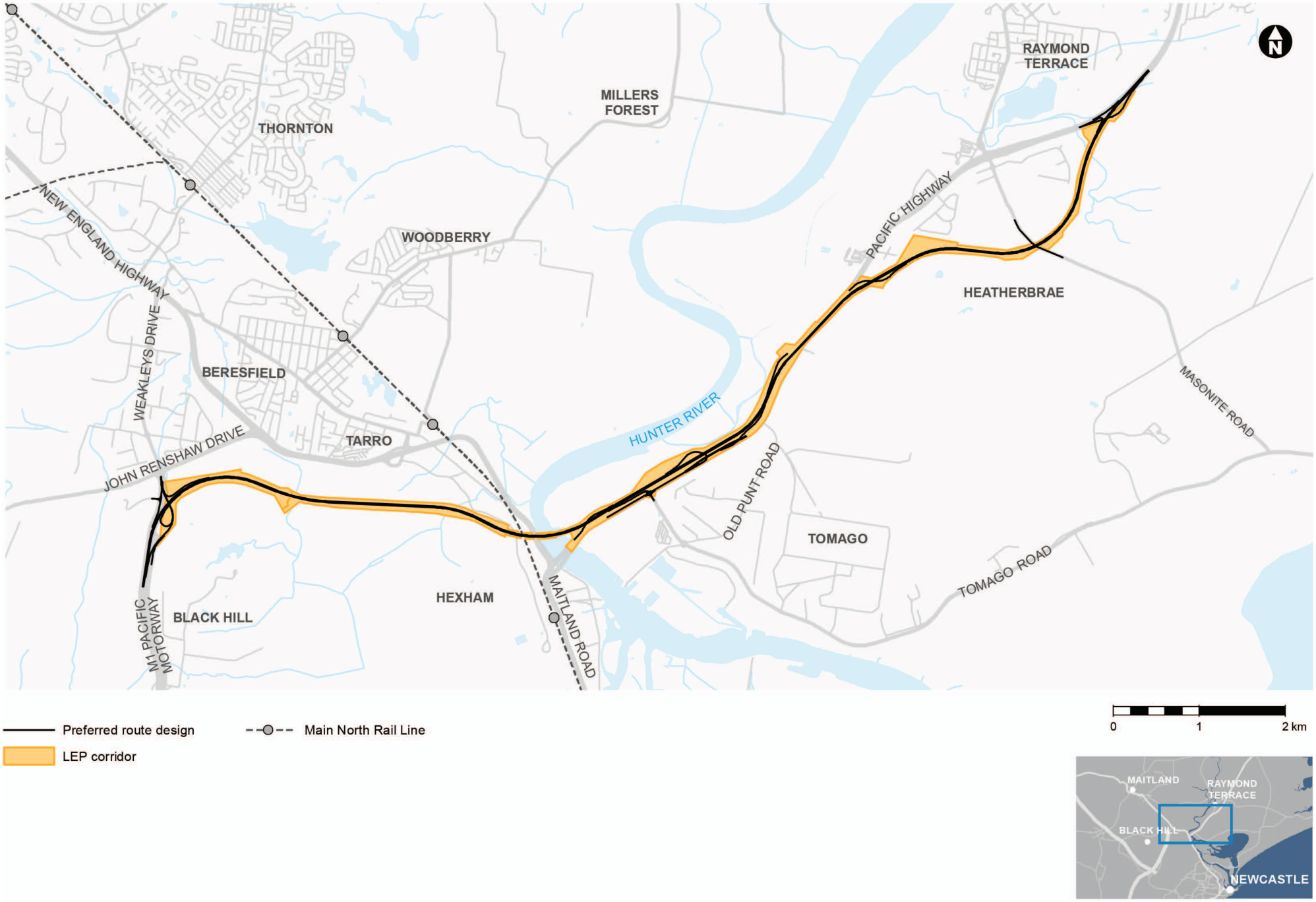

Figure 4-4 The 2010 Preferred Route and LEP corridor

4.3 Project review: alignments

In 2014, the NSW Government allocated funding to continue project development. Following this, a project review of the 2010 Preferred Route design was carried out to identify and investigate potential improvements to the project. The project review found that there were opportunities for improvement in the following key aspects for the project:

- Functionality and performance, including connectivity to the regional road network
- Design and geometric elements of the project, and how lessons learnt from recently completed Pacific Highway projects in floodplain and soft soil areas could be incorporated into a revised concept design
- Traffic characteristics, particularly regarding changes to the regional road network since the opening of the Hunter Expressway and completion of other road projects
- Environmental impacts, particularly regarding changes to environmental policy and legislation (including the implementation of the now repealed State Environmental Planning Policy No 14 – Coastal Wetlands)
- Integration with the existing transport network and the ability to accommodate any potential future upgrades.

4.3.1 Alignment options

Alternate alignment options to the 2010 Preferred Route were identified to address the issues raised in the project review and to better meet the project objectives. This included providing improved accessibility and connectivity across the road network, addressing design constraints in crossing the Hunter River and floodplain and minimising environmental impact. Accordingly, the area between Black Hill and south of Heatherbrae was reviewed. Alignment 1 and Alignment 2 were progressed for further investigation.

Further detail on these options is provided in the M1 Pacific Motorway extension to Raymond Terrace: Discussion paper – Revised concept design (Roads and Maritime Services 2015a). The alignment options are shown on **Figure 4-5**.

A number of interchange arrangements were also investigated at Black Hill, Tarro, Tomago, Heatherbrae and Raymond Terrace. All of these options met the project objectives.

4.3.2 Alignment 0 – 2010 Preferred Route

This option refers to the preferred route design as displayed in December 2010, as discussed in **Section 4.2.2** and as shown in **Figure 4-5**. Updates to the 2010 Preferred Route design (refer to **Figure 4-4**) included changes to reduce traffic weaving movements at the Black Hill interchange and Raymond Terrace interchange. Additionally, a viaduct was included to replace the proposed embankment across the Hunter River floodplain to reduce changes to flood behaviour and constructability issues as a result of building high earth embankments in soft soil areas.

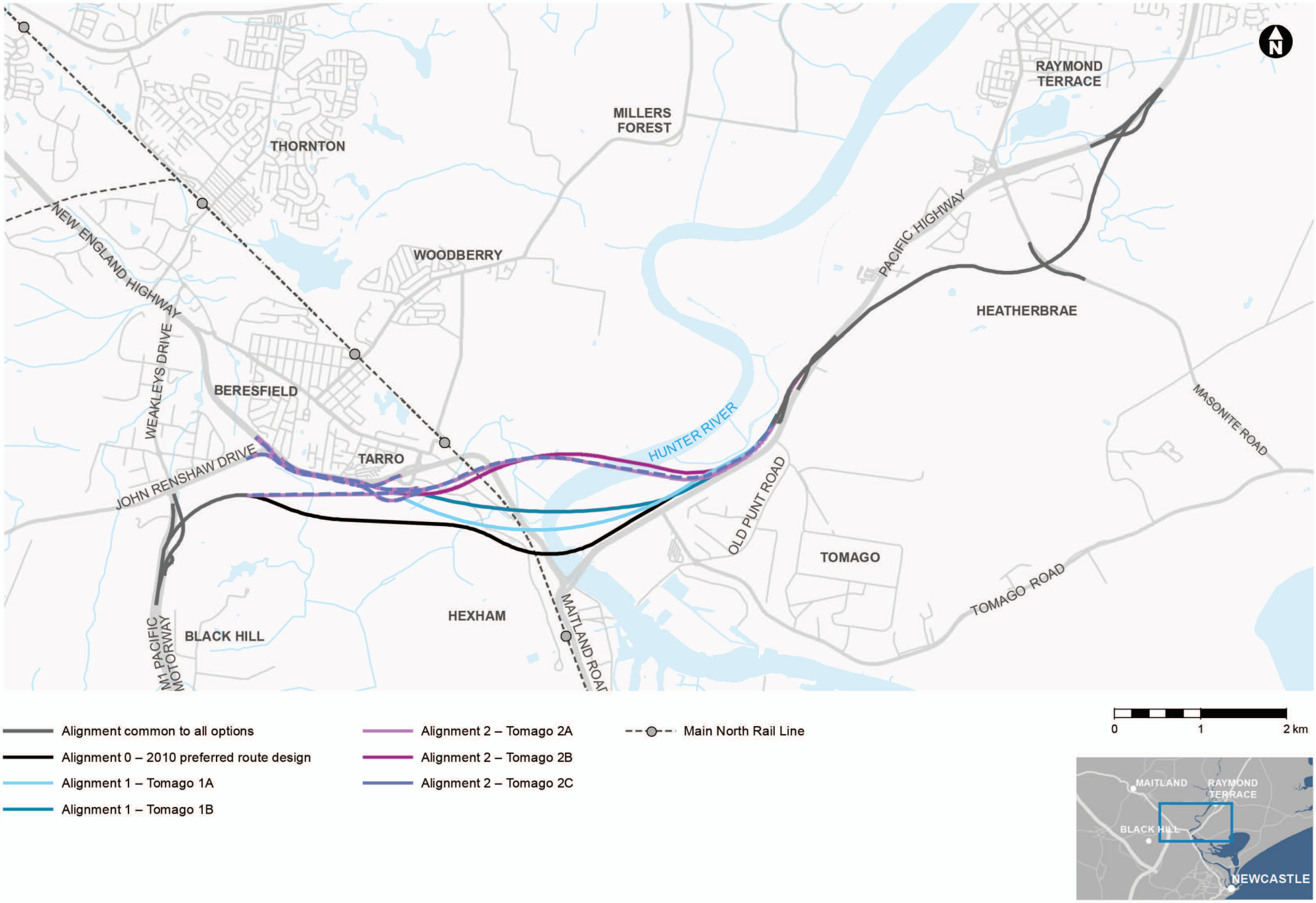

Figure 4-5 Alignment options

4.3.3 Alignment 1

This option runs between Alignment 0 and the New England Highway in a roughly parallel direction until the Tarro interchange at the New England Highway (refer to **Figure 4-5**). It crosses the Hunter River north of the existing bridges, passes through wetland areas and re-joins the existing Pacific Highway at the Tomago Road intersection. This option was considered to provide a more constructible major bridge structure across the Hunter River and its floodplain.

Two main variations for the Tomago interchange were considered for this alignment (refer to **Figure 4-6**):

- Tomago 1A: with a northbound exit ramp directly into Tomago Road, northbound and southbound entry ramps at Pacific Highway north of Tomago Road via overpasses, a southbound entry ramp from Tomago Road and a northbound entry from Pacific Highway south of the Tomago Road intersection
- Tomago 1B: the alignment across the Hunter River was adjusted to avoid salt marsh and coastal wetlands. This arrangement provided northbound exit and southbound entry ramps at the Pacific Highway and Tomago Road intersection via an underpass, and northbound entry and southbound exit ramps at an upgraded Pacific Highway and Old Punt Road intersection. This alignment is a variation of Tomago 1A in response to recommendations made at the value management workshop held between 28 and 29 April 2015 (as discussed in **Section 4.3.5**). Refinements to Tomago 1A to arrive at Tomago 1B included:
  - An at-grade intersection at Tomago Road
  - Adjusting the alignment to reduce impacts on ecological communities listed under the EPBC Act and the TSC Act (which was in force at the time).

4.3.4 Alignment 2

This option follows Alignment 1 until the Tarro interchange at the New England Highway (refer to **Figure 4-5**). It passes to the north of Alignment 1, and crosses the Hunter River and its floodplain to the north-east of the existing bridges, re-joining the Pacific Highway between the Tomago Road and Old Punt Road intersections. This alignment avoided the high-value wetlands and State and Commonwealth-listed threatened environmental communities on the northern side of the Hunter River.

Three variations of Tomago interchange were considered for this alignment (refer to **Figure 4-6**):

- Tomago 2A: provided a northbound exit ramp to the Tomago Road intersection via a reverse-loop ramp and northbound and southbound entry ramps from the Tomago Road intersection. A southbound exit ramp provided at an upgraded Old Punt Road intersection
- Tomago 2B: provided a northbound entry ramp from Tomago Road intersection, a northbound exit ramp passing over the alignment to join Pacific Highway southbound and southbound entry and exit ramps at Tomago Road intersection
- Tomago 2C: provided a northbound entry ramp from Pacific Highway west of Tomago Road via an overpass. A northbound entry and exit ramp and a southbound entry ramp provided east of Tomago Road via a roundabout and overpass. This overpass connects to new intersections at Old Punt Road and Tomago Road. A southbound exit ramp connects to an upgraded Pacific Highway and Old Punt Road intersection. This variation of Alignment 2 was developed as an evolution of Tomago 2A. Recommendations from the value management workshop and further investigations drove the changes to Tomago 2A as discussed in **Section 4.3.5**. The main refinements to Tomago 2A to arrive at Tomago 2C included improvement of the Tomago interchange to achieve a longer-term solution to meet traffic demand.

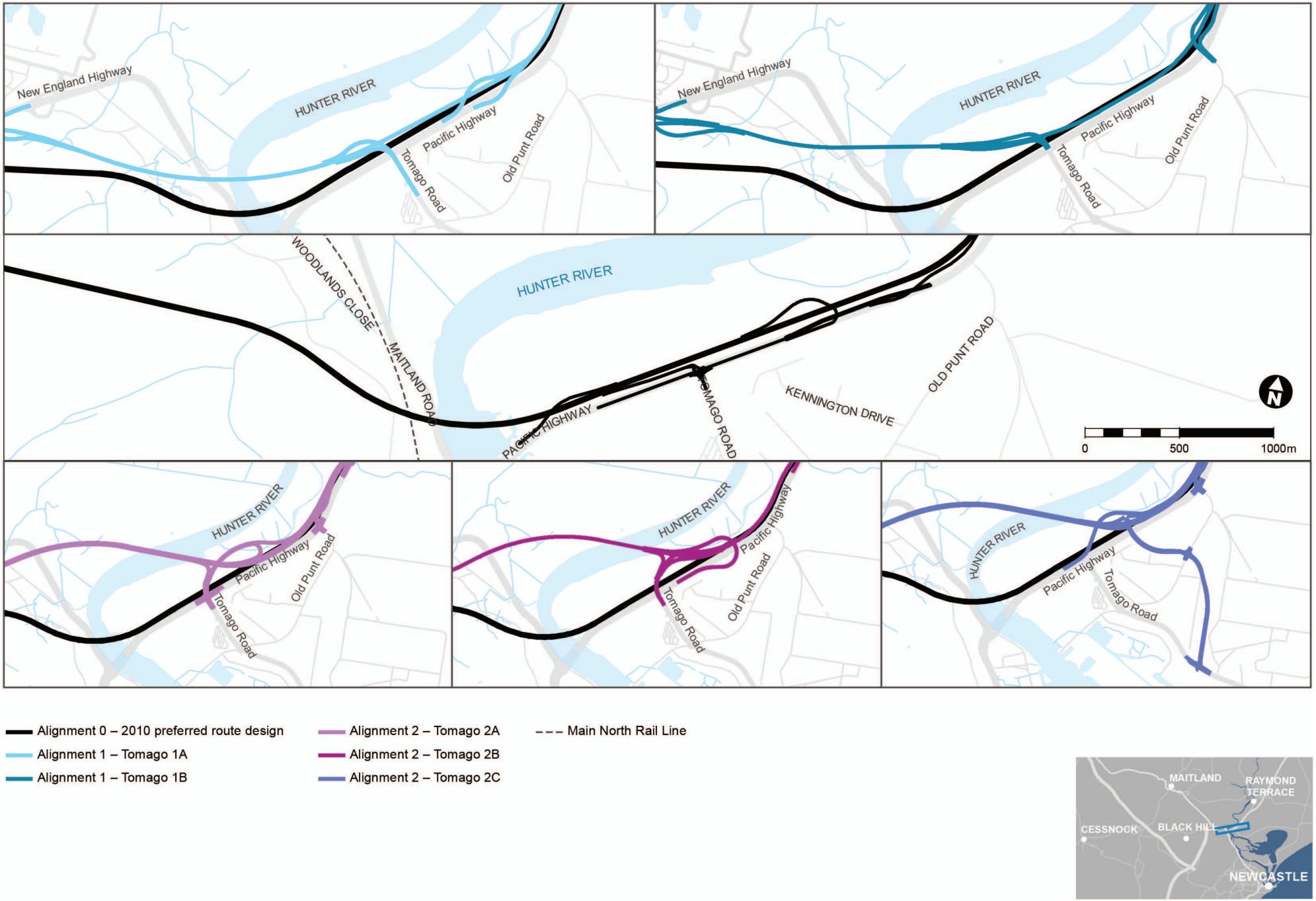

Figure 4-6 Interchange options at Tomago

4.3.5 Evaluation of alignment options

A value management workshop was held on 28 and 29 April 2015 to assess the alignment options. (Alignment 0, Alignment 1 – Tomago 1A, Alignment 2 – Tomago 2A and Tomago 2B). The value management workshop was held with the project team, project stakeholders, local council representatives and representatives of the community.

Values important to the project were identified through desktop investigations and during collaborative workshops and meetings with key stakeholders. These values included the Ecologically Sustainable Development (ESD) considerations**.** These values informed the assessment criteria used to identify a preferred option. The workshop used criteria in the following categories to assess the options as shown in **Figure 4-7**.

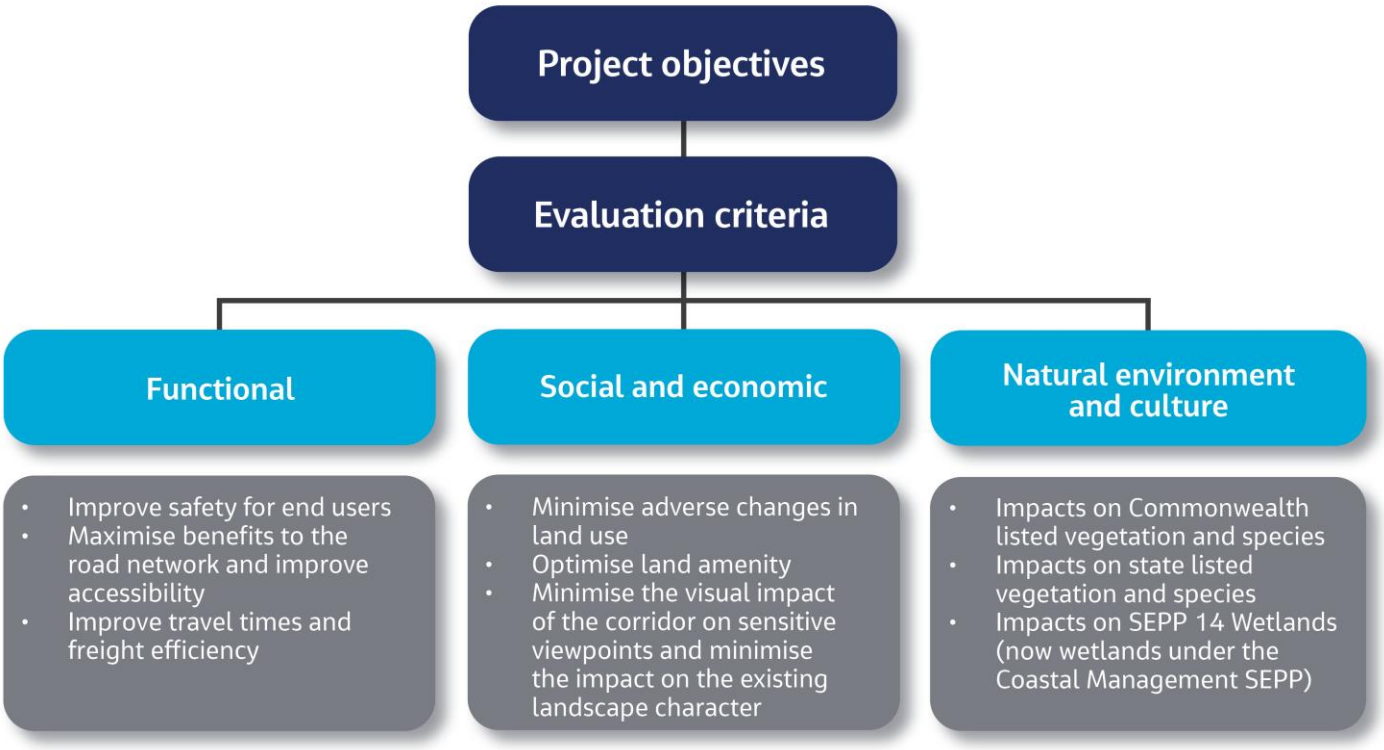

Figure 4-7 Evaluation criteria

The Value Management Workshop recommended that Tomago 1A and Tomago 2A be progressed for further consideration. Both alignments performed equally from a social and economic perspective. Tomago 1A was the best performer from a functional perspective, while Tomago 2A was the best performer from an environmental perspective. It was also concluded that Alignment 0 and Tomago 2B should not proceed any further.

Following the Value Management Workshop, further refinements were made to Tomago 1A to provide an intersection with Tomago Road that was comparable with Tomago 2A and to reduce the impact on the sensitive environment near the Hunter River. This refined alignment has been called ‘Tomago 1B’.

A review of Tomago 1B and Tomago 2A found that the functionality and cost of these options were very similar. However, Tomago 2A was preferred due to the improved environmental avoidance it provided in accordance with ESD principles.

Further refinement of Tomago 2A was then carried out to improve the Tomago interchange and achieve a longer-term solution for traffic demand. This included a new link road to connect between the motorway and Tomago Road and a grade separated interchange between Tomago Road and Old Punt Road. This amended alignment was called ‘Tomago 2C’.

Further investigation and assessment including traffic analysis, capital costs, and environmental factors confirmed Tomago 2C as the best performing alignment across the range of criteria and ESD principles. **Table 4-3** summarises the performance of each alignment option, as each option had been designed to meet each of the project objectives.

Table 4-3 Performance of each option

Option	Advantages	Disadvantages
Alignment 0	• Existing road that requires the least number of new property acquisitions.	• Impacts on high value biodiversity areas including wetlands north and south of the Hunter River • Poor functionality and connectivity to the local road network, particularly at Black Hill and Tomago • Requires the existing bridge crossing of the Hunter River to be widened and constructed as twin bridges.
Alignment 1 – Tomago 1A	• Improved functional performance at Black Hill and Tarro with new interchanges proposed providing improved connectivity to the adjoining road network • Improved alignment providing simpler construction than Alignment 0 • Grade separated interchange at Tomago provides improved functionality over Alignment 0.	• Worst performer on the basis of environmental impact. In particular, this option would have a major impact on the wetlands located on the northern side of the Hunter River • Tomago interchange could have constructability issues due to proximity to floodplain and environmental constraints • Does not have the improved connectivity of other options at Tomago.
Alignment 1 – Tomago 1B	• Improved functional performance at Black Hill and Tarro with new interchanges proposed providing improved connectivity to the adjoining road network • Improved alignment providing simpler construction than Alignment 0 • Improved alignment over Alignment 1A due to decreased impact on environmentally sensitive areas including of the wetlands south of the river and the Commonwealth-listed coastal saltmarsh north of the Hunter River. • Tomago interchange provides improved connectivity by connecting to existing traffic signals at Tomago Road and Old Punt Road.	• This option would still have a major impact on the wetlands located on the northern side of the Hunter River • Tomago interchange would perform with less functionality and road safety than other options due to connection into the signalised intersection • Tomago interchange could have constructability issues due to proximity to floodplain and environmental constraints.
Alignment 2 – Tomago 2A	• Improved functional performance at Black Hill and Tarro with new interchanges proposed providing improved connectivity to the adjoining road network • Minimises environmental impact (i.e. avoids severance of high quality vegetation and avoids the majority of the wetlands north and south of the river) • Improved alignment providing simpler construction than Alignment 0 • Tomago interchange provides improved connectivity by connecting to existing traffic signals at Tomago Road and Old Punt Road.	• Requires new property acquisitions in comparison to Alignment 0 • Requires a more complex Hunter River bridge crossing due to the angle of the river crossing • Road safety issues at proposed northbound exit ramp to Tomago (reverse loop) • Tomago interchange could have constructability issues due to proximity to floodplain and environmental constraints.

Option	Advantages	Disadvantages
Alignment 2 – Tomago 2B	• Improved functional performance at Black Hill and Tarro with new interchanges proposed providing improved connectivity to the adjoining road network • Minimises environmental impact (i.e. avoids severance of high quality vegetation and avoids the majority of the wetlands north and south of the river) • Improved alignment providing simpler construction than Alignment 0.	• Requires new property acquisitions in comparison to Alignment 0 • Requires a more complex Hunter River bridge crossing due to the angle of the river crossing • Tomago interchange provides less functionality for the changed northbound exit. Additional infrastructure requirements to provide the interchange • Tomago interchange could have constructability issues due to proximity to floodplain and environmental constraints.
Alignment 2 – Tomago 2C	• Improved functional performance at Black Hill and Tarro with new interchanges proposed providing improved connectivity to the adjoining road network • Minimises environmental impact (i.e. avoids severance of high quality vegetation and avoids the majority of the wetlands north and south of the river). Avoiding and minimising impacts satisfies the NSW Offsets Policy for Major Projects as well as the Federal requirements under the bilateral agreement with NSW. • Improved alignment providing simpler construction than Alignment 0 • Tomago interchange provides improved connectivity and functionality due to provision of grade separated interchange • Allows for improved constructability of Tomago interchange, predominantly out of the floodplain and located for simplified construction.	• Requires new property acquisition in comparison to other options, due to additional new link road at Tomago.

4.3.6 Preferred alignment

The preferred alignment to progress was Alignment 2 – Tomago 2C. This alignment best met the project objectives (refer to **Table 4-2**), had less environmental impacts, provided better opportunities to connect to the regional road network, improved the interface and constructability across existing rail and road infrastructure and had the best allowance for future urban development.

The preferred alignment and associated design was announced in October 2015. **Figure 4-8** illustrates the preferred alignment.

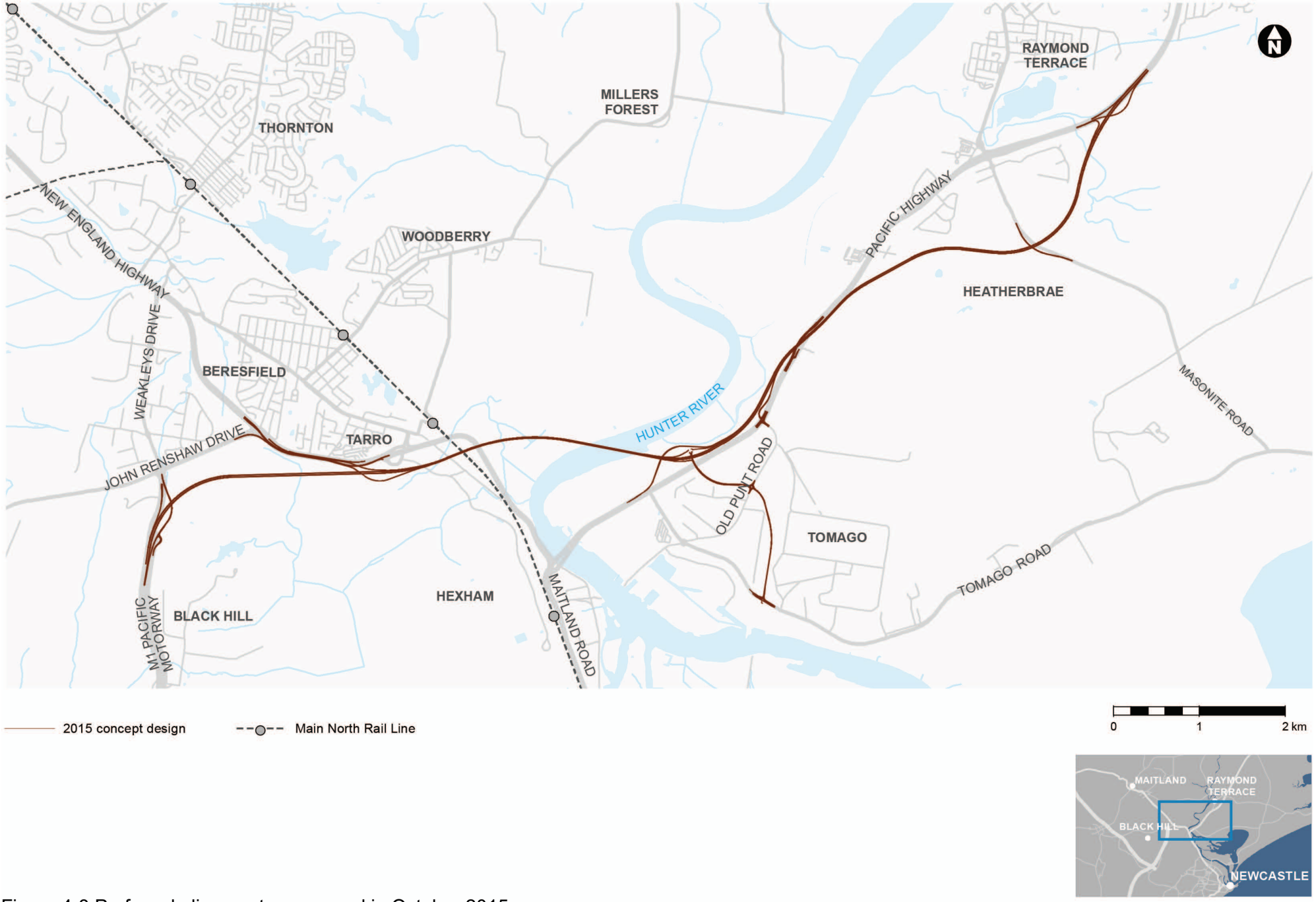

Figure 4-8 Preferred alignment announced in October 2015

4.4 The preferred option – 2016 concept design

Following the announcement of the preferred alignment, the concept design was revised based on feedback received from the community and stakeholders, as well as the outcomes of further field investigations carried out in 2015 and 2016.

Key issues raised during public display of the preferred alignment and property owner discussions related to timing of the project, access to Heatherbrae, impacts to the existing road network, traffic impacts and the project alignment. **Chapter 6** provides further detail on consultation that occurred during display of the preferred option.

Design revisions are detailed in **Table 4-4** and shown on **Figure 4-9**. The key change made to the design as a result of consultation was the introduction of a northbound exit ramp south of Heatherbrae. These revisions were developed with consideration of the project objectives and only refinements that met the project objectives were progressed as part of the concept design.

Table 4-4 Revisions to the concept design

Location and design element	Change	Justification for change
Black Hill interchange	• Converting the northbound exit ramp from a single lane ramp to a double lane ramp	Traffic modelling identified that additional capacity would be required to cater for modelled traffic volumes at this ramp. The impact for the project would remain the same at this location. No additional environmental impact is expected as a result of the change.
Project alignment at Black Hill and Tarro interchange	• Adjusting the main alignment closer to New England Highway • Moving Tarro interchange further north and east	A review of the alignment at Black Hill identified the opportunity to reduce the area of property impacted between the New England Highway and the project, reducing the area of property acquisition for the project. This would reduce the area of native vegetation fragmented by the project at Black Hill. The main alignment change would also shorten the bridge structure over the wetlands, reducing direct impacts to the wetlands. Moving the Tarro interchange further north and east would provide additional distance between lane changes on the New England Highway, improving motorist safety and reducing weaving movements.
Main viaduct across the Hunter River floodplain	• Realignment of the viaduct and crossing of Hunter River	This change would improve road geometry across the viaduct, reducing the angle at which the Hunter River is crossed. The viaduct alignment was adjusted endeavouring to avoid features on the property located on the eastern bank of the Hunter River.
Tomago interchange	• Removing roundabout and converting the interchange to a free flow interchange • A new southbound on ramp from the Pacific Highway at Tomago	This change would improve traffic conditions due to the free flow access at Tomago and would provide a safer interchange for road users by removing a conflict point associated with the roundabout when exiting the motorway. It would improve access for heavy vehicles using the southbound entry ramp onto the main alignment. This change would also remove the need to widen the viaduct directly west of the interchange. This change was in response to submissions received during the public display of the revised concept design in 2015.

Location and design element	Change	Justification for change
New link road at Tomago	• Realigning the link road further west outside of the transmission line easement, to run parallel to a property boundary	This change would reduce impacts on TransGrid's high voltage transmission infrastructure due to the vertical clearances required, while avoiding a Commonwealth-listed threatened flora population of *Grevillea parviflora* subsp. *parviflora*.
Heatherbrae interchange	• A new northbound exit ramp at Heatherbrae	This change was in response to submissions received during the public display of the revised concept design in October 2015, which identified a need to review access to Heatherbrae. Stakeholder and community concern was expressed about the lack of direct access to Heatherbrae, specifically the lack of a ramp for northbound traffic south of Heatherbrae, and the effect that this may have on Heatherbrae local business. A larger impact to native vegetation in this area would be expected due to the larger footprint of the new ramps.
Project alignment at Raymond Terrace	• Moving the Masonite Road bridge to the east	This change was implemented to allow continued operation of Masonite Road during construction. This change would also improve the geometry of the Masonite Road bridge, improving safety for motorists. This change also allows additional room for drainage channels and water quality basins, improving water quality in this location.
Raymond Terrace interchange	• Removing the northbound exit ramp • Moving the southbound exit ramp to the south	Removing the exit ramp to travel south to Heatherbrae, minimises impacts on native vegetation in this area. This change was applied because a northbound exit ramp, south of Heatherbrae, was provided for better connectivity. The adjustment to the southbound exit ramp would not be expected to result in increased environmental impacts.

Further community consultation was carried out in August and September 2016 to communicate the design changes carried out since the previous design display and consultation period in late 2015. Further detail on community consultation is provided in **Chapter 6**.

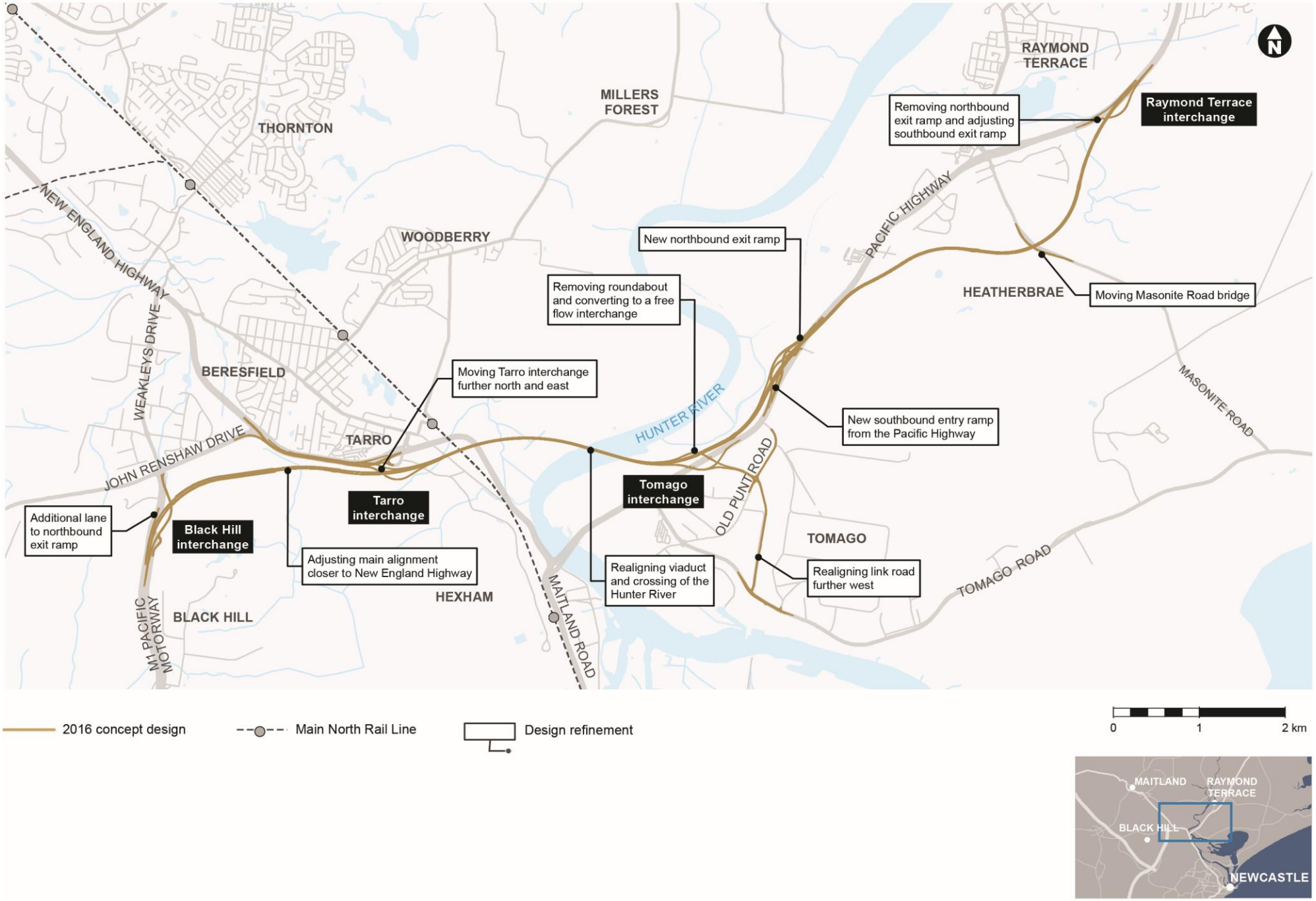

Figure 4-9 The preferred option – 2016 concept design

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4.5 Design refinements

Since the community consultation periods in 2016, remaining issues being investigated and refined include impacts on the Hunter Region Botanic Gardens and their access, private property access, and general improvement to the concept design outcomes.

Further consultation, subsequent to the community consultation, with landowners, utility providers and key stakeholders identified further design refinements.

The further design refinements that have led to the project design and environmental assessment are detailed in **Table 4-5** and shown on **Figure 4-10**.

Table 4-5 Refinements to the concept design

Location and design element	Change	Justification for change
Black Hill interchange	• Widening the southbound bridge from John Renshaw Drive onto the M1 Pacific Motorway to allow for additional lanes in the future	A future third lane would possibly be required to cater for traffic growth, particularly if major adjoining employment land use occurs. Increasing widths allows any future changes to minimise impacts to the future operation of the project. The additional bridge widening would not require an increase in the footprint of the project at this location, and no additional environmental impacts from this change would be expected.
Tarro interchange	• Adjusting the westbound exit ramp and eastbound entry ramp to and from New England Highway to the south east • Adjusting the alignment to enable the viaduct realignment • Changing the bridge arrangement at the interchange so that the northbound entry ramp would go over the westbound carriageway of the New England Highway (rather than vice versa)	Reduction in impact on the property located to the west of New England Highway and also provide space required to realign the Aurizon private access road. Changing the bridge arrangement of the interchange so that the entry ramp goes over the New England Highway rather than having the New England Highway over the entry ramp provides a more suitable alignment for the New England Highway. This arrangement also reduces noise from the New England Highway, allowing for minor noise benefits and a minor reduction in resource use during construction at this location.
Main viaduct across the Hunter River floodplain	• Horizontal realignment of the viaduct	The viaduct was realigned to maintain an acceptable horizontal road geometry and to reduce the skew (angle) at which the Hunter River is crossed, allowing for greater capacity to simplify the bridge type. This change also addresses concerns from consultation existing residents near the New England Highway, between Purgatory Creek and the M1 Pacific Motorway extension by relocating the alignment further away. Changing the alignment of the viaduct over the Hunter River would result in a minor reduction in resource use during construction and a generally more constructible design.

Location and design element	Change	Justification for change
Tomago interchange	• Consolidation of the Tomago and Heatherbrae interchanges into a single interchange • Adjusting Tomago Road intersection to allow northbound vehicles to access the project at Tomago, and adjusting the Old Punt Road intersection • Minimising impacts on land proposed for the Newcastle Power Station • Provision of improved access to Hunter Region Botanic Gardens.	Two matters were still to be resolved after community consultation in 2016. • Planning for the Newcastle Power Station was developed, then proposed by AGL on land that was in conflict with the 2016 design. • Access to the Hunter Region Botanic Gardens. Both matters were considered in refinement of the project design between Tomago Road and north of the Hunter Region Botanic Gardens access. The design refinements were displayed in a community update in November 2020 and provide the following: • A consolidated Tomago interchange at Old Punt Road to avoid conflict to the Power Station proposal. • The design allows direct northbound and southbound access to the Hunter Region Botanic Gardens to be retained and improved from the Pacific Highway. • A new right turn from Tomago Road and the new northbound Pacific Highway alignment allows for vehicles from Tomago to access the Motorway to travel north more efficiently. • Direct connection to the realigned Pacific Highway under the Motorway to a new signalised intersection.
Project alignment at Heatherbrae	Raising the project vertical alignment through the Hunter Water Corporation land in the Tomago Sandbeds Catchment Area	This change was implemented to improve protection and endeavour to avoid water quality impacts on the Tomago Sandbeds Catchment Area. The vertical alignment change allowed for pavement drainage to be graded so that stormwater would be directed towards lined water quality basins for treatment prior to discharge (refer to **Chapter 11** (surface water and groundwater quality)). This refinement would minimise effects on sensitive habitats, such as waterways and wetlands, native vegetation and fauna.
New link road at Tomago	Removing the link to Tomago Road	The link road was removed as it would have caused major impacts to existing adjoining land use to cater for the design. Removing the link road would avoid impact to state-listed threatened ecological communities.

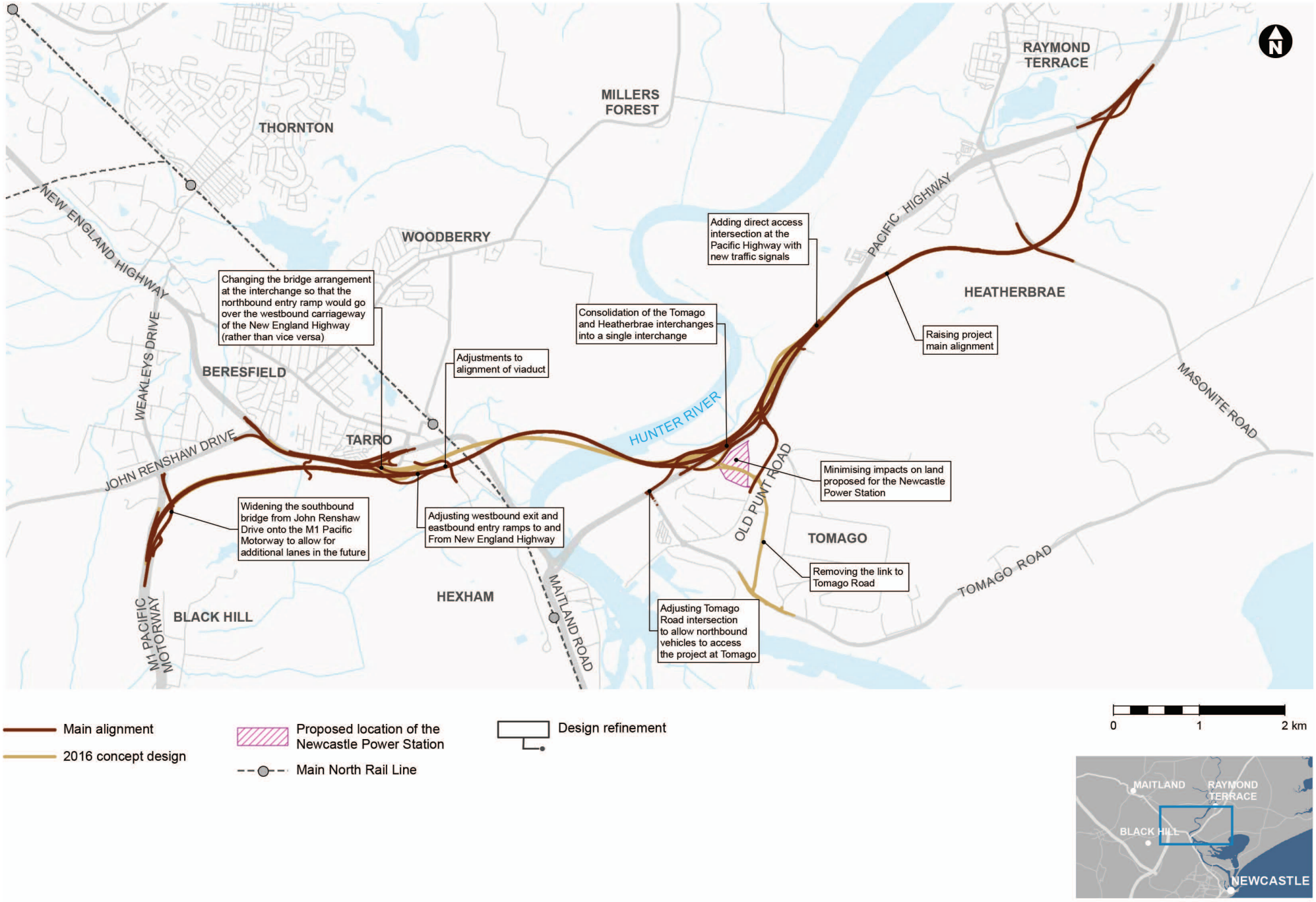

Figure 4-10 The preferred option and design refinements

4.5.1 Minimising and avoiding environmental impacts

A number of environmental impacts have been avoided or minimised throughout the development of the project. As discussed in **Section 4.1**, **Section 4.2** and **Section 4.3**, alternatives and options have been identified and assessed against a range of engineering, environmental, social, land-use and economic considerations. As a result of the project development process, the project has avoided and minimised many environmental impacts associated with:

- Biodiversity:
  - Minimising direct impacts to wetlands west of Woodlands Close
  - Avoiding and minimising impacts to floodplain wetlands and associated biodiversity with a viaduct across the Hunter River floodplain instead of an embankment
  - Minimising fragmentation of habitat, including koala habitat, by aligning the project closely to existing infrastructure and land use
  - Avoiding impacts to remnant vegetation, potential habitat for threatened species, connectivity impacts and a population of Commonwealth-listed *Grevillea parviflora* subsp. *parviflora* with the removal of the link road at Tomago.
- Hydrology and flooding:
  - Minimising substantial upstream flooding impacts by replacing embankment with a 2.6 kilometre long viaduct across the Hunter River floodplain and providing multiple bridges across waterways. This would minimise impact to upstream drainage capacity, flood storage and conveyance and local afflux.
- Water quality:
  - Minimising surface water quality impacts by realigning the project with less impacts across the floodplain
  - Minimising groundwater impacts by reducing soft soil consolidation activities.
- Non-Aboriginal heritage:
  - Minimising impacts at the Glenrowan Homestead complex, and avoiding impacts to Hexham Bridge, Hexham Shipbuilding Yards and Hannell Family Vault structure through modifications to the alignment.
- Land use and property:
  - Project alignment has been refined to be more closely aligned to existing infrastructure to minimise the land severance and impacts to existing properties and land use.
- Socio-economic:
  - Design changes providing improved interchange arrangements at Black Hill and Tarro, and at Tomago and Raymond Terrace that have improved accessibility and minimised impacts to existing businesses at Beresfield and Heatherbrae respectively.

The project has, through its design and construction methodology, sought to minimise environmental impacts. For further detail on how the project has minimised and avoided impacts based on the application of environmental management measures, refer to **Chapter 7** (traffic and transport) through to **Chapter 23** (cumulative impacts) as well as **Chapter 24** (summary of environmental management measures).

4.6 The project

As discussed throughout this chapter, the preferred option and design for the project were determined and refined through an extensive evaluation, community consultation (as discussed in **Chapter 6**) and review process. Changing the project alignment to allow connection to the New England Highway has resulted in the project better aligning with project objectives, while improving local and regional connectivity. This change has also resulted in minimising environmental impacts including reducing socio-economic and land use, biodiversity and heritage impacts (as discussed in **Section 4.5.1**). The change from an embankment across the floodplain to a viaduct has resulted in avoiding substantial environmental impacts associated with flooding, groundwater, surface water quality and hydrology as discussed in **Section 4.5.1**).

Overall, the project development process has ensured that the project best meets the project objectives, while minimising social and economic and natural environment impacts to ultimately provide value for money.

The preferred option for the project as described in **Section 4.4** together with the design refinements detailed in **Section 4.5** comprises the project.

In summary, the project as shown on **Figure 1-2** consists of:

- A new dual-carriageway motorway, with two lanes in each direction, between Black Hill and Raymond Terrace
- Interchanges at Black Hill, Tarro, Tomago and Raymond Terrace
- Realignment of New England Highway, Pacific Highway and other local roads to maintain existing routes and tie-in with the project.

Refinements to the design as set out in this EIS may occur as a result of submissions received as part of the community consultation and EIS submission process. The design may also be refined during the detailed design of the project.

A detailed description of the project and its elements is provided in **Chapter 5**.

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BUILDING OUR FUTURE

NSW GOVERNMENT

M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Chapter 5: Project description

Transport for NSW | July 2021

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5. Project description

This chapter describes the proposed scope of work, including the route alignment, corridor width, main project elements, ancillary facilities, design standards and construction activities.

The project description presented in this EIS represents the project concept design. Sufficient flexibility has been provided in the concept design to allow for refinement during detailed design, in response to any submissions received following the exhibition of the EIS or to minimise environmental impacts. The final design may therefore vary from the project described in this chapter.

Table 5-1 lists the SEARs as they relate to the project description and identifies where these have been addressed in this EIS.

Table 5-1 SEARs (project description)

Secretary's requirement	Where addressed in EIS
2. Environmental Impact Statement	
1. The EIS must include, but not necessarily be limited to, the following:	
(b) description of the project and all components and activities (including ancillary components and activities) required to construct and operate it, including:	The project scope and key design elements are described in **Section 5.1**, **Section 5.2** and **Section 5.3** The construction of the project is described in **Section 5.4**
− the proposed route;	The proposed route is detailed in **Section 5.3.2** and shown on **Figure 5-1**
− design of the road and its components, including interchanges; bridges and viaducts; structures over roads, rail lines and pipelines; road user, pedestrian and cyclist facilities; and lighting;	The project design and key elements are described in **Section 5.2** and **Section 5.3**
− road upgrade works, including road widening, intersection treatment and grade separation works, property access, parking, pedestrian and cyclist and public transport facilities;	Road upgrade and road widening in **Section 5.3.1** to **Section 5.3.4** Intersection treatments and grade separation works in **Section 5.3.3** Property access in **Section 5.3.20** Construction parking in **Section 5.4.3** Pedestrian and cyclist and public transport facilities in **Section 5.3.16** and **Section 5.3.17**.
− location and operational requirements of construction ancillary facilities and access;	The locations and operational requirements of ancillary facilities (including access arrangements) are detailed in **Section 5.4.3**
− the relationship and/or integration of the project with existing and proposed public and freight transport services;	Integration of the project with existing public and freight transport services is described in **Section 5.3.17** and **Section 5.3.18**. Integration of the project with existing road and rail is described throughout **Section 5.3** and **Section 5.4**.
(r) relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software.	Relevant plans, drawings and diagrams are provided throughout this EIS and attached in the appendices

5.1 Project scope

5.1.1 The project

Transport is proposing to extend the M1 Pacific Motorway from Black Hill to the Pacific Highway at Raymond Terrace, a distance of about 15 kilometres, bypassing Beresfield, Hexham and Heatherbrae, as shown in **Figure 1-2**. The project would traverse the City of Newcastle and Port Stephens Council local government areas (LGAs). The suburbs of Beresfield, Tarro, Heatherbrae and Raymond Terrace are located to the north of the project, with Black Hill, Hexham and Tomago located to the south of the project.

The project would provide a critical link in the National Land Transport Network (NLTN), particularly for the coastal Sydney to Brisbane corridor. The project is anticipated to open in 2028. This timing is subject to planning approval and completion of the detailed design.

The project would include the following key features:

- A 15 kilometre motorway comprised of a four lane divided road (two lanes in each direction)
- Motorway access from the existing road network via four new interchanges at:
  - Black Hill: connection to the M1 Pacific Motorway
  - Tarro: connection and upgrade (six lanes) to the New England Highway between John Renshaw Drive and the existing Tarro interchange at Anderson Drive
  - Tomago: connection to the Pacific Highway and Old Punt Road
  - Raymond Terrace: connection to the Pacific Highway.
- A 2.6 kilometre viaduct over the Hunter River floodplain including new bridge crossings over the Hunter River, the Main North Rail Line, and the New England Highway
- Bridge structures over local waterways at Tarro and Raymond Terrace, and an overpass for Masonite Road in Heatherbrae
- Connections and modifications to the adjoining local road network
- Traffic management facilities and features
- Roadside furniture including safety barriers, signage, fauna fencing and crossings and street lighting
- Adjustment of waterways, including at Purgatory Creek at Tarro and a tributary of Viney Creek
- Environmental management measures, including surface water quality control measures
- Adjustment, protection and/or relocation of existing utilities
- Walking and cycling considerations, allowing for existing and proposed cycleway route access
- Permanent and temporary property adjustments and property access refinements
- Construction activities, including establishment and use of temporary ancillary facilities, temporary access tracks, haul roads, batching plants, temporary wharves, soil treatment and environmental controls.

The key operational features of the project are shown in **Figure 1-2**. A detailed description of the project, including key design criteria, details of the proposed permanent work, and property access and acquisition, is provided in **Section 5.2** and **Section 5.3**. The proposed construction work associated with the project is described in **Section 5.4**.

5.2 Design criteria

5.2.1 Design standards

Transport is committed to providing high quality, safe and efficient infrastructure. As such, the development of the project has been guided by recognised standards and criteria. The concept design has incorporated sufficient road corridor width to accommodate design development and refinement opportunities during detailed design.

Design development was based on:

- Austroads guides and publications (with appropriate Roads and Maritime Services supplements)
- Australian standards
- Roads and Maritime Services technical directions, standards, and model drawings
- Australian Rainfall and Runoff: A Guide to Flood Estimation (Ball et al. 2019).

The key design criteria adopted for the project are summarised in **Table 5-2**.

Table 5-2 Key design criteria

Item	Design element	Key design criteria
General	Design vehicle	25m B-double
	Design speed	• Main alignment:110km/h • Ramps: 90km/h
	Posted speed limit	• Main alignment: 110km/h • Ramps: 80km/h
	Number of lanes	• Main alignment: Two lanes in each direction • Ramps: one lane (except the southbound entry ramp at the Black Hill interchange, which is two lanes)
	Lane, verge and median width	• Through and turn lanes: 3.5m • Nearside shoulder width: 2.5m (3.0m on bridges) • Offside shoulder width: 1.0m (1.5m on bridges) • Verge width: 0.5m offside / 1.5m near side • Depressed median width: Varies, up to 12m • Median width: paved 5m / raised: 2.6m
	Grades	Main alignment: • Minimum grade: 0.5% • Maximum grade: 2.6% (Tomago interchange)
	Cut batter slopes	• 2 (horizontal (H)):1 (vertical (V))
	Fill batter slope (embankment)	• 4H:1V (2.5H:1V with barrier)
	Bench width minimum curve radius	• Bench width: 4.5m • Curve radius: Main alignment: 900m / Ramps: 240m

Item	Design element	Key design criteria
	Vertical clearances	• Ramps and local access: Minimum vertical clearance of 5.4m • Rail: Minimum vertical clearance of 7.1m • A navigable channel within the Hunter River, with a minimum vertical clearance of 10m and a minimum horizontal clearance of 32m
	Safety barriers	• Includes wire rope barriers, concrete barriers, W-beam steel safety barriers, and flexible bollards
	Minimum flood immunity requirements	• Both carriageways of the project would target immunity for a 5% annual exceedance probability (AEP) event flood event to the outer edge line of each carriageway
	Pavement design life	• 40 years
Bridges	Bridge design life	• 100 years
	Bridge drainage design	Flows must not extend into the traffic lane for rainfall events up to the 5% AEP event

5.2.2 Urban design objectives and principles

Urban design objectives and principles were prepared to guide the project design as set out in this document. These consider how the project would integrate physically and visually with the surrounding environment.

The urban design objectives and principles for the project are identified in **Chapter 15** (urban design, landscape and visual amenity) and are consistent with the following Urban Design Guidelines:

- Beyond the Pavement 2020 Urban design approach and procedures for road and maritime infrastructure planning, design and construction (Transport for NSW 2020a)
- Bridge aesthetics design guidelines: Design guideline to improve the appearance of bridges in NSW (Transport for NSW 2019a)
- Landscape design guideline: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors (Roads and Maritime Services 2018a).

The following overarching urban design objectives were developed for the project:

- Provide a flowing road alignment that is responsive to and integrated with the landscape
- Provide a well vegetated, natural road reserve
- Provide an enjoyable, interesting highway
- Value the communities and towns along the road
- Provide consistency-with-variety in road elements
- Provide a simplified and unobtrusive road design.

Urban design principles were adopted for each urban design objective as described in **Chapter 15** (urban design, landscape and visual amenity).

5.2.3 Detailed design requirements

This EIS seeks approval for the project elements and their functionality as described in this chapter. The concept design presented in this EIS may be refined following the EIS exhibition process and during the detailed design, including future community consultation as part of the detailed design process.

The development of the detailed design would:

- Meet any conditions of approval determined for the project
- Be consistent with key design criteria and functionality as described in this EIS and any subsequent response to submissions
- Avoid or minimise environmental impacts wherever possible
- Further develop and refine environmental management measures
- Appropriately develop and incorporate the urban design and landscape strategy and the urban design objectives and principles presented in **Chapter 15** (urban design, landscape and visual amenity)
- Address risk management during construction and operation
- Allow for safe and cost-effective maintenance of the project during operation in accordance with work health and safety requirements and relevant specifications.

Design outcomes and the construction methodology would be further optimised during detailed design. **Chapter 27** (project synthesis) discusses the further work that would be carried out during detailed design.

5.3 The completed project

5.3.1 Operational footprint

The operational footprint, as shown on **Figure 5-1**, includes the main alignment and additional areas required for the operation and maintenance of the project, comprising the following elements:

- Main alignment
- Interchanges including entry and exit ramps, tie-ins and upgrades to local and state roads
- Embankments and cuttings
- Culverts and drainage structures
- Water quality control measures, including basins and swales
- Landscaping
- Maintenance access
- Fencing
- Other project elements required during operation of the project (e.g. intelligent transport systems (ITS), utilities and variable message signs (VMS)).

The total operational footprint is about 300 hectares. The width of the operational footprint is largely influenced by the width of the main alignment (which is about 20 to 35 metres) and varies between about 35 metres and 160 metres wide to allow for utilities, drainage features, cuttings and embankments and roadside furniture. At interchanges and road connections (including at New England Highway and Pacific Highway) the operational footprint width is up to 400 metres.

The construction footprint for the project is discussed in **Section 5.4.1**.

5.3.2 Main alignment

The main alignment of the M1 Pacific Motorway extension is shown in **Figure 5-1** and consists of the following (heading south to north):

- The main alignment would start on the M1 Pacific Motorway at Black Hill, about 1.2 kilometres south of the John Renshaw Drive and Weakleys Drive intersection. A new interchange would be provided at Black Hill (refer to **Section 5.3.3**) connecting to the intersection of John Renshaw Drive and Weakleys Drive, after which the main alignment then heads east through a major cutting towards Tarro
- The main alignment then proceeds parallel to the existing New England Highway. Twin bridges (B02) would be provided across the unnamed wetland at Tarro and a new interchange would connect the main alignment to Tarro (refer to **Section 5.3.3**). The westbound New England Highway would be realigned and both carriageways of the New England Highway would be upgraded to three lanes for a distance of 800 metres between John Renshaw Drive and Tarro
- The main alignment would then continue on to a viaduct (B05) commencing west of Woodlands Close. The viaduct would cross over Woodlands Close, the Main North Rail Line and the New England Highway before continuing east across the floodplain and Hunter River. The viaduct finishes west of the Tomago interchange, which connects the main alignment, between the Pacific Highway intersections at Tomago Road and Old Punt Road (refer to **Section 5.3.3**). The viaduct is described further in **Section 5.3.5**
- The main alignment would continue north-east in close proximity to, and necessitating the realignment of, the Pacific Highway. It would then travel east, past the existing Heatherbrae industrial area and pass beneath the realigned Masonite Road. A bridge (B11) would be provided across the wetland at Windeyers Creek and the main alignment would conclude at the new Raymond Terrace interchange (refer to **Section 5.3.3**). This interchange would be located south of Raymond Terrace and would enable entry and exit to/from the project. The existing southbound Pacific Highway would be adjusted to traverse over the main alignment via an overpass bridge (B12) to provide space for the Raymond Terrace interchange.

The main alignment would typically consist of two 3.5 metre traffic lanes in each direction with a median that would range from six to 15 metres. The shoulder and verge of the main alignment would provide a width of at least three metres to enable a vehicle to pull over wholly within the shoulder. Entry and exit ramps for the main alignment would typically consist of:

- A single 3.5 metre traffic lane (with the exception of the southbound entry ramp at Black Hill interchange and the northbound Pacific Highway bridge (B06) at Tomago, where two 3.5 metre traffic lanes would be provided)
- A two metre inside shoulder
- A one metre outside shoulder
- 1.5 metre to 2.5 metre verges, depending on the embankment and presence of a safety barrier.

The northbound and southbound traffic lanes would be separated by a 12 metre wide median south of the viaduct (B05) crossing of the Hunter River. From the viaduct (B05) to the overbridge above Old Punt Road intersection (B08), a 3.9 metre wide median with a concrete barrier would be provided. North of Old Punt Road through to Raymond Terrace, the median width would vary from typically six metres (due to corridor and environmental constraints) to 15 metres at the tie into the existing Pacific Highway at Raymond Terrace.

The project design has considered future widening of the main alignment from two lanes in each direction to three lanes in each direction. Allowance has been made in the design, as set out in this EIS, to provide enough space to accommodate the additional travel lanes.

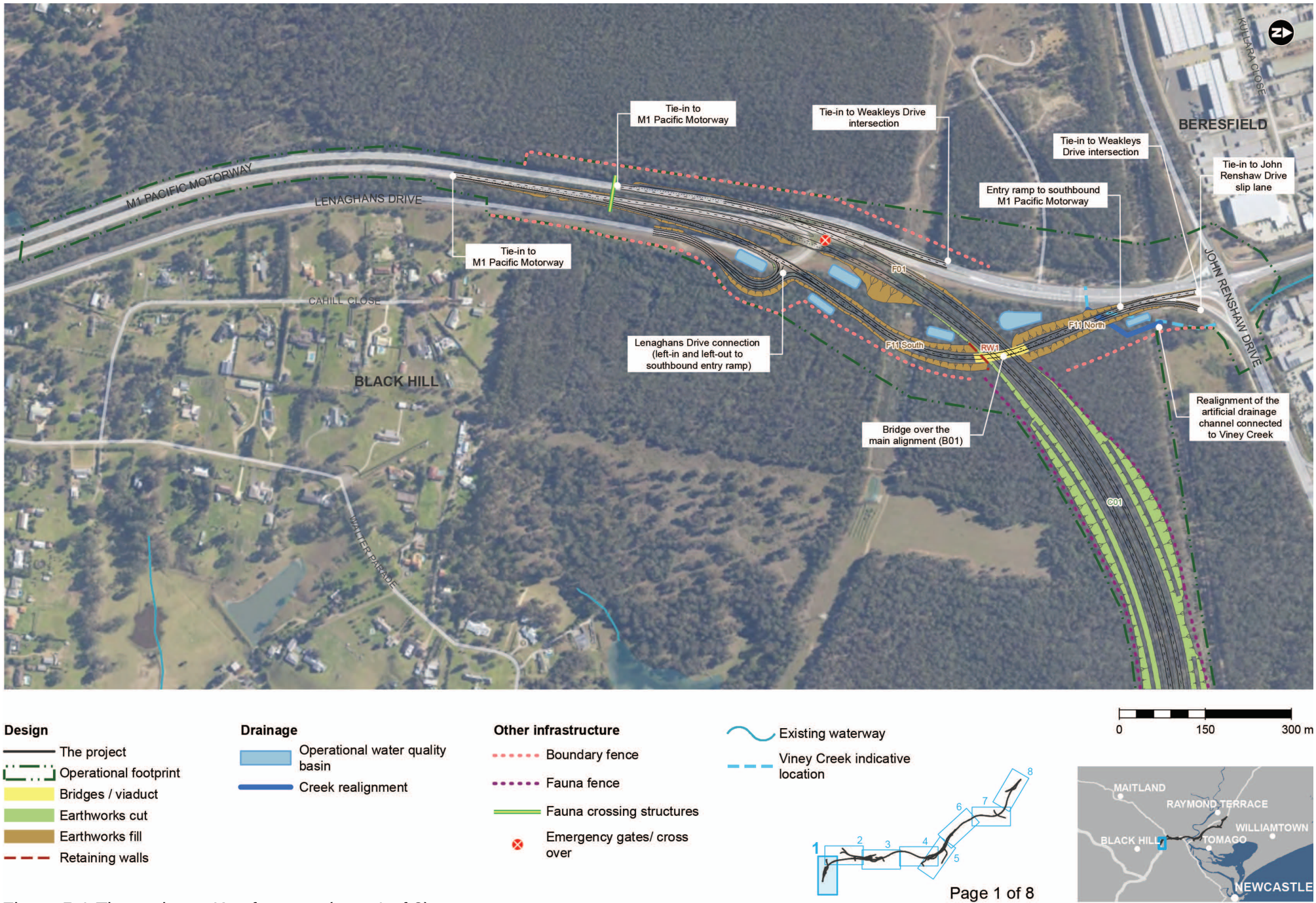


Figure 5-1 The project – Key features (map 1 of 8)

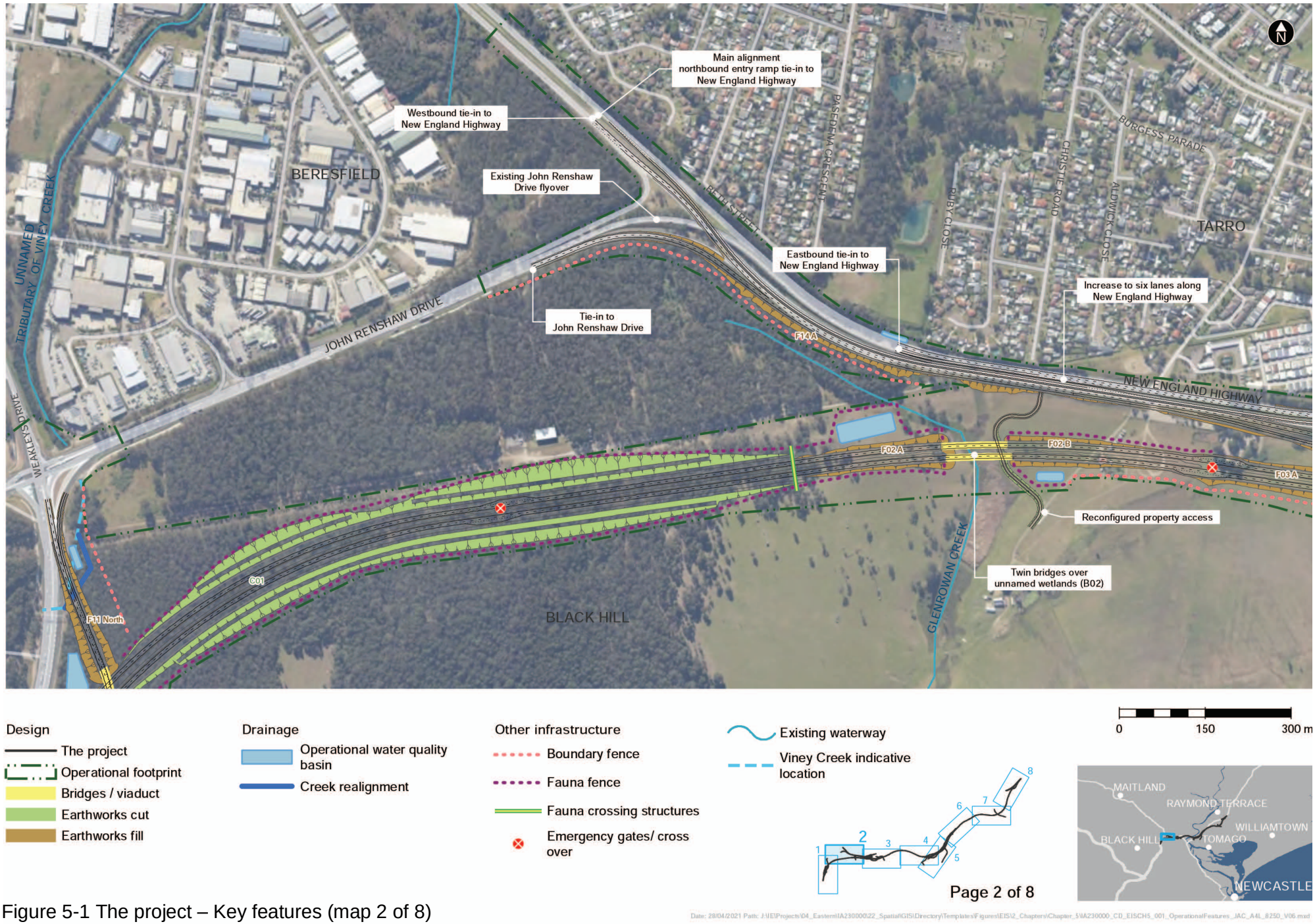


Figure 5-1 The project – Key features (map 2 of 8)

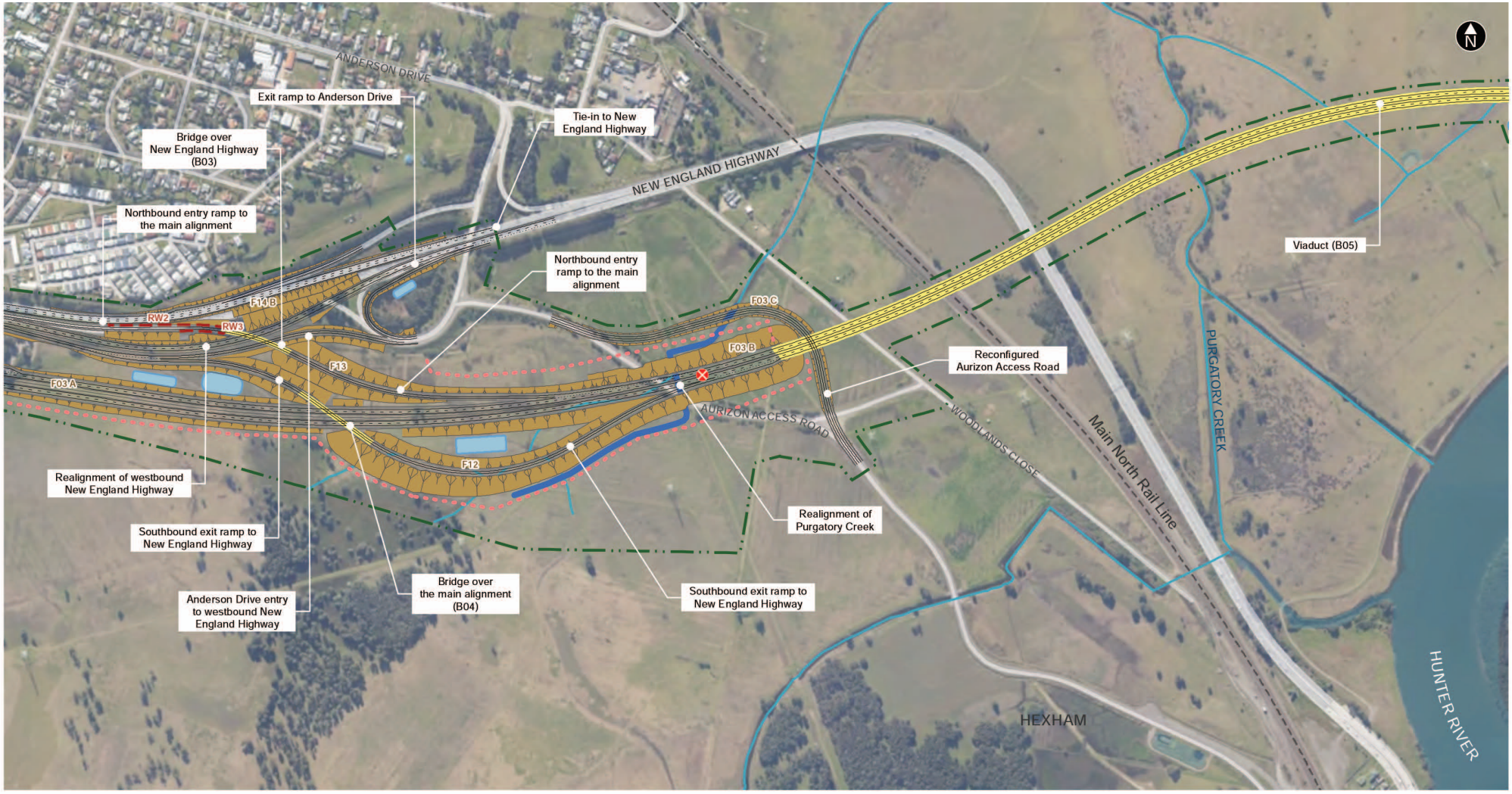
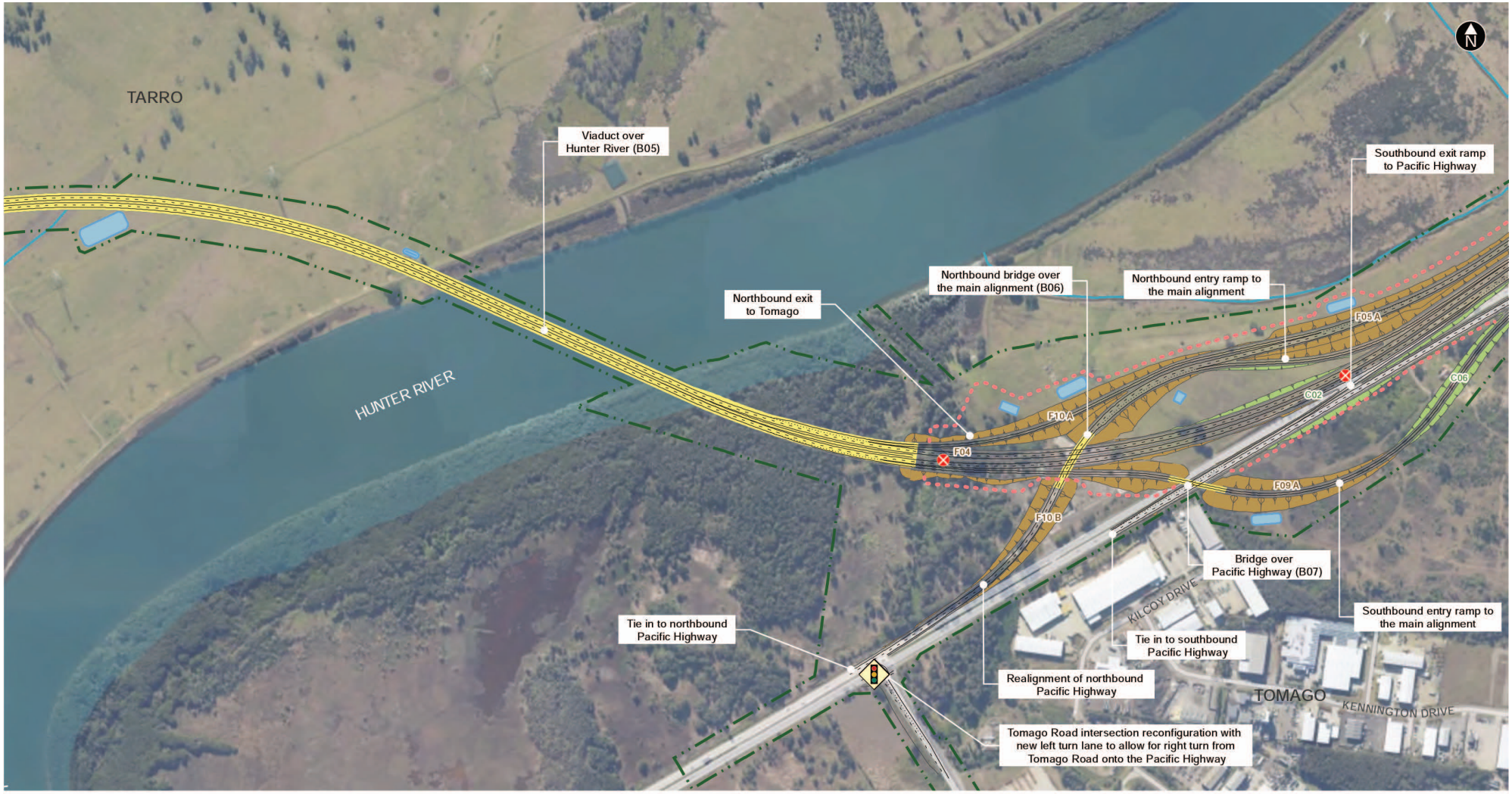


Figure 5-1 The project – Key features (map 3 of 8)



Design
- The project
- Operational footprint
- Bridges / viaduct
- Earthworks cut
- Earthworks fill

Drainage
- Operational water quality basin

Other infrastructure
- Boundary fence
- Emergency gates/ cross over
- Traffic signal

Existing waterway

0 150 300 m

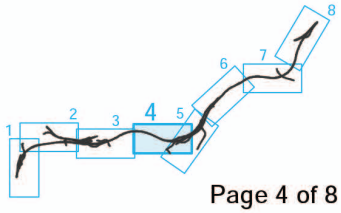


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Figure 5-1 The project – Key features (map 4 of 8)

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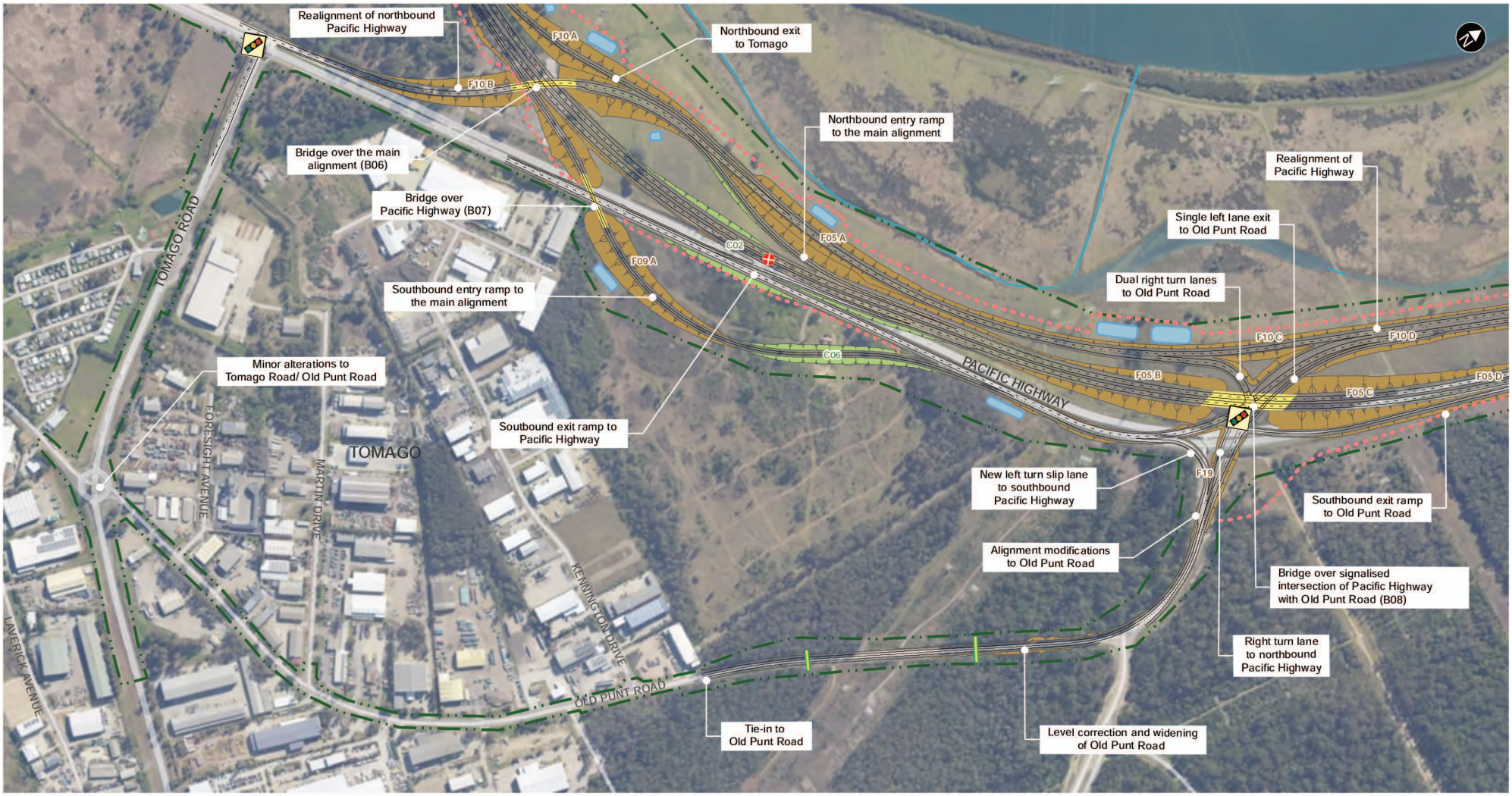

Figure 5-1 The project – Key features (map 5 of 8)

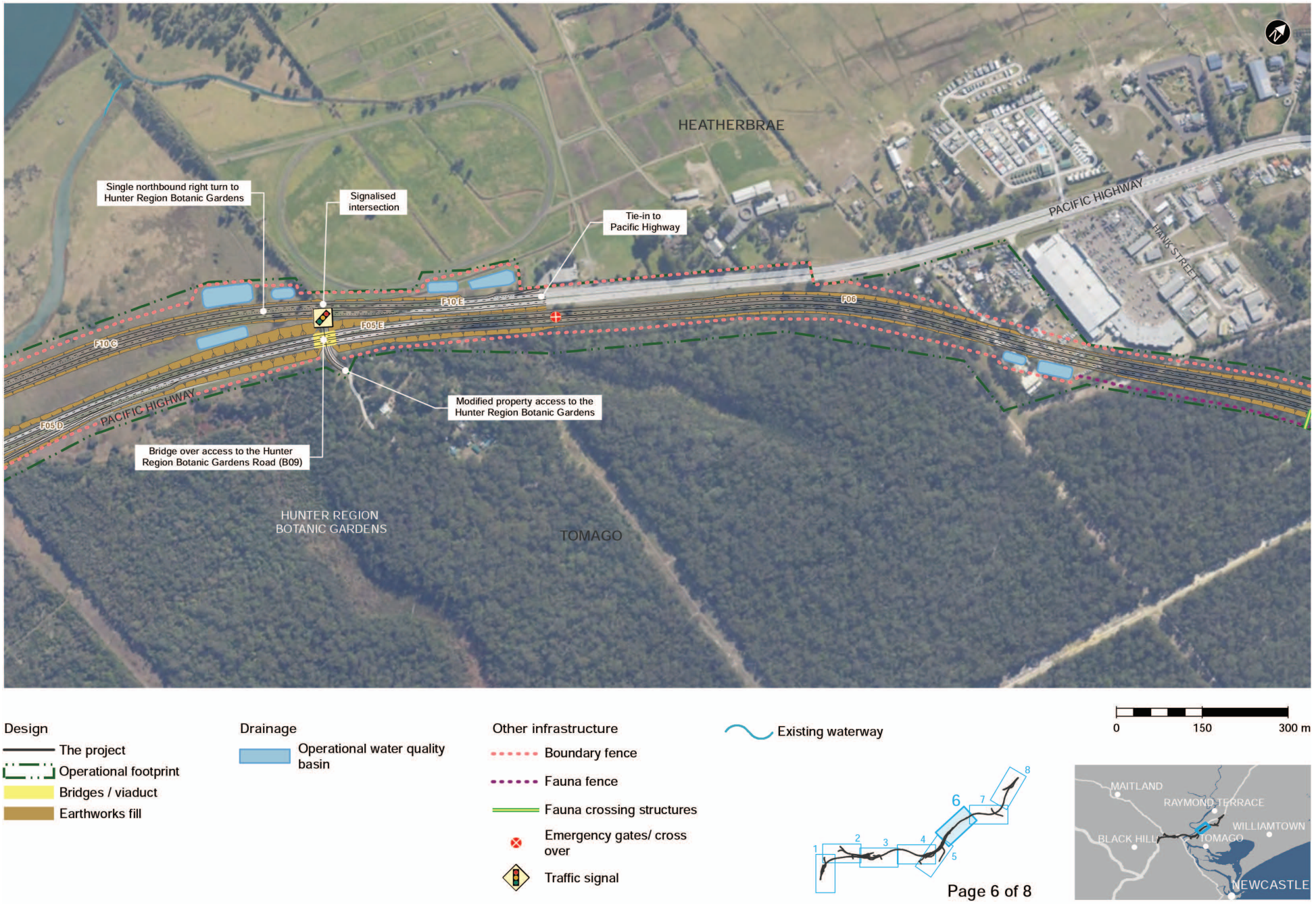

Figure 5-1 The project – Key features (map 6 of 8)

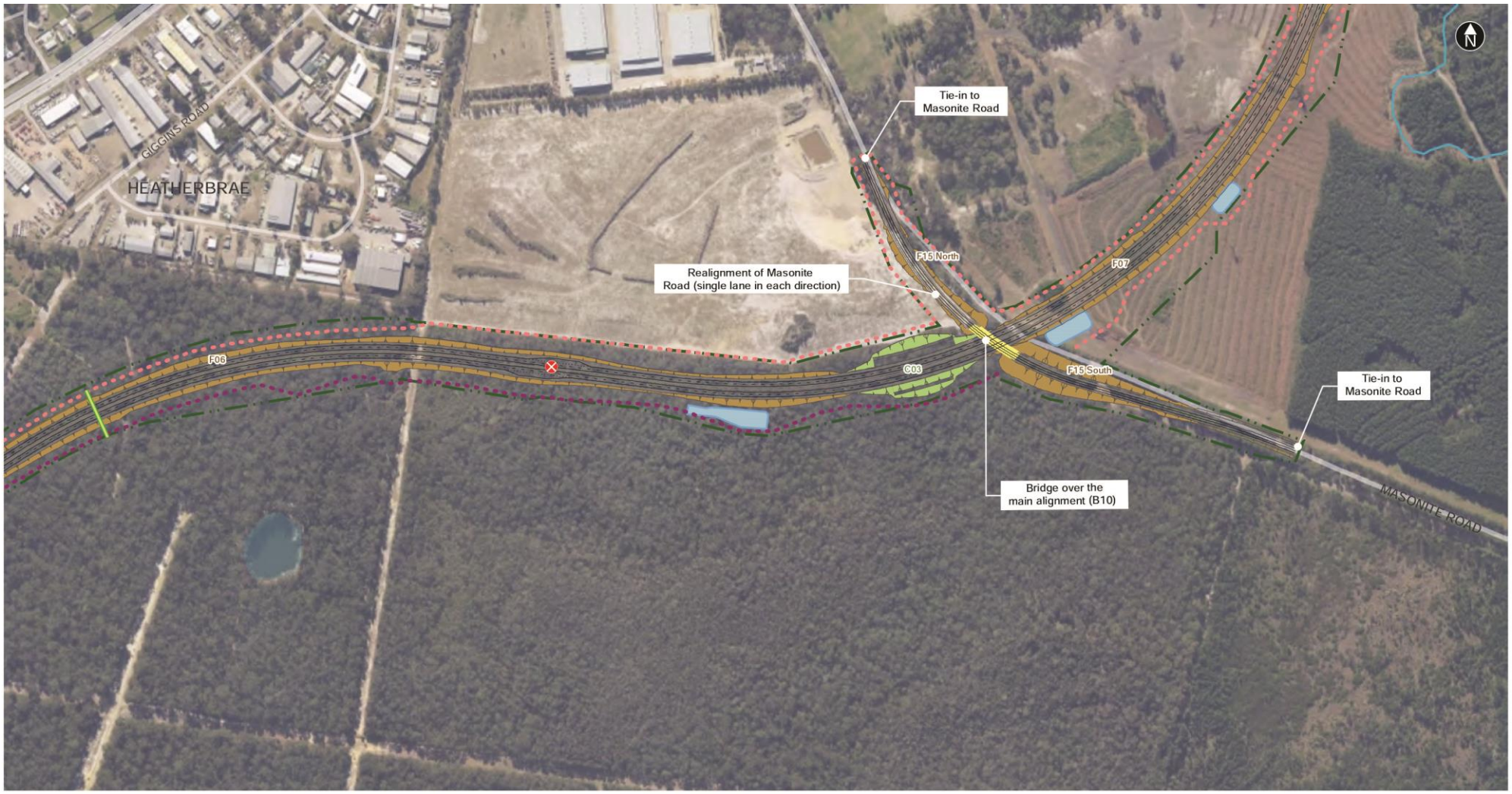

Figure 5-1 The project – Key features (map 7 of 8)

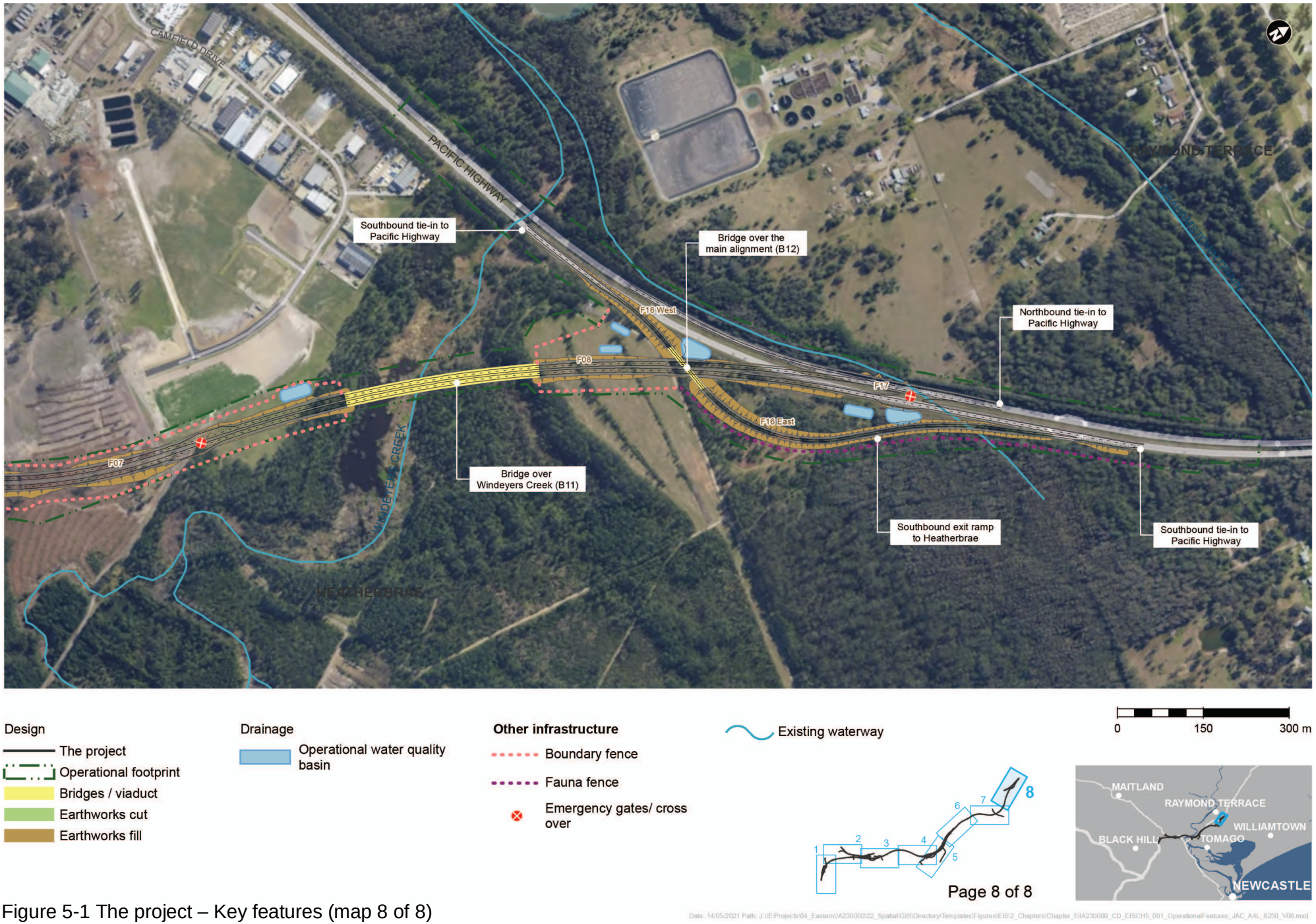

Figure 5-1 The project – Key features (map 8 of 8)

5.3.3 Interchanges, intersections and local road changes

The project would include four new interchanges to provide free flowing connections for motorists travelling on the main alignment at:

- Black Hill interchange
- Tarro interchange
- Tomago interchange
- Raymond Terrace interchange.

The project would also include adjustments to the following existing intersections:

- M1 Pacific Motorway and John Renshaw Drive intersection
- Tomago Road and Pacific Highway intersection
- Old Punt Road and Pacific Highway intersection
- Old Punt Road and Tomago Road intersection
- Hunter Region Botanic Gardens (HRBG) access road and Pacific Highway intersection.

Several local roads (notably Masonite Road as described below) would be affected by the project. Where affected, local roads would be overpassed or underpassed as described in the following sections. Where local roads cannot be overpassed or underpassed, they would be upgraded or changed to ensure safe and efficient connections with the project as described in the following sections.

These proposed new interchanges and adjustments to intersections and local roads are described in further detail below.

Black Hill interchange

The interchange at Black Hill would be located south of the existing M1 Pacific Motorway and John Renshaw/Weakleys Drive intersection, as shown in **Figure 5-1**. Road users coming from north of the interchange around Beresfield would be required to travel to the Tarro interchange to head northbound along the main alignment. Similarly, road users travelling south on the main alignment would be required to travel to the Tarro interchange to access Beresfield. The key features of the Black Hill interchange include:

- A two lane northbound exit ramp carrying traffic to the signalised intersection of John Renshaw Drive and Weakleys Drive
- A two lane southbound entry ramp, via a bridge (B01) carrying traffic from the intersection of John Renshaw Drive and Weakleys Drive, and the John Renshaw Drive slip lane onto the existing M1 Pacific Motorway
- Left in and left out movements at Lenaghans Drive from the southbound entry ramp
- Realignment of about 220 metres of Lenaghans Drive to about 80 metres southeast of its existing location, connecting it to the southbound entry ramp of the M1 Pacific Motorway.

The configuration of the proposed interchange at Black Hill is shown in **Figure 5-2**, with a visualisation provided as **Figure 5-3**.

M1 Pacific Motorway and John Renshaw Drive intersection

The existing signalised M1 Pacific Motorway and John Renshaw Drive intersection would be upgraded to provide a signalised pedestrian crossing across the southern approach to the intersection to provide a safe crossing location for cyclists.

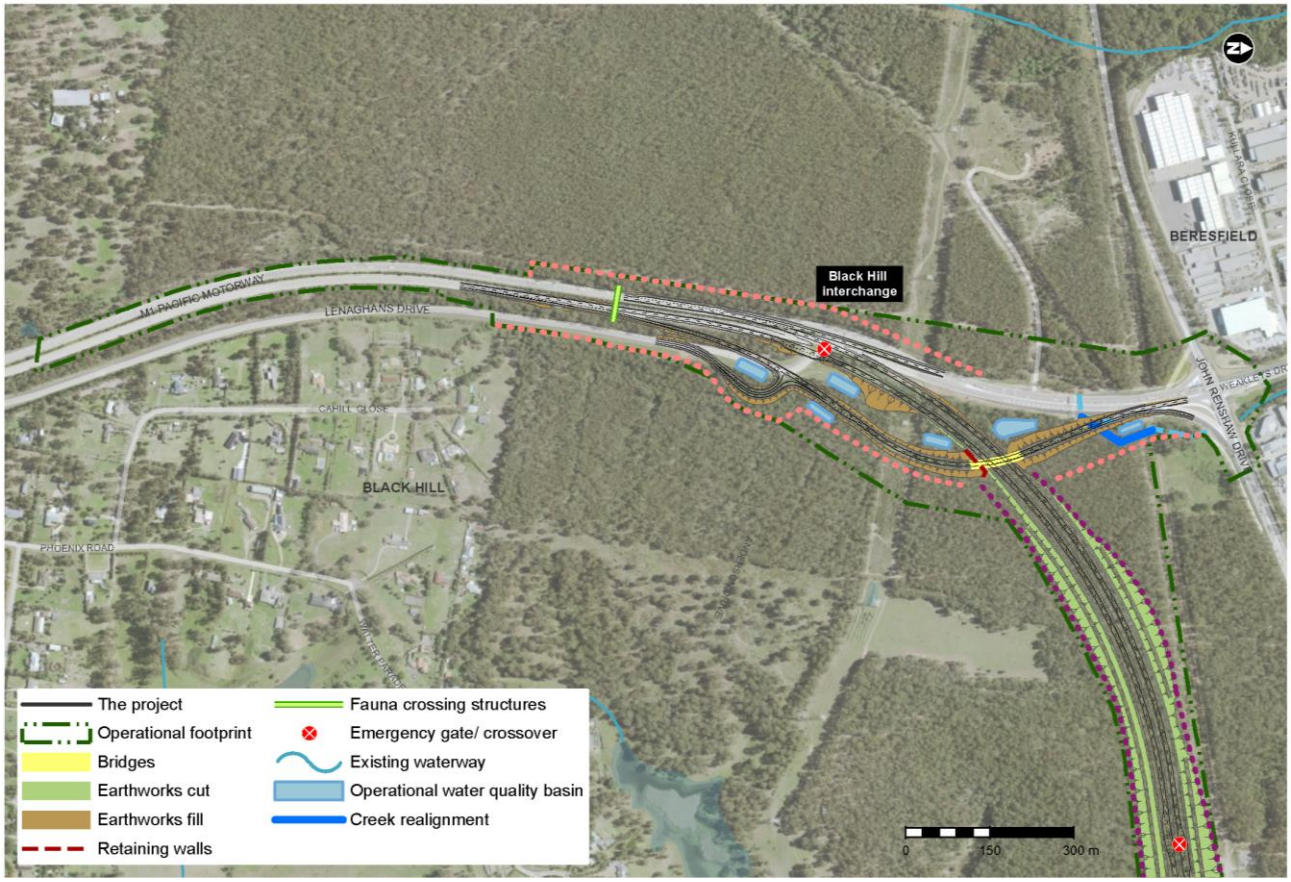

Figure 5-2 Black Hill interchange configuration

Figure 5-3 Black Hill interchange visualisation

Tarro interchange

The interchange at Tarro would be located east of the existing M1 Pacific Motorway and south of the New England Highway, as shown in **Figure 5-1**. Vehicles heading north to the Hunter Valley would exit to the New England Highway at this interchange. The key features of the Tarro interchange include:

- A single lane northbound entry ramp, via a bridge (B03) from New England Highway eastbound to the main alignment
- A single lane southbound exit ramp, via a bridge (B04) from the main alignment to the New England Highway westbound
- Upgrade of the New England Highway from four to six lanes between John Renshaw Drive and the existing Tarro interchange (refer to **Section 5.3.4**)
- Realignment of the New England Highway westbound carriageway to accommodate the Tarro interchange (refer to **Section 5.3.4**)
- Modification of the Anderson Drive westbound entry ramp to the New England Highway to merge with the main alignment southbound exit lane to the New England Highway
- Realignment of Aurizon access road to accommodate the Tarro interchange (refer to **Section 5.3.20**)
- Viaduct (B05) over the realigned Aurizon access road.

The configuration of the proposed interchange at Tarro is shown in **Figure 5-4**, with a visualisation provided as **Figure 5-5**.

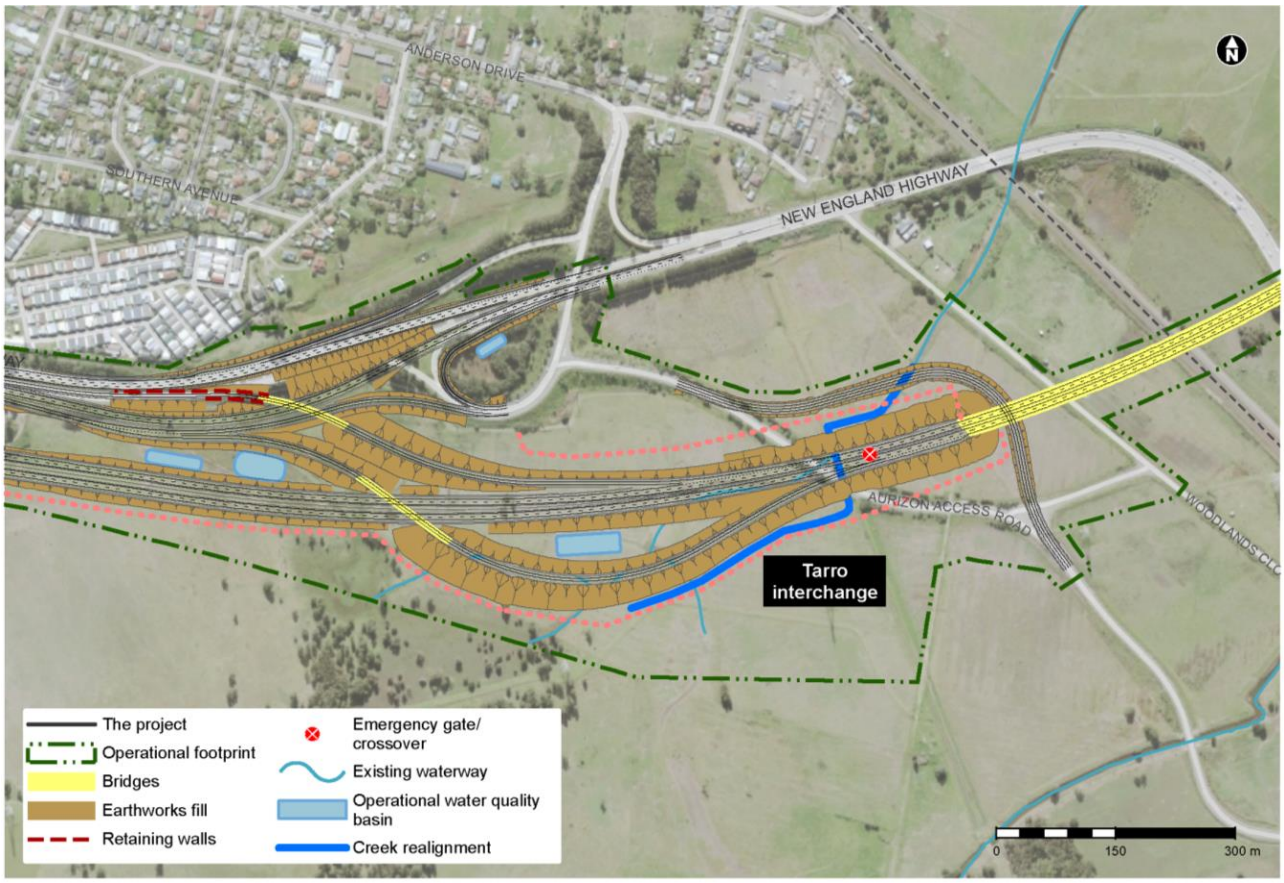

Figure 5-4 Tarro interchange configuration

Figure 5-5 Tarro interchange visualisation

Tomago interchange

The interchange at Tomago would be located immediately north of the existing Pacific Highway, as shown in **Figure 5-1**. The key features of the interchange include:

- A one lane northbound exit ramp carrying traffic from the main alignment to the Pacific Highway northbound
- A one lane southbound exit ramp carrying traffic from the main alignment to the Pacific Highway southbound that would also provide access to Tomago Road
- Realignment and separation of the Pacific Highway northbound and southbound travel lanes to accommodate the main alignment
- A bridge (B06) over the main alignment for traffic travelling northbound along the Pacific Highway, providing continuity of the Pacific Highway
- Twin bridges (B08) to carry traffic along the main alignment over the intersection of Old Punt Road and Pacific Highway
- A one lane southbound entry ramp which would carry traffic from Pacific Highway and Old Punt Road onto the main alignment, via a bridge (B07) over the Pacific Highway.

Tomago Road and Pacific Highway intersection

The existing signalised Tomago Road and Pacific Highway intersection would be upgraded to enable right turn movements from Tomago Road onto the Pacific Highway. A new right turn lane would be provided, while the two existing left turn lanes would be retained.

Old Punt Road and Pacific Highway intersection

The Old Punt Road and Pacific Highway intersection would be upgraded under B08 of the main alignment. This work would also include:

- Upgrade of Old Punt Road between about 110 metres north of Kennington Drive and the Pacific Highway
- A one lane southbound exit ramp carrying traffic from the main alignment to Old Punt Road
- Connectivity to Old Punt Road
- Slip and turning lanes, including:
  - A single left turn slip lane from Old Punt Road to the Pacific Highway southbound
  - A single right turn lane from Old Punt Road to the Pacific Highway northbound
  - A single left turn lane from the Pacific Highway southbound to Old Punt Road
  - Two right turn lanes from the Pacific Highway northbound to Old Punt Road.

The configuration of the proposed interchange at Tomago is shown in **Figure 5-6**, with a visualisation provided as **Figure 5-7**.

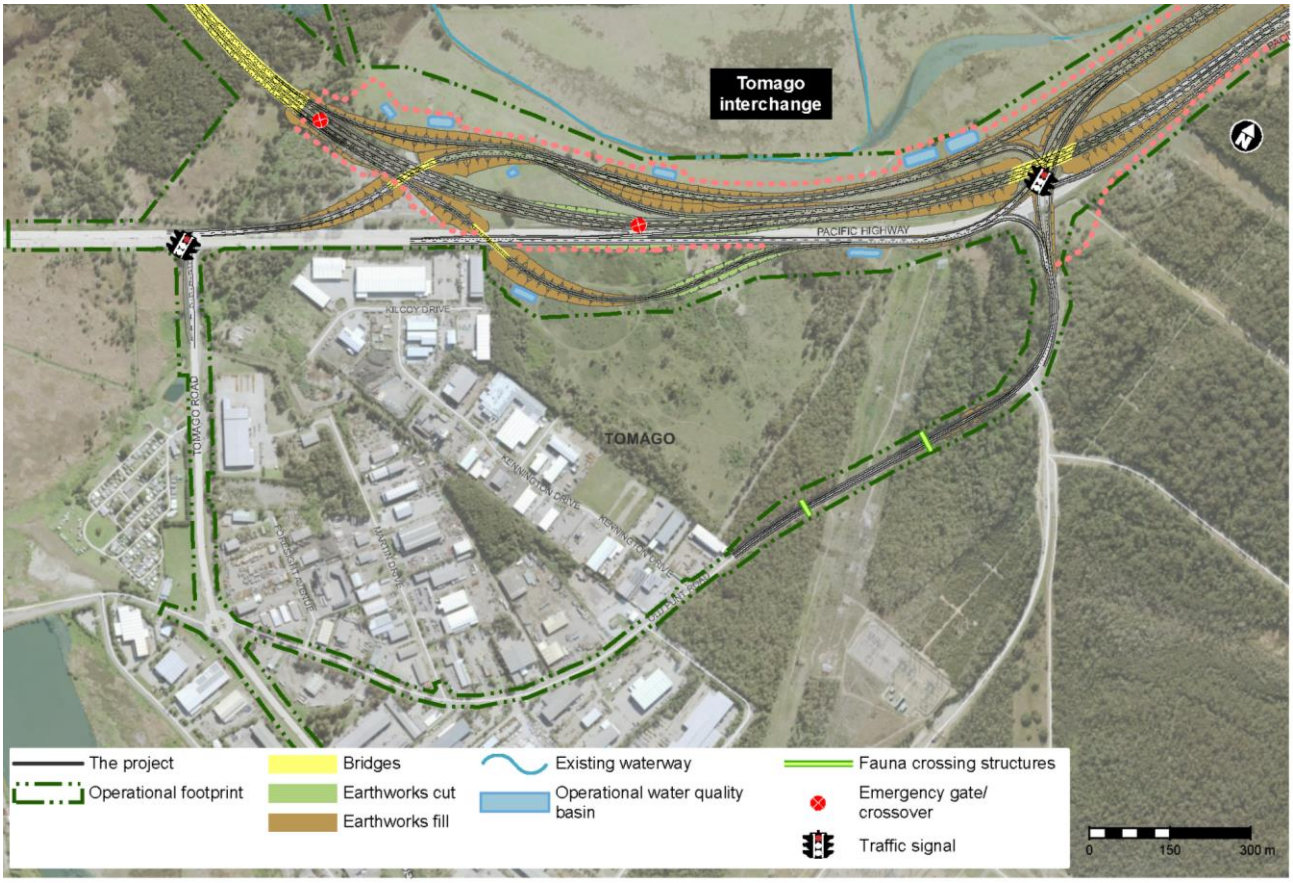

Figure 5-6 Tomago interchange configuration

Figure 5-7 Tomago interchange visualisation

Raymond Terrace interchange

The interchange at Raymond Terrace would be located on the southern side of the Pacific Highway, as shown in **Figure 5-1**. The key features of the interchange at Raymond Terrace would include:

- One lane northbound entry ramp carrying traffic from the Pacific Highway to the main alignment tie in with the Pacific Highway
- One lane southbound exit ramp carrying traffic via an overpass (B12) from the main alignment to Pacific Highway.

The configuration of the proposed interchange at Raymond Terrace is shown in **Figure 5-8**, with a visualisation provided as **Figure 5-9**.

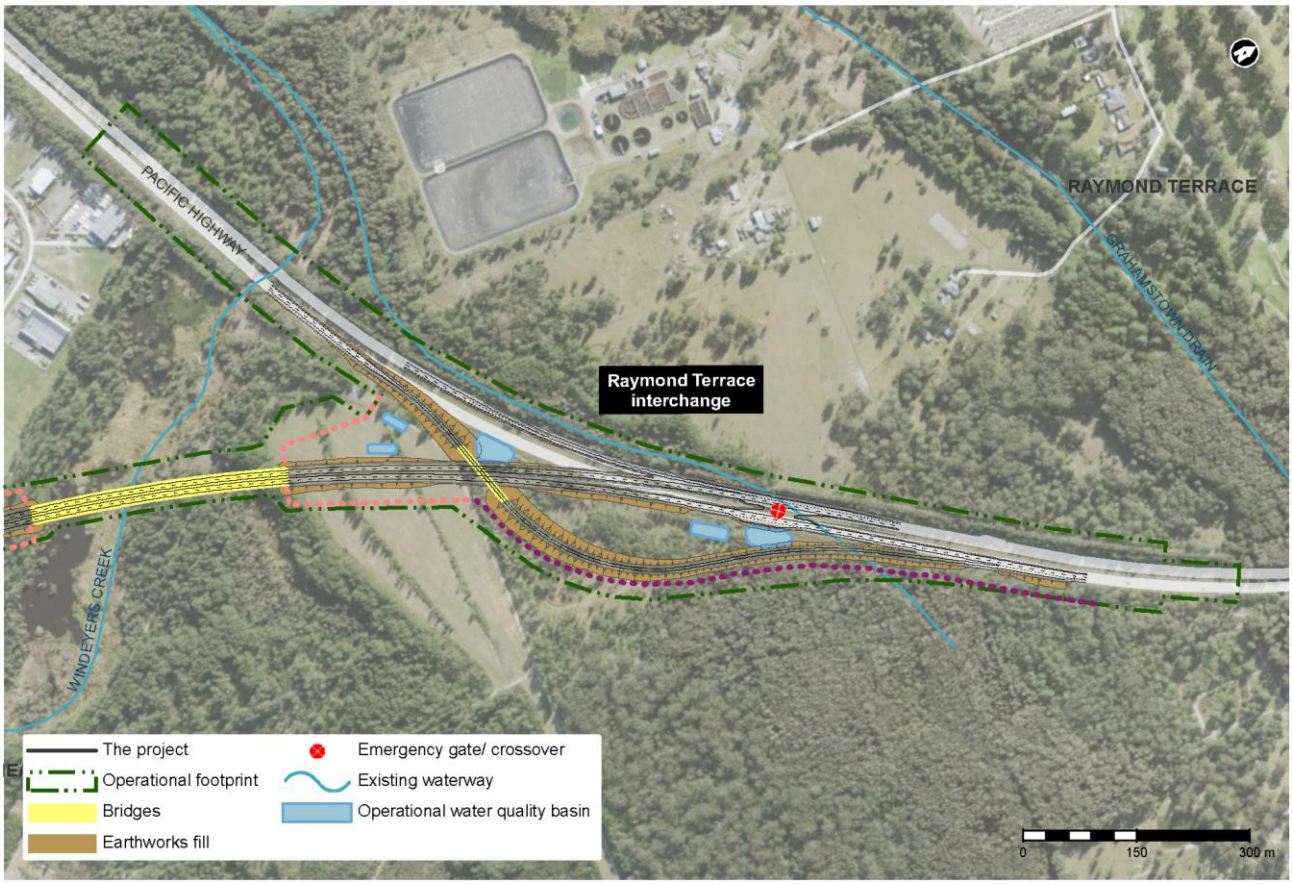

Figure 5-8 Raymond Terrace interchange configuration

Figure 5-9 Raymond Terrace interchange visualisation

Old Punt Road and Tomago Road intersection

Parts of Old Punt Road would have pavement and kerb adjustments to cater for heavy vehicle movements and utilities work. In addition, minor intersection upgrades including adjustments to kerbs and median would occur at the Old Punt Road and Tomago Road intersection to cater for heavy vehicle movements (refer to **Figure 5-1**).

Hunter Region Botanic Gardens access road and Pacific Highway intersection

The Pacific Highway would be realigned near the HRBG to accommodate the main alignment of the project. To ensure that access is maintained, the project would provide a signalised intersection at the HRBG access road and the realigned Pacific Highway. The access road would travel under the main alignment (refer to **Figure 5-10**).

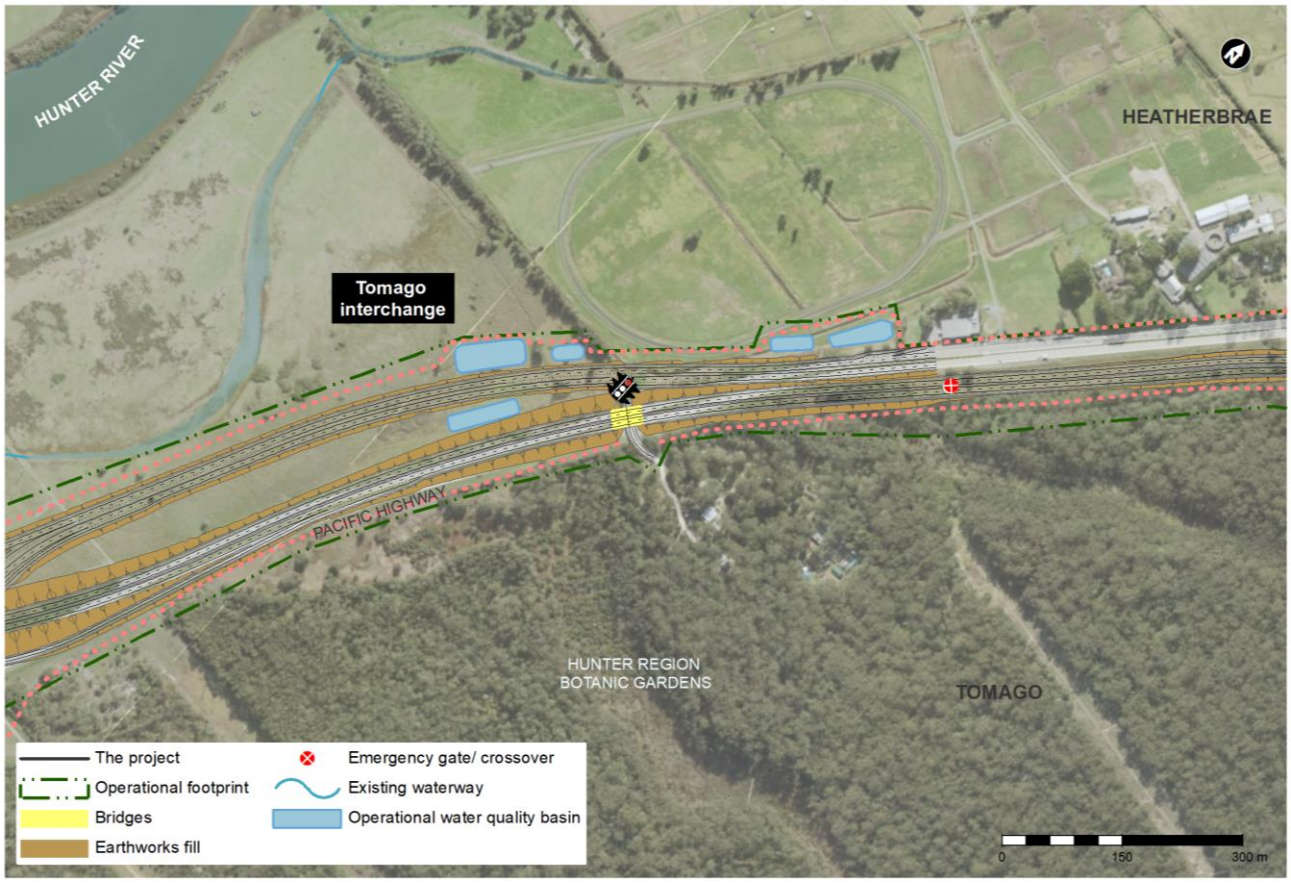

Figure 5-10 Hunter Region Botanic Gardens access

Masonite Road

Currently, Masonite Road is comprised of one lane in each direction. As part of the project, Masonite Road would be realigned, widened and upgraded with a bridge (B10) to pass over the main alignment within the operational footprint. The project would provide two 3.5 metre traffic lanes (one in each direction) with two metre shoulders along Masonite Road. It would have a one metre verge with a three per cent cross fall. Tie ins would be located about 330 metres to the northwest and about 500 metres southeast of the bridge (B10). A new three metre wide shared path would also be located next to the southbound lane (refer to **Figure 5-1**).

5.3.4 New England Highway

As described in **Section 5.3.2**, the New England Highway would be upgraded and realigned between John Renshaw Drive and Tarro to accommodate the Tarro interchange. This is shown in **Figure 5-11** and would include:

- Widening the New England Highway from four to six lanes generally between John Renshaw Drive and the Tarro interchange
- Realigning the existing westbound New England Highway, and the John Renshaw Drive exit from the New England Highway, to accommodate the northbound entry ramp to the main alignment
- Constructing an additional lane of the existing westbound New England Highway to provide access for the southbound exit ramp from the main alignment
- Modifying the existing New England Highway exit ramp to Anderson Drive and modifying the Anderson Drive westbound entry ramp to the New England Highway to merge with the main alignment exit ramp to the New England Highway.

Figure 5-11 New England Highway upgrade and realignment

5.3.5 Bridge structures and viaducts

The project would require 12 new bridge structures, the largest of which is a viaduct (B05) that would traverse the Hunter River floodplain. Bridge structures would:

- Provide grade separation for the interchanges from the existing road network
- Maintain connectivity of existing local roads
- Span over waterways and environmentally sensitive areas.

Bridges and the viaduct are presented in **Table 5-3**, with locations shown in **Figure 5-12**.

The superstructure for each bridge (the portion of the bridge that is supported on piers and abutments) would include one or more of the following four super structure types:

- Precast super-T girder
- Precast bulb-T girder
- Precast segmental box girder
- Cast in place voided slab.

Most bridges for the project would have a super-T or bulb-T superstructure. However, the viaduct (B05) would be a combination of a super-T and box girder structure while the twin bridges over Old Punt Road intersection (B08) would be cast in place voided slab structures. An indicative drawing of each bridge structure type is provided in **Figure 5-13** to **Figure 5-16**.

All bridge details are based on the design as set out in this chapter and are subject to change during detailed design. The urban design of the proposed bridges is detailed further in **Chapter 15** (urban design, landscape and visual amenity).

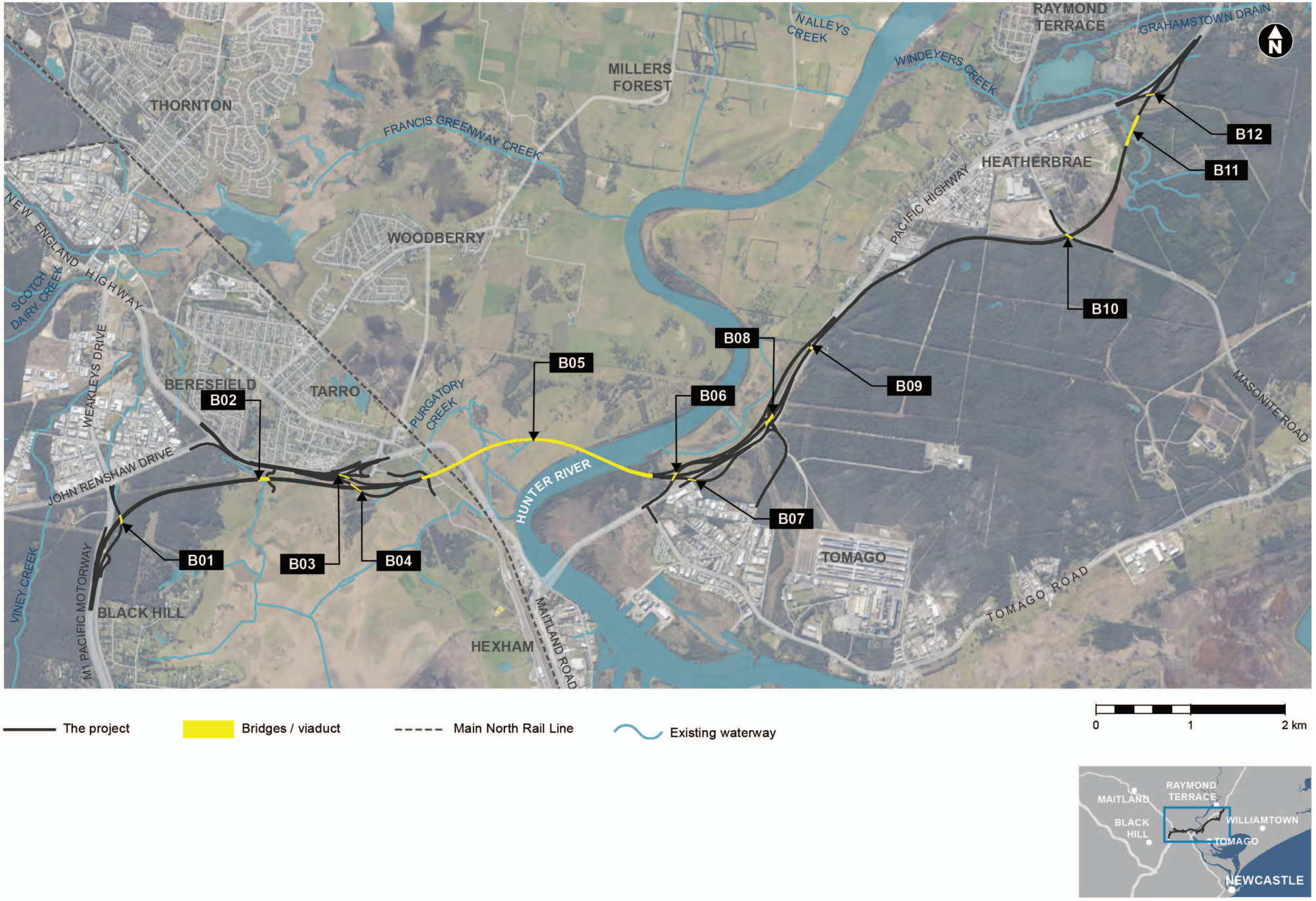

Figure 5-12 Project bridge locations

Table 5-3 Bridges and viaducts

Bridge reference and location	Description		Superstructure	Indicative length (m)	Indicative number of spans
B01 Black Hill	A southbound entry ramp bridge over the main alignment at Black Hill. The bridge includes a reinforced soil wall (RW1) to reduce span length and skew angle. The bridge would provide about 5.5m of vertical clearance to the main alignment.		Super-T	72	2
B02 Tarro	Twin (northbound and southbound) bridges over unnamed wetlands classified under the Coastal Management SEPP at Tarro. The bridge would pass over the realigned property access south of the New England Highway at Tarro.		Super-T	104	4
B03 Tarro	A northbound entry ramp bridge from Tarro over the westbound travel lanes of the New England Highway. The bridge would carry traffic from the New England Highway eastbound to the main alignment northbound. A reinforced soil wall (RW3) would minimise the extent of embankment. The bridge would provide about 6.6m vertical clearance to the New England Highway.		Bulb-T	101	4
B04 Tarro	A southbound exit ramp bridge over the main alignment. The bridge would carry traffic from the main alignment southbound to the New England Highway westbound. The bridge would provide about 5.8m of vertical clearance to the main alignment.		Bulb-T	117	4
B05 Hunter River floodplain	The 2550m long viaduct would carry the main alignment over the Hunter River between Tarro and Tomago. It would pass under existing major electrical facilities and rise on approach to the Hunter River to provide clearance for maritime traffic. The bridge consists of three different sections: • The southern approach which crosses Woodlands Close, the Main North Rail Line, New England Highway, Hunter River floodplain • The Hunter River crossing • The western approach to the Tomago interchange.	Abutments	-	2550	78
		South of the New England Highway to the Hunter River	Super-T		
		Over the Hunter River	Box girder		
		North of the Hunter River	Super-T		
B06 Tomago	A northbound bridge for the realigned Pacific Highway over the main alignment at Tomago. The bridge would carry traffic from the realigned Pacific Highway northbound over the main alignment and provide access to the northbound entry ramp to the main alignment. The bridge would provide a vertical clearance to the main alignment of about 6.6m.		Bulb-T	82	3

Bridge reference and location	Description	Superstructure	Indicative length (m)	Indicative number of spans
B07 Tomago	A southbound entry ramp bridge from the realigned southbound Pacific Highway over the Pacific Highway. The bridge would carry traffic from the Pacific Highway southbound and Tomago to the main alignment southbound. The bridge would provide a minimum 5.6m of vertical clearance to the Pacific Highway.	Bulb-T	70	3
B08 Tomago	Twin (northbound and southbound) bridges over the intersection between the Old Punt Road and the Pacific Highway. The bridge would carry traffic along the main alignment. The bridge would provide about 6.4m vertical clearance to the Pacific Highway.	Voided slab	110	3
B09 Tomago	A single bridge over the HRBG access road at Tomago. The bridge would carry the main alignment over the access road from the realigned Pacific Highway to the HRBG. The bridge would provide about 5.1m vertical clearance to the access road.	Super-T	28	1
B10 Heatherbrae	A bridge over the main alignment at Masonite Road, Heatherbrae. The bridge would carry traffic travelling along Masonite Road over the main alignment. The bridge would provide about 5.7m vertical clearance to the main alignment.	Super-T	68	2
B11 Heatherbrae	A single bridge over Windeyers Creek and associated wetlands. The bridge would carry traffic travelling along the main alignment.	Super-T	330	10
B12 Raymond Terrace	A southbound exit ramp bridge over the main alignment. The bridge would carry traffic on the Pacific Highway southbound over the main alignment. The bridge would provide a vertical clearance to the main alignment of about 5.4m.	Bulb-T	76	2

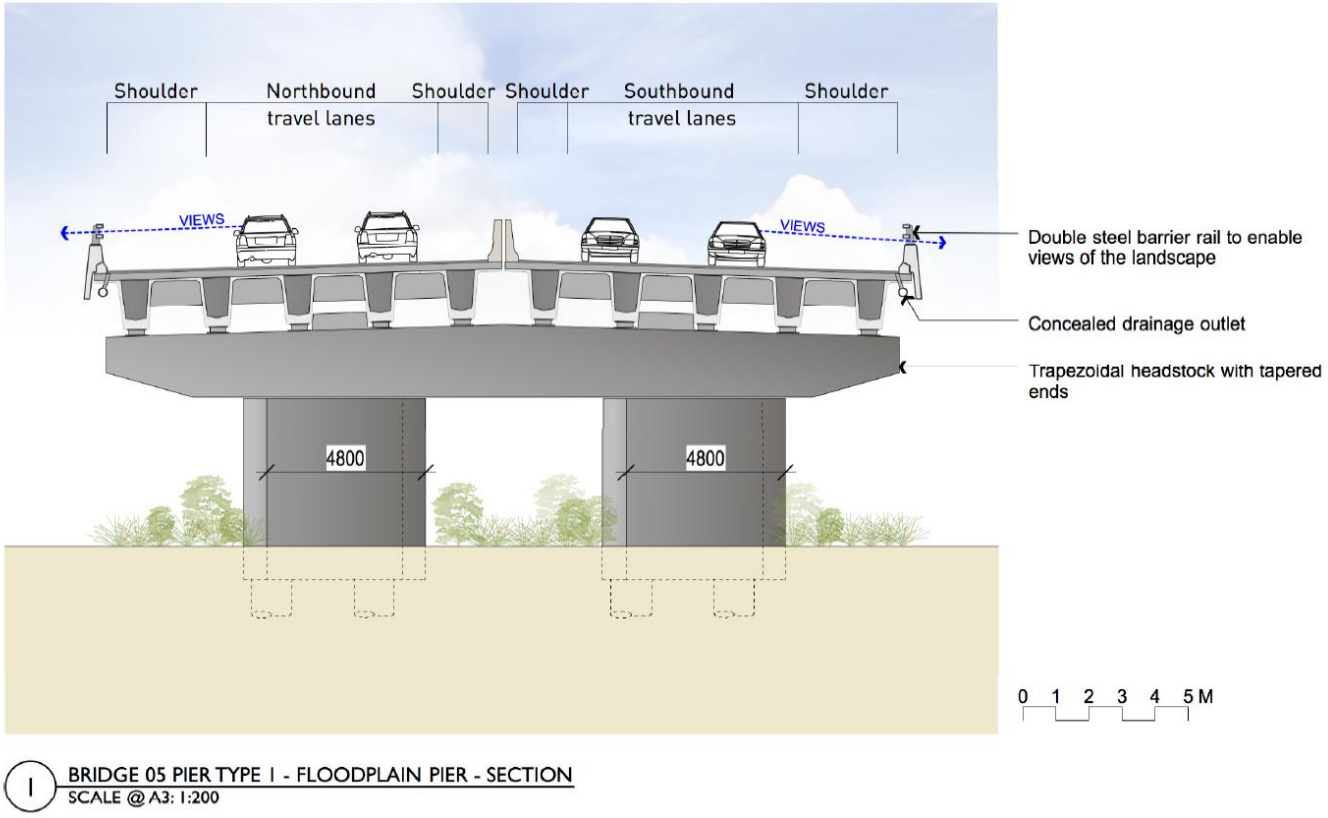

Figure 5-13 Indicative drawing of super-T girder bridge structure (B05)

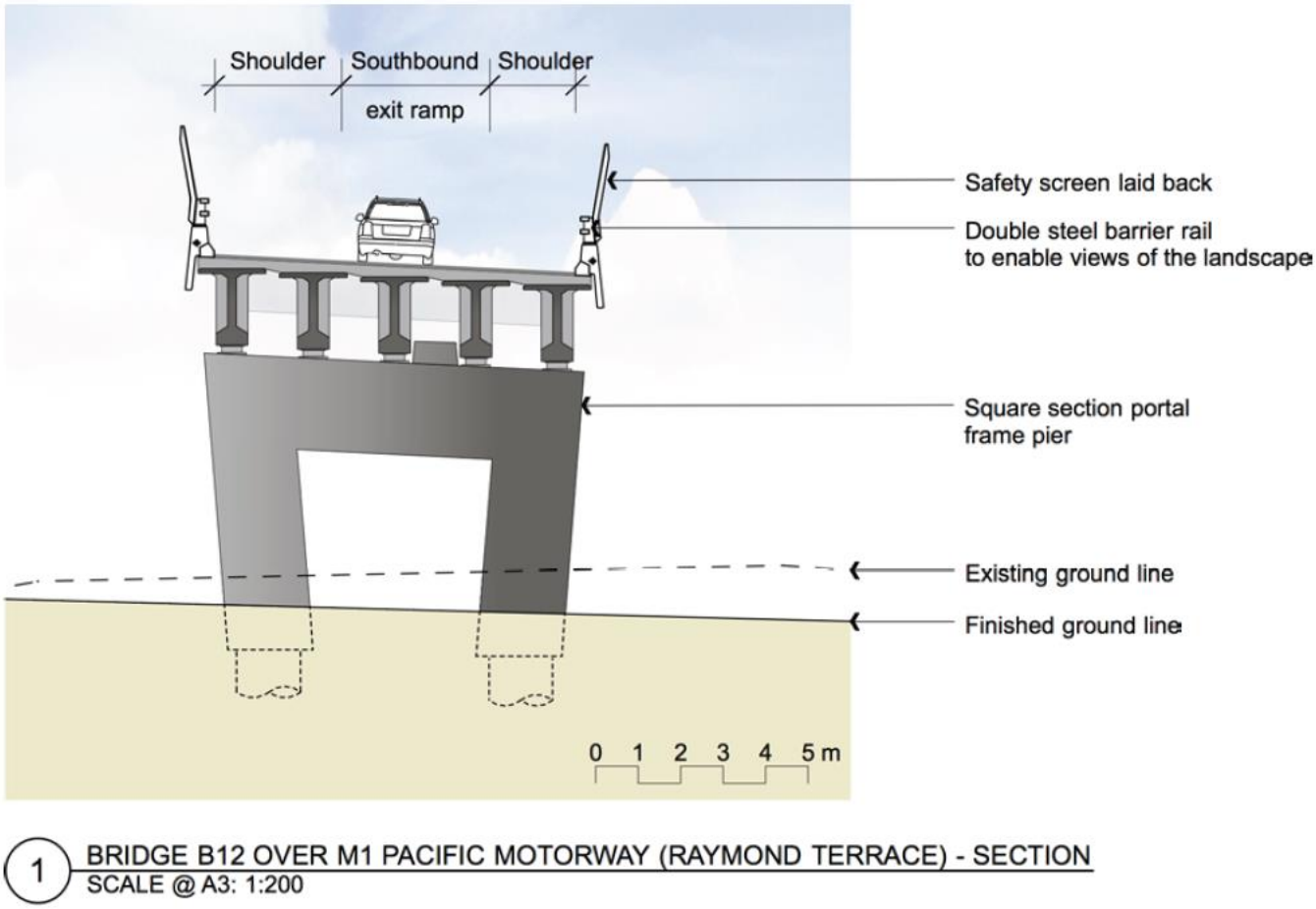

Figure 5-14 Indicative drawing of a bulb-T girder bridge structure (B12)

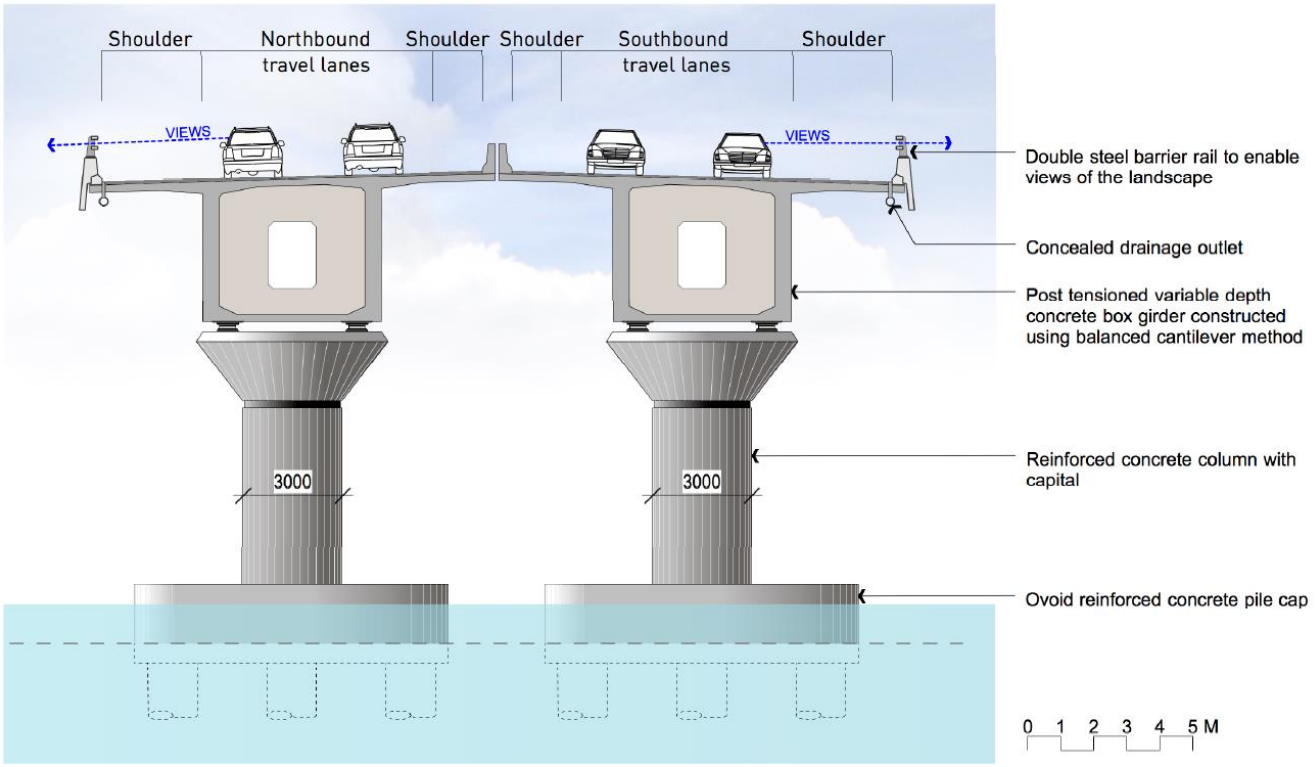

Figure 5-15 Indicative drawing of box girder bridge structure (B05)

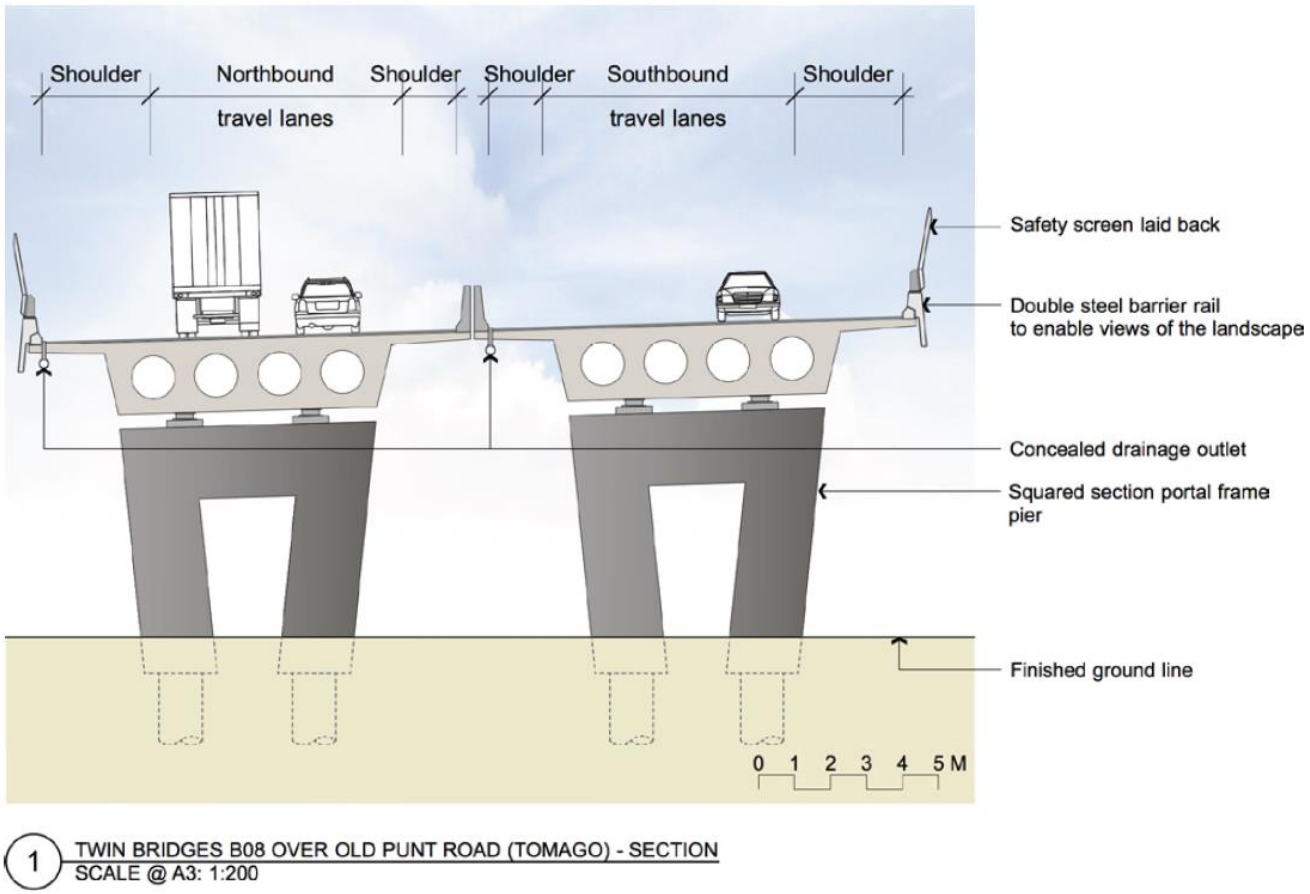

Figure 5-16 Indicative drawing of the voided slab bridge structure (B08)

5.3.6 Road cuttings, fill embankments and retaining walls

Road cuttings and fill embankments

Large road cuttings and embankments are not proposed along local roads. A number of road cuttings and fill embankments would be required along the main alignment due to the undulating topography, including:

- At the Black Hill interchange
- Along the main alignment from Black Hill to Tarro
- At the Tarro interchange
- Along the New England Highway
- At the Tomago interchange
- Along the main alignment from the Tomago interchange to Masonite Road
- Along Masonite Road
- Along the main alignment from Masonite Road to the Raymond Terrace interchange
- At the Raymond Terrace interchange.

Indicative drawings of cuts are shown in **Figure 5-17** to **Figure 5-21**.

Cuttings would generally have a slope of 2H:1V, with the exception of the Black Hill interchange, which would have a slope of 2.5H:1V with a 6.5 metre wide bench where required. Where space permits, embankments would have a slope of 4H:1V. Where required to reduce the overall operational footprint, embankments of up to 2H:1V would be constructed. Safety barriers would be provided where the height of embankment exceeds two metres and/or where embankments are steeper than 4H:1V. To improve stability, benches (flat steps in the slope) would be provided where the cut height exceeds eight metres and the embankment height exceeds 10 metres.

Further description of proposed earthworks is provided in **Section 5.4.5**. Cuttings are subject to change following geotechnical analysis and further design development. The location and dimension of cuttings and embankments would be confirmed during detailed design.

Where space is limited or there is a need to reduce property acquisition or vegetation clearing, retaining walls may be considered in place of embankments to minimise the operational footprint. Additional retaining walls would be confirmed during detailed design.

All slopes would be revegetated to the edge of the indicative road corridor or existing landforms, where reasonable and feasible, to integrate the project with the surrounding landscape.

The project would integrate cutting and embankment slopes with the surrounding topography where possible. Cut batters in hard rock would be left as natural stone where:

- It is stable or
- 2H:1V slopes are not feasible or
- It is not reasonable and feasible to revegetate the cut batter.

Any slope treatments would be in accordance with the urban design guidelines described in **Section 5.2.2**.

Retaining wall structures

Two types of retaining wall structures would be required for the project:

- A reinforced soil wall: Comprising an earth embankment strengthened with soil reinforcement (comprising steel straps or geotextiles between layers of compacted fill material), which is attached to concrete fascia panels or blocks which are placed on a concrete levelling pad
- L-shaped concrete structures: Typically consisting of a concrete wall supported by a flat concrete footing which prevents instability from overturning, uplifting or sliding.

Three key retaining walls would be required for the project as summarised in **Table 5-4** and shown in **Figure 5-1**. The extent and design of retaining walls would be refined during detailed design.

Table 5-4 Retaining wall summary

ID	Location	Description	Maximum height (m)	Length (m)
RW1	Black Hill interchange	Reinforced soil wall at the bridge (B01) abutment	5.5	60
RW2	Tarro interchange	Concrete retaining wall at the bridge (B03) abutment	4.5	200
RW3	Tarro interchange	Reinforced soil wall at the bridge (B03) abutment	9	70

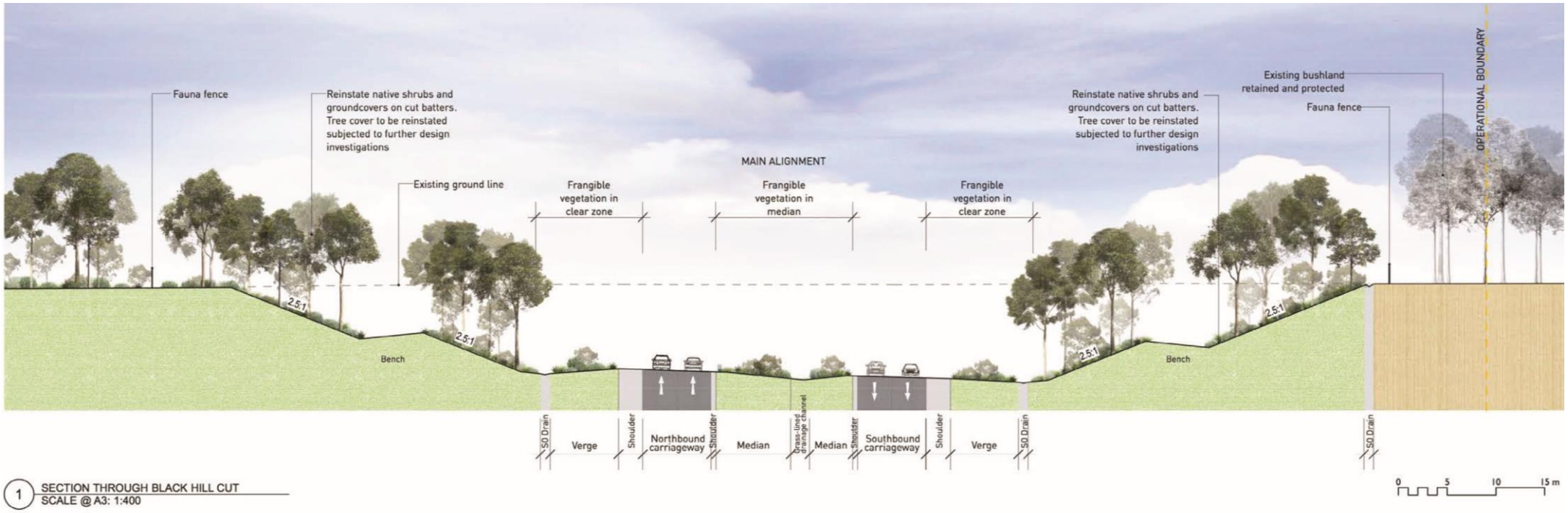

Figure 5-17 Indicative drawing of Black Hill section

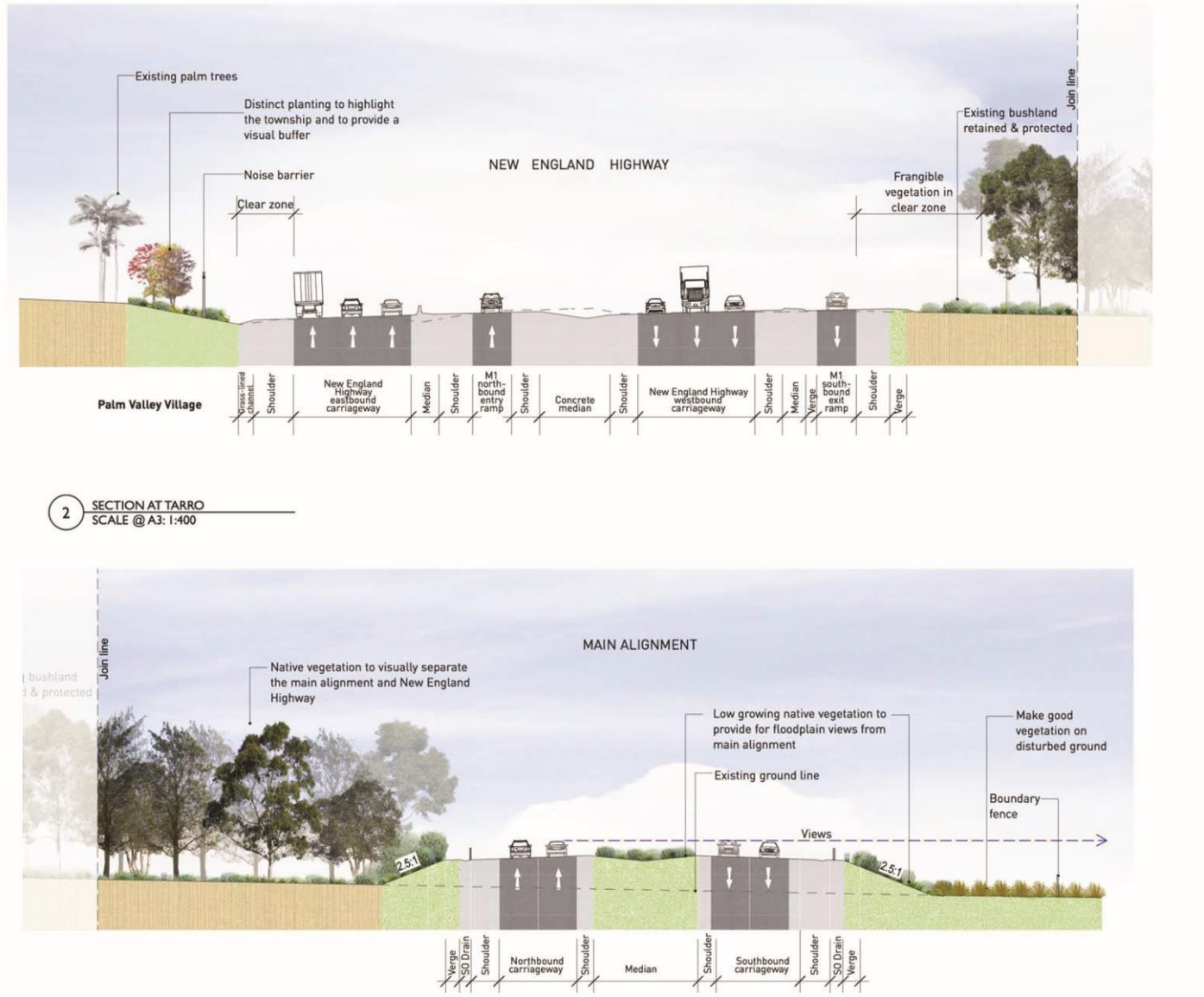

Figure 5-18 Indicative drawing of Tarro section

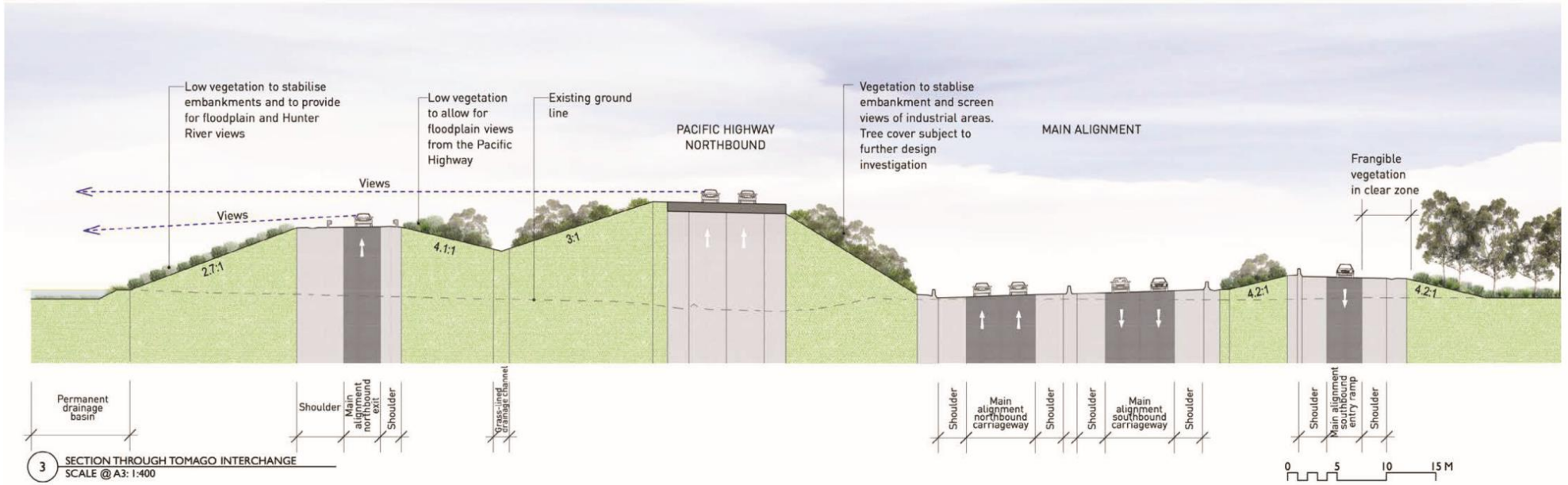

Figure 5-19 Indicative drawing of Tomago interchange section

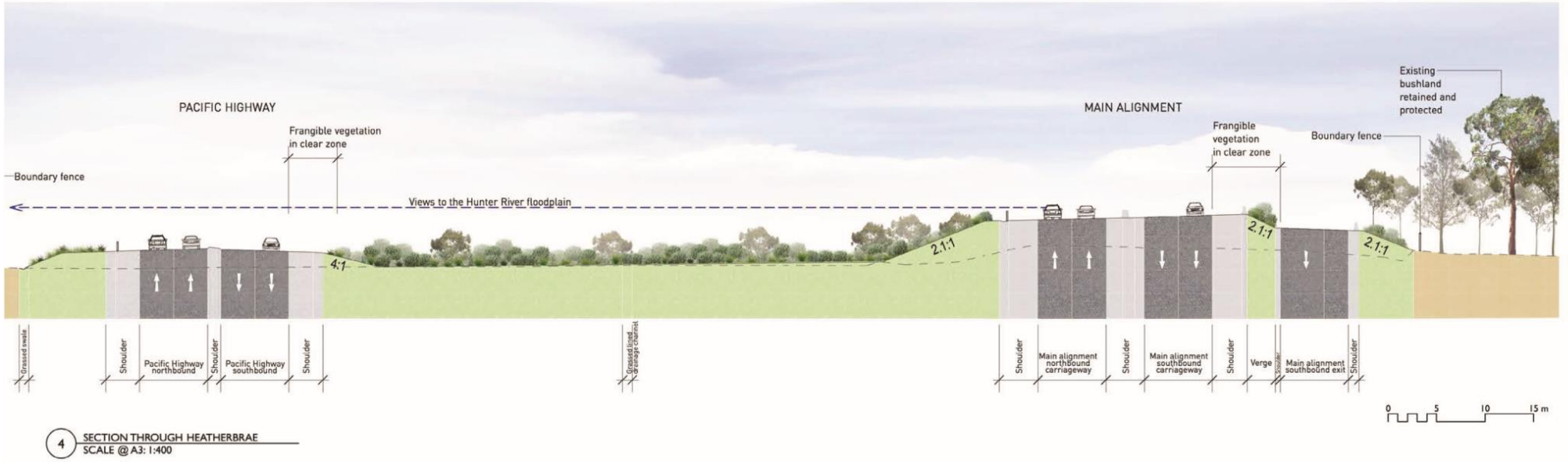

Figure 5-20 Indicative drawing of Heatherbrae section

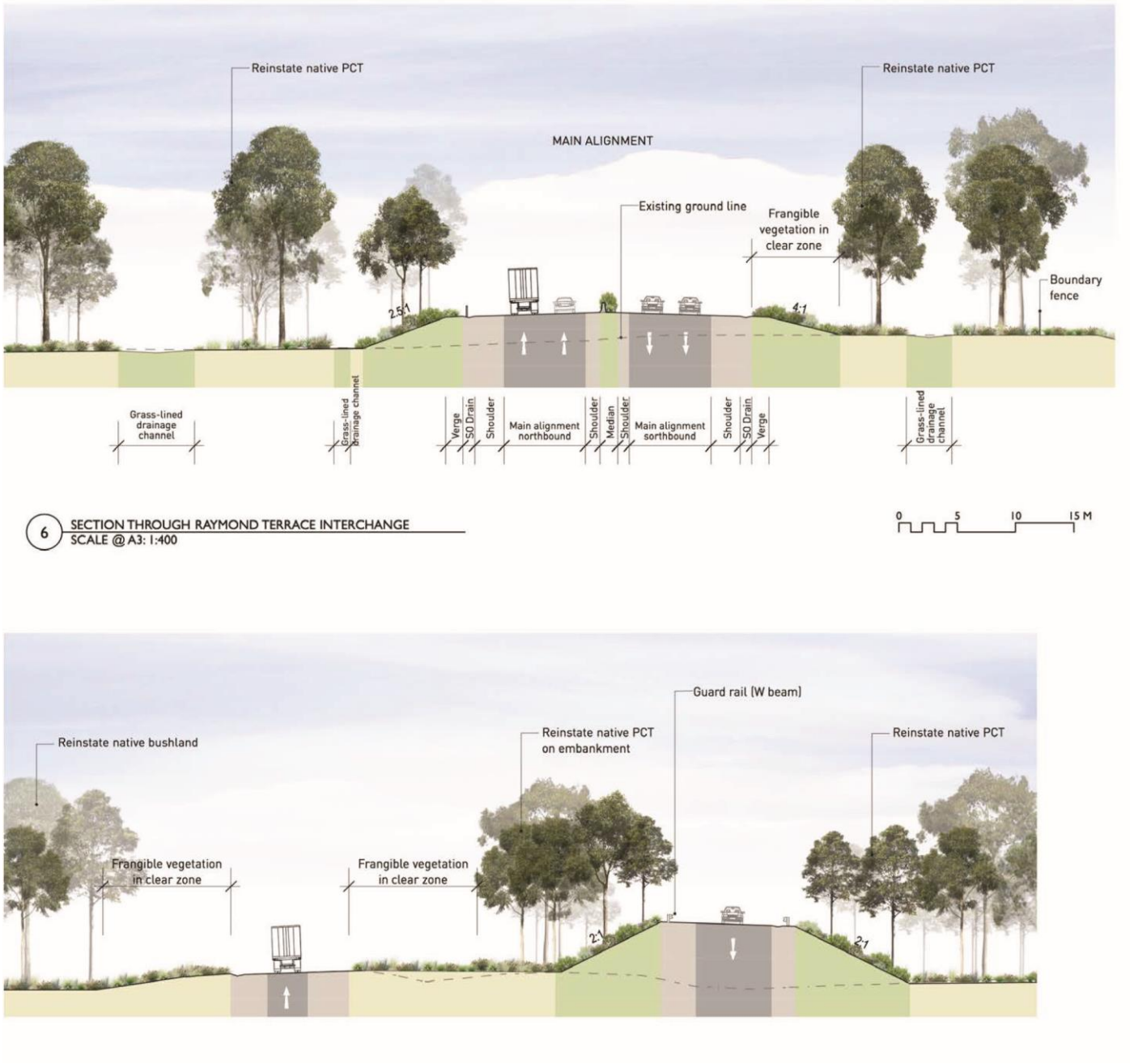

Figure 5-21 Indicative drawing of Raymond Terrace interchange section

5.3.7 Pavement

The road pavement would likely vary for each of the following components of the project:

- The main alignment
- Entry and exit ramps
- Intersections and interchanges
- Arterial and local roads
- Property access roads
- Shared user path and footpaths (limited locations)
- Median islands.

In general, new pavement along the project would consist of a heavy-duty pavement (in accordance with Transport design guidelines) with a nominal design life of 40 years.

Pavement types investigated for the main alignment include a plain concrete base with lean mix concrete sub-base and full depth asphalt. Pavement types assessed for ramps, the New England Highway and local roads include deep strength asphalt with a lean mix sub-base and deep strength asphalt with heavily bound sub-base. Existing pavement would be rehabilitated at the New England Highway, Pacific Highway and Old Punt Road and where the project ties into the existing road network.

Pavement types for the project would be refined during the detailed design stage of the project.

The new pavement would be marked in accordance with Transport requirements to delineate travel lanes, traffic merges and vehicle movements permitted at intersections.

5.3.8 Drainage infrastructure

Water management design criteria

Drainage infrastructure that would be installed or modified for the project is discussed below. Infrastructure would generally comply with criteria outlined in **Table 5-5**. **Table 5-5** outlines the flood events for which drainage infrastructure has been designed. The table shows the AEP, which is used to describe the chance of a flood of a given or larger size occurring in any one year.

Table 5-5 Drainage criteria for water management structures

Drainage infrastructure	Design criteria
Drainage	• Pavement drainage: 10% AEP event • Cross drainage: 5% AEP event • Culverts main alignment: 1% AEP event • Culverts main alignment (flood affected): 5% AEP event • Width of flow into traffic lanes: 1% AEP event generally, to 5% AEP event • Deck drainage: 5% AEP event • Piped system (including pits): 150mm in 10% AEP event.
Culverts (reinforced concrete)	• 600mm to 1500mm diameter for piped culverts • 1800mm to 3000mm wide x 750mm to 900mm high for box culverts

Drainage infrastructure	Design criteria
Permanent water quality basins	• Designed to capture and treat runoff from the main alignment, where the point source discharge is within 500m of a sensitive receiving environment. • Provide for accidental spill containment of 20,000L • Within the Tomago Sandbeds Catchment Area the minimum containment volume will be 30,000L • By default, all permanent basins provide spill containment through underflow baffles proposed at the outlet side of the basin.

Drainage and stormwater management

In addition to the bridges described in **Section 5.3.5** that would carry the project over waterways and floodplains, a number of cross drainage structures would be required to convey water under and around the project. These would generally consist of concrete box culverts and pipes. Drainage infrastructure aims to reduce scour impacts and minimise flooding impacts from the project.

Types of drainage include:

- Road surface drains: consisting of stormwater inlets and pits that connect to reinforced concrete pipes which would cater for run-off from the road surface, cut batters and the median
- Longitudinal catch drains (channels): would be located at the top of cuttings or at the bottom of the embankment, at culvert inlets and outlets and from the water quality basins to the drainage outlet points
- Bridge deck drainage: in the form of scuppers and carrier pipes directed to water quality control measures before discharging into a waterway
- Cross drains (culverts): would convey surface water under the project
- Spill containment structures and permanent water quality basins
- Existing drainage infrastructure: would be reused at connections with existing roads.

The design of the project would generally allow the natural flow regimes to be maintained. With the exception of the Masonite Road bridge (B10) where the risk of spills impacting groundwater is much lower, all bridges would include drainage systems that would discharge to the road surface drainage system and would not directly discharge into waterways. Bridge abutments would generally be located to minimise scour velocities and impacts on flood behaviour. Appropriate scour protection would be provided on both upstream and downstream ends of all structures where increased velocities have the potential to cause scour.

The main alignment pavement drainage in the vicinity of the Tomago Sandbeds Catchment Area diverts runoff towards permanent water quality basins. These basins ensure that any runoff is treated before any discharge or overflow occurs within the Tomago Sandbeds Catchment Area (limited to after rainfall events). Pavement drainage from the realignment of Masonite Road discharges to the northeast and outside of the Tomago Sandbeds Catchment Area.

The proposed road drainage network would either connect to the existing council drainage network (in the case of local road adjustments) or discharge at defined locations to operational water quality control structures before discharging to waterways or existing overland flow paths.

The main alignment would mostly be located in greenfield areas where there is no existing drainage system. In the areas where the project intersects with existing drainage systems, alterations or adjustments would be made to appropriately manage drainage from the project.

The permanent water quality control measures for the operational phase of the project are discussed further in **Section 5.3.9**.

5.3.9 Water quality management

A strategy to ensure an appropriate water quality outcome was developed for the project which considered existing land use and traffic loading, landform and topography, environmental and heritage issues, the presence of the Tomago Sandbeds as a drinking water catchment) and consideration of the construction and operational requirements of the project. The strategy aims to improve or maintain the environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems.

Operational water quality controls for road pavement runoff were based on design criteria and assessment criteria (water quality objectives) as discussed in **Chapter 11** (surface water and groundwater quality) and the Surface Water and Groundwater Working Paper (**Appendix K**).

Permanent water quality control measures proposed for the operational phase of the project are outlined in **Table 5-6** and detailed further below.

Table 5-6 Operational water quality controls

Control	Description	Indicative location	Benefits
Permanent water quality basins	Permanent water quality basins are stormwater detention systems that promote settlement of sediments by slowing down and temporarily detaining flows. Water quality basins can be wet or dry.	Permanent water quality basins would be located to capture and treat runoff from the main alignment, where diffuse or point source discharge is within 500m of a sensitive receiving environment (an environment that has a high conservation or community value or support uses of water that are particularly sensitive to pollution or degradation of water quality). Their specific location would be been governed by available space within the operational footprint.	Permanent water quality basins would reduce the amount of total suspended solids, (i.e. solids in water that can be trapped by a filter), and associated pollutants, including nitrogen and phosphorus.
Vegetated swales	Vegetated swales are open channels that convey stormwater runoff and provide water quality treatment.	Vegetated swales would be located in conjunction with permanent water quality basins, where they can be used to reduce basin size.	Vegetated swales would achieve nutrient removal through the capture of suspended solids and nutrient uptake by plants.
Spill containment	Spill containment would be incorporated in water quality basins, which have been designed to contain a 20,000L spill. Within the Tomago Sandbeds Catchment Area the minimum containment volume will be 30,000L.	Spill containment would be provided at drainage outlets that are located within 500m of aquatic environmentally sensitive areas.	The water quality controls would use a combination of bunds, negatively graded pipes and baffle boards to trap spilled liquids (particularly hydrocarbons) while allowing stormwater to continue to be discharged during rain events.

In order to capture and treat runoff, 39 permanent water quality basins are proposed for the operation of the project. Of these, 33 water quality basins would be converted from construction use (refer to **Section 5.4.11**).

Twenty-five water quality basins would intersect with the groundwater table. Groundwater intersection impacts are assessed in **Chapter 10** (hydrology and flooding) and **Chapter 11** (surface water and groundwater quality), the Hydrology and Flooding Working Paper (**Appendix J**) and the Surface Water and Groundwater Quality Working Paper (**Appendix K**).

The proposed locations of permanent water quality basins are shown in **Figure 5-1**. The location, design and size of all permanent water quality basins would be subject to refinement during detailed design.

Vegetated swales would be installed on approach to basins where appropriate. These would operate in conjunction with the permanent water quality basins to treat water allowing for reduced basin size.

Permanent water quality basins and grassed swales within in the Tomago Sandbeds Catchment Area, as well as in locations with a high salinity intrusion, would be lined to avoid contamination of groundwater.

The permanent water quality basins and grassed swales are discussed in more detail in **Chapter 11** (surface water and groundwater quality), together with an assessment of water quality performance achieved by those controls.

Scour protection and energy dissipation measures (such as rock rip rap, rock mattress, geotextile layers) would be identified during detailed design for the specific requirements of each culvert. Where required, the engineered treatments would extend downstream from the culvert outlet to the operational footprint.

5.3.10 Waterway adjustments

The project has been designed to minimise impacts on waterways. However, Purgatory Creek at Tarro and a section of a tributary of Viney Creek would need to be adjusted in order to accommodate the project. The existing section of Purgatory Creek at Tarro has been substantially modified by artificial incision and stabilisation, removal of native riparian vegetation and floodgate management. A description of the adjustments are provided in the following sections.

The need for, extent and design of the adjustments would be investigated further during detailed design with the aim of minimising changes to the natural creek alignment and form. The proposed adjustments would be designed to behave in a similar hydrologic and geomorphic manner as existing conditions.

The adjusted waterway channels would be rehabilitated following construction work in accordance with the urban design plans for the project described in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**). The location and extent of on-site rehabilitation would be confirmed during detailed design.

Potential ecology, hydrology and water quality impacts of the potential creek adjustments are detailed in **Chapter 9** (biodiversity), **Chapter 10** (hydrology and flooding) and **Chapter 11** (surface water and groundwater quality).

Tributary of Viney Creek

About 150 metres of an artificial drainage tributary of Viney Creek would be adjusted up to 70 metres to the east to accommodate the M1 Pacific Motorway entry ramp at the Weakleys Drive and John Renshaw Drive intersection as shown in **Figure 5-22**. The tributary is ephemeral with an ill-defined channel and is considered to be more of a drainage line than a natural creek at this location.

The adjustment of the tributary would commence at the culvert that crosses the existing M1 Pacific Motorway, would extend under the entry ramp via a culvert, and then northwards towards the Hunter Water Corporation easement for about 90 metres where it would join the existing tributary of Viney Creek.

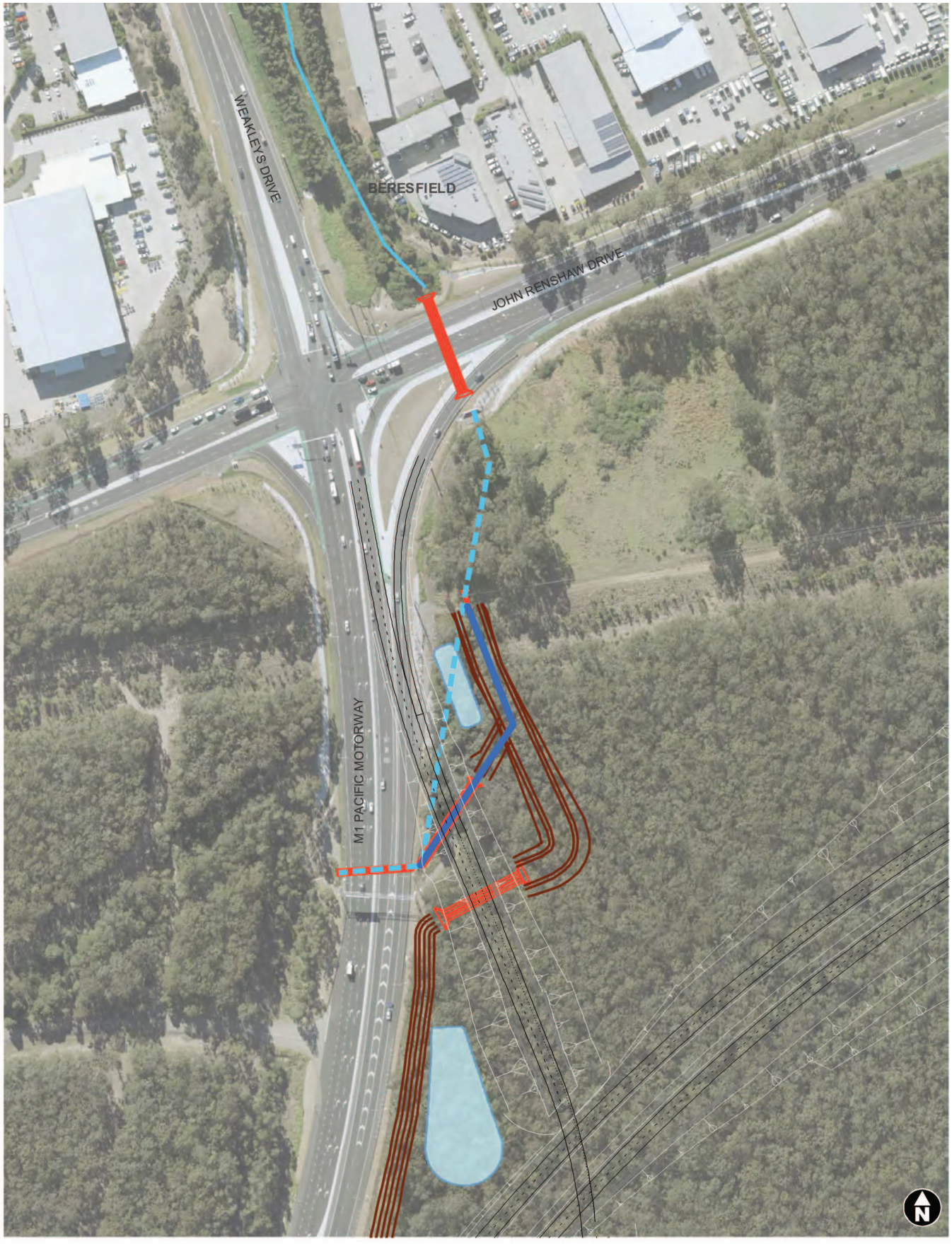

Figure 5-22 Tributary of Viney Creek adjustment

Purgatory Creek

Where crossing the project at Tarro interchange, Purgatory Creek is an ephemeral creek. Purgatory Creek becomes perennial about 1.5 kilometres upstream of its confluence with the Hunter River. About 320 metres of Purgatory Creek would be adjusted to accommodate the Tarro interchange as shown in **Figure 5-23**. The creek would be adjusted with a 10 metre wide grass-lined channel to generally match its existing form.

The creek adjustment would commence about 400 metres to the south of the New England Highway and would follow an alignment along the southern edge of the M1 Pacific Motorway southbound exit ramp. Culvert crossings would be provided beneath the main alignment and the realigned Aurizon access road.

The concept design includes about 550 metres of channel on the northern edge of the Tarro northbound entry ramp to direct flows from the Tarro interchange batters into Purgatory Creek.

The Purgatory Creek adjustment would have a similar waterway capacity to the existing creek channel and as far as practicable, would be designed in a way that mimics natural flow conditions.

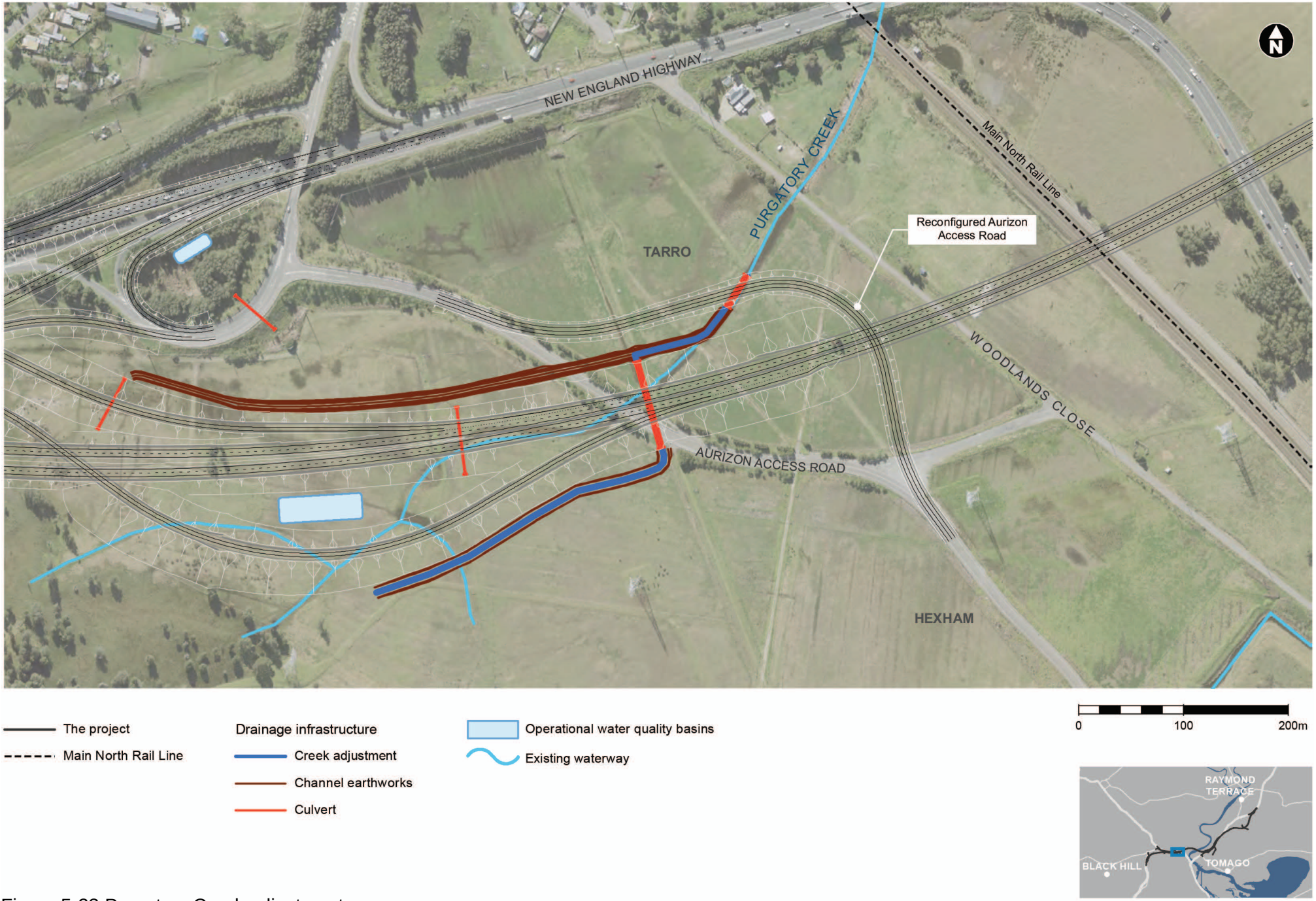

Figure 5-23 Purgatory Creek adjustment

5.3.11 Roadside furniture, fencing and lighting

Roadside furniture would be installed for the project as described in **Table 5-7**. The final locations and extents of the roadside furniture, fencing and lighting infrastructure would be confirmed during detailed design and in consultation with property owners. No rest areas would be included as part of the project as the project provides opportunity for motorists to enter and exit the main alignment at interchanges to access existing facilities in Beresfield, Tomago and Heatherbrae.

Table 5-7 Roadside furniture

Roadside furniture	Description
Safety barriers	Barriers would be used along the main alignment of the project. These would differ depending on the design of the road to be either: • Wire rope barriers • Concrete barriers • Steel rail safety barriers • Flexible bollards.
Safety screens	Screens would be about 3.4m high and would be installed on bridge structures as required and would be integrated with safety barriers to reduce the risk of objects falling onto the roads below.
Fencing	Fencing would be installed where required (refer to **Figure 5-1**) to prevent unauthorised access to the main alignment and other operational areas. Fencing would be erected as close as possible to the final road, and would also be used to prevent animals from entering the road and to guide animals to the crossing structures described in **Section 5.3.12**.
Signs	Signs would be installed along the project to enforce road rules and regulations and to provide information on direction of travel, posted speed limit and parking restrictions.
Systems for monitoring and managing traffic	Systems would be installed for the project as required, and may include closed circuit television (CCTV), VMS, and power and communications backbone cabling for the provision of ITS.
Emergency telephones	Telephones would be provided at each of the emergency U-turn bays along the main alignment, at each end of the viaduct and at the mid-point of the viaduct. Telephones would be solar powered and would connect with the communications network using 4G wireless technology.
Line marking	Line marking would be provided in accordance with design and construction specifications and would comprise: • Longitudinal markings such as lane lines, edge lines and continuity lines • Transverse markings such as stop or hold lines and give way lines • Posted speed numbers and pavement arrows to provide clear information for drivers.
Lighting	Lighting would be provided at interchanges and associated ramps and along the New England Highway and John Renshaw Drive, Old Punt Road and at the Old Punt Road and Pacific Highway intersection for safety reasons. Lighting would be in accordance with the Australian Standards (Lighting for roads and public spaces AS/NZS1158.1.1:2005).

5.3.12 Fauna connectivity

A Biodiversity Connectivity Strategy has been prepared as part of the project and is detailed in **Section 9.5.1** and the Biodiversity Assessment Report (**Appendix I**). This strategy proposes the use of fauna crossing structures as required in the Wildlife Connectivity Guidelines (Roads and Maritime Services 2011a). Proposed crossing structures and associated fencing for the project is detailed in **Table 5-8** and shown in **Figure 5-1**.

Table 5-8 Fauna crossing and fencing structures

Location	Proposed structure
Fauna crossing structures	
Black Hill	• East–west rope crossing across the main alignment linking large areas of Lower Hunter Spotted Gum Ironbark Forest • North–south rope crossing across the main alignment. This would include strategic planting of Eucalypts to improve link to existing vegetation.
Heatherbrae	North–south rope crossing across the main alignment to link isolated patch of remnant Smooth-barked Apple –Blackbutt open forest.
Old Punt Road	Glider poles on Old Punt Road linking vegetation to the east and west
Fauna exclusion fencing	
Black Hill to Tarro (located along the alignment on both sides)	Exclusion fencing (combined with property boundary and cattle fence)
Heatherbrae (located on the southern side of the alignment)	Fauna exclusion fencing
Eastern side of Pacific Highway at Raymond Terrace	Fauna exclusion fencing to tie in within existing exclusion fence on start of Raymond Terrace Bypass

Fencing designs would differ depending on characteristics of local fauna. Fauna fencing would be further refined in detailed design in consultation with relevant government agencies.

5.3.13 Emergency service access and traffic management features

The project would include the features for emergency service access and traffic management described in the sections below. Combined emergency crossover, U-turn facilities and stopping bays (in addition to the road shoulder) would be provided to allow U-turns by Transport and emergency vehicles and for diversion of traffic to the other carriageway in the case of an emergency, including bushfire, as shown in **Figure 5-1**. Some locations do not have additional stopping bays due to design constraints. The following 10 locations provide locations for emergency cross over and traffic management:

- At the Black Hill interchange
- South of the utility easement in Black Hill
- West of the Tarro interchange, Tarro
- West of the southern end of the viaduct (B05) at Tarro
- East of the northern end of the viaduct (B05) at Tomago
- At Tomago near the southbound off ramp to the Pacific Highway
- South of Heatherbrae near the HRBG
- West of the Masonite Road overbridge, Heatherbrae
- North of Windeyers Creek, Heatherbrae
- At the merge with the Pacific Highway, Raymond Terrace.

Roadside furniture such as steel rail gates or flexible bollards would be installed to act as a deterrent for unauthorised vehicles from using the U-turn facilities.

The project includes 2.5 metre minimum nearside shoulders along the main alignment. This allows vehicles to pull over at any location in the event of a breakdown or other incident and provides space between the stationary vehicle and passing traffic.

On the viaduct and bridges, the nearside shoulder width would be between 2.5 and 3.5 metres wide. This would be adequate for most vehicles to be able to stop clear of traffic.

5.3.14 Noise barriers

Noise mitigation treatment would be carried out in accordance with Transport guidelines and may include low-noise pavements, noise barriers or at-property treatments. Noise barriers, in the form of noise walls, screens or mounds would be installed as part of the suite of noise treatments where required to address operational noise impacts.

The proposed noise barriers are based on feasibility constraints including integration with existing noise barriers, as well as interactions with existing utilities, established landscaping and vegetation, heritage, landscape character, visual amenity and constructability. The project noise barriers are shown in **Figure 5-24** and comprise:

- NB.01: a relocated noise barrier with a similar height (about 2.5 metres, allowing for variations in topography) and about 265 metres in length
- NB.02: an extension of an existing barrier about 3.8 metres in height to about 1105 metres long
- NB.03: a new barrier about four metres in height and about 740 metres long.

A summary of the noise barrier analysis carried out for the project, and a discussion of reasonable and feasible mitigation measures are summarised in **Chapter 8** (noise and vibration) and the Noise and Vibration Working Paper (**Appendix H**). Noise barriers would be reviewed further during detailed design to confirm the exact location and height of noise barriers.

Figure 5-24 Noise barriers

5.3.15 Utility services

The following existing utilities are located within the operational footprint:

- Electricity supply and street lighting: Ausgrid and TransGrid (high voltage transmission lines)
- Telecommunications: Telstra, Optus, NBN and Nextgen optic fibre and telephone cables
- Gas: Jemena and AGL
- Water and sewer services and infrastructure including the Hunter Water Corporation Chichester Trunk Gravity Water Main.

Utilities would need to be relocated, adjusted or protected where they may be affected by project construction, particularly in areas where ground disturbance is required. Potential utility adjustment or protection are outlined in **Table 5-9**.

Utility work within the construction footprint is considered and assessed in this EIS. The location of existing utility services and any changes required would be confirmed by the construction contractor during the detailed design in consultation with the relevant utility provider. Utility work during construction would be carried out in consultation with asset owners.

Further work would be carried out during detailed design to confirm the exact impact on utilities and any permanent relocations that would be required. Depending on the utility service being relocated, work may be required to occur outside the construction footprint to meet the utility service provider requirements. Changes to utilities that are located outside the construction footprint would be subject to separate environmental assessment.

Table 5-9 Potential utility relocations, adjustments and protection

Location	Asset owner	Asset type	Potential impact and indicative protection strategy
• Black Hill interchange • Across the floodplain west of the Hunter River • Tomago interchange	TransGrid	Major overhead high voltage transmission lines	A minimum overhead clearance of 12m is required. The project would achieve this at Black Hill and Tomago. However, the project is unable to achieve the minimum vertical clearance across the floodplain, west of the Hunter River. Therefore, the overhead lines would be lifted here via the installation of a mid-span suspension structure to achieve the minimum clearance over the main alignment. A minimum horizontal clearance of 20m is required for transmission tower structures. This is achieved at the Tomago interchange. Minor embankments would encroach on the clearance at Black Hill. Transport will continue to consult with TransGrid regarding this issue.
Pacific Highway between Tomago Road and Heatherbrae	Ausgrid	Overhead and underground high and low voltage lines	High voltage overhead and underground low voltage lines near the Tomago interchange would be impacted by the project. These lines would be relocated adjacent to the realigned Pacific Highway and main alignment.
Black Hill between Weakleys Drive and Lenaghans Drive	Ausgrid	Overhead high voltage line	The high voltage overhead lines located parallel to the M1 Pacific Motorway between Weakleys Drive and Lenaghans Drive would be impacted by the project. These lines would be relocated adjacent to the project.

Location	Asset owner	Asset type	Potential impact and indicative protection strategy
Black Hill, south of Weakleys Drive	Ausgrid	Overhead transmission and high voltage lines	The concrete pole supporting the overhead transmission and high voltage lines from John Renshaw Drive, east and west of the M1 Pacific Motorway, may be impacted by widening required for the project. This pole may require relocation or protection in consultation with Ausgrid.
Beresfield / Tarro between John Renshaw Drive and Anderson Drive	Ausgrid	Overhead transmission lines	The overhead transmission lines located parallel to the New England Highway between John Renshaw Drive and Woodlands Close would be impacted by the widening and realignment of the New England Highway. These lines would be relocated adjacent to the project main alignment in consultation with Ausgrid. The overhead lines that cross the New England Highway east of John Renshaw Drive and connect to Christie Road may also require minor adjustments.
Woodlands Close, Tarro	Ausgrid	Overhead high voltage transmission lines	The overhead lines located parallel to Woodlands Close would be impacted by the viaduct (B05). These lines would be relocated underground adjacent to Woodlands Close.
Heatherbrae, near Jura Street	Ausgrid	Underground and overhead high voltage lines	High voltage overhead and underground lines that intersect the project near Jura Street, Tomago. Minor adjustments to the overhead and underground lines would be required in consultation with Ausgrid.
Masonite Road, Heatherbrae	Ausgrid	Overhead high voltage transmission lines	The overhead lines located adjacent to Masonite Road would be impacted by the realignment of Masonite Road. These lines would be relocated adjacent to the realigned Masonite Road in consultation with Ausgrid. Additional minor adjustments may be required where the lines cross the main alignment north-east of Masonite Road.
Heatherbrae, near Camfield Drive	Ausgrid	Overhead transmission lines and potential All-Dielectric Self-Supporting (ADSS) Fibre Optic	The overhead transmission lines and potential ADSS Fibre Optic cross the project alignment near Camfield Drive and would require minor adjustments to ensure that adequate clearances are maintained.
Pacific Highway, north of Masonite Road, Raymond Terrace	Ausgrid	Overhead high voltage and low voltage lines	The overhead electrical lines located at the Pacific Highway would be impacted by the project. A section of these lines would be relocated adjacent to the project in consultation with Ausgrid.
Tarro interchange	Hunter Water Corporation	Proposed Chichester Trunk Gravity Main (CTGM)	A substantial length of the gravity main would be beneath the project at Tarro. The CTGM would need to be either protected or relocated by the project in consultation with Hunter Water Corporation.
• Black Hill • Tomago • Heatherbrae • Raymond Terrace	Hunter Water Corporation	Water mains and sewer mains	A number of water and sewer mains would be impacted by the project. These assets will be further considered during detailed design and protected or relocated depending on their accurate location and depth.

Location	Asset owner	Asset type	Potential impact and indicative protection strategy
Multiple locations within construction/ operational footprint	Telstra, Nextgen, and Optus	Optical fibre and copper network	Numerous major and minor aerial and underground cables are located along and through the project and would be impacted by the project at various locations. These cables are typically located within existing road corridors. Locations where telecommunications utilities would be impacted and require either protection and/or relocation include: • The main alignment, Lenaghans Drive, Weakleys Drive and John Renshaw Drive at Black Hill • The New England Highway at Beresfield and Tarro • Woodlands Close at Tarro • Tomago Road and Old Punt Road at Tomago • The Pacific Highway at Tomago, Heatherbrae and Raymond Terrace • Masonite Road at Heatherbrae. Further survey to accurately locate these cables will be carried out during detailed design to determine the need for protection and/or relocation.
Tomago	AGL	High pressure gas main and proposed plant site	The Tomago to Hexham gas pipeline would be in the vicinity of the project and may require protection and relocation. In addition, a gas-fired power station is proposed at Tomago between the Pacific Highway and Old Punt Road, near ancillary facility AS12. The proposed power station would be in the vicinity of the main alignment, and an easement for the gas pipeline would be impacted by the project.
Pacific Highway between Tomago and Heatherbrae	Jemena	Gas main	Gas mains are in the vicinity of the project and would be relocated to avoid potential impacts.
Old Punt Road, Tomago	AGL	Gas main	A gas main is located in the vicinity of the project at Old Punt Road and may require protection or relocation to avoid impacts.

5.3.16 Walking and cycling

Walking

The area surrounding the project is predominantly comprised of agricultural and industrial land uses, with limited land uses generating walking, which leads to very low volumes of pedestrians. While pedestrian infrastructure is limited along the existing M1 Pacific Motorway for these reasons, footpaths are located to connect to local facilities. Signalised pedestrian crossings are provided at the following intersections:

- Tomago Road and Pacific Highway: across the eastern leg of the intersection to access the bus stop on the Pacific Highway servicing the Tomago industrial area
- Pacific Highway and Hank Street: across all approaches to the intersection due to the adjacent commercial and retail developments in Heatherbrae.

The project would provide a shared path about 900 metres long along the southbound lane of Masonite Road in order to provide safe access across bridge B10 and to accommodate future development in the surrounding area.

The proposed signalised intersection at the HRBG would provide a signalised pedestrian crossing which would provide access to the bus stop located on the eastern side of the Pacific Highway. It would also offer improved pedestrian access to the HRBG.

No other shared paths would be provided along the main alignment or local roads forming part of the project.

Cycling

No existing cycle routes would be impacted by the project. No dedicated cycle paths are located in the construction footprint, with cyclists currently using the shoulders of the existing road network. While no dedicated cyclist infrastructure would be provided along the main alignment, cycling opportunities would be provided using the wide road shoulders along the main alignment. Changes to the existing cycle network include:

- An improved cyclist crossing at the Weakleys Drive/John Renshaw Drive intersection with connectivity to the project
- Relocating the existing cyclist crossing on the New England Highway, east of John Renshaw Drive further west before the northbound entry ramp at the Tarro interchange
- Provision of a westbound cyclist crossing on the New England Highway across John Renshaw Drive
- Replacing the existing gore crossings at the Tarro interchange with new ramps which would create a link between the main alignment in both directions and the future Richmond Vale Rail Trail from Tarro to Shortland
- Provision for northbound cyclists on the Pacific Highway crossing to access Old Punt Road and for crossing from Old Punt to access the northbound Pacific Highway Carriageway
- Provision for northbound cyclists on Pacific Highway to access the main alignment at Tomago interchange and to connect to the traffic signals at Tomago Road
- Provision for northbound cyclists on Pacific Highway to access the HRBG
- Provision for northbound and southbound cyclists to use an access point off Masonite Road.

Further information on cycling is provided in **Section 7.3.7**.

5.3.17 Public transport

Coaches and buses carrying passengers between destinations such as Sydney, Newcastle, Port Macquarie, Coffs Harbour and Brisbane use the M1 Pacific Motorway, New England Highway and Pacific Highway. Buses would be able to use the project once opened. No additional public transport infrastructure along the main alignment would be provided.

Three existing bus stops would be relocated to accommodate the project. These are:

- The bus stop on the Pacific Highway, just north of the Tomago Road intersection
- The northbound bus stop on the Pacific Highway, near the HRBG access road and Pacific Highway intersection
- The southbound bus stop on the Pacific Highway, near the HRBG access road and Pacific Highway intersection.

The relocated bus stops would be located as close as possible to the original bus stop locations, and pedestrian pathways would be provided to allow access to the relocated bus stops. Consultation would be carried out with the affected bus operators during detailed design (refer to **Chapter 6**).

The rail network in the vicinity of the project consists of the Main North Rail Line, which primarily serves freight traffic from the Hunter Valley mining industry with some passenger rail. Railway stations close to the project, including Thornton, Beresfield, Tarro, Hexham and Sandgate, are serviced by the Hunter Line.

The Main North Rail Line is also used by NSW TrainLink regional services between Sydney and Moree, Armidale, Grafton, Casino and Brisbane. However, TrainLink regional services do not stop at stations close to the project. The nearest stations serviced by these trains are Broadmeadow and Maitland, which are located around 11.5 kilometres and 10.5 kilometres from the construction footprint respectively..

5.3.18 Oversize overmass vehicles

The project would generally cater for oversize overmass (OSOM) vehicle movements, with a clearance envelope 8.5 metres wide and 6.5 metres high. There are some locations where design constraints do not allow for vehicles of this size to access the project. Alternative routes available to cater for these OSOM movements are described in **Table 5-10**.

Table 5-10 OSOM restrictions to vehicle movements not catered for by the project

OSOM vehicle movements not catered for by the project	Alternative OSOM vehicle movement
Between Black Hill interchange (B01) and Tarro interchange (B04)	The minimum vertical clearance would be about 5.5m. Alternate route via the New England Highway and John Renshaw Drive in both directions.
Between Raymond Terrace interchange (B12) and Tomago interchange	The minimum vertical clearance under Raymond Terrace interchange (B12) would be about 5.4m. Alternate route via the Pacific Highway through Heatherbrae in both directions.
Tomago Interchange at Old Punt Road (B08)	The minimum vertical clearance under the main alignment at Old Punt Road at B08 would be about 6.4m. The OSOM strategy provides a gated opening in the median barrier and additional pavement would be provided to allow OSOM to cross over between the main alignment and the Pacific Highway carriageways under traffic control and lane closures.
Tomago Interchange for southbound entry under Pacific Highway (B06)	The minimum vertical clearance under B06 would be about 6.6m. The OSOM strategy provides a gated opening in the median barrier and additional pavement would be provided to allow OSOM to cross over between the main alignment and the Pacific Highway carriageways under traffic control and lane closures.

5.3.19 Property acquisition

The project has been designed and aligned to minimise fragmentation of land and property acquisition where reasonably practicable.

Where land acquisition is required for the project, it would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, the Land Acquisition Information Guide (NSW Government 2014b) and the land acquisition reforms announced by the NSW Government in 2016. It is Transport's preferred approach to complete all acquisitions by negotiation without the need for compulsory acquisition.

Properties impacted by acquisition or adjustments are listed in **Chapter 14** (land use and property). In summary, 43 lots have been purchased by Transport for the project. An additional 19 properties

(comprising 36 lots) would be acquired for the project in addition to those previously purchased by Transport. The project would directly impact three dwellings, including two dwellings on rural land and one dwelling associated with a commercial property at Heatherbrae.

The extent of property impacts would be confirmed during detailed design, in consultation with the property owners. Transport would consider the acquisition of any residual parcels created by the location and design of the project. For partial acquisitions, property adjustment plans would be developed in consultation with the property owner. Following consultation with property owners, some of the lots listed as requiring partial acquisition may be totally acquired.

Properties required to accommodate ancillary facilities during the project's construction would be subject to temporary lease as discussed in **Section 5.4.3** and **Chapter 14** (land use and property).

If a property is wholly acquired, but not all land is required for the project, the excess land would be either:

- Sold after construction is complete
- Kept by Transport for future use
- Transferred to the local council or another government agency.

Severance or fragmentation of rural properties would be managed as described in **Chapter 14** (land use and property).

5.3.20 Property access

The project design allows for all property access to be maintained by incorporating some changes to existing property access arrangements.

The project would require realignment of two property access roads and a modification to the HRBG access road. These access changes include:

- Property access road south of the New England Highway at Tarro: This road would be realigned to the west of the existing access and pass under the twin bridges (B02) over the unnamed wetlands (refer to **Figure 5-1**)
- The Aurizon access road off Anderson Drive: A permanent diversion would be provided, with the diversion traversing the viaduct (B05) abutment, passing under the viaduct (B05) then tying into the existing access road south of the main alignment embankment (refer to **Figure 5-1**). This road would also serve as the new route for the Tarro to Shortland cycle route proposed by the City of Newcastle
- HRBG: The entry to the HRBG and the carpark would be modified to cater for the Pacific Highway realignment at this location. Access to the HRBG would be provided as part of a new signalised intersection with the Pacific Highway. The modified access road would pass under the bridge (B09) on the main alignment (refer to **Figure 5-1**).

The project would also require adjustments to existing tracks and trails, including access and easement tracks to utility infrastructure and associated easements and driveways to three private properties.

Where required, and where the project severs existing access tracks, (including fire trails) turnaround facilities would be provided on access tracks to allow vehicles to turn around. Access tracks and driveway adjustments would be confirmed during detailed design and consultation with property owners.

Access to all existing and proposed infrastructure for maintenance purposes would be provided by maintaining existing access and easement arrangements where possible or developing alternative maintenance access arrangements where required.

5.4 Construction work

5.4.1 Construction footprint

The construction footprint is the total area required to construct the project, as shown in **Figure 5-25**. The construction footprint is generally broader than the operational footprint, and includes the area required for road work, bridge and viaduct work, access for construction vehicles and plant, drainage infrastructure, utility and service adjustments, construction and operational water quality controls measures, temporary stockpiles and construction ancillary facilities.

The construction footprint was established to minimise environmental impacts while providing sufficient room to allow the project to be constructed in a safe manner. The total construction footprint area is about 466 hectares.

The construction footprint has been used to assess the maximum area of disturbance during construction. This footprint is indicative only and would be refined during detailed design and construction. Some factors that could affect the final construction footprint include the location and size of water quality controls measures, drainage, the location of final ancillary facilities, utility relocations, the construction methodology and arrangements made with directly affected landowners.

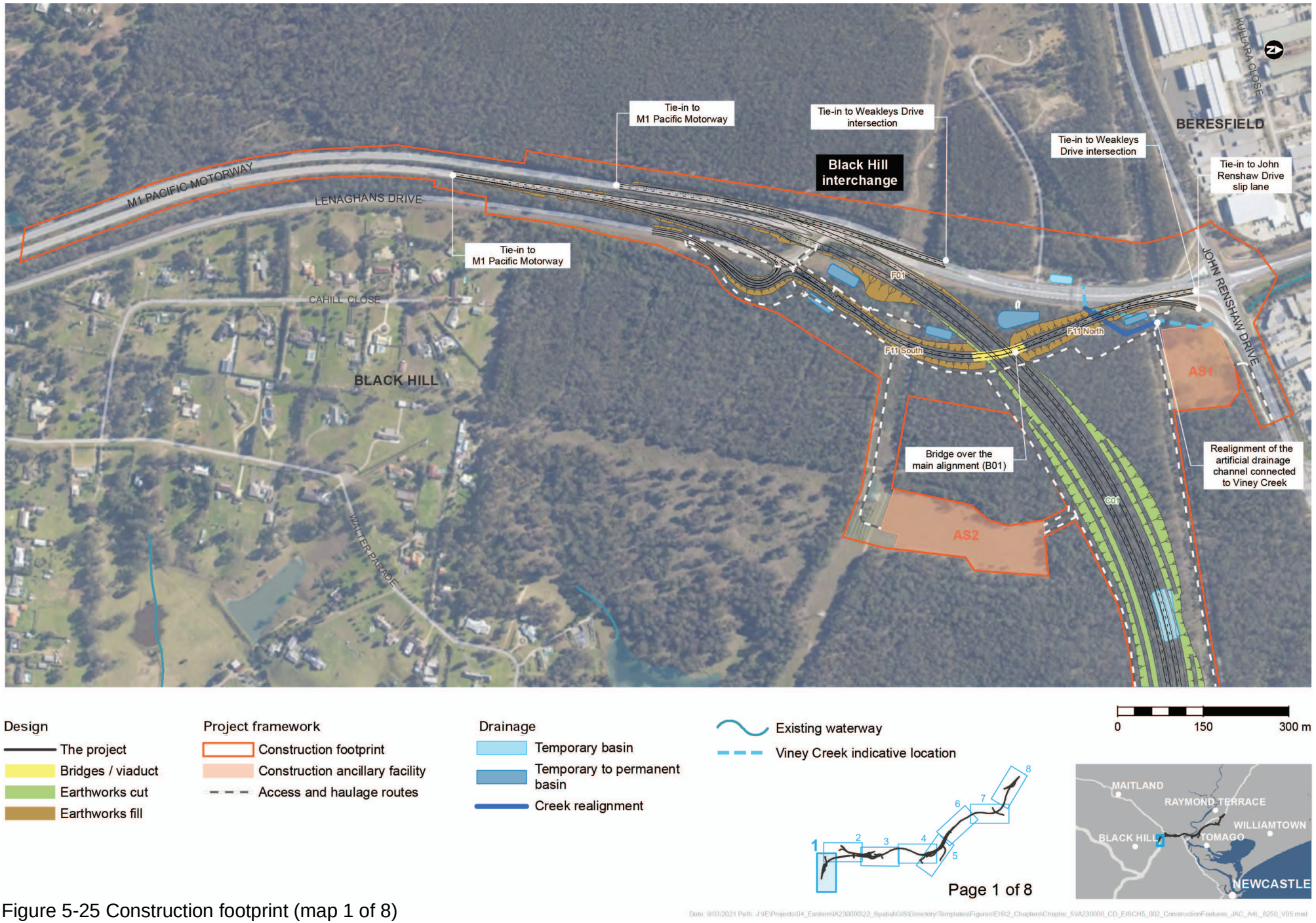

Figure 5-25 Construction footprint (map 1 of 8)

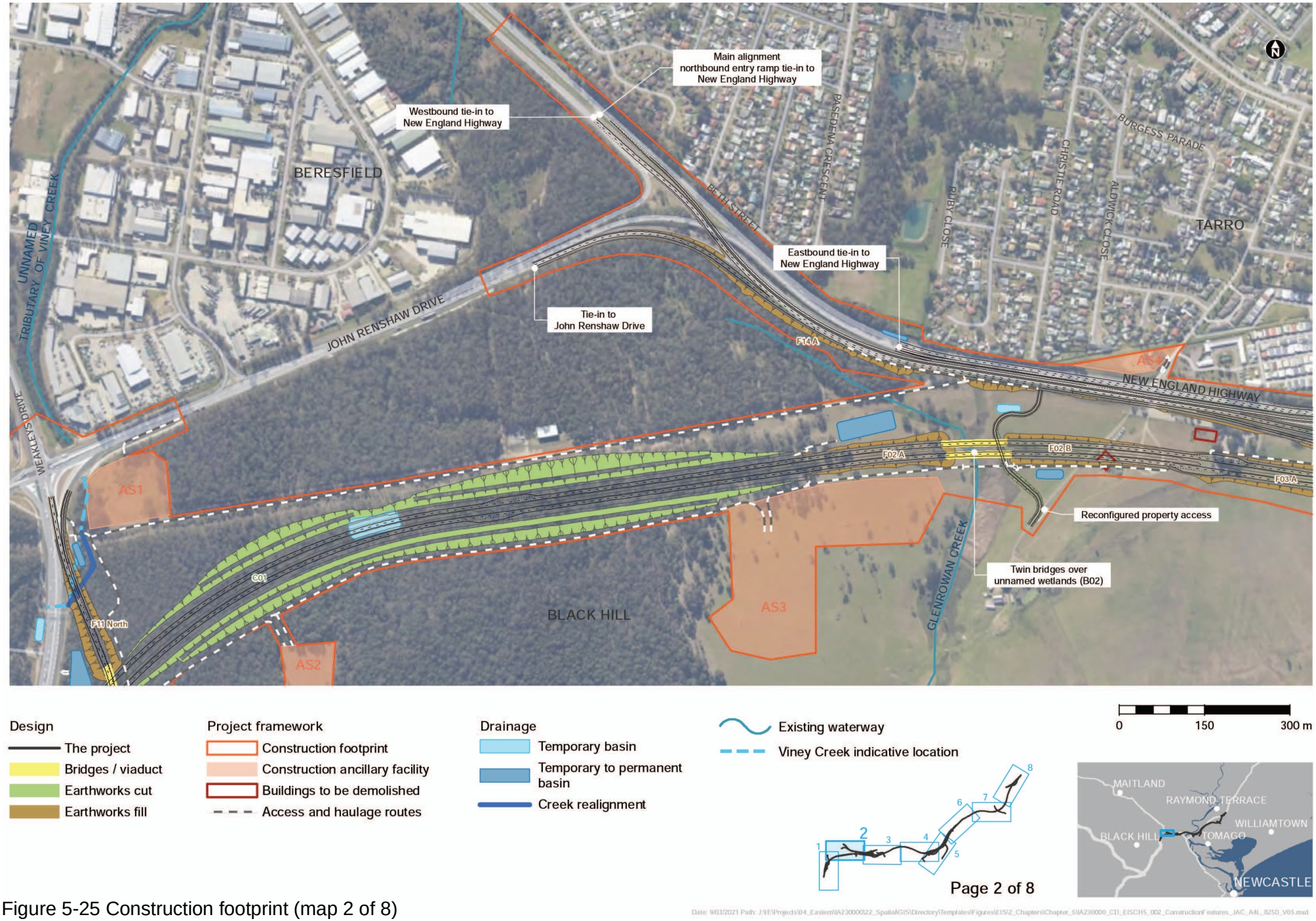

Figure 5-25 Construction footprint (map 2 of 8)

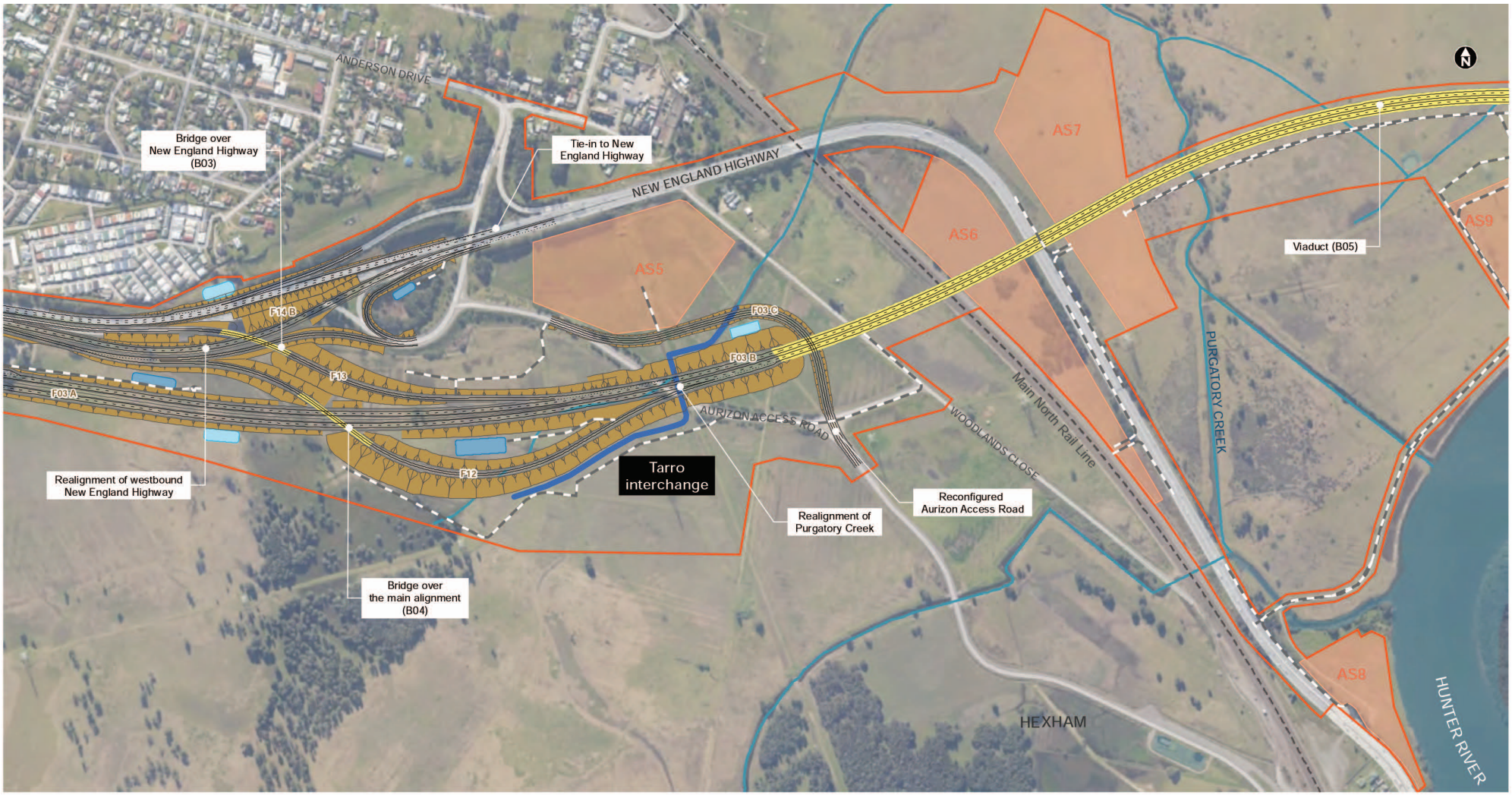

Figure 5-25 Construction footprint (map 3 of 8)

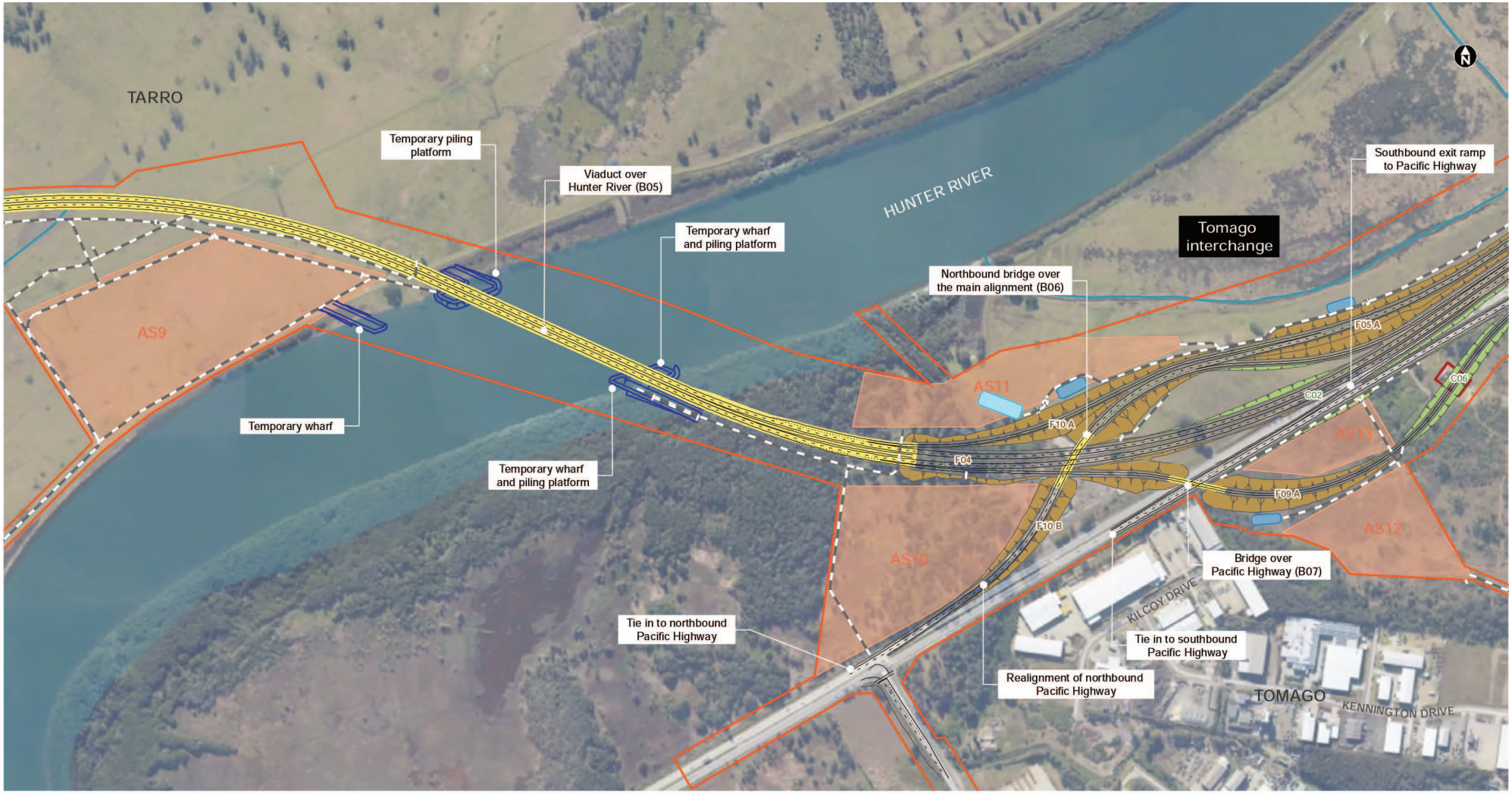

Figure 5-25 Construction footprint (map 4 of 8)

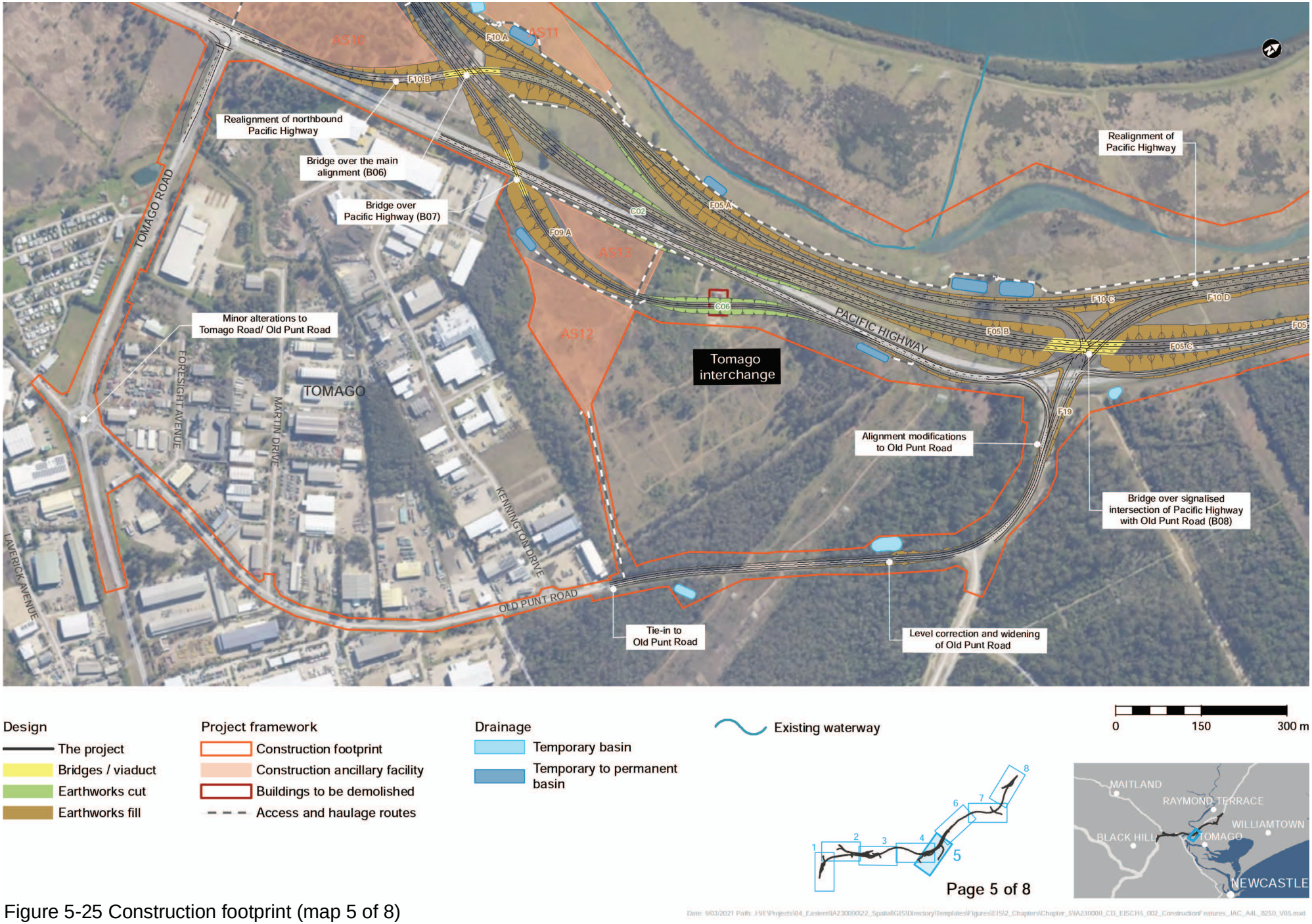

Figure 5-25 Construction footprint (map 5 of 8)

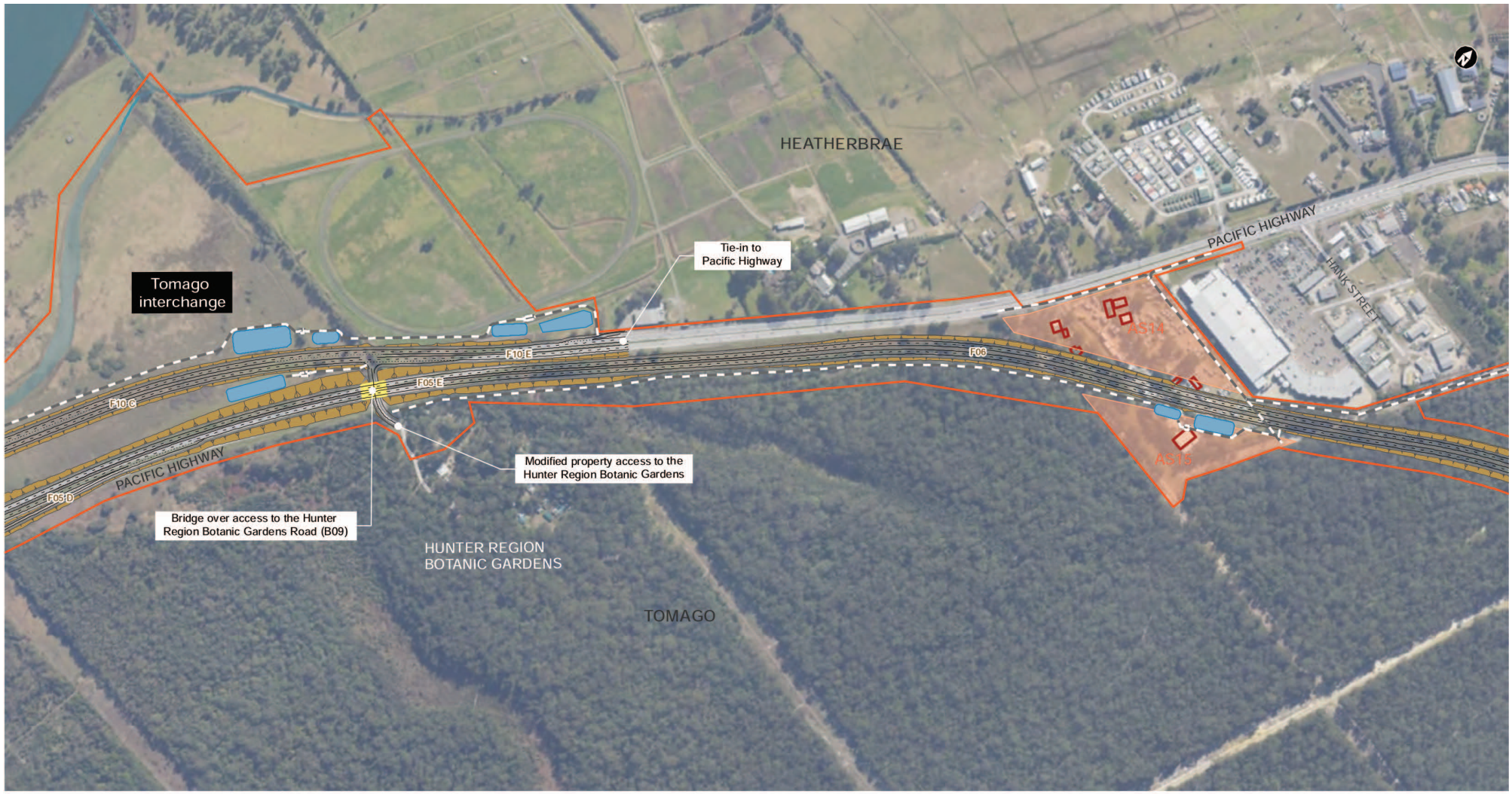

Figure 5-25 Construction footprint (map 6 of 8)

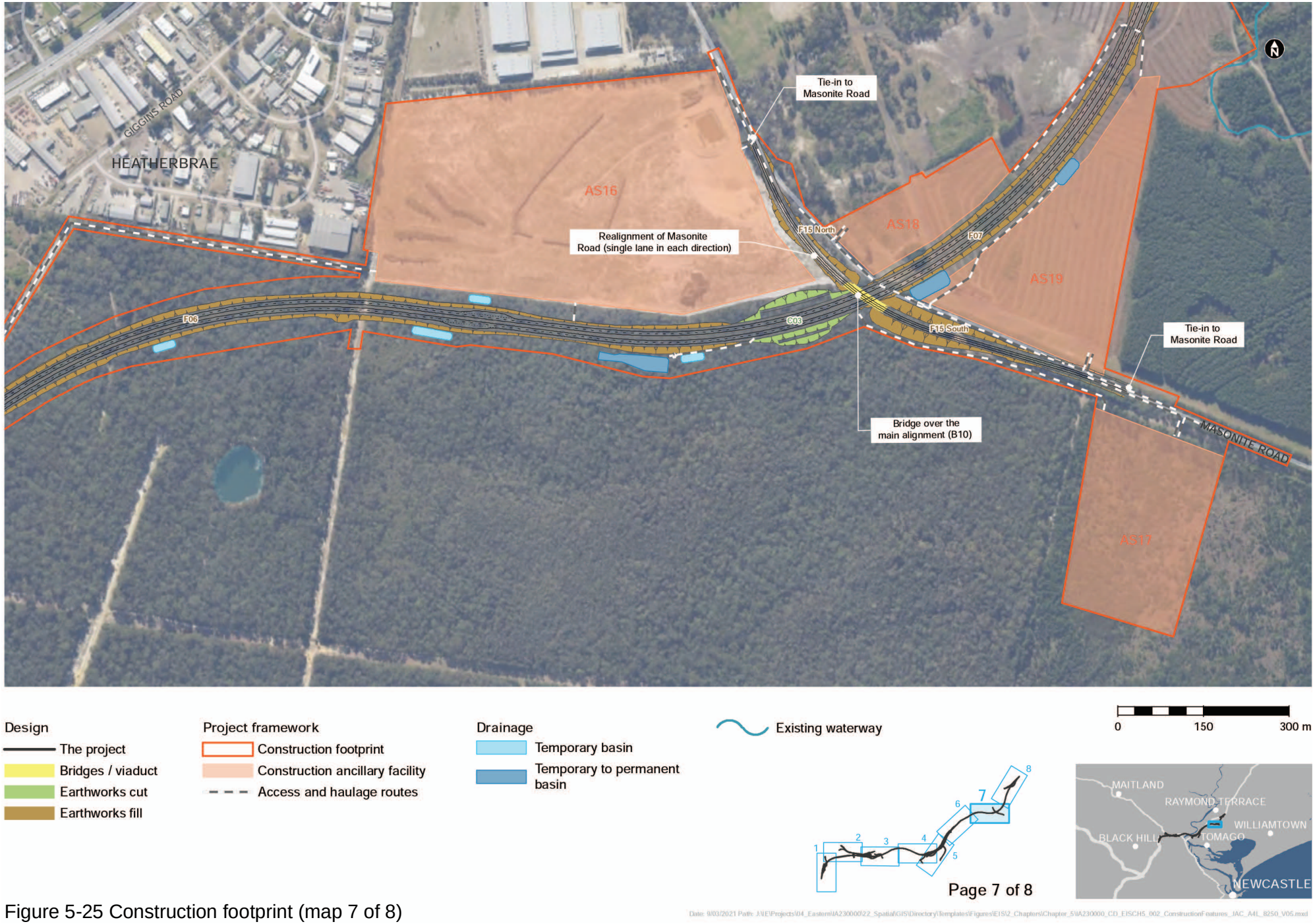

Figure 5-25 Construction footprint (map 7 of 8)

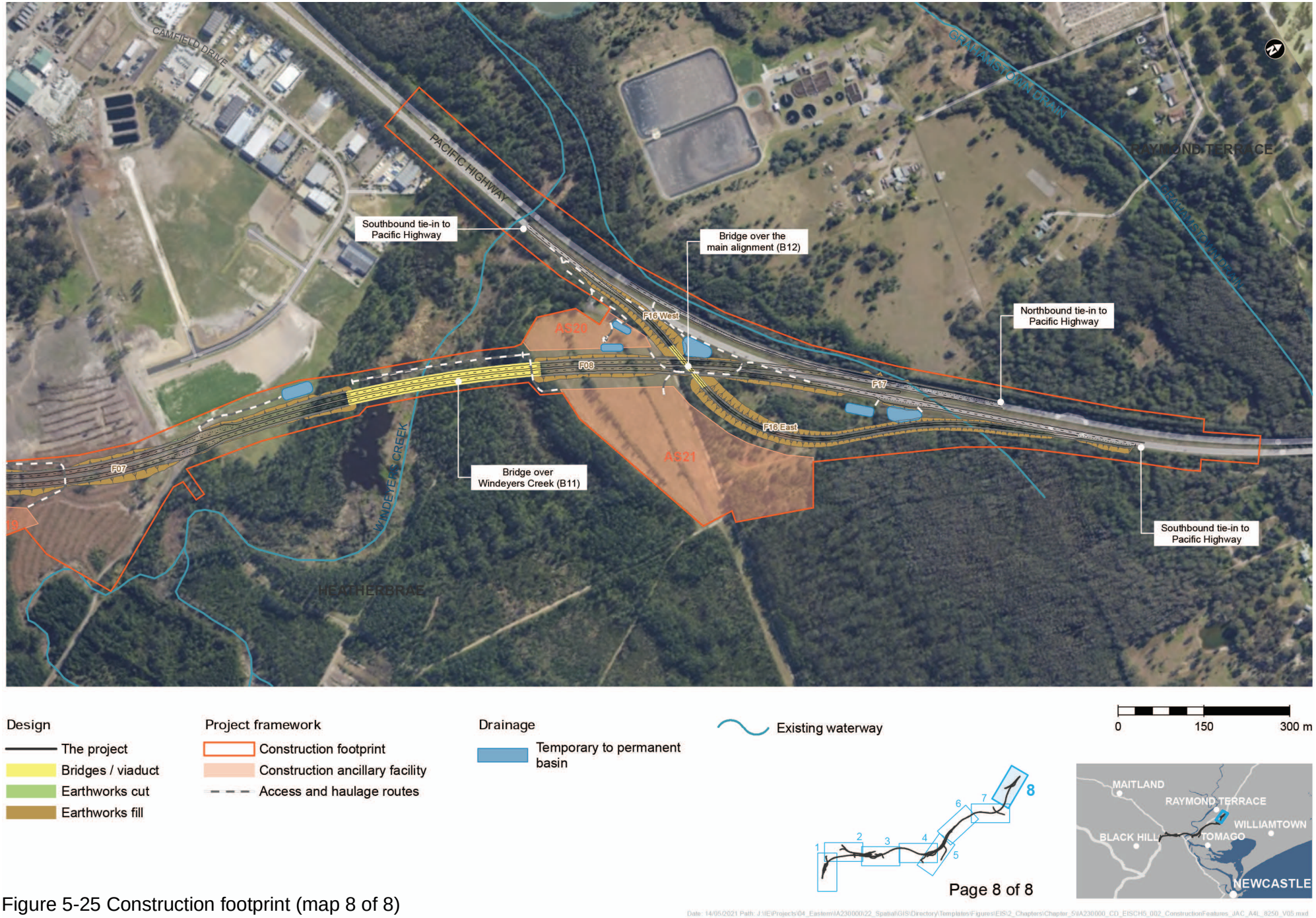

Figure 5-25 Construction footprint (map 8 of 8)

5.4.2 Overview of construction activities

The principles of ecologically sustainable development (ESD) were a key consideration throughout the options development process and the selection of the preferred option (refer to **Chapter 4**) and will continue to be considered during detailed design and construction of the project. In addition, the project has also considered the ESD principles in the assessment of environmental impacts, as outlined in **Chapter 7** (traffic and transport) to **Chapter 23** (cumulative impacts).

The overview of construction work described in this section is based on the concept design. Further construction planning would be carried out during detailed design. Construction planning would consider specific work methods and scheduling to manage community and environmental issues including noise, access, amenity and general disruption, and concurrence with Work Health and Safety legislation.

The construction methods and mitigation measures to minimise environmental impacts would be detailed in the Construction Environmental Management Plan (CEMP), which would be prepared by the construction contractor.

Overview of construction work

The project would likely be built using conventional methods used on most highway projects. Key construction components would include:

- Enabling work
- Construction of ancillary facilities
- Operation of ancillary facilities
- Drainage and water quality control measures
- Clearing, grubbing, and demolition
- Bulk earthwork
- Construction of pavements
- Construction of bridges and the viaduct
- Construction of roadside furniture and finishing work
- Traffic management and control
- Landscaping work.

It is expected that many of these construction activities would occur concurrently or consecutively across different locations within the construction footprint, with some activities occurring as enabling work to maximise efficiency. The typical construction plant and equipment for each component is provided in **Section 5.4.4**.

More information about the main components of these construction activities is provided in the following sections.

Construction components

The typical activities associated with construction are summarised in **Table 5-11**. This includes the work associated with the main alignment, intersections, interchanges, bridges and the viaduct. This work has been separated into construction components to consider:

- The need to minimise road user delays
- The need for local road and property access
- The need for land acquisitions
- The earthwork balance – both locally and across the project
- Areas that may require soft soil pre-loading
- The sequence in which completed sections could be opened to traffic.

Table 5-11 Construction components and activities

Component	Typical activities
Enabling work and utilities	• Property acquisition and adjustments, including property access changes • Detailed investigations and survey work including geotechnical investigative drilling, excavations, and archaeological investigations and salvage • Road dilapidation and building condition surveys • General site clearance, site establishment work, fencing and signage • Temporary traffic management arrangements including construction of access roads • Installation of environmental controls including temporary or permanent fencing, and erosion and sediment control mitigation measures • Construction of temporary drainage controls including temporary creek crossings • Adjustment, relocation and protection of public utilities and services.
Construction of ancillary facilities	• Initial site survey • Installation of erosion and sediment control measures • Establishment of construction site access points, traffic management measures and site access roads • Site clearance and establishment work including fencing, signage and lighting • Establishment of hardstand and bridge work areas • Establishment of facilities, including site offices and amenities.
Operation of ancillary facilities	• Operation of ancillary facilities, including stockpiling, delivery and storage of materials, and worker parking • Operation of batch plant and pre-cast fabrication, including crushing and screening of excavated material, stockpiling and loading activities.
Drainage and water quality control	• Installation of cross drainage including culverts, and inlet and outlet work (channel diversions and scour protection) • Installation of water quality control measures, including drainage, temporary sediment basins and swales • Dewatering of basins as required.
Clearing, grubbing, and demolition	• Clearing and grubbing of vegetation • Mulching of vegetation for reuse in landscaping activities (where possible) • Stripping of topsoil and stockpiling for reuse in landscaping activities • Demolition of dwellings and farm sheds (refer to **Section 5.4.7**) • Minor demolition of pavements, kerbs and other road elements and structures
Bulk earthwork	• Excavation of bulk earthwork cuttings and stabilisation of cut batters • Rock removal using rock breakers, hammers or controlled rock blasting • Crushing and screening • Haulage of materials from excavated cuttings, borrow sites and external sources to fill locations • Construction of embankments and earth mounds including foundation drainage • Ground improvement activities.
Pavements	• Construction of pavement and sub surface drainage • Construction of pavement layers including wearing surface.

Component	Typical activities
Bridges and the viaduct	• Construction of wharf areas for loading and unloading of plant and equipment from barges on Hunter River • Installation of silt fences and other environmental controls • Construction of temporary platforms to enable construction of Hunter River crossing piers located on the bank and in the Hunter River • Construction of bridge and abutment foundations (bored or driven piles) • Installation of embankment and utility service piles (at required locations) • Construction of pile caps • Construction of bridge abutments and piers • Construction of bridge superstructure including deck and road surface (cast in situ or precast bridge elements) • Construction of scour protection and reinforced soil walls where required • Dewatering.
Roadside furniture and finishing work	• Construction of concrete barriers, wire rope fencing and guardrails • Installation of traffic lights, road markings, signposting, roadside furniture, lighting, VMS and ITS • Removal of temporary work • Restoration and landscaping of ancillary facilities • Restoration of construction access roads (where required) • General site clean up • Removal of temporary environmental controls.
Traffic management and control	• Temporary traffic barrier installation and movement – including anchor drilling • Temporary pavement construction • Traffic switches.
Landscaping	• Progressive landscaping and tree planting • Rehabilitation and reinstatement of existing conditions • Landscape maintenance.

5.4.3 Construction ancillary facilities

Ancillary facilities would be required at different locations across the construction footprint to support project construction as shown in **Figure 5-25**. It is expected the majority of the ancillary facilities would be used for the duration of construction.

Opportunities to use suitable existing sites in the surrounding industrial areas in Black Hill, Beresfield, Hexham, Tomago and Raymond Terrace would be investigated during detailed design to reduce the construction footprint. Preference would be given to suitable sites directly next to the construction footprint.

Activities at each ancillary facility would vary according to the support required at that location. The potential sites that could be used, and the indicative details of the size and purpose of each facility, are provided in **Table 5-12**.

Typically, main ancillary facilities would include:

- Temporary buildings including offices and meeting rooms, amenities and first aid facilities (the size and number of office facilities at the main compound would be greater than at the secondary compounds)
- Hardstand parking areas with sufficient space to accommodate the numbers of construction workers expected at any site
- Materials laydown, storage and handling areas, including purpose-built temporary structures as required and appropriately bunded storage for hazardous and non-hazardous substances
- Secure perimeter fencing, including visual screening of construction compounds where necessary
- Workshops with appropriate safety and environmental controls for servicing plant and equipment.

Access to construction ancillary facilities would be either via the access points on the existing road network or via new access tracks within the construction footprint. Known access locations to ancillary facilities are detailed further in **Section 5.4.12** and shown in **Figure 5-25**.

Areas of land that are leased by Transport for the purposes of construction would be rehabilitated upon completion of construction and restored to their existing condition, or as otherwise agreed with the landowner. Ancillary facilities would be progressively rehabilitated where possible to minimise soil exposure and the potential for dust generation, erosion and sedimentation, and visual impacts.

The final location, use, type and number of ancillary facilities would be confirmed by the construction contractor before construction and identified in a site establishment management plan. Where amendments or additional ancillary facilities are identified outside of the project construction footprint, the contractor would consult with Transport advisor to confirm the suitability of the proposed amendment or additional facility, and whether additional environmental assessment is required.

The main functions of the construction ancillary facilities are described below. The treatment of acid sulphate soils and temporary wharf facilities are described in **Section 5.4.5** and **Section 5.4.6** respectively.

Table 5-12 Proposed construction ancillary facility locations and uses

Ancillary ID	Location	Area (ha)	Potential function										Construction activities			
			Laydown	Stockpiles – (includes mulch)	Crushing and materials processing	Concrete batch plant	Concrete precast yard	Acid sulphate soil treatment	Main compound (incl. parking)	Wharf facilities	Asphalt batch plant	Satellite compound (incl. parking)	Parking	Established for enabling work	Interchange	Viaduct (B05)	Bridge
AS1	**Black Hill:** On the corner of John Renshaw Drive and the M1 Pacific Motorway. North of a transmission line easement, east of vegetation	1.6	✓	✓								✓		✓	✓		✓
AS2	**Black Hill:** East of the M1 Pacific Motorway. South of a transmission line easement	2.7	✓	✓								✓			✓		✓
AS3	**Black Hill:** South of the New England Highway and a transmission line easement	6.7	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓	✓	✓
AS4	**Tarro**: North of the New England Highway. South and west of residential area	0.5	✓	✓									✓		✓		
AS5	**Tarro:** South of the New England Highway, west of Woodlands Close	4.7	✓	✓				✓				✓		✓	✓	✓	✓
AS6	**Tarro:** West of Maitland Road / New England Highway and east of the railway corridor	4.6	✓	✓				✓				✓		✓		✓	
AS7	**Tarro:** East of Maitland Road / New England Highway and north and south of main alignment	6.8	✓	✓	✓	✓	✓	✓	✓		✓					✓	
AS8	**Tarro:** East of Maitland Road / New England Highway and west of the Hunter River	1.7	✓	✓								✓				✓	

Ancillary ID	Location	Area (ha)	Potential function										Construction activities			
			Laydown	Stockpiles – (includes mulch)	Crushing and materials processing	Concrete batch plant	Concrete precast yard	Acid sulphate soil treatment	Main compound (incl. parking)	Wharf facilities	Asphalt batch plant	Satellite compound (incl. parking)	Parking	Established for enabling work	Interchange	Viaduct (B05)	Bridge
AS9	**Tarro:** East of Purgatory Creek and north of the Hunter River	9	✓							✓		✓				✓	
AS10	**Tomago:** North-west of the Pacific Highway and south of the Hunter River. South of the main alignment	5.7	✓	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
AS11	**Tomago:** North-west of the Pacific Highway and south of the Hunter River. North of the main alignment	3.5	✓	✓		✓	✓	✓			✓	✓			✓	✓	✓
AS12	**Tomago:** South of the Pacific Highway and east of Tomago industrial area. South of the main alignment	2.7	✓	✓	✓	✓						✓		✓	✓		✓
AS13	**Tomago:** South of the Pacific Highway and east of Tomago industrial area. North of the main alignment	1.3	✓	✓								✓		✓	✓		✓
AS14	**Heatherbrae:** East of the Pacific Highway, south of Heatherbrae commercial area. North of the main alignment.	2.9	✓	✓				✓				✓		✓			✓
AS15	**Heatherbrae:** East of the Pacific Highway, south of Heatherbrae commercial area. South of the main alignment	2.1	✓	✓				✓					✓				✓
AS16	**Heatherbrae:** South of the Pacific Highway and west of Masonite Road	25.1	✓	✓		✓	✓	✓	✓		✓			✓			✓

Ancillary ID	Location	Area (ha)	Potential function										Construction activities			
			Laydown	Stockpiles – (includes mulch)	Crushing and materials processing	Concrete batch plant	Concrete precast yard	Acid sulphate soil treatment	Main compound (incl. parking)	Wharf facilities	Asphalt batch plant	Satellite compound (incl. parking)	Parking	Established for enabling work	Interchange	Viaduct (B05)	Bridge
AS17	**Heatherbrae:** South of Masonite Road	7.5	✓	✓		✓	✓		✓		✓	✓		✓			✓
AS18	**Heatherbrae:** South of the Pacific Highway and east of Masonite Road. North of the main alignment	3.2	✓	✓									✓				✓
AS19	**Heatherbrae:** South of the Pacific Highway and east of Masonite Road. South of the main alignment.	8.6	✓	✓		✓	✓	✓	✓		✓	✓		✓			✓
AS20	**Raymond Terrace:** South of the Pacific Highway, west of the main alignment.	1.2	✓	✓									✓		✓		✓
AS21	**Raymond Terrace:** South of the Pacific Highway, east of the main alignment.	5.7	✓	✓				✓				✓			✓		✓

Stockpile and laydown areas

Stockpile and laydown areas would be required to temporarily store:

- General construction materials
- General fill material: Temporary storage of select material, rock or other material at various locations along the project
- Spoil: Excavation of existing ground and road surfaces would create excess spoil material that may need to be stockpiled
- Mulch and topsoil: Stockpiling of topsoil and mulch created from clearing and chipping of vegetation would be needed before this material is re-used on the project.

Temporary stockpiling may be required to suit the sequence of construction activities. The laydown and spoil stockpile areas would be located within the ancillary facilities identified in **Table 5-12** and shown in **Figure 5-25** as well as other areas within the construction footprint.

Batching plants

Asphalt and concrete required for the construction of the project would be obtained from local suppliers as far as practicable. However, existing suppliers may be unable to meet the production rates required where large quantities are required at high production rates for the project. As such, it is likely that one or more on-site asphalt and concrete batching plants would be required to form asphalt and concrete required for the project. Batching plants would be located within ancillary facilities as identified in **Table 5-12**.

To support the batching plants, temporary buildings for staff amenities, offices and quality assurance control would also be required.

It is desirable that crushing plants be located in the vicinity of batching plants. Potential for co-location would be taken into consideration when choosing the relevant locations for the facilities.

Crushing plants

Crushing plants would be required primarily to process rock material from cuttings to make suitable fill material. Aggregate production to support concrete and/or asphalt batching in addition to materials for drainage would also be carried out where possible. The potential location of the crushing and materials processing plants have been identified in **Table 5-12**.

The crushing plants would also be expected to include areas for the stockpiling of material. Stockpiling requirements would depend on the construction staging and contractor's work methods, but it is assumed that storage would be required either in the crushing plant area or in the construction footprint before it is placed in fill locations.

Crushing plants would be located as near as possible to concrete or asphalt batch plants to minimise haulage on public roads.

Precast facilities

Precast facilities may be required to produce the precast concrete products to build bridge deck segments and girders ready for assembly. The potential location of the precast facilities have been identified in **Table 5-12**.

The need for precast facilities would be determined by the construction contractor and would depend on the bridge construction method adopted, value for money and the availability and proximity of alternative precast facilities.

Assessment of ancillary facilities

Where possible, ancillary facilities identified in this EIS are nominated in locations that:

a) Are more than 50 metres from a waterway
b) Are within or adjacent to land where the project is being carried out
c) Have ready access to the road network
d) Minimise the need for heavy vehicles to travel through residential areas
e) Are on relatively level land
f) Are separated from nearest residences by at least 200 metres (or at least 300 metres for a temporary batching plant)
g) Do not require vegetation clearing beyond that already required for the project
h) Avoid and minimise impact on heritage items (including areas of archaeological sensitivity) beyond those already impacted by the project
i) Do not unreasonably affect the land use of adjacent properties
j) Are above the one in 20 year ARI flood level (equivalent to about an 5% AEP flood level) unless a contingency plan to manage flooding is prepared and implemented
k) Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

An assessment of the proposed ancillary facilities against the standard considerations above are summarised in **Table 5-13**. Where the ancillary facility does not comply with the above criteria it has been noted as 'N', shaded grey and an explanatory comment included. Where the ancillary facility location does not currently meet the criteria (such as criteria c, h, and j) but would be rectified prior to use, it has been noted as 'Y' and shaded light green.

Table 5-14 lists the management measures that would be implemented for ancillary facilities which do not meet the criteria. Further details of environmental management measures are summarised in **Chapter 24** (summary of environmental management measures).

Table 5-13 Assessment of ancillary facilities against standard considerations

Ancillary ID	Compliance with the standard condition criteria										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
AS1	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS3	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
AS4	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
AS5	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y
AS6	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
AS7	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
AS8	N	Y	Y	Y	Y	N	Y	Y	N	N	Y
AS9	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
AS10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS11	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS12	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS13	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS14	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
AS15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS16	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS17	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS18	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
AS19	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
AS20	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AS21	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 5-14 Relevant mitigation measures for ancillary facilities

Criteria	Issue	Ancillary facility	Environmental management measure
a)	Ancillary facilities are located next to or within 50m of the Viney Creek tributary, Purgatory Creek or the Hunter River	AS1, AS7-AS9 and AS11	A Soil and Water Management Plan will be prepared as part of the CEMP. This plan will specify a range of measures to be implemented to manage potential impacts to watercourses (**Chapter 11** (surface water and groundwater quality)).
c)	Site access	AS3 and AS9	Access to the ancillary facilities would be provided within the construction footprint or using existing easements (such as the Hunter Water Corporation CTGM easement) (refer to **Section 5.4.12**).
f) and i)	Residences are located between 10m and 175m from the ancillary facility. Noise, light and amenity would need to be managed	AS3-AS5, AS8 and AS14.	A Construction Noise and Vibration Management Plan will be prepared as part of the CEMP. This plan would include a range of measures to manage and mitigate noise and vibration impacts from use of the ancillary facilities (refer to **Chapter 8** (noise and vibration)).
h)	Impacts to known Aboriginal heritage items	AS1-AS4, AS16 and AS17	The management measures identified in the Aboriginal Cultural Heritage Assessment Report (**Appendix L**) will be implemented. This will include the completion of all archaeological investigations and any required actions such as salvage would have been completed prior to the establishment of the ancillary facility
j)	Ancillary facilities are subject to flooding within 5% AEP flood level.	AS5-AS9, AS18 and AS19	The Flood Management Plan will specify a range of measures to be implemented to manage potential flood impact associated with the ancillary facilities and access tracks (refer to **Chapter 10** (hydrology and flooding)). Management measures will include: • Appropriate management measures will be implemented during construction to ensure minimal impact on the Hunter River and floodplain and its capacity to convey flows in the event of a flood • Where feasible, the size of the ancillary facilities will be reduced • Ancillary facilities (and access tracks) will be raised above the floodplain to manage the risk in the event of a flood exceeding 5% AEP • Ancillary facilities will include appropriate erosion and sediment control measures to minimise the sediment that could be transported into the Hunter River.

Temporary leases

The project would temporarily lease land for ancillary facilities, access tracks and construction. The leased areas would be rehabilitated upon completion of construction and restored to existing condition, or as otherwise agreed with the landowner. Properties subject to temporary leases generally include those affected by partial acquisition.

Details of properties that may be temporarily leased within the construction footprint are provided in **Chapter 14** (land use and property) and the Land Use and Property Working Paper (**Appendix N**).

5.4.4 Plant and equipment

Indicative equipment for the different construction components is presented in **Table 5-15**. The final plant and equipment profile would be determined by the construction contractor and may vary to what is listed.

Table 5-15 Indicative construction plant and equipment

Component	Typical plant and equipment
Enabling work and utilities	Trucks (road, fuel and concrete), light vehicles, heavy vehicles (floats, semi-trailers), excavators, backhoe, front end loader, dump trucks, chainsaws, jackhammers, concrete saws, mulchers, water carts, small cranes and lifting equipment, hand tools and welding equipment
Construction of ancillary facilities	Trucks (road and fuel), light vehicles, heavy vehicles (floats, semi-trailers), excavators, backhoes, front end loaders, chainsaws, mulchers, water carts, small cranes and lifting equipment, hand tools, welding equipment, site sheds, light towers, generators and ablutions
Operation of ancillary facilities	Trucks (road and fuel), light vehicles, heavy vehicles (floats, semi-trailers), excavators, backhoes, front end loaders, chainsaws, small cranes and lifting equipment, site sheds, light towers, generators and ablutions, dump trucks, rock crusher and screening equipment For concrete batch plant: Drum mixer with incline conveyor, aggregate storage and feeder bins, silos for cement, fly ash and slag, electrical switch room, generators, air compressors, admixture tanks, water tanks, laboratory, storage containers, storage bins and truck wash bays For asphalt batch plant: Barrel mixer, feeder bins with incline conveyors, storage silos/tankers for bitumen, lime and fuel, control room, water tanks, laboratory, generators, air compressors, containers for general storage, storage bins, truck wash and weighbridge
Drainage and water quality control	Excavators, backhoe, elevated work platforms, mobile cranes, small cranes and lifting equipment, trucks (concrete and road), concrete pumps, compressors, generators, vibratory rollers, light vehicles, hand held compactors, light towers and hand held tools
Clearing, grubbing, and demolition	Excavator, excavator with harvester attachment, fuel truck, bulldozer, dump truck, skidder, chainsaws, tub grinder and mulcher, elevated work platform and light vehicles
Bulk earthwork	Excavators, excavator with hydraulic breaker, dump trucks, bulldozers, front end loaders, graders, scrapers, water cart, truck and dog, vibratory rollers, light vehicles, impact crusher, jaw crusher plant and drilling and blasting equipment
Pavements	Water carts, road trucks, truck compressor, concrete paver, asphalt paver, texturing machines, sprayers for curing, bitumen spraying truck, smooth drum vibratory rollers, multi-tyre roller, aggregate spreader, asphalt rotomill, concrete saw, backhoe, truck compressor, light vehicles, light towers and kerbing machine
Bridges and viaducts	Bored piling rigs, crawler crane with vibrating or impact driving hammer, excavator with sheet piling attachment, excavators, trucks (concrete and fuel), dump trucks, concrete pumps, hand tools, welding equipment, compressors, generators, small cranes and lifting equipment, mobile crane, piling rig barge, elevated work platforms, dewatering pumps, water carts, light towers, post tensioning jacks and equipment, light vehicles and heavy vehicles delivering piling materials, plant, and equipment, and crane and supply barges

Component	Typical plant and equipment
Roadside furniture and finishing work	Excavators, elevated work platforms, trucks (road, concrete and line marking) mobile cranes, small cranes and lifting equipment, concrete trucks, light vehicles, light towers, hand held tools, jackhammers, line and generators
Traffic management and control	Small trucks, light vehicles, light towers, generators and hand tools
Landscaping	Light vehicle, water cart, backhoe, excavator, front end loaders, graders, road trucks, hand held tools and side tipper

5.4.5 Construction resources

Construction of the project would require a range of materials to be transported to and within the construction footprint, including within and between ancillary facilities. The major construction materials are discussed in further detail below. None of these resources are or are likely to become in short supply as a result of the project. Where feasible, materials would be reused and recycled.

Earthwork

Earthwork would be required along the entire length of the project as part of:

- Topsoil stripping
- Cut and fill
- Retaining wall and reinforced soil wall construction
- Site preparation for bridge construction
- Road drainage infrastructure installation
- Sedimentation and erosion control
- Building up of some access tracks and ancillary facilities to provide a level of flood immunity during construction.

Areas of cut and fill are shown in **Figure 5-25** and described in **Section 5.3.6**.

Table 5-16 shows the approximate bulk total earthwork quantities. In summary, project earthworks are likely to result in an estimated net deficit of fill material and would require importation of fill.

Table 5-16 Approximate total bulk earthwork quantities

Type of material	Approximate quantity (m^3)
Total fill material required	1,940,000
Total cut material to be excavated	860,000
Total fill deficit to be imported	1,080,000
Topsoil to be stockpiled	80,000

The project has been designed with a strategy of maintaining an earthwork balance to the south of the Hunter River where possible. The aim is to achieve haulage efficiencies and reduce construction traffic across the existing Hexham Bridge. Haulage movements between the cut and fill areas shown in **Figure 5-25** are expected to be contained in the construction footprint or use the existing road network (refer to **Section 5.4.12**).

As it is undesirable to haul large quantities of general fill materials long distances, alternative sources of construction materials such as from local mine backfill, borrow pits and other Transport projects would be further investigated during detail design.

All suitable excavated material would be reused as general fill either within the same section of work or elsewhere along the project. Where excavated material cannot be reused within the project, material would be managed in the following order of priority:

- Transfer to other Transport projects for reuse in accordance with the NSW EPA's excavated public road resource recovery order and exemption
- Transfer to an approved Transport stockpile site for reuse on a future project if a specific project is identified and statutory and regulatory requirements under the POEO Act are met
- Remove off-site for reuse by a third party in accordance with relevant NSW EPA resource recovery order and exemption or to a NSW EPA licensed waste recovery facility
- Dispose at an accredited materials recycling or waste disposal facility – where excavated material is deemed unsuitable for reuse or emplacement due to contamination, it would be taken to a waste facility licensed to accept the waste.

Cutting at Black Hill

Road cuttings are likely to be excavated by bulldozers. However, controlled rock blasting may be used at the large cutting at Black Hill (C01) to enable the contractor to be more efficient. The location of this cutting shown in **Figure 5-25**.

Rock breaking alternatives such as penetrating cone fracture and hydraulic rock breakers may also be used. No blasting within waterways is proposed for this project.

If required, a Blast Management Plan would be prepared before blasting starts to identify exact blasting locations. Where a blast location is predicted to have an impact on a sensitive receiver, a series of trials would be carried out at a reduced scale to determine site specific blast response characteristics and to define allowable blast sizes. Safety measures for the travelling and general public, including safe blast distances and exclusion zones, would be identified within the Blast Management Plan. **Chapter 8** (noise and vibration) further considers the noise and vibration impacts of blasting.

Based on the geotechnical investigations completed for the project, the material excavated from the cutting at Black Hill (C01) is expected to comprise highly weathered rock and residual soils (clays). With appropriate crushing and blending, it is anticipated that all cut material from Black Hill would be suitable for general fill requirements.

Acid sulfate soils

Regional acid sulphate soil (ASS) maps indicate that there is a high probability of ASS being present within the Hunter River sediments, associated low lying floodplains and swamp areas within the construction footprint. The majority of ASS is expected to be encountered while boring concrete piles for bridges. Potential acid sulphate soils (PASS) and ASS would be either treated where they are extracted or transferred to treatment areas within ancillary facilities (refer to **Figure 5-25** and **Chapter 16** (soils and contamination).

The estimated volume of material to be treated is expected to be about 50,000 cubic metres. Treatment of ASS is to be confirmed during detail design, however, would generally involve:

- Establishing a treatment area prior to the work that is likely to encounter ASS or PASS
- If possible, prior to the disturbance of soil in situ, add lime over the area (limited opportunity for piling spoil)
- Transfer soil to the treatment area
- Place soil in layers on a treatment pad and add lime
- Turn the soil over in such a manner that the lime is mixed and distributed

- Leave the material on the treatment pad for a period of time (typically ranging from a few days to a week), turning the soil when the surface dries out
- Once test results confirm that acceptance criteria have been achieved the material may be reused on site.

Soft soil treatment

Soft soils are geologically young and have not undergone substantial consolidation since their formation. They are soils where settlement criteria cannot be achieved without the use of ground improvement techniques. These soils are problematic as they may move and settle over a long time span.

These areas require improvement of the existing foundation material in order to meet settlement criteria applicable for the project. Areas of soft soils include:

- The viaduct (B05) approach embankment, including the Tarro interchange and Tomago interchange
- Approach to the bridge (B09) at the HRBG access
- Approach to the bridge (B12) on Masonite Road
- Raymond Terrace interchange embankments.

These areas would be improved via the process of preloading the soils up to nine months before construction. Preloading involves applying a load on the ground surface to accelerate consolidation. This would be carried out as part of initial earthwork activity in these areas. Some of the bridges would cross over large extents of soft soils, reducing the area of soft soils that need to be treated.

Wick drains may be installed within the preload soils and embankments to accommodate displaced groundwater expelled (surcharged) from the expected settlement. Discharge from wick drains is considered dewatering discharge and will be monitored and managed in accordance with the Construction Soil and Water Management Plan and Acid Sulfate Soils Management Plan, under the project CEMP (refer to **Chapter 24** (summary of environmental management measures)).

Soils and geology are discussed further in **Chapter 16** (soils and contamination) while groundwater quality is discussed in **Chapter 11** (surface water and groundwater quality).

Construction materials

Concrete and asphalt

Concrete and asphalt would be required for pavements, bridges and road surface sub-base as shown in **Table 5-17**. As described above, asphalt and concrete would be obtained from local suppliers as far as practicable and would be delivered in agitator trucks. Where required, concrete may also be sourced from batching plants. Potential locations for batching plants include AS3, AS7, AS10, AS11, AS12, AS16, AS17 and AS19, as discussed in **Section 5.4.3**.

Table 5-17 Approximate quantities of concrete and asphalt

Type of material	Approximate quantity (m^3)
Selected material zone pavement	155,000
Wearing course (asphalt)	60,000
Wearing course (concrete)	140,000
Bridge structures (concrete)	100,000

Precast girders

About 1030 precast bulb-T and super-T girders are required for the bridge elements within the project. Additionally, about 185 precast segments are required to construct the five spans of the viaduct (B05) over the Hunter River.

Precast girders would be delivered to site as required to avoid double handling, while minimising the storage area required. However, the construction contractor may adopt a different strategy and consideration of possible areas for the storage of precast girders at the various ancillary facilities has been considered in **Section 5.4.3**.

Precast segment manufacturing for the box girder crossing of the Hunter River would likely to be cast in a yard close to site. These precast girders would then be moved into place.

Steel

About 16,000 tonnes of reinforcing steel and 12,000 tonnes of steel piles would be required for structures. Steel would be sourced by the construction contractor, with the final quantity of steel dependent on volumes, quality and performance requirements of the project.

Rock

Rock for drainage blankets, bridging layers, gabion walls, scour protection and pavement gravel would be sourced from road cuttings such as at Black Hill (C01) and local quarries where possible.

Water

Water would be used during construction for a range of purposes including, but not limited to, dust suppression, earthwork compaction, wheel washing, machinery, concrete and asphalt batching, curing structures and for amenities (toilets, sinks, showers, and drinking). Indicative construction water use is estimated in **Table 5-18**.

Construction water sources would be confirmed during detailed design and by the construction contractor but are likely to include a combination of potable mains supply and recycled water, drawn from sources internal and external to the construction footprint. The quantity and quality of the water is readily available in the local area. Relevant approvals required for the extraction of water are discussed in **Chapter 2**.

A water balance for ground and surface water and the sources of water expected for the project are discussed in **Chapter 10** (hydrology and flooding) and **Chapter 11** (surface water and groundwater quality). Further information is provided in the Hydrology and Flooding Working Paper (**Appendix J**) and the Surface Water and Groundwater Quality Working Paper (**Appendix K**).

Table 5-18 Estimated water use during construction

Construction activity	Water use volume (megalitres)
Bulk earthwork	82
Dust suppression	76
Road surface construction	90
Concrete and asphalt batching plants	56
Potable water at ancillary facilities	40
Landscape watering	35
Curing of concrete	1
Total	**380**

Fuel

Plant, equipment and light vehicles would require the use of diesel fuel and petrol during the construction phase of the project. All fuels and chemicals stored in construction areas would be secured in areas with appropriate bunding. Refuelling and maintenance of plant and equipment would only occur in the site compounds or at designated areas in the construction footprint. The dedicated refuelling and maintenance areas would be provided with the necessary controls, including spill kits, to minimise any potential contamination incidents to protect soils and nearby waterways.

Further detail regarding the use and storage of fuel on-site is provided in **Chapter 16** (soils and contamination).

Electricity

Electricity consumption during construction would vary, and would depend on the contractor's proposed site use, facilities, staffing numbers and equipment. Electricity needs for the project would be relatively low and are envisaged to include lighting, air-conditioning and office equipment. Connecting the offices to the local power grid would be sufficient for these purposes.

Generators may be necessary for emergency power supply and at some ancillary facilities where connection to the local power supply is not readily available. Similar recent Transport projects have used a 200 kVA generator to supply the main site office.

Power consumption by the proposed concrete and asphalt batching facility would vary and would depend on the size of the plant. A typical medium-sized batching plant draws about 110 kilowatts per hour.

Spoil and waste disposal

Various waste streams would be generated during construction. The main waste streams would include:

- Surplus spoil (excavated soil, sediment, rock) from bulk earthwork which is unable to be reused within backfilling or restoration
- Demolition waste, including building materials, bridge removal materials, vegetation, kerbs and road surfaces
- Rocks, geofabric and other materials from the bridge work platforms
- Packaging materials from items delivered to site, such as pallets, crates, cartons, plastics, and wrapping materials
- Contaminated soils that may be exposed during construction, and if exposed, would require offsite disposal
- Existing stockpile sites located within the road reserve. The quality of the material within the stockpiles is unknown and could potentially contain contaminated material, including asbestos
- Surplus material from construction and general site reinstatement, such as fencing, sediment from temporary basins, concrete, steel, formwork, and sand bags
- Vegetative waste from clearing and grubbing
- Plant and vehicle maintenance waste, such as oil containers
- General waste from construction sites, including office wastes, scrap materials and biodegradable waste
- Liquid waste
- Sewage waste generated through the use of personnel facilities.

The impact of potential waste expected to be generated by the project and the proposed measures to manage waste are detailed in **Chapter 19** (waste).

5.4.6 Bridge work

Twelve bridge structures would be required for the project, including a 2.6 kilometre viaduct, bridges to cross wetlands or waterways and overpass bridges, as described in **Section 5.3.5**.

All bridge structures would be designed and configured to follow industry accepted construction practices. Potential construction methods and the construction program were considered in the design of bridges. Construction of the bridges would generally involve:

- Construction of bridge footing and substructures, including piles, abutments, piers and headstocks
- Construction of superstructures including beams, girders, decks and barriers
- Installation of anti-throw screens where bridge passes over another roadway.

Nine bridges (B01, B02, B03, B04, B06, B08, B10, B11 and B12) and sections of B05 would be able to be constructed offline. Online construction of three bridges (B05, B07 and B09) and sections of B05 would not require full closures of roads for extended periods. However, they may require temporary road and/or lane closures and traffic diversions during suitable times to allow safe execution of work near:

- Pacific Highway
- New England Highway
- Aurizon access road
- HRBG access road.

Impacts on traffic, including the requirement for temporary road and/or lane closures and traffic diversions are further discussed in **Chapter 7** (traffic and transport).

Construction of the bridge structures at the interchange with the M1 Pacific Motorway at Black Hill, New England Highway at Tarro and Pacific Highway at Raymond Terrace, may have one or a combination of the following impacts on the travel lanes and ramps:

- Speed reductions
- Temporary lane closures while lifting girders above the road
- One directional carriageway closures during off-peak time.

A detailed assessment of bridge options would be carried out during detailed design to minimise the impact of bridge construction on the existing M1 Pacific Motorway, New England Highway and Pacific Highway operations, as much as practically possible.

Construction of the viaduct (B05) over the Main North Rail Line would be carried out in consultation with rail authorities (including Australian Rail Track Corporation (ARTC)) and would occur during rail shut down periods.

The design of the bridges to date has considered the requirements of the Policy and Guidelines for Fish Habitat Conservation and Management (update 2013) which incorporates Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge 2003).

Bridge foundations

Geotechnical investigations carried out to date at the proposed bridge locations indicate that each bridge can be supported on either driven or cast in place (bored) pile footings into bedrock. The depth to low medium strength bedrock or dense sand would be typically greater than 10 metres below existing ground surface levels.

Bridge foundations (including piles, abutments and piers) would be constructed using standard bridge building techniques.

Construction of bridge foundations near existing roads would typically require temporary lane closures and traffic diversions. Full road closures over extended periods would not be required, but closures over short periods may be required to facilitate critical construction activities that cannot otherwise be practically carried out. Impacts on traffic, including the requirement for temporary road and/or lane closures and traffic diversions are further discussed in **Chapter 7** (traffic and transport).

Superstructures

The majority of the bridges would likely be constructed using the precast construction techniques, where superstructure elements would be precast and placed on bridge supports. Generally, precast elements of the bridges would be prepared off-site at dedicated casting yards and transported to the project site by road, however as noted in **Table 5-12**, there is the potential for on-site precast yards at project ancillary facilities. The precast element would be stored at the manufacturer's site and at relevant construction ancillary facilities where required.

A crane would be used to lift the beams and girders into place directly onto the abutments and pier headstocks once the bridge bearings are constructed. Temporary bracing may be required between the girders.

The bridge deck and barriers would typically be constructed from reinforced concrete. In most cases, precast units would be used for the barriers. Concrete bridge decks would require temporary formwork to be installed before pouring. The formwork would typically be supported directly from the bridge girders. Where required, girders would be post tensioned once the concrete cures to its required strength and the falsework and formwork removed.

The abovementioned techniques describe common bridge construction scenarios. Site specific opportunities and constraints identified during detailed design may require alternative construction techniques.

In some circumstances (such as the bridge (B08) over Old Punt Road), bridges would be constructed in place using falsework and formwork. Formwork and its associated falsework (temporary or permanent moulds into which concrete is poured) would be constructed in place then the reinforcing placed within the formwork and the concrete placed using concrete pumps and vibrators.

Work platforms

Work platforms would be required at bridge sites to provide a working area for bridge pier and abutment construction, including piling. Platforms may also be required along the length of the bridge to provide a stable platform for the crane when erecting girders between the bridge piers.

The exact number and location of the working platforms would depend on the construction contractor's preferred construction method and equipment for the bridge work and may differ depending on the bridge type and bridge length. The number and location of work platforms required would be identified in the CEMP.

Specific work platforms required to support the viaduct (B05) are discussed below.

Hunter River crossing

The portion of viaduct (B05) that crosses the Hunter River would be constructed using the precast segmental balanced cantilever method with transitions to precast concrete girder approach spans on either side of the river.

The piers in the centre of the Hunter River are proposed to be constructed using piling rigs, cranes and concrete pumps on barges with secondary barges supplying the materials to the piers and removing spoil.

To aid in bridge construction, temporary work, such as temporary rock platforms, temporary bridges and temporary wharves, would be installed in the Hunter River. While the majority of the bridge work on the Hunter River would be carried out using barges, the piers directly next to the riverbanks would be in an area too shallow for barges to access. This temporary work would be installed between the riverbank and the piers to provide access for plant such as piling rigs, cranes and concrete pumps.

Two temporary work options have been considered to facilitate construction of the bridge over the Hunter River:

- Temporary rock platforms would be built by placing geotextile fabric on the Hunter River bed, installing silt fencing and laying down rocky material to create a platform about 15 metres by 25 metres in size. An example of a temporary rock platform is shown in **Photo 5-1**
- Temporary bridges would be built by driving steel piles into the riverbed. A temporary bridge deck would be used, typically made of precast concrete or steel.

The final decision about what type of structure to use would be dependent on the contractor's construction methodology, as well as the flooding, water quality and aquatic ecology impacts of a rock platform. The temporary structure type would be confirmed during construction planning. These temporary structures would be removed following construction.

In addition, up to two temporary wharves of about 15 metres by 15 metres would be constructed on one or both sides of the river to service the barges for construction of the river crossing. An example of a temporary wharf is shown in **Photo 5-2**. The wharf would likely be constructed in a similar manner to the temporary platforms, however sheet piles could also be used in order to provide a vertical end to the wharf. Alternatively, the wharf could be constructed as a temporary bridge using piles and precast deck.

Final details regarding temporary work would be confirmed during the detailed design phase of the project. Access for marine vessels using the Hunter River would be maintained during construction.

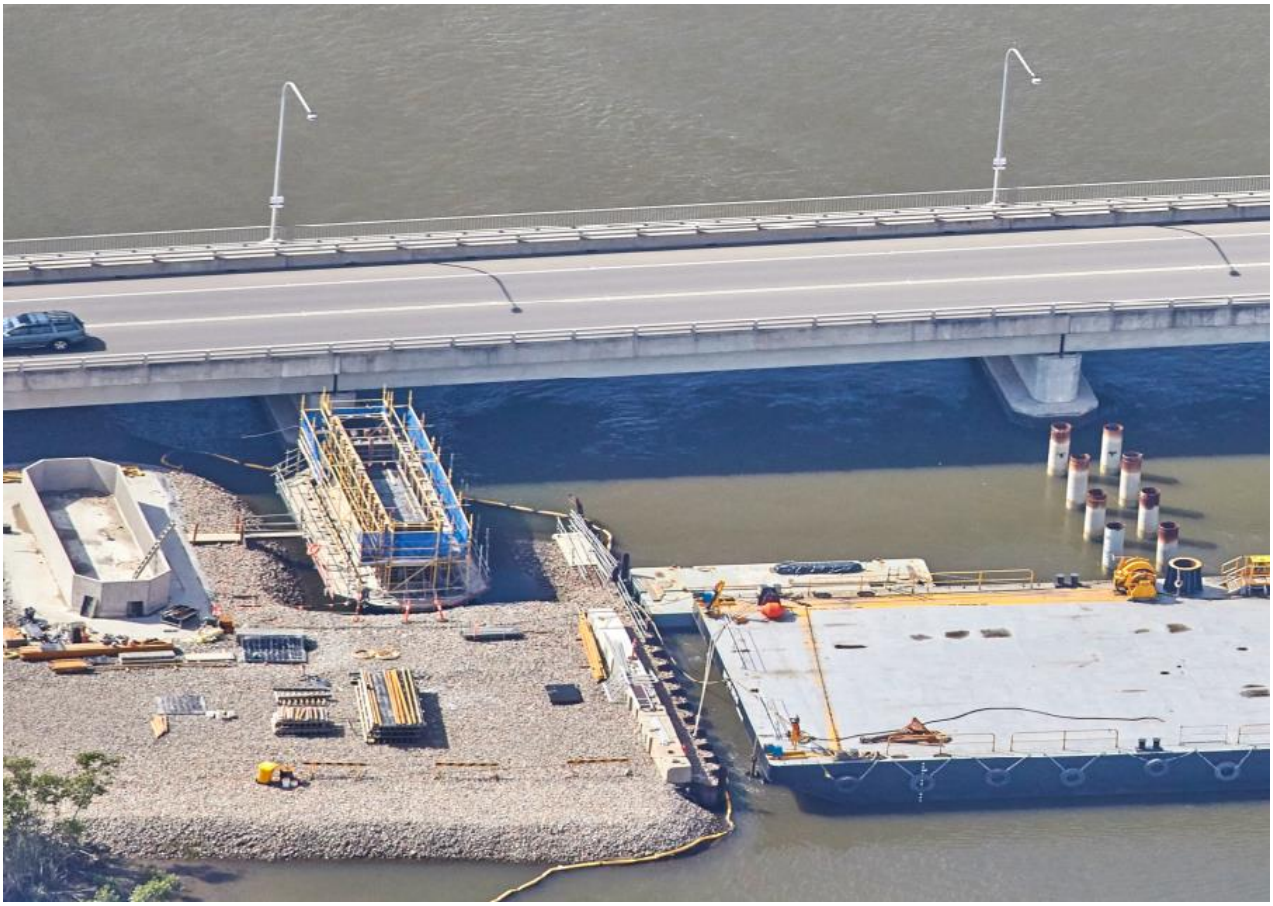

Photo 5-1 Example of a temporary rock platform within a river

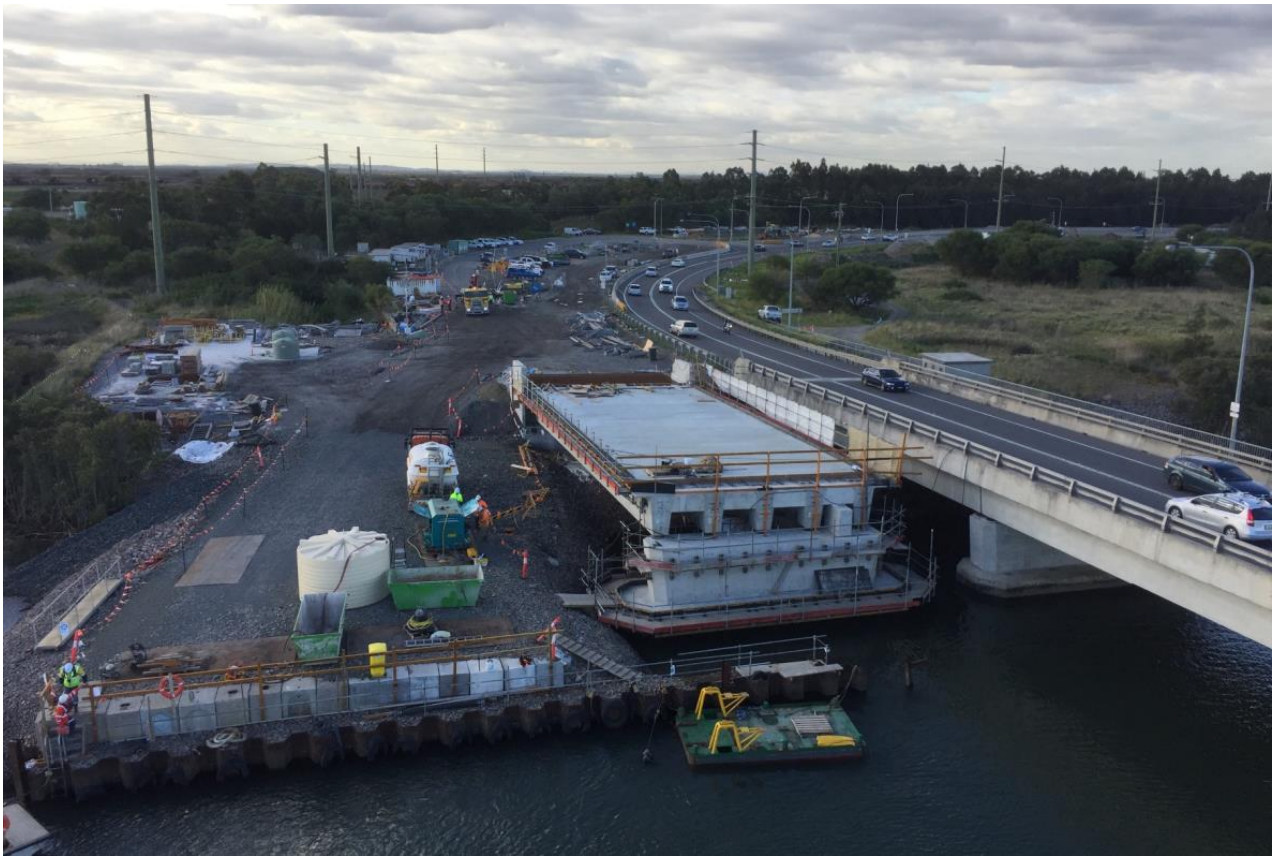

Photo 5-2 Example of a temporary wharf

Dredging

Construction of the viaduct (B05) would require dredging the Hunter River bed within the construction footprint to allow barges to access the site. Dredging is a relatively common activity within New South Wales ports and coastal waters for capital and maintenance projects, with specialised contractors and equipment designed to meet project and environmental requirements in a variety of conditions. An example of a dredge in operation is provided in **Photo 5-3**.

Dredging operations would be carried out within a floating silt curtain enclosure to a depth of two to three metres to minimise impacts to the surrounding aquatic environment. A shallow silt curtain would also be installed next to ecologically sensitive areas to provide additional protection.

Suitable dredged material would be either transported to an ancillary facility for assessment, treatment and potential reuse on site, or disposed of off-site to a licensed facility.

Photo 5-3 Example of dredging within the Hunter River

5.4.7 Demolition

Existing buildings and infrastructure within the construction footprint that would be unable to be reused as ancillary facilities during construction would be demolished and removed. Buildings and infrastructure requiring demolition and removal would include:

- Buildings (including residences), sheds or farm infrastructure: all buildings would be demolished in accordance with Australian Standard AS2601: The Demolition of Structures (AS 2601). Three dwellings would be demolished, including two dwellings on rural land and one dwelling associated with a commercial property at Heatherbrae. The need for and impact of acquisitions are considered in **Chapter 14** (land use and property)
- Road pavement: road adjustments would result in redundant road pavement. For instance, in the vicinity of the interchanges, at new entry and exit ramps to and from the main alignment and at merges with or diverges from the existing M1 Pacific Motorway. After construction, road surfaces and their function would be reinstated to their current standards or better. Redundant pavement would be removed, and the ground rehabilitated in accordance with the project specifications.

Demolition waste would be reused and recycled where possible or disposed of at an appropriately licensed facility.

5.4.8 Waterway adjustments

As described in **Section 5.3.10**, Purgatory Creek and a tributary of Viney Creek would be adjusted. The indicative methodology for the waterway adjustments includes:

- Installation of erosion and sediment control measures to protect the existing creek
- Bulk earthwork for the adjustment would be carried out offline to minimise interruption of the existing creek flow
- The new section of creek would be kept free of flowing water to allow the planting and establishment of local native riparian vegetation and placement of rock for scour protection
- When work is complete and the new channel is established, flow would be introduced to the new channel during a period of low flow in the existing creek

- While the adjusted creek channel is becoming established, water would be allowed to flow along both the old section of creek and the adjusted section. This would allow for a final assessment and checking of the work
- Final diversion of all flows to the new creek channel
- Once the diversion work is complete, the old creek channel would be backfilled.

Temporary diversions of other minor drainage lines may be required for the installation of culverts as discussed in **Section 5.4.9**.

The need for, extent and design of the waterway adjustments would be reviewed during detailed design, taking into account the potential environmental benefits of minimising any changes to the creeks' natural geomorphology.

5.4.9 Temporary creek crossings

Temporary crossings are likely to be required at waterways such as Purgatory Creek and Windeyers Creek for the construction of haul roads and construction access tracks within the construction footprint. These waterways crossings would likely comprise a temporary causeway with culverts or pipes installed to maintain flows and would be maintained for the duration of construction.

Temporary crossings would:

- Maintain flow conditions in the waterways
- Be certified by the road designer to confirm no adverse flooding impacts would occur during design flood events
- Be removed in full and the area rehabilitated following completion of construction.

Temporary waterway crossings would be designed in accordance with Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull and Witheridge 2003).

5.4.10 Drainage infrastructure

The project would require the construction of new drainage infrastructure and alterations to existing drainage infrastructure as described in **Section 5.3.8**. Construction of drainage work would involve localised excavation, compaction and installation of drainage culverts, pipes and pits, and construction of table drains and swales.

Drainage structures such as culverts and pipes would be installed to enable natural flows to be maintained during road formation construction. Where required, temporary diversion channels would be constructed to enable the installation of culverts and pipes. Appropriate controls would be implemented for the diversion channels to minimise the potential for scour. After the culvert or pipe is installed, the drainage line would be reinstated, and the temporary channels removed.

Generally, the construction of new surface drainage on the outside of the carriageways would be carried out in parallel with the earthwork required for road construction.

5.4.11 Water quality management

Construction of the project has the potential to affect water quality through erosion of exposed or disturbed areas and subsequent sedimentation of waterways. To mitigate these effects, erosion and sediment control and temporary sediment basins would be installed along the project to trap sediments and other pollutants from disturbed areas. The proposed water quality control measures are discussed further below.

Erosion and sediment controls

Erosion and sediment controls would be implemented to reduce the potential for impacts on waterways. A detailed assessment of erosion and sediment issues and associated management measures is provided in **Chapter 11** (surface water and groundwater quality) and **Chapter 16** (soils and contamination). Controls would vary from location to location and would typically include:

- Sediment fences and filters to intercept and filter small volumes of construction runoff
- Level spreaders to convert erosive, concentrated flow into sheet flow
- Progressive revegetation as soon as practicable
- On-site diversion drains that collect and divert construction runoff to treatment facilities
- Off-site diversion drains to collect clean runoff from upstream and divert it around or through the construction site without it mixing with construction runoff
- The lining of channels and other concentrated flow paths
- Temporary sediment basins to capture sediment and associated pollutants in construction runoff
- Specific measures and procedures for work within waterways, such as the use of silt barriers and temporary creek diversions.

Temporary sediment basins

The location and size of temporary sediment basins were determined in accordance with the Blue Book criterion. This criterion indicates that if the estimated annual soil loss from a disturbed catchment is less than 150 cubic metres, then a sediment basin may not be required, provided that other erosion and sediment controls are implemented (Soils and Construction, 2008 Volume 2D Main Road) (DECC 2008).

Based on the design as set out in this document, it is expected that up to 47 temporary sediment basins would be required to treat water during construction, as shown in **Figure 5-1**. Further details regarding the proposed temporary sediment basins are provided in **Chapter 11** (surface water and groundwater quality). The detailed design of erosion and sediment controls required during construction may result in changes to basin locations, sizing and/or the number of basins.

Temporary sediment basins would be established at the beginning of construction and maintained in effective working order until construction is complete. Many of the temporary sediment basins would be removed at the end of construction however, up to 33 basins would be retained or modified to provide permanent water quality control measures and/or onsite detention capacity during operation. Where possible, the operational water quality control measures described in **Section 5.3.9** would be constructed early and used during the construction stage. Permanent water quality basins are discussed further in **Section 5.3.9** and shown in **Figure 5-1**.

Progressive erosion and sediment control plans would be prepared for the project to outline the type and location of other required erosion and sediment controls.

Dewatering

Temporary construction dewatering would be required to support construction. Activities most likely to require dewatering include:

- Construction of temporary sediment basins
- Bridge structure construction including piles and pile caps, particularly at the wetlands crossing (B02), the viaduct (B05) and the Windeyers Creek (B11) crossing
- Excavation below the groundwater table for work associated with utilities, either protection of existing, or new utility alignments
- Excavation below the groundwater table for the installation of drainage infrastructure including culverts
- Pre-loading of soft soil areas, through wick drains.

Dewatering would be required where any construction activity occurs below the groundwater table. This is most likely in areas of high groundwater levels, including:

- The unnamed wetlands near the twin bridge (B02) between Black Hill and Tarro
- Around Tarro and New England Highway, including at Purgatory Creek
- The floodplain between New England Highway and the Hunter River
- The floodplain north of the Hunter River
- Tomago between the end of the viaduct (B05) to around the HRBG
- Windeyers Creek crossing.

Dewatering of temporary sediment basins and other excavations would be limited to the duration that excavations are open. Dewatering via wick drains would occur for the duration of soft soil consolidation, with dewatering volumes dependent on groundwater levels and consolidation rates. Dewatering would be managed via a dewatering management plan, which would be prepared as part of the Construction Soil and Water Management Plan, under the CEMP (refer to **Chapter 24** (summary of environmental management measures)).

5.4.12 Traffic management, transport and access

Pedestrian, cyclist and road traffic would be impacted during all stages of construction. These impacts are detailed in in **Chapter 7** (traffic and transport). The timing and sequence of the construction components has been designed to allow the existing road corridor to remain open to traffic, cyclist and pedestrian movements (refer to **Section 5.4.14**).

Traffic management

The construction footprint would intersect or run alongside the existing road network at several locations, as shown in **Figure 5-25**. Construction traffic moving to and from work sites could impact traffic on the existing road network. Where possible, construction traffic would be contained within the construction footprint and would use temporary internal haul roads to move around the project. This would minimise impacts on the public road network.

Construction activities are expected to be completed while maintaining through traffic on existing roads. Access would be maintained, or alternative access provided to properties, businesses and utilities with impacted access during the construction and operation of the project. Alternative provisions would be agreed with affected property, business or utility owners where required.

Temporary traffic management measures would be implemented at various stages of the project in accordance with Traffic Control at Work Sites (Roads and Maritime Services 2018b). These measures would include:

- Modification of lane widths to facilitate safe entry, exit and movement of plant and materials, and to allow for construction staging of work near existing roads
- Placement of separation barriers to protect road users and construction personnel
- Reduced speed zones on roads adversely modified by construction work
- Reduced shoulder widths to allow for tie-in work to be completed
- Traffic detours and switches.

Temporary directional and advisory signs, along with variable message signs, would be used throughout construction where necessary. It is envisaged that the contractor would maintain the current level of serviceability with only minor disruptions to traffic during final road surfacing and line marking.

An assessment of the likely traffic and transport impacts resulting from the construction of the project are presented in **Chapter 7** (traffic and transport). The assessment identifies the management measures that would be implemented to minimise these impacts.

Temporary road pavement, intersection and closures

Permanent road closures are not expected to be required.

Temporary short-term diversions, temporary road closures and temporary traffic intersections may be required, however, to support construction.

In general, temporary road pavement and temporary side-tracks and would be constructed as early as possible to remove live traffic from construction work zones. These would be required to facilitate construction at the interchanges, bridges and tie-ins to the local and state road networks.

To accommodate construction activities and delivery of materials to various sites across the project, the following temporary traffic intersections are proposed:

- New England Highway eastbound exit ramp at Tarro: modification of the existing intersection to allow right turn movements onto Anderson Drive
- Aurizon access road at Tarro: modification of the existing intersection to allow right turn movements onto Anderson Drive
- Anderson Drive at Tarro: modification to allow vehicles to exit to eastbound New England Highway
- Tomago Road intersection with the Pacific Highway at Tomago: modification of the signalised intersection to allow construction vehicles to exit and enter ancillary facility (AS10 and AS11) to the north of Pacific Highway
- Old Punt Road intersection with the Pacific Highway at Tomago: temporary modification of the signalised intersection to facilitate construction work of the realignment to the Pacific Highway
- Masonite Road: channelised intersection to allow right turn movements into ancillary facility AS16 (if a roundabout as part of a previously approved development application is not constructed prior to commencement of the project), Masonite Road would also be realigned to maintain access during construction
- Temporary turn provisions (possibly including acceleration and deceleration lanes) for entry and exit to ancillary facilities across the entire project.

These temporary traffic intersections would be subject to final design, construction staging and contractor usage of ancillary facilities.

Construction site access

Construction access would be from the existing road network including the M1 Pacific Motorway, Pacific Highway, John Renshaw Drive, New England Highway, Lenaghans Drive, Anderson Drive, Woodlands Close, Tomago Road, Old Punt Road, Quarter Sessions Road and Masonite Road. These roads are shown in **Figure 5-25** and would be used or crossed for:

- Importing materials to work areas
- Hauling materials from one work area to another across the local road network
- Providing access for the delivery of all construction materials and consumables
- Providing access for the workforce to the various locations along the project, particularly to the project laydown areas and project site office.

Most of the additional vehicle movements on the existing road network would occur at access points to the construction footprint and on the roads linking sources and suppliers of key construction materials to the construction footprint.

Access points from the construction footprint to the road network would be located at:

- The frontages of construction ancillary facilities (refer to **Table 5-19**)
- Varied locations along the main alignment construction site, with direct access from the existing road network:
  - John Renshaw Drive
  - Lenaghans Drive
  - TransGrid and Hunter Water Corporation easement off the M1 Pacific Motorway (if required)
  - The New England Highway between the existing Tarro interchange and Hexham
  - Tarro interchange/Aurizon access road
  - Pacific Highway at Tomago and Heatherbrae
  - Old Punt Road
  - Masonite Road
  - The Pacific Highway at Raymond Terrace.

Access points to the construction site would be confirmed by the construction contractor before construction and detailed in the Traffic Management Plan (TMP) and be subject to temporary traffic controls.

Table 5-19 Access to ancillary facilities

Ancillary ID	Direct entry access	Direct exit access
AS1	Left in from John Renshaw Drive	Left out to John Renshaw Drive
AS2, AS3	Left in from Lenaghans Drive	Left out to Lenaghans Drive
AS1, AS2, AS3 (alternative access via utility easement)	Left in from the New England Highway (westbound)	Left out to the New England Highway (westbound)
AS4	Left in from Quarter Sessions Road	Right out to Quarter Sessions Road
AS5	Left in from existing Aurizon access road	Right out to existing Aurizon access road
AS6	Left in from the New England Highway (westbound)	Left out to the New England Highway (westbound)
AS7	Left in from the New England Highway (eastbound)	Left out to the New England Highway (eastbound)
AS8	• Left in from the New England Highway (eastbound) • Right in from the New England Highway (westbound)	Left out to the New England Highway (eastbound)
AS9	Left in from the New England Highway (eastbound)	Left out to the New England Highway (eastbound)
AS10, AS11	Left in from the Pacific Highway (northbound)	Left out to the Pacific Highway (northbound)
AS12, AS13	Left in from the Pacific Highway (southbound)	Left out to the Pacific Highway (southbound)
AS12, AS13 (alternate access via Old Punt Road)	Left in from Old Punt Road (northbound)	Left out to Old Punt Road (northbound)

Ancillary ID	Direct entry access	Direct exit access
AS14, AS15	Left in from the Pacific Highway (southbound)	Left out to the Pacific Highway (southbound)
AS16	• Left in from Masonite Road (northbound) • Right in from Masonite Road (southbound)	Left out to Masonite Road (northbound)
AS17	Left in from Masonite Road (northbound)	Left out to Masonite Road (northbound)
AS18, AS19	Left in from Masonite Road (southbound)	Left out to Masonite Road (southbound)
AS20, AS21	Left in from the Pacific Highway (southbound)	Left out to the Pacific Highway (southbound)

Temporary access roads

The project would require construction of temporary access roads in the construction footprint to provide access during construction, as shown in **Figure 5-25**. Some access roads across the floodplain to and along the viaduct (B05) would be retained for maintenance during operation of the project.

Haulage routes and vehicle movements

During construction, haulage of bulk earthwork materials is expected to be the main contributor to additional heavy vehicle movements in the area. Where possible, haulage of materials would generally be carried out within the construction footprint along internal access and haul roads to minimise construction vehicle movements on public roads. Where possible, transport movements on the existing road network would be scheduled to ensure that the number of vehicle movements would be minimised during the morning and evening peak traffic periods. Scheduling of construction transport movements will be detailed in the TMP as part of the CEMP.

In addition to haulage within the construction footprint, construction vehicles would be required to import materials to the construction site along the public road network. Where possible, heavy vehicles would primarily use major roads including Pacific Highway and New England Highway. However, the use of regional and local roads may be required.

Haulage would occur at various times, but haulage planning would consider peak traffic hours and periods, particularly during school and public holidays, to minimise the potential for delay on the existing road network.

Construction vehicle movements would occur throughout the project, and moderate fluctuations in traffic volumes are likely in response to the construction program and key activities in each location. Construction is expected to result in an average of about 1300 truck movements per day. Haulage and delivery of materials may occur during extended construction hours, and the delivery of oversized structural elements requiring police or other escorts may occur out of standard work hours.

Traffic impacts during construction are discussed in **Chapter 7** (traffic and transport).

Rail

Viaduct (B05) construction would impact on the Main North Rail Line, as shown in **Figure 5-25**. As much as possible, construction would occur outside of the rail corridor. However, activities, such as establishing girders (a large iron or steel beam) and placing pre-cast viaduct components, would occur within the rail corridor. Construction would occur during scheduled possessions of the rail line. Transport are currently consulting with ARTC in order to obtain concurrence.

5.4.13 Workforce and construction work hours

Workforce

The size and composition of the construction workforce would vary over the duration of construction depending on the activities carried out and the construction program and staging. The workforce is expected to peak at about 1050 workers per year, including construction workers and professional and administrative staff. Multiple work crews may be constructing the project at any one time.

Construction work hours

The recommended standard hours for construction as noted in the Interim Construction Noise Guideline (DECC 2009) are shown in **Table 5-20**. In the event that the Environmental Planning and Assessment (COVID-19 Development – Construction Work Days) Order 2020 is still in force at the time of construction, or if standard construction work hours are further altered, the standard construction hours for the workforce would be adopted.

Table 5-20 Standard working hours

Day	Start time	Finish time
Monday to Friday	7am	6pm
Saturday	8am	1pm
Sunday and public holidays	No work	

Extended working hours

The Interim Construction Noise Guidelines (DECC 2009) recognises there are some situations where construction may need to be carried out outside of the recommended standard construction hours. This includes public infrastructure work that shortens the construction period of the project.

As the majority of work would be away from residences and sensitive receivers (particularly north of Tarro), Transport is seeking approval for standard construction hours plus:

- An extra hour at the start and end of each day Monday to Friday
- An extra five hours on a Saturday
- Work on Sunday and public holiday from 7am to 5pm.

This is referred to as ‘extended construction hours’, outlined in **Table 5-21**, and would apply across the project. Transport would carry out targeted consultation with affected residents before work starts.

Table 5-21 Extended working hours

Day	Start time	Finish time
Monday to Friday	6am	7pm
Saturday	7am	5pm
Sunday and public holidays	7am	5pm

Transport aims to achieve a balance between amenity and more efficient delivery of major infrastructure upgrades. As a result, Transport is investigating opportunities for ensuring delivery of the benefits of the project as soon as possible. Early completion of construction would provide considerable benefits to the community and road users. In particular, extended working hours would:

- Reduce the volume of traffic on roads during peak hours due to construction staff and construction vehicles travelling to and from the construction site outside of peak traffic periods
- Time benefits, including potentially bringing forward the opening date for the project by increasing the allowable construction hours
- Cause less disruption to sensitive receivers, the community, local business, motorists, pedestrians and cyclists as work would be completed earlier than compared to adopting standard work hours
- Enable greater flexibility in project scheduling. This would enable the contractor to make allowances for adverse weather and potential flooding events.

The proposed extended construction hours would only apply to normal construction activities. If required, blasting would only be carried out Monday to Friday between 9am and 5pm and Saturday between 9am and 1pm.

Out-of-hours work

The Interim Construction Noise Guidelines (DECC 2009) also recognises there are some situations where specific construction work may need to be carried out outside the recommended standard hours.

In addition to standard working hours and extended construction hours, some construction activities would need to be carried out during evening and night time periods (referred to as 'out-of-hours work'). The activities that may need to be carried out out-of-hours include:

- Delivery of plant and materials that is required outside construction work hours as requested by police or other authorities for safety reasons (e.g. oversized deliveries)
- Installation of traffic controls, such as concrete barriers
- Traffic switches between each construction phase
- Operation of concrete and asphalt batching plants within ancillary facilities
- Resurfacing of asphalt pavement on existing roads and concrete and asphalt pouring
- Construction work interfacing with the M1 Pacific Motorway, New England Highway and the Pacific Highway, including construction of overbridge piers for the M1 Pacific Motorway entry and exit ramps and ramp tie-ins with the M1 Pacific Motorway, cross drainage below existing roads, pavement, surfacing, line markings, kerbs and traffic islands, traffic signs and signals
- Short-term traffic diversions along the existing road network (M1 Pacific Motorway, New England Highway, John Renshaw Drive, Masonite Road, and the Pacific Highway)
- Bridge construction work over the Main North Rail Line and existing roads including the New England Highway, Pacific Highway and Old Punt Road traffic along existing road networks (including establishing temporary protection work, installation of girders, sealing of joints, establishing temporary screens to enable construction to continue on the deck, and removal of temporary work)
- Utility modifications, relocations or protection measures work
- Removal of existing static signage and installation of new signs
- Removal of existing traffic barriers and installation of temporary and permanent traffic barriers
- Removal of existing lane marking and application of new lane marking on existing roads
- Any work that does not cause noise emissions to be audible at any sensitive receiver
- Emergency work to avoid the loss of lives, property or to prevent environmental harm.

Out-of-hours construction activities would be supported by out-of-hours operation of temporary ancillary facilities.

The exact timing of out-of-hours work would depend on construction activities, construction techniques and constraints imposed by the affected communities or the relevant authorities (utility authorities or road and motorway operators) and would be subject to the requirements of the construction contractor.

The potential construction noise and vibration impacts are presented in **Chapter 8** (noise and vibration). Extended and out-of-hours work would be managed through the implementation of a Construction Noise and Vibration Management Plan which would include feasible and reasonable mitigation measures to minimise the potential for adverse impact on the local community. The plan would be implemented in conjunction with an EPL issued under the POEO Act.

5.4.14 Construction program and components

Construction program

The timing and sequence of the project has considered the requirement to minimise impact on existing traffic, enable safe construction access and minimise the duration of construction. Construction of the project is expected to begin in 2023 and end in 2028, with work occurring across the full length of the construction footprint during this period. Construction could occur sooner and would be subject to approvals and funding availability. An overview of the construction program is shown in **Table 5-22**.

Table 5-22 Construction program

Construction component	Year 1	Year 2	Year 3	Year 4	Year 5
Enabling work and utilities					
Construction of ancillary facilities					
Operation of ancillary facilities					
Drainage and water quality control					
Clearing, grubbing and demolition					
Bulk earthwork					
Pavements					
Bridges and viaducts					
Roadside furniture and finishing work					
Traffic management and control					
Landscaping					

Construction components

The typical activities associated with each construction component are summarised in **Table 5-11**. This includes the work associated with the main alignment, intersections, interchanges, bridges and the viaduct. The timing and sequence of the construction components would occur as shown in **Table 5-22** and considers:

- The need to minimise road user delays
- The need for local road and property access
- The need for land acquisitions
- The earthwork balance – both locally and across the project
- Areas that may require soft soil pre-loading
- The sequence in which completed sections could be opened to traffic.

The final timing and sequence of the project would be determined by the construction contractor.

Project delivery

Subject to project approval, Transport would consider and select the most suitable procurement method for project construction delivery. This may include:

- A detailed design contract(s) followed by a separate construction contract(s), each awarded through a competitive tendering process
- A combined detailed design and construction contract awarded through a competitive tendering process.

The preferred procurement method would be selected and implemented in compliance with this EIS, the project's approval and any licences or permits. Transport would be responsible for overseeing the construction, including inspections, monitoring and auditing work performed by the construction contractor(s).

5.4.15 Project staging

Construction of the project is expected to begin in 2023 and end in 2028.

Project staging may occur and would be dependent on the confirmed procurement and delivery strategy to most effectively and efficiently complete construction. Any potential staged opening of the project would need to be assessed further. Any such project staging would be investigated further as the project progresses towards construction.

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M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement – Chapter 6: Consultation

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6. Consultation

This chapter provides an overview of the consultation activities that have been carried out for the project to date and outlines the consultation activities planned for future project stages, including EIS exhibition and before and during project construction. This chapter also presents a summary of issues raised by the community, organisations and public authority stakeholders and where they are addressed in this EIS.

Table 6-1 outlines the SEARs as they relate to consultation with government, relevant stakeholders and community groups and identifies where consultation has been addressed in this EIS.

The desired performance outcome for the project relating to consultation, as outlined in the SEARs, is to:

- Ensure that the project is developed with meaningful and effective engagement during design and preparation of the EIS (refer to **Section 6.1**).

Table 6-1 SEARs (consultation)

Secretary's requirement	Where addressed in EIS
4. Consultation	
1. The project must be informed by consultation, including with relevant local, State and Commonwealth government agencies, infrastructure and service providers, special interest groups (including Local Aboriginal Land Councils, Aboriginal stakeholders, and pedestrian and bicycle user groups), affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines.	Consultation carried out during route selection, and concept design development and the environmental assessment is outlined in **Section 6.2.5** and **Section 6.2.6**. A summary of consultation with Aboriginal stakeholders is provided in **Section 6.2.4** and **Section 6.3.4**, and captured in full in the Aboriginal Cultural Heritage Assessment Report (ACHAR) (**Appendix L**). No major pedestrian groups exist in the vicinity of the project and, as such, no consultation has been carried out with these groups. Consultation with Newcastle Cycleways Movement, a bicycle user group, is outlined in **Table 6-4**. Consultation was carried out in accordance with the guidelines outlined in **Section 6.2.3**. Future consultation to be carried out is outlined in **Section 6.4**.
2. The Proponent must document the consultation process, and demonstrate how the project has responded to the inputs received.	The consultation process for the project is outlined in **Section 6.2** and shown in **Figure 6-1**. Feedback received to date and how it has been responded to, including where it is discussed in the EIS, is outlined in **Section 6.3**.
3. The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution.	Community consultation carried out during design and EIS development is outlined in **Section 6.2**. Community consultation to be carried out during delivery of the project (including detailed design) is outlined in **Section 6.4**. The mechanisms for community feedback, keeping the community informed, and complaints handling and resolution are described in **Section 6.4**.

Secretary's requirement	Where addressed in EIS
12. Socio-economic, Land Use and Property	
7. A draft Community Consultation Framework must be prepared identifying relevant stakeholders, procedures for distributing information and receiving/ responding to feedback and procedures for resolving stakeholder and community complaints during the design, construction and operation of the project. Key issues that must be addressed in the Framework include, but are not limited to: (a) traffic management (including property, cyclists and pedestrian access) (b) landscaping/ urban design matters (c) hydrology and flooding (d) staging and timing of construction activities including out of hours work and utility relocations (e) noise and vibration mitigation and management (f) soil erosion and water quality management (g) interaction with existing land uses.	A draft Community Consultation Framework has been prepared and is provided in **Appendix E**. The draft Community Consultation Framework is briefly discussed in **Section 6.4.1** and in the Socio-economic Working Paper (**Appendix M**).

6.1 Consultation objectives and strategy

Transport has prepared and implemented a Community and Stakeholder Engagement Plan (CSEP) (Transport for NSW 2021) which establishes the objectives and strategies to guide stakeholder engagement throughout the life of the project and outlines the engagement approach and project stakeholders. The CSEP is a working document which aims to support the concept design and EIS investigations for the project. The CSEP has been progressively updated throughout the project to capture developments in the consultation process over time.

The engagement approach for the project has been guided by the International Association for Public Participation (IAP2) spectrum of public participation, delivered at a 'consult' level. By engaging the community and stakeholders at the 'consult' level, Transport has, and will continue to, work with stakeholders and the community to obtain feedback on analysis, alternatives and/or decisions during project development and will provide feedback on how the input was considered in the decision making process.

The objectives of community and stakeholder consultation for the project are to:

- Keep all relevant stakeholders informed of the need for the project and project progress including any design changes, in a timely manner
- Provide ample opportunity for stakeholders and the community to learn about the project and provide feedback to the project team
- Consider all community and stakeholder feedback when making project design decisions
- Respond to all feedback appropriately and in a timely and respectful manner
- Identify issues early to avoid surprises and manage issues effectively to minimise impact on project delivery
- Increase understanding of the area around the project and the community and stakeholder values relating to this project
- Leave a positive legacy for this project within the community.

6.2 Consultation process

6.2.1 Consultation overview and background

An extensive consultation program has been carried out since project initiation in 2004, including community updates, media releases, public displays and community feedback periods to support the preferred route, concept design development and environmental assessment.

Transport has endeavoured to keep the community informed as the project has progressed and has worked with the neighbouring communities and stakeholders to ensure that all issues and concerns are understood, documented and addressed throughout project development.

Figure 6-1 provides a summary of the project consultation stages from preferred route identification, application to the Minister for Planning and Public Spaces with a State Significant Infrastructure Application (SSIA), development of the concept design and environmental assessment and the associated community consultation carried out. Consultation activities carried out during route selection, concept design and environmental assessment are summarised in **Section 6.2.4** to **Section 6.2.6**. Future consultation to be carried out for the project is outlined in **Section 6.4**.

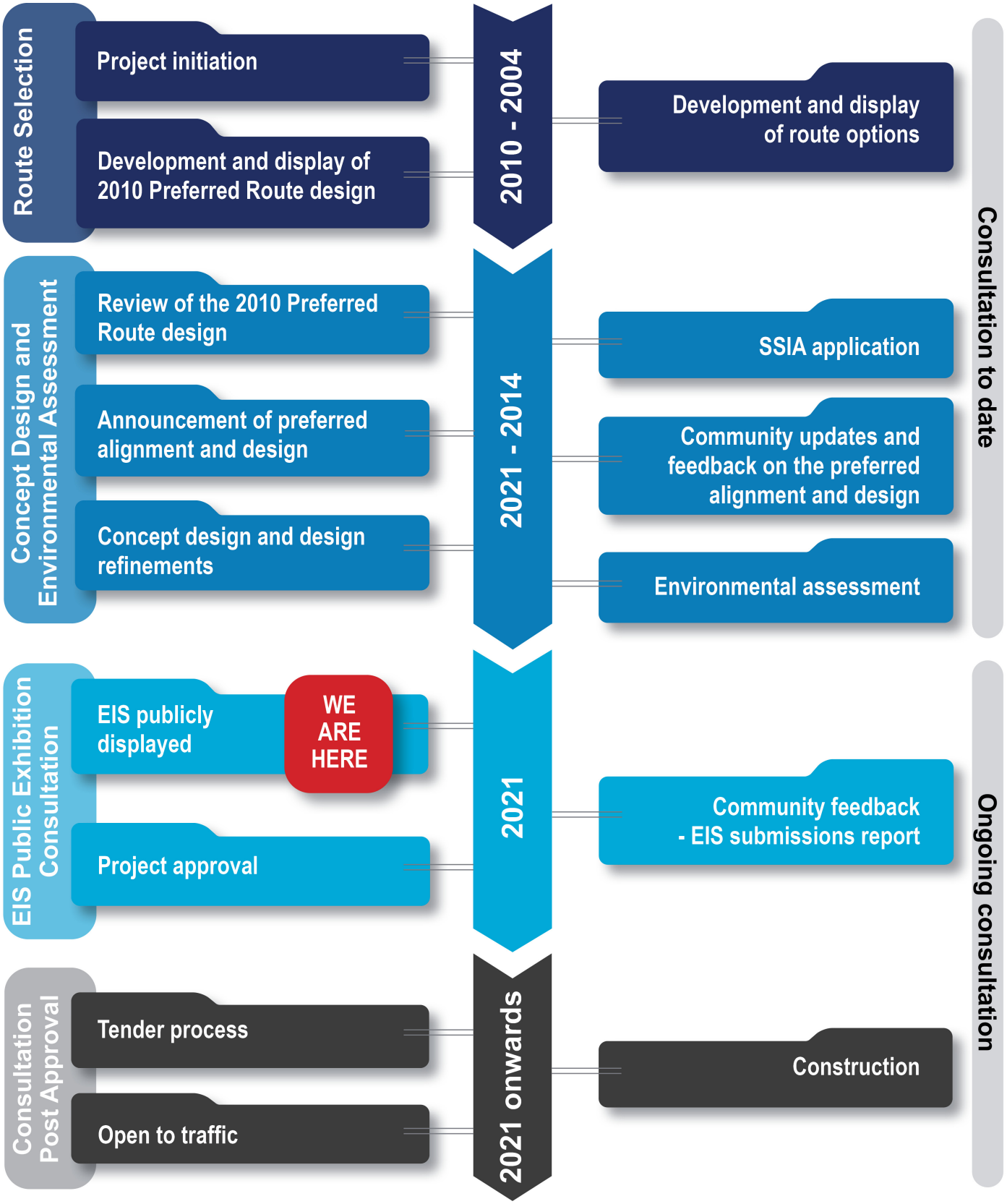

Figure 6-1 Summary of project consultation stages

6.2.2 Stakeholders

Stakeholders were identified as those parties that may have an interest in or have the potential to be affected by the project and include:

- Government stakeholders:
  - Local, State and Commonwealth agencies
  - Local councillors
  - State and Federal members of parliament
  - Other divisions of Transport (prior to merge with Roads and Maritime Services)
  - Department of Planning, Industry and Environment (DPIE) (formerly the Department of Planning and Environment (DPE))
  - Australian Rail Track Corporation (ARTC)
  - Environment, Energy and Science (EES) Group of the DPIE (formerly the Office of Environment and Heritage (OEH))
  - Commonwealth Department of Infrastructure, Transport, Regional Development and Communications (formerly Commonwealth Department of Infrastructure and Regional Development)
  - Commonwealth Department of Agriculture, Water and the Environment (DoAWE) (formerly the Commonwealth Department of the Environment and Energy (DoEE))
  - Environment Protection Authority (EPA)
  - Subsidence Advisory NSW
  - Transport Management Centre (TMC)
  - Local Land Services.
- Local government areas (LGAs):
  - City of Newcastle (LGA in which the project is located – formerly Newcastle City Council)
  - Port Stephens Council (LGA in which the project is located)
  - Maitland City Council (nearby LGA)
  - Cessnock City Council (nearby LGA).
- Local Aboriginal Land Councils (LALC) and Registered Aboriginal Parties (RAPs)
- Other relevant industry and stakeholders such as:
  - Property owners and businesses
  - Motorists including the freight industry and bus operators
  - Environmental groups
  - Educational facilities
  - Emergency services.
- The wider community, special interest groups (where they exist) and community groups and facilities
- Utility and service providers.

6.2.3 Guidelines, engagement and consultation tools

Consultation was carried out in accordance with the following guidelines:

- Community Engagement and Communications Manual (Roads and Maritime Services 2012)
- Land Acquisition Information Guide (NSW Government 2014) and land acquisition reforms announced by the NSW Government in 2016 which can be found online here: **finance.nsw.gov.au/sites/default/files/NSW_Government_Response.pdf**
- Property Acquisition. A Guide for Residential Owners (NSW Government 2019)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a)
- Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services 2011b)
- NSW Sustainable Design Guidelines Version 4.0 (Transport for NSW 2017a).

A number of engagement channels were established for the project to seek input from stakeholders and the community and to facilitate ongoing community and stakeholder engagement. These include:

- A project email address (M1RT@jacobs.com) and phone number (1800 094 895) to receive feedback, manage enquiries and provide information on the EIS
- A project website (**nswroads.work/m12rt**) which provides background information on the project, along with maps, project updates and announcements, and information on how to provide feedback on the project
- Other tools used to facilitate consultation for the project include:
  - Community newsletters delivered via letterbox drop
  - Project posters
  - Doorknocking
  - Community information and feedback sessions
  - Media releases
  - Newspaper and digital advertisements
  - Postcard advertising community information sessions
  - Electronic variable message sign (VMS).
- Aboriginal Focus Group (AFG) meetings
- Stakeholder briefings and one-on-one meetings with residents, businesses and property owners
- Social media posts
- Email to contacts on the established distribution list
- Community information sessions and ‘pop-up’ information stands.

6.2.4 Aboriginal cultural heritage consultation

The project is located within the Mindaribba LALC and the Worimi LALC areas.

Transport has developed the PACHCI (Roads and Maritime Services 2011b) to provide a consistent means of effective consultation with Aboriginal communities about activities that may impact on Aboriginal cultural heritage values and ensure a consistent assessment approach for Transport activities across NSW.

Aboriginal stakeholder engagement was carried out to address the requirements of the PACHCI in accordance with relevant statutory requirements and government policies, including the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a). Further details relating to Aboriginal community consultation is provided in the ACHAR (**Appendix L**).

Aboriginal stakeholder consultation carried out for the project has involved:

- Identification of relevant stakeholders and LALCs through letters to government agencies, Native Title searches and register of Aboriginal Owners. Identified Aboriginal stakeholders were invited to register as Aboriginal parties for the project. A further search of the National Native Title Register was also carried out in November 2015 at the request of the RAPs
- Site surveys involving RAPs and Aboriginal site officers, included:
  - Three surveys carried out with nominated LALC site officers in February, July and October 2015
  - Additional survey carried out in November 2015, with all RAPs given the opportunity to participate
  - Survey of the areas not previously surveyed, carried out with RAPs in July 2020.
- Test excavations, carried out between May and August 2016, with approved site officers
- Five AFG meetings, including:
  - October 2015: An initial AFG following public display of the project. Prior to the AFG, the draft archaeological survey report and archaeological methodology were issued to the RAPs and Heritage NSW for review and comment
  - December 2015: Provided the updated archaeological survey report and archaeological methodology. Outcomes of this meeting were considered in the updated archaeological survey report and revised archaeological methodology, which was provided to the RAPs in March 2016
  - September 2016: Provided the results of test excavation program, including potential impacts and management measures
  - September 2018: Provided an overview of the project, results of the test excavation program, and review of sites, impacts and management measures
  - November 2020: Provided an overview of the areas not previously surveyed and presented the results of the survey carried out in July 2020. Potential impacts of the project on Aboriginal cultural heritage and proposed mitigation measures were also outlined.
- Ongoing consultation with the Aboriginal community.

A list of RAPs who responded to the notification letters and/or advertisements continues to be maintained for the project for ongoing consultation. Issues raised by the Aboriginal community are briefly discussed in **Section 6.3.4** and discussed further in the ACHAR (**Appendix L**). Future consultation is discussed in **Section 6.4**.

6.2.5 Consultation carried out during route selection

During project development and route selection, a number of consultation activities were carried out with a range of stakeholders including the local community, landowners, residents, State and Commonwealth Government agencies, local councils, infrastructure and service providers, business and industry. Activities carried out during the project development involved:

- Project initiation: 2004 to 2005
- Development and display of route options: 2005
- Development and display of the preferred route and 2010 Preferred Route design: 2005 to 2010.

These activities, and their associated community consultation outcomes, including key issues raised, are detailed further in **Table 6-2**. Consultation activities carried out during concept design and environmental assessment are detailed in **Section 6.2.6**.

A number of stakeholders have undergone name changes since project initiation, as described in **Section 6.2.2**. Where these stakeholders are referenced in the following sections, the stakeholder name accurate to the time of consultation has been used.

Table 6-2 Community consultation activities carried out during route selection

Consultation stage and date	Consultation activity and communication summary
Project initiation	
2004	The project was announced by the Minster for Roads in October 2004 as the F3 to Raymond Terrace Upgrade. Following announcement, input from the community was sought to inform the concept design and selection of the preferred route. Consultation activities included: • Establishment of an 1800 (toll free) project information line in October 2004 • Establishment of a project website in November 2004 • Community update distributed in November 2004 providing background to the project and sought nominations for a Community Liaison Group (CLG) • A community information session held at Raymond Terrace High School on 15 November 2004 • A Planning Focus Meeting was held on 15 November 2004. Attended by 20 representatives from key government agencies, local councils, utility companies and Mindaribba and Worimi LALCs • The CLG was formed in December 2004 and provided a link between the community and the project team through the planning stage of the project. The first CLG meeting was held on 13 December and provided an overview of the project development process and the key constraints and opportunities of the project. Members of the CLG represented farming interests in the area, residents of Black Hill, Heatherbrae and Beresfield, LALCs, Port Stephens, Maitland and Newcastle Councils, Raymond Terrace Chamber of Commerce, Heatherbrae businesses, the Green Coalition, Hunter Region Botanic Gardens (HRBG), Millers Forest and Hunter River High School • A number of meetings involving representatives from government agencies and local councils including Port Stephens Council, Newcastle City Council, Maitland City Council, the Department of Planning, the Department of Natural Resources and the Department of Environment and Conservation • Interviews with major landowners to identify current land uses, key issues and any major constraints within the land parcels applicable to the project.
2005	• A CLG meeting was held on 18 January 2005. The meeting included a bus tour of the project to allow members to gain a more thorough understanding of the key attributes and physical conditions of the project.
Development and display of route options	
2005	Community consultation was carried out to inform the development of route options for the project. Route options were developed from February 2005, with the selected options presented in the F3 Freeway to Raymond Terrace Route Options Development Report (RTA 2005a), which was displayed between 21 October 2005 and 2 December 2005. Consultation activities during route options development and display included: • Three CLG meetings, held in January, June, and November 2005. The meetings provided an opportunity to generate route options on aerial base and constraint plans, provide updates on route options development, identify the key constraints of the project, and introduce the two feasible route options short-listed in the F3 Freeway to Raymond Terrace Route Options Development Report (RTA 2005a). The route options display and value management process were also explained and the next steps toward the selection of the preferred route outlined • Advertisements in April 2005 announcing the expansion of the route options study area to allow consideration of route options within a corridor to the south of the Hunter River • Five staffed displays held at various locations between 27 October and 29 October 2005 • A community update was issued in October 2005 about the options development report display. A total of 1500 copies of the community update were printed and distributed to members of the community, relevant government agencies, local councils and other stakeholders. Copies of the update were also enclosed within letters to CLG members, potentially affected property owners and placed at the display locations. Further copies were distributed to properties and businesses within the study area

Consultation stage and date	Consultation activity and communication summary
	• A community information session held at Hunter River High School on 15 November 2005 • A total of 24 meetings with potentially-affected property owners • A meeting with Hunter Water Corporation on 1 December 2005 to discuss impacts to the Tomago Sandbeds Catchment Area. Eighty-five feedback forms and 55 telephone calls were received, with the most commonly raised concerns including social and business impacts, noise and vibration, impacts to terrestrial ecology, impacts on hydrology and flooding, land/property acquisition, safety and access, and visual and urban design.
Development and display of the preferred route and 2010 Preferred Route design	
2005	Following display of the route options, consultation outcomes were considered and informed the development of a preferred route option for the project (refer to **Chapter 4** for details on the design development). A value management workshop was held in December 2005. Forty participants attended the workshop, including representatives from the CLG, local councils, government agencies and LALCs. Three route options were identified for further investigation.
2006	• Two CLG meetings, held in January and September 2006. The meetings were held to discuss the value management workshop, and provide updates on the preferred route selection process, with the preferred route presented in the September meeting • A meeting with Hunter Water Corporation on 23 February 2006 to further discuss impacts to Tomago Sandbeds Catchment Area. The preferred route option was presented in the F3 Freeway to Raymond Terrace Preferred Route Report (RTA 2006), which was displayed between 30 August 2006 and 13 October 2006. Consultation activities during display of the preferred route included: • Three staffed displays held at various locations between 8 September 2006 and 9 September 2006 • Letters advising of the preferred route were sent to stakeholders. Stakeholders included directly affected property owners, property owners in the vicinity of the construction footprint, property owners no longer affected by the construction footprint, members of the CLG and other parties that had registered an interest in the project • Phone calls to directly-affected property owners to follow up receipt of the letter and offer a meeting with the project team. Individual meetings were arranged to further discuss specific issues • A community update was issued in August 2006 informing the community of the preferred route option display. Responses received during display of the preferred route option were considered during development of the concept design. The most commonly raised concerns included flooding impacts, impacts to terrestrial ecology, safety and access, the location of design elements, and impacts to groundwater resources.
2007	• A CLG meeting was held in April 2007 which provided an update on the concept design process • A meeting with Hunter Water Corporation was held on 13 September 2007 to further discuss impacts to Tomago Sandbeds Catchment Area.

Consultation stage and date	Consultation activity and communication summary
2008	The concept design, including responses to comments received during 2006 display of the preferred route option, were presented in the F3 Freeway to Raymond Terrace Concept Design Report (RTA 2008). The concept design was placed on display at five locations between 14 July 2008 and 15 August 2008. Consultation activities included: • Three staffed displays held at the Heatherbrae Visitor Information Centre on 31 July, 2 August and 7 August 2008 • A CD copy of the concept design report was provided to CLG members who attended the Thursday 31 July staffed display • Letters, including the concept design community update, were sent to stakeholders advising of the concept design display. Stakeholders included directly affected property owners, owners directly affected by the preferred route but no longer directly affected by the concept design, property owners in the vicinity of the project, members of the community liaison group, councils and other government agencies, and other parties that had registered an interest in the project • A total of 1500 copies of the concept design community update were also distributed to members of the community relevant government agencies, local councils and other stakeholders. Further copies of the update were placed at the static display locations and distributed following requests to the project information line • Phone calls and meetings (if requested) with directly affected property owners • Three meetings were held with the board of the HRBG • An 1800 telephone number and a project inbox (email) were available for community and stakeholder enquiries throughout the display period (and ongoing for the project). Around 150 submissions were received, with the most commonly raised concerns including access and interchange arrangements (notably at HRBG, access to Heatherbrae, and the Tomago interchange), flooding, water quality, noise, signage and impacts to flora and fauna.
2010	Submissions received during display of the concept design and Transport's responses to the issues raised were presented in the F3 Freeway to Raymond Terrace Concept Design Submissions Report (RTA 2010), which was placed on public display in December 2010. A community update was also issued in December 2010 which informed the community of a revised concept design (referred to in this EIS as the 2010 Preferred Route design) and outlined two options for alternate access arrangements to the HRBG. Following the release of the December 2010 community update, project development was put on hold.

6.2.6 Consultation carried out during concept design and environmental assessment

Transport has carried out ongoing community consultation through the development of the refined concept design and environmental assessment, as outlined in **Chapter 4**. Details of the main consultation activities carried out during this period are provided in **Table 6-3**. Stakeholders consulted as part of this process, together with relevant consultation activities, are provided in **Table 6-4**.

Consultation for the concept design and environmental assessment began in 2014. At this time, Transport also initiated an extensive review of the 2010 concept design with an aim to improve functionality and traffic flow around the interchanges, benefit from lessons learnt during other Pacific Highway projects in floodplain environments, minimise environmental impacts and address the changing needs of the network, particularly after the Hunter Expressway opened in 2014. The outcomes of the review are detailed further in **Chapter 4**.

Alongside the display of the revised concept design in September 2015, the State significant infrastructure (SSI) application (Roads and Maritime Services 2015b) was made publicly available on the former DPE website. Consultation with the former DoEE was also initiated in September 2015 with submission of the referral.

Table 6-3 Consultation carried out during concept design and environmental assessment

Activity	Date(s)	Details
Review of the 2010 concept design	2014-2015	A series of meetings with stakeholders was held in September and October 2014. Representatives from Roads and Maritime Services met with council (Newcastle and Port Stephens), directly impacted business owners, ARTC, Hunter Water Corporation, HRBG, the then OEH, EPA and a number of directly affected property owners. The purpose of these meetings was to provide an update on the project, and to identify any changes to land use that would need to be considered in the concept design review. In September 2015, the M1 Pacific Motorway extension to Raymond Terrace Discussion Paper – Revised Concept Design (Roads and Maritime Services 2015a) was placed on public display. This discussion paper outlined the process used to identify and develop a revised concept design for the project.
State Significant Infrastructure Application (SSIA) report and SEARs	September 2015	The SSIA report was issued to the former DPE (Roads and Maritime Services 2015b). The report was made publicly available on the department's website at the time. During the process of developing SEARs for the project, the former DPE consulted with state agencies to seek input into the SEARs.
Public display of revised concept design	October 2015	Changes to the 2010 concept design were placed on public display between 7 October 2015 and 27 November 2015. Comments on design changes were invited from all members of the public, government agencies and stakeholders. Consultation activities during this time included: • Three media releases on 7 October 2015 (announcement of the public display), 29 October 2015 (a reminder to the community to provide feedback) and 2 November 2015 (announcement of the extension of the public display) • Newspaper advertisements on various dates in October and November 2015 placed in the Maitland Mercury, Newcastle Herald, Cessnock Advertiser and Port Stephens Examiner • Project updates were directly mailed to stakeholders including government agencies, elected government representatives, schools, transport groups, community groups and environmental groups. Project updates were also available for collection at the then Roads and Maritime Services motor registries in Wallsend, Cessnock, Raymond Terrace and Nelson Bay, and Service NSW centres at Newcastle and East Maitland, and at City of Newcastle, Port Stephens Council, Cessnock City Council and Maitland City Council • Project postcards were delivered to 13,000 properties including residences and businesses in Beresfield, Black Hill, Heatherbrae, Hexham, Lenaghan, Millers Forest, Nelsons Plains, Raymond Terrace, Tarro, Thornton, Tomago and Woodberry • The project webpage was updated with the latest project information including the project update, postcard, frequently asked questions and discussion paper, as well as updated for the extension of the public display • Two community information sessions were held at Stockland Shopping Centre, Green Hills (Thursday 15 October 2015) and Market Place Shopping Centre, Raymond Terrace (Saturday 17 October 2015) • Fifteen stakeholder meetings were held between 6 and 14 October with directly affected property owners and stakeholders • An 1800 telephone number and a project inbox were available for community and stakeholder enquiries by telephone and email throughout the display period (and ongoing for the project). Forty-seven submissions were received from the community and stakeholders during this period. This included 25 emails, seven letters, four telephone calls, five web forms and six handwritten feedback forms. Thirty-seven issues were raised in the submissions received.

Activity	Date(s)	Details
		The most commonly raised issues included timing of the project, access to Heatherbrae, impacts to the existing road network and traffic impacts, and the revised alignment. Transport reviewed and considered all comments and incorporated them into the decision-making stages of the project as appropriate. The submissions received are discussed in detail in the M1 Pacific Motorway extension to Raymond Terrace Community Consultation Report (Roads and Maritime Services 2016a). Comments on the project were considered in the design of the project, as outlined in **Chapter 4**.
Planning Focus Meeting	October 2015	A Planning Focus Meeting was held in Newcastle to present the project, the draft SEARs, and carry out a bus tour of the study area. Thirty-two participants attended, including representatives of the former Roads and Maritime Services, DPE, ARTC, OEH, Port Stephens Council, City of Newcastle, TransGrid, Hunter Water Corporation and Jacobs. Following the Planning Focus Meeting, agencies provided comment on the draft SEARs. Agencies also provided comments relating to the content of the project EIS, the project design and requested further consultation. These agency comments and issues raised are summarised in **Table 6-5**.
Consultation with business owners	2015 ongoing	Consultation with business owners was carried out in 2016 as part of the Socio-economic assessment for the project, as discussed in **Chapter 13** (socio-economic) and the Socio-economic Working Paper (**Appendix M**). Consultation involved written surveys which were delivered to owners / managers of retail and service businesses within Heatherbrae and Beresfield. Surveys were either completed face-to-face or left to be completed by the business owner / manager. A total of 26 surveys were completed. Consultation with targeted business owners was carried out throughout 2019 and 2020. Consultation activities included face-to-face meetings with targeted businesses and distribution of reengagement letters in April 2020.
Flood Focus Group	February 2016	As a result of community and stakeholder feedback, Transport established a Flood Focus Group. The aim of the Flood Focus Group was to create a forum for discussion and exchange of information between the project team and the community regarding flooding events on the Hunter River floodplain. A Flood Focus Group was held in Raymond Terrace with 18 participants, including representatives from Transport, Port Stephens Council, City of Newcastle, an independent reviewer from WMAWater, and property owners and businesses directly affected by the project. Property owner discussions were held in August 2016 with Transport, Jacobs and an independent reviewer from WMAWater. The purpose of the meetings was to facilitate further discussions with property owners and gain an understanding of flooding near the project. A total of six discussions were carried out. Comments from these discussions were considered when assessing the potential impacts of the project on flooding as outlined in **Chapter 10** (hydrology and flooding).
Public display of concept design changes	August 2016	Transport invited further community feedback on the revised concept design for the project between 29 August and 28 September 2016. Consultation activities during this time included: • Two media releases on 30 August 2016 (announcing the public display) and 14 September 2016 (reminding the community to have their say) • Newspaper advertisements on various dates in August and September 2016 placed in the Maitland Mercury, Newcastle Herald, Cessnock Advertiser and Port Stephens Examiner

Activity	Date(s)	Details
		• Project updates were directly mailed to stakeholders in the local area including government agencies, elected government representatives, schools, transport groups, community groups and environmental groups. Project updates were also available for collection at the then Roads and Maritime Services motor registries in at Nelson Bay; Service NSW centres at Newcastle, Wallsend, East Maitland, Cessnock and Raymond Terrace; City of Newcastle, Port Stephens Council, Cessnock City Council and Maitland City Council • Project updates were directly mailed to about 500 residences and businesses in Heatherbrae and Tomago • Project postcards were delivered to about 16,000 properties including residences and businesses in Beresfield, Black Hill, Heatherbrae, Hexham, Lenaghan, Millers Forest, Nelsons Plains, Raymond Terrace, Tarro, Thornton, Tomago and Woodberry and Medowie • The project webpage was updated on 29 August with the latest project information including the project update and postcard • Stakeholder meetings were held between 6 and 14 October with directly affected property owners and stakeholders. Forty-eight submissions were received from the community and stakeholders during this period. This included 24 emails, eight letters, nine telephone calls, seven survey forms. Twenty-nine issues were raised in the submissions received. The most commonly raised issues included impacts to businesses, timing and funding of the project, access (including the access to the HRBG) and signage and line marking. Transport reviewed and considered all comments and incorporated them into the decision-making stages of the project as appropriate. The submissions received are discussed in detail in the M1 Pacific Motorway extension to Raymond Terrace Community Consultation Report (Roads and Maritime Services 2017a).
Community consultation reports and project updates	May 2016 June 2017 November 2020	Community feedback on the 2015 revised concept design was presented in the M1 Pacific Motorway extension to Raymond Terrace Community Consultation Report (Roads and Maritime Services 2016a) in May 2016. A project update was also placed on public display in May 2016. The project update provided a summary of submissions received during the 2015 display of the revised concept design and informed stakeholders of potential changes to the project design as a result of community feedback. Community feedback on the 2016 revised concept design was presented in June 2017 in the M1 Pacific Motorway extension to Raymond Terrace Community Consultation Report (Roads and Maritime Services 2017a). A project update was placed on public display in June 2017. The project update provided a summary of submissions received during the 2016 display of the revised concept design and provided a link to the M1 Pacific Motorway extension to Raymond Terrace Community Consultation Report (Roads and Maritime Services 2017a). A project update was placed on public display in November 2020. The project update provided an overview of the project, described the current status of the project and summarised the improvements made to the project since the 2016 revised concept design.
Consultation with land owners	2019 ongoing	Consultation with targeted land owners was carried out throughout 2019 and 2020. Consultation activities included: • Continued meetings with directly impacted property owners • Distribution of reengagement letters to targeted land-owners in April 2020, including requests for further consultation (if required) • Distribution of voluntary property acquisition letters to targeted land-owners in October 2020.

Table 6-4 Stakeholders consulted during concept design and environmental assessment

Stakeholder group	Individual stakeholder	Consultation activities
Public authorities	• Local councils including City of Newcastle, Port Stephens Council, Maitland City Council and Cessnock City Council • NSW Department of Planning, Industry and Environment (DPIE) • NSW Environment, Energy and Science (EES) Group • Environmental Protection Agency (EPA) • Department of Primary Industry (Fisheries) • Australian Rail Track Corporation (ARTC) • NSW Local Land Services • Department of Agriculture, Water and the Environment (DoAWE) • Subsidence Advisory NSW • Port of Newcastle	• Meetings and briefings • Telephone enquiries • Letters and emails • Project updates • Commonwealth referral for project impacts on Matters of National Environmental Significance • SSIA
Emergency services	• Police • Fire and Rescue • Ambulance • State Emergency Services	• Meetings and briefings including presentations at the Lower Hunter Emergency Management Co-ordinating Committee meetings • Letters and emails • Project updates
Public transport providers	• Hunter Valley Buses • Port Stephens Coaches	• Telephone enquiries • Letters and emails • Project updates
Specialist interest groups	• Donaldson Coal • Newcastle Fishermen's Cooperative • HRBG • Hunter Cycleways Movement	• Meetings and briefings • Letters and emails
Utility and service providers	• TransGrid • AGL • Hunter Water Corporation	• Meetings and briefings • Telephone enquiries • Letters and emails • Project updates
Aboriginal groups	• Mindaribba LALC • Worimi LALC • Project RAPs	• AFG meetings • Surveys • Test investigations • Project updates
Community	• Local residents and registered stakeholders • Directly affected land-owners • Business owners • Local media	• Community drop-in • Information sessions • Telephone enquiries • Letters and emails • Project updates • Project website • Media releases • One-on-one meetings

6.3 Summary of issues raised during concept design and environmental assessment

6.3.1 Summary of key issues raised

Key issues raised by the community, organisations and public authorities included:

- Impacts on traffic, transport and access: including access to the HRBG and Heatherbrae, cyclist and pedestrian access and integration with the existing rail and road networks
- Business and property impacts: including impacts on the HRBG and businesses at Heatherbrae and impacts on private property and existing land uses
- Impacts on existing infrastructure and utilities: including future operation of the existing road network and impacts to water supply infrastructure
- Timing and funding: including construction timeframes and funding availability
- Impacts on flooding and water quality: including flood immunity of the project and impacts on the Tomago Sandbeds Catchment Area
- Contaminated land: including existing contaminated land
- Impacts to Aboriginal heritage
- Urban design and visual impacts: including landscaping and vegetation species
- Noise and vibration impacts: including the efficacy of existing noise controls and the noise impacts of the project
- Biodiversity impacts and offsetting: including impacts on flora and fauna
- Project design: including the alignment, locations of intersections, interchanges and bridges, and road safety
- Community consultation: including ongoing and future consultation.

All of these issues were investigated and considered as part of the development of the concept design as discussed in the following sections.

6.3.2 Issues raised by public authorities and emergency services

Transport has carried out ongoing engagement with public authorities and emergency services through a number of engagement channels during project development, as outlined in **Table 6-4**.

A summary of issues raised during this engagement and where issues have been addressed in the EIS is provided in **Table 6-5**.

Table 6-5 Summary of issues raised by public authorities

Stakeholder	Issue category	Issues raised	How issue has been addressed
City of Newcastle	Project design	• Consider a bridge or culvert for the crossing of Purgatory Creek	A section of the alignment of Purgatory Creek would be adjusted as discussed in **Section 5.3.10**.
	Cyclists	• Consider planning cycleway networks in the area • Concern regarding safety for cyclists • Consider cycling facilities in the design, in line with existing and future cycleways	The project provides opportunities for on-road cycling in road shoulders and connection to existing cycleway networks in the area, as discussed in **Section 5.3.16**.
	Consultation	• Request to be kept informed by Transport regarding the project • Consultation with stakeholders and community should continue	Transport will continue to engage with stakeholders and the community, including council, throughout the development and delivery of the project as discussed in **Section 6.4**.
	Hydrology and hydraulic	• Request for a comprehensive flooding assessment be carried out	Potential flooding impacts have been addressed in the Hydrology and Flooding Working Paper (**Appendix J**), with a summary in **Chapter 10** (hydrology and flooding).
	Cumulative impacts	• Future developments need to be considered	Cumulative impacts, including an assessment of the project's interaction with future developments, are provided in **Chapter 23** (cumulative impacts).
Port Stephens Council	Land use, social and economic	• Concern regarding the loss of trade and impact on businesses being bypassed, particularly at Heatherbrae	Potential land use and business impacts have been addressed in the Land Use and Property Working Paper (**Appendix N**) and the Socio-economic Working Paper (**Appendix M**), which have been prepared as part of the EIS. A summary of the assessments is provided in **Chapter 14** (land use and property) and **Chapter 13** (socio-economic) respectively. To reduce the potential business impacts of the project, signage will be provided in accordance with Transport signage policy to inform the travelling public about services in Beresfield and Heatherbrae.

Stakeholder	Issue category	Issues raised	How issue has been addressed
	Project design	• Request to be involved with the design and construction requirements for Masonite Road • Need to integrate with existing and potential future rail facilities • Explore opportunities for rail linkages to Port Stephens, particularly Newcastle Airport	Transport will continue to engage with Port Stephens Council during design development. The project has been designed to allow for existing and future rail infrastructure, such as the Main North Rail Line at Hexham. The project has been developed to provide a motorway between the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace. New rail projects are considered by Transport and are outside the scope of this project.
	Traffic and transport	• Project should assess impact on the existing road network during construction • Request that the project includes future operational responsibilities for the Pacific Highway • Concern about the existing and future operation of the M1 Pacific Motorway and Pacific Highway	Potential traffic and transport impacts have been addressed in the Traffic and Transport Working Paper (**Appendix G**). A summary of the assessment is provided in **Chapter 7** (traffic and transport). The assessment considered long term growth to ensure the project caters for the forecasted traffic volumes. Transport is in liaison with relevant local councils if any road previously not council's responsibility becomes the responsibility of council as a result of the project. This will be discussed and negotiated with the relevant local council before opening the completed project.
	Consultation	• Request that Transport provides regular updates regarding the project to the community	Transport will continue to engage with stakeholders and the community throughout the development and delivery of the project, as discussed in **Section 6.4**.
	Access	• Consider and address informal access arrangements for businesses on the Pacific Highway	Access to property and other infrastructure has been considered during design development, as discussed in **Section 5.3.19**. Measures to minimise impacts of the project on businesses, including access arrangements, are provided in **Chapter 13** (socio-economic) and the Socio-economic Working Paper (**Appendix M**).
	Timing and funding	• Clarity around timeframes for construction	Construction of the project is expected to begin in 2023 and conclude in 2028. The construction program and construction staging is discussed in **Section 5.4.14**. The potential for project staging is discussed in **Section 5.4.15**.

Stakeholder	Issue category	Issues raised	How issue has been addressed
Maitland City Council	Project design	• Opportunity to build cycleways to integrate into future cycling facilities	The project provides opportunities for on-road cycling in road shoulders and provides connections to existing and planned future cycleway networks in the area, as discussed in **Section 5.3.16**.
	Traffic and transport	• Concern about the existing and future operation of the New England Highway in the area of the proposed Tarro interchange, particularly in relation to weaving and merging • The traffic assessment needs consider future development and population growth • Existing traffic patterns on John Renshaw Drive should be considered by the project	Potential traffic and transport impacts have been addressed in the Traffic and Transport Working Paper (**Appendix G**). A summary of the assessment is provided in **Chapter 7** (traffic and transport). The current interchange arrangements are the best options for the project and are considered to best connect to the existing road network (refer to **Chapter 4**). The assessment considered long term population and employment growth to ensure the project caters for the forecasted traffic volumes. The project provides increased road capacity (three lanes in both directions) along the New England Highway through Tarro.
Hunter Water Corporation	Existing utilities and access	• Impact to existing Hunter Water Corporation assets including potential adjustments, construction protection and access for maintenance	Transport has carried out ongoing engagement with Hunter Water Corporation to ensure any impacts to water assets are managed appropriately. Assets would either be protected or relocated as necessary, in consultation with Hunter Water Corporation. Transport will continue to liaise with Hunter Water Corporation to ensure the project is compatible with existing and future asset infrastructure. Utilities are discussed in **Section 5.3.15**.
	Tomago Sandbeds Catchment Area	• Export of all potentially contaminated run off water from the project out of the groundwater drawn zone to guarantee no detrimental impacts on aquifer recharge water quality • The project will need to meet requirements and criteria for the drinking water catchment. The Australian Drinking Water Guidelines would be seen as minimum requirement	Transport have liaised with Hunter Water Corporation throughout the development of the project to ensure the design best meets requirements to protect the catchment area. In consultation with Hunter Water Corporation, the designed road level was raised in this area to avoid impacts arising from road run-off. Pavement drainage in this area was also designed to discharge road runoff away from the drinking water catchment to prevent any potential pollution impacts to the Tomago Sandbeds Catchment Area. Permanent water quality basins in this area will be lined to prevent groundwater interaction. As result of design changes, the project is not expected to impact on water quality within the Tomago Sandbeds Catchment Area during construction or operation. Potential impacts to the Tomago Sandbeds Catchment Area have been addressed in the Biodiversity Assessment Report (**Appendix I**), the Hydrology and Flooding Working Paper (**Appendix J**), and the Surface Water and Groundwater Quality Working Paper (**Appendix K**). Summaries of these assessments are provided in **Chapter 9** (biodiversity), **Chapter 10** (hydrology and flooding), and **Chapter 11** (surface water and groundwater quality) respectively.

Stakeholder	Issue category	Issues raised	How issue has been addressed
	Biodiversity	• Early consideration of BioBanking areas	Transport has carried out ongoing consultation with Hunter Water Corporation, including discussion of the existing Hunter Water Corporation BioBanking site located near the HRBG. While the construction footprint has been designed to avoid and minimise direct impact where possible to this biobanking site, the project would impact on around 0.6 hectares (0.5 per cent) of this site on its the western edge. Impacts to the existing BioBanking site owned by Hunter Water Corporation have been considered in the Biodiversity Assessment Report (**Appendix I**), with a summary provided in **Chapter 9** (biodiversity).
DPIE	Crown land	• Identify any Crown Land affected by the project	The project would require some temporary and permanent impacts to Crown Land along the banks of the Hunter River. Crown land impacted by the project is identified and assessed in the Land Use and Property Working Paper (**Appendix N**), with a summary provided in **Chapter 14** (land use and property).
	Mineral resources	• Consider the potential for the project to impact upon any significant mineral resources	The project construction and operational footprints are covered by an exploration license (EL5497) and an assessment lease (ALA71). The boundaries for this license and assessment lease extend to the western side of the M1 Pacific Motorway at Black Hill. Works in this area are generally located within or near to the existing M1 Pacific Motorway corridor and potential impacts on any future mining uses are expected to be minimal. The construction and operational footprints cover a small area where underground coal mining has previously occurred. This includes part of an ancillary facility (AS1) and land within the John Renshaw Drive road corridor. No mine induced subsidence impacts are anticipated during operation of the project. Impacts to mineral resources are further discussed in the Land Use and Property Working Paper (**Appendix N**), with a summary provided in **Chapter 14** (land use and property).
	Commercial aquaculture	• Ensure commercial prawn trawlers are contacted in relation to the proposed bridge and navigation is not hindered	Transport has carried out ongoing engagement with Newcastle Fishermen's Cooperative to ensure impacts to commercial aquaculture activities are minimised where possible. A navigation channel will be maintained within the Hunter River near to construction works for maritime traffic. Where temporary access changes or restrictions are proposed, these will be undertaken in consultation with affected stakeholders. Impacts to commercial prawn trawling operations are further assessed in the Socio-economic Working Paper (**Appendix M**), with summary provided in **Chapter 13** (socio-economic).

Stakeholder	Issue category	Issues raised	How issue has been addressed
	Biodiversity	• Potential impact on wetland areas that are habitat for the wading and migratory birds • Inclusion of biodiversity offsets for aquatic environments in the EIS	The project has been designed to minimise potential impacts on biodiversity as far as possible, including Hexham Swamp and floodplain areas, which represent habitat for wading a migratory species. Additionally, migratory wader habitat is poorly represented within the construction footprint, with no migratory waders recorded during field surveys. The removal of some wetland habitat, representing potential habitat for migratory species, would be required. The extent of habitat removal and the associated impacts are further discussed in the Biodiversity Assessment Report (**Appendix I**), with a summary provided in **Chapter 9** (biodiversity). A Biodiversity Offset Strategy (**Appendix I**) has been prepared for the project, which includes consideration of offsets for impacts to aquatic habitats. A summary of the strategy is provided in **Chapter 9** (biodiversity).
	Water quality and hydrology	• Consideration of tidal movements • Impacts on surface water and groundwater sources, including related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.	Tidal influence has been considered in the flooding assessment and flood modelling carried out for the project. An assessment of flooding and hydrology, including the influence of tidal movements, is provided in the Hydrology and Flooding Working Paper (**Appendix J**), with a summary provided **Chapter 10** (hydrology and flooding). Impacts on surface water and groundwater quality are assessed in the Surface Water and Groundwater Quality Working Paper (**Appendix K**), with a summary provided in **Chapter 11** (surface water and groundwater quality). Impacts on surface water and groundwater quantities are assessed in the Hydrology and Flooding Working Paper (**Appendix J**) with a summary provided in **Chapter 10** (hydrology and flooding). Impacts to riparian land and groundwater dependent ecosystems are further assessed in the Biodiversity Assessment Report (**Appendix I**), with a summary provided in **Chapter 9** (biodiversity). Management measures are also provided to reduce the impacts of the project on surface water and groundwater sources.
	Access	• Access and maintenance roads during project operation to be included in the assessment	The project has considered and responded to the need for access and maintenance roads during operation. Existing property accesses will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners. Further discussion of access arrangements during operation is provided in **Section 5.3**.

Stakeholder	Issue category	Issues raised	How issue has been addressed
EES Group	Environmental assessment	• Address biodiversity, historic heritage, Aboriginal cultural heritage, water and soils, flooding (including the Hunter Valley Flood Mitigation Scheme requirements), and coastal erosion.	The environmental assessment presented in this EIS has included an assessment of project impacts on all of the issues raised, provided in the applicable chapters and working papers (as listed in **Chapter 1**). The project would potentially impact on discharge flow rates in drainage channels which are part of the Hunter Valley Flood Mitigation Scheme. Transport would continue to consult with the operators of the Hunter Valley Flood Mitigation Scheme during detailed design to minimise project impacts wherever possible.
	Biodiversity	• Usage of land for biodiversity offsetting, particularly around the Watagan to Stockton Green Corridor	A Biodiversity Offset Strategy (**Appendix I**) has been prepared for the project as part of the EIS. A summary of the strategy is provided in **Chapter 9** (biodiversity). Transport is considering all options to meet the offsetting obligations of the project.
EPA	Environmental assessment	• Adequately describe the development proposal, the environmental implications of the proposed activity, and the existing environment including air, noise, waters, contamination/soils, chemicals and waste	The environmental assessment presented in this EIS has included a description of the existing environment and an assessment of project impacts on all of the issues raised, provided in the applicable chapters and working papers (as listed in **Chapter 1**).
	Water quality	• Maximum discharge needs to be reported	Discharge amounts and rates have been identified and assessed in the Hydrology and Flooding Working Paper (**Appendix J**) with a summary provided in **Chapter 10** (hydrology and flooding).
ARTC	Access	• Consider existing access to the ARTC network via the Tarro Interchange	There would be no impact to the function of the Main North Rail Line and Hexham Train Support Facility during project operation. Access to Thornton, Beresfield, Tarro and Hexham railway stations, and ARTC assets via Tarro interchange, would remain as existing. Access to existing infrastructure is discussed further in the Traffic and Transport Working Paper (**Appendix G**), with a summary provided in **Chapter 7** (traffic and transport). The Aurizon access road will be relocated as part of the project but access will continue to be retained during construction.
	Flooding	• Flood modelling and assessment to include consideration of impacts on ARTC infrastructure	Existing railway infrastructure has been considered in the flooding assessment and flood modelling carried out for the project. An assessment of flooding and hydrology, including impacts to railway infrastructure, is provided in the Hydrology and Flooding Working Paper (**Appendix J**), with a summary provided in **Chapter 10** (hydrology and flooding).

Stakeholder	Issue category	Issues raised	How issue has been addressed
Hunter Local Land Services	Biodiversity offsets	• Consider biodiversity offsets to contribute to the health of the Hunter River Estuary	A Biodiversity Offset Strategy (**Appendix I**) has been prepared for the project. A summary of the strategy is provided in **Chapter 9** (biodiversity).
Emergency Services	Water supply	• Water supply locations for firefighting to be identified	Emergency water supply locations for firefighting are outlined in **Chapter 22** (safety and risk).
	Access	• Identify access points for emergency services to the construction site • Maintain adequate space for emergency vehicle access to fire trails • Emergency access to the motorway to be available for firefighters to avoid getting trapped	The project has considered and responded to the need for access and maintenance roads during construction and operation. Existing property accesses will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners. Where required, and where the project severs existing access tracks, (including fire trails) turnaround facilities would be provided on access tracks to allow vehicles to turn around. Further discussion of access arrangements during operation is provided in **Section 5.3**. The project includes 2.5m minimum nearside shoulders along the main alignment. This allows vehicles to pull over at any location in the event of a breakdown or other incident and provides space between the stationary vehicle and passing traffic. On the viaduct and bridges, the nearside shoulder width would be between 2.5 and 3.5m wide. This would be adequate for most vehicles to be able to stop clear of traffic, as discussed in **Section 5.3**.
	Project design	• Include additional hardstand areas near emergency cross-overs/u-turn facilities for speed enforcement purposes	Combined emergency crossover, U-turn facilities and stopping bays (in addition to road shoulders) would be provided for use by Transport, police and emergency vehicles, as discussed in **Section 5.3.13**.
	Signage	• Suggested that “kilometre” markers and interchanges be named to allow members of the public to easily identify location of incidents	Interchanges have been named according to the area of the project they service (from west to east: Black Hill Interchange, Tarro Interchange, Tomago Interchange, and Raymond Terrace Interchange), providing an easily-identifiable reference point for the location of incidents. As outlined in the Socio-economic Working Paper (**Appendix M**), signage will be provided in accordance with Transport signage policy to inform the travelling public about services in Beresfield and Heatherbrae.

6.3.3 Issues raised by the community

Table 6-6 provides a summary of issues raised by the community including special interest groups, utilities and service providers and where these have been addressed in the EIS.

Table 6-6 Summary of issues raised by the community – individuals, special interest groups, utilities and service providers

Issue category	Consultation period	Issues raised	How issue has been addressed
Traffic, transport and access			
Access	2015	• Property access	Access to private property and other infrastructure during construction and operation of the project has been considered during design development, as discussed in **Section 5.3.20**. Potential property access impacts have been addressed in the Land Use and Property Working Paper (**Appendix N**) and the Socio-economic Working Paper (**Appendix M**). A summary of these assessments is provided in **Chapter 14** (land use and property) and **Chapter 13** (socio-economic) respectively. Direct access to the M1 Pacific Motorway from surrounding properties would be restricted by fencing. Where existing property accesses are affected by the project, access would be provided either from existing roads or new access roads and tracks provided as part of the project. Access adjustments would be carried out in consultation with property owners and prior to the realisation of construction impacts to ensure access is maintained.
	2016	• Impact the project would have on access to private property	
Access to Heatherbrae	2015	• Request review of access to Heatherbrae • Lack of ramp for northbound traffic south of Heatherbrae • No direct access to Heatherbrae	The design changes at Tomago, Heatherbrae and Raymond Terrace now enable access to and from Heatherbrae from the north and south. This was a major design change provided to address business concerns through Heatherbrae. Refer to **Chapter 4** for further discussion on the design changes progressively included to address business concerns. No direct private property access to the main alignment would be permitted. The Tomago and Raymond Terrace interchanges are described in **Section 5.3.3**.
	2016	• Southbound access to the motorway from Heatherbrae • Need to ensure access is maintained to and from the M1 Pacific Motorway	

Issue category	Consultation period	Issues raised	How issue has been addressed
Traffic impacts	2015	• The traffic assessment needs to take into account future development and population growth • Would the project improve traffic conditions on the New England Highway?	The project is expected to improve traffic conditions on roads within the project and reduce traffic volumes across the existing network during morning and evening peak periods. Construction traffic movements will be required along Quarter Sessions Road to access AS4, however construction traffic is not expected to substantially increase traffic along Quarter Sessions Road. Potential traffic and transport impacts have been addressed in the Traffic and Transport Working Paper (**Appendix G**). A summary of the assessment is provided in **Chapter 7** (traffic and transport). The assessment considered long term population and employment growth to ensure the project caters for the forecasted traffic volumes. Transport will continue to work with local councils to ensure the surrounding road network will operate effectively when the project is built.
	2016	• Concern over potential increase in traffic on adjoining roads, particularly Tomago Road and Quarter Sessions Road • Congestion from weekday peak traffic heading to Newcastle • Increased traffic volumes on road network surrounding Newcastle Airport	
Connectivity to Tarro	2015	• Restricted access to Tarro	The project will maintain access to Tarro through the existing road network and the Tarro Interchange. The Tarro Interchange is described in **Section 5.3.3**. Potential impacts on access and connectivity for residents, workers and visitors have been addressed in the Socio-economic Working Paper (**Appendix M**). A summary of the assessment is provided in **Chapter 13** (socio-economic).
Cyclists	2015	• Need to apply safety standards for active road users • Need to lead regional cycleway strategy • There is an opportunity to build cycleways to integrate into future cycling facilities • Consider planning cycleway networks in the area	The project provides opportunities for on-road cycling in road shoulders and connection to existing cycleway networks in the area, as discussed in **Section 5.3.16**. The project would enable integration into the future cycleway planning in the area. The development of a regional cycleway network is outside the scope of the project. It is expected that the project would improve cycling conditions on the existing network by reducing traffic volumes on adjoining roads. Transport will continue to consult with cycling groups throughout project development.
	2016	• Consider cycling facilities in the design, in line with existing and future cycleways	

Issue category	Consultation period	Issues raised	How issue has been addressed
Rail	2015	• Need to integrate with existing and potential future rail facilities	The project has been designed to allow for existing and future rail infrastructure, such as the existing Main North Rail Line at Hexham.
		• Explore opportunities for rail linkages to Port Stephens, particularly Newcastle Airport	New rail projects are outside the scope of this project.
Hunter Region Botanic Gardens (HRBG) access	2016	• Concern about access and visibility of the HRBG. Concern over the lack of visibility for motorists accessing the gardens	Access to the HRBG has been carefully considered during project development. Access to the HRBG would be via a new access road with a signalised intersection at the Pacific Highway (refer to **Section 5.3.3**). The new signalised intersection would be provided at the HRBG to cater for pedestrian access to public transport and the site.
		• Consider location of bus stops and pedestrian links for better access to the gardens	The locations of existing bus stops have been considered during project development. Bus stops on the Pacific Highway at the HRBG (Transport Stop ID 2324115 and 2322117) would be permanently moved to a new location either side of the HRBG intersection.
Construction traffic impacts	2015	• Project should minimise impact on existing road network during construction	Potential traffic and transport impacts have been addressed in the Traffic and Transport Working Paper (**Appendix G**). A summary of the assessment is provided in **Chapter 7** (traffic and transport). Construction activities would cause minimal disruption along the existing road network. Where disruptions may occur, management measures, including the need for temporary traffic intersections, reduced speed limits, temporary pavement, and traffic switches, have been proposed. To reduce traffic delays, design and construction staging has been developed to maintain existing speed limits of up to 80km per hour within the construction footprint. However, some speed limits would need to be reduced for the safety of both road users and construction workers on site.
	2016	• Concern about traffic delays during construction	

Issue category	Consultation period	Issues raised	How issue has been addressed
Business and property			
Business impacts	2015	• Loss of trade and impact on businesses being bypassed	The design changes at Tomago, Heatherbrae and Raymond Terrace now enable access to and from businesses in Heatherbrae from the north and south. A new access road would be provided from the Pacific Highway to maintain direct access to the HRBG, passing under the bridge (B09) on the main alignment, as shown in **Figure 5-1** of **Chapter 5**. Potential business impacts have been addressed in the Socio-economic Working Paper (**Appendix M**). A summary of the assessment is provided in **Chapter 13** (socio-economic). As outlined in the Socio-economic Working Paper, signage will be provided in accordance with Transport signage policy to inform the travelling public about services in Beresfield and Heatherbrae.
	2016	• Loss of trade and impact on Heatherbrae businesses • Loss of business exposure and impact on the HRBG	
Property impacts	2015	• Concern about impact to property • Concern about proximity to dwellings • The project should consider that private land within the area has a number of uses	Transport have minimised impacts to private property during the development of the project wherever possible. Consideration of private property impacts have informed the options decision-making process, as discussed in **Chapter 4**. Potential property impacts have been addressed in the Land Use and Property Working Paper (**Appendix N**) and the Socio-economic Working Paper (**Appendix M**), A summary of these assessments is provided in **Chapter 13** (socio-economic) and **Chapter 14** (land use and property) respectively. Transport has carried out extensive consultation with targeted landowners, including negotiating acquisition of properties where necessary, as outlined in **Table 6-3**. Transport will continue to assess impacts to private property and liaise directly with property owners as the project progresses.
	2016	• Concern about proximity of proposed alignment to dwelling and impact to private property • Impact to existing uses on land	
Property impact compensation	2015	• The project devalues property	Potential acquisition impacts have been addressed in the Land Use and Property Working Paper (**Appendix N**). A summary of the assessment is provided in **Chapter 14** (land use and property). Transport would be required to acquire properties to build the project. Compensation to landowners directly impacted by the project (full or partial acquisitions) is governed by the *Land Acquisition (Just Terms Compensation) Act 1991*. Proposed property acquisition is detailed in **Section 5.3.19**.
	2016		

Issue category	Consultation period	Issues raised	How issue has been addressed
Existing infrastructure and utilities			
Existing road network	2015	• Concern about existing roads and their future operation • Request to upgrade the existing Pacific Highway roundabout at Masonite Road • High traffic volumes and congestion on road network surrounding Thornton	The completed project would improve traffic conditions across the surrounding road network by reducing traffic volumes and enabling existing routes and intersections, such as the Pacific Highway and Masonite Road intersection, to operate more efficiently. Potential traffic and transport impacts have been addressed in the Traffic and Transport Working Paper (**Appendix G**). A summary of the assessment is provided in **Chapter 7** (traffic and transport). High traffic volumes surrounding Thornton are outside the scope of the project.
		• Lack of full interchange at M1 Pacific Motorway/Hunter Expressway	This interchange is located beyond the scope of the project.
		• Continued use of Weakleys Drive for southbound travel from Maitland to M1 Pacific Motorway	The M1 Pacific Motorway/Weakleys Drive intersection was upgraded from a roundabout to traffic signals as part of a separate project to improve the operational performance of the existing roundabout. The Weakleys Drive and John Renshaw Drive intersection upgrade was completed in March 2019.
		• Request to allow a right turn from Tomago Road at the Pacific Highway	The project design as assessed in the EIS allows a right turn from Tomago Road at the Pacific Highway.
		• Viability of reconfiguring Pacific Highway and New England Highway intersection at Hexham	The New England Highway and Pacific Highway intersection at Hexham would experience a substantial reduction in right turn movements when the project is built. There would be opportunities to improve the intersection after the project is completed, however the ongoing demand for right turn movements would need to be considered. The viability of reconfiguring the Pacific Highway and New England Highway intersection at Hexham will be assessed in a separate project.
	2016	• Impact of the project on the existing road network	The completed project would improve traffic conditions across the surrounding road network by reducing traffic volumes and enabling routes and intersections to operate more efficiently.

Issue category	Consultation period	Issues raised	How issue has been addressed
		• Remove southbound right turn from existing Hexham Bridge onto New England Highway	The New England Highway and Pacific Highway intersection at Hexham would experience a substantial reduction in right turn movements when the project is built. There would be opportunities to improve the intersection after the project is completed, however the ongoing demand for right turn movements would need to be considered. The viability of reconfiguring the Pacific Highway and New England Highway intersection at Hexham will be assessed in a separate project.
		• Consider further motorway extensions beyond the project to link with the Hunter Expressway and Newcastle Airport • Consider making the southbound Hexham Bridge single lane with a cycle lane	Upgrades to areas outside of the project are outside of the project scope.
Existing Hunter River bridges	2015	• The existing on ramp to the northbound Hexham Bridge is dangerous. Request to consider the ramp be closed to all vehicles or heavy vehicles	The existing bridges would be retained and continue to serve non-motorway traffic wishing to cross the Hunter River from the Pacific and New England highways.
Future road classification	2015	• Need to detail the responsibilities for maintenance of existing roads in the network after completion of the project so suitable funding arrangements can be made	Transport is continuing to liaise with relevant local councils. Any road previously not council's responsibility that becomes the responsibility of council as a result of the project will be discussed and negotiated with the relevant local council before opening the completed project.
Utilities	2015	• Proximity of the main alignment to the Hunter Water Corporation pipeline	As outlined in **Section 6.3.1** and **Section 6.3.2**, Transport has carried out ongoing engagement with Hunter Water Corporation to ensure any impacts to water supply utilities are managed appropriately. Hunter Water Corporation assets would either be protected or relocated as necessary, in consultation with Hunter Water Corporation. Transport will continue to liaise with utility asset owners such as Hunter Water Corporation to ensure the project is compatible with existing and future infrastructure. Utilities are discussed in **Section 5.3.15**.

Issue category	Consultation period	Issues raised	How issue has been addressed
Timing and funding			
Timing and staging	2015	• Consider building the upgrade in stages if there is a lack of funding • The project should be prioritised and constructed in the short-term	Construction of the project is expected to begin in 2023 and finish in 2028, but could be sooner. The construction program, including construction staging, is discussed in **Section 5.4.14**. The potential for project staging is discussed in **Section 5.4.15**. The current stage of concept design and environmental assessment is one of the final steps before gaining approval to progress the project to detailed design and construction.
	2016	• The project should be prioritised and built in the short term • Clarity around construction timeframes	
Funding	2015	• Concern the project has been in planning for a long time and is yet to be built or fully funded • Concern over a lack of funding	Additional commitment to funding for the project has been provided by the Australian and NSW Governments since 2015. The project currently has combined funding commitment of $2 billion from the Australian and NSW Governments. The project design was determined and refined through an extensive evaluation and review process to ensure that it best meets the project objectives, is evaluated against the functional, social and economic and natural environment and culture considerations and provides major benefits to road users, as discussed in **Chapter 4**.
	2016	• Concern the project has been in planning for a long time and is yet to be built or fully funded • Concern about cost of the project and floodplain bridge (viaduct) • Concern about the additional cost of bypassing Heatherbrae.	
Flooding and water quality			
Flooding	2015	• Concerns raised about how the project would impact flooding • Need to ensure that the flooding assessment is carried out appropriately	Flooding is one of the key issues identified for this project. Potential flooding impacts have been addressed in the Hydrology and Flooding Working Paper (**Appendix J**). A summary of the assessment is provided in **Chapter 10** (hydrology and flooding).

Issue category	Consultation period	Issues raised	How issue has been addressed
	2016	• Concern the project would impact flooding and drainage • Project needs to address the existing flooding and drainage impacts adjacent to the project • Flood immunity of the upgrade.	Drainage has also been considered as part of the project design and environmental assessment, and is discussed in **Section 5.3.8**, **Section 5.4.10**, **Chapter 10** (hydrology and flooding) and the Hydrology and Flooding Working Paper (**Appendix J**). The project has been designed to be consistent with other Pacific Highway upgrade program projects which provide a minimum of 5% AEP (one in 20 year) flood immunity to the edge lines of the carriageway. The project has the added advantage of numerous bridge structures, which would provide one in 100-year flood immunity between Black Hill and Tomago. Flooding is one of the key issues identified for this project. Potential flooding impacts have been addressed in the Hydrology and Flooding Working Paper (**Appendix J**). A summary of the assessment is provided in **Chapter 10** (hydrology and flooding).
Groundwater	2016	• Impact on the Tomago Sandbeds Catchment Area.	Transport have liaised with Hunter Water Corporation throughout the development of the project to ensure the design best meets requirements to protect the catchment area. In consultation with Hunter Water Corporation, the designed road level was raised in this area to avoid impacts arising from road run-off. Pavement drainage in this area was also designed to discharge road runoff away from drinking water catchments to prevent any potential pollution impacts to the Tomago Sandbeds Catchment Area. Basins and grassed swales in this area will also be lined to prevent groundwater interaction. As result of design changes, the project is not expected to impact on water quality within the Tomago Sandbeds Catchment Area during construction or operation. Potential impacts to the Tomago Sandbeds Catchment Area have been addressed in the Biodiversity Assessment Report (**Appendix I**), the Hydrology and Flooding Working Paper (**Appendix J**), and the Surface Water and Groundwater Quality Working Paper (**Appendix K**). Summaries of these assessments are provided in **Chapter 9** (biodiversity), **Chapter 10** (hydrology and flooding), and **Chapter 11** (surface water and groundwater quality) respectively.
Contaminated land			
Contaminated land	2015 2016	• Properties in the project could be contaminated	Potential contamination impacts have been addressed in the Soils and Contamination Working Paper (**Appendix P**). A summary of the assessment is provided in **Chapter 16** (soils and contamination). The assessment includes measures to manage the risk of contamination across the project, including existing contamination.

Issue category	Consultation period	Issues raised	How issue has been addressed
Aboriginal heritage			
Aboriginal heritage	2015	• Need to ensure Aboriginal heritage is considered	Potential Aboriginal heritage impacts have been addressed in the ACHAR (**Appendix L**). A summary of the assessment is provided in **Chapter 12** (Aboriginal cultural heritage). Aboriginal stakeholder engagement has been carried out to address the requirements of the relevant statutory requirements and Government policies, including the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a). Aboriginal stakeholder engagement is further discussed in **Section 6.2.4** and **Section 6.3.4**.
Urban design and visual impacts			
Visual impacts	2015	• Concern about the visual impact of the project	Potential landscape and visual impacts have been addressed in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**). A summary of the assessment is provided in **Chapter 15** (urban design, landscape and visual amenity).
Landscaping	2016	• Consider non-allergenic vegetation for landscaping	Vegetation species to be used for landscaping along the project will be selected with consideration of safety, security, commercial availability, performance under motorway conditions, and establishment and maintenance requirements.
Noise and vibration			
Noise impacts	2015	• Concern about noise impacts • Existing noise barriers do not address issues • Concern about compression braking	Noise management strategies have been developed to reduce the impacts of both construction and operational noise and to meet criteria set by the EPA. Potential noise impacts have been addressed in the Noise and Vibration Working Paper (**Appendix H**). A summary of the assessment is provided in **Chapter 8** (noise and vibration). The adequacy of existing noise management measures, such as existing noise walls are considered in this assessment.
	2016	• Concern about noise impacts resulting from the proposed floodplain bridge (viaduct)	

Issue category	Consultation period	Issues raised	How issue has been addressed
Biodiversity			
Fauna	2015	• Concerns about potential impacts on wildlife caused by the project and request for fauna sensitive design • Need to consider impact on natural environment, including koala	The project has been designed to avoid and minimise potential impacts on biodiversity as far as possible, including minimising direct impacts to Hexham Swamp and floodplain areas, reducing habitat fragmentation, avoiding impacts to remnant vegetation and threatened species habitat and minimising impacts to native vegetation where possible. Fauna sensitive design, including fauna crossing structures and fauna exclusion fencing, have also been implemented to reduce impacts on wildlife during project operation. Potential impacts on threatened flora, threatened fauna and threatened ecological communities within the vicinity of the project have been addressed in the Biodiversity Assessment Report (**Appendix I**). A summary of the assessment is provided in **Chapter 9** (biodiversity). Potential impacts on wildlife and their habitat, including koala, have also been considered in this assessment.
Biodiversity	2016	• Consider impact on wildlife habitat in HRBG bushland	Impacts on wildlife habitat in the bushland surrounding the HRBG have been addressed in the Biodiversity Assessment Report (**Appendix I**). A summary of the assessment is provided in **Chapter 9** (biodiversity).
		• Biodiversity offset should consider the local strategic priorities surrounding the corridor and engagement should be carried out with key stakeholders.	A Biodiversity Offset Strategy (**Appendix I**) has also been prepared for the project. A summary of the strategy is provided in **Chapter 9** (biodiversity). The Biodiversity Offset Strategy considers the availability of local and regional offset sites.
Project design			
Design changes and revised alignment	2015	• Concern about the change in alignment • Request to consider 2010 option or other options further east • Concern about the project crossing the floodplain • Were interchanges located in consideration of traffic conditions	The project as assessed in the EIS best balances environmental, infrastructure and physical constraints in the project area. The current alignment and interchange arrangements would allow for improved connection to the existing road network, improved interchange function and increased avoidance of sensitive environmental areas and wetlands. Additional interchanges are not being considered at this stage. The interchange locations have been selected to provide connections to existing major roads, most notably the M1 Pacific Motorway, the Pacific Highway, and the New England Highway. Interchange locations have also been selected to provide

Issue category	Consultation period	Issues raised	How issue has been addressed
	2016	• Convenience of interchange arrangements at Heatherbrae • Consider an interchange at Masonite Road • Suggestion to leave the motorway through Heatherbrae and not build a bypass • Consider a new alignment across Hexham Swamp	access to key destinations and existing routes such as the Tomago industrial area, Heatherbrae and Raymond Terrace. The current arrangements and locations for interchanges are the best options for the project and are considered to best connect to the existing road network (refer to **Chapter 4**). A previous alignment across Hexham Swamp was considered for the project and was presented in the F3 Freeway to Raymond Terrace Concept Design Report (RTA 2008). The preferred alignment has since been revised to minimise environmental impacts on Hexham Swamp. Project development and alternative alignment options considered are discussed further in **Chapter 4**.
Bridges and structures	2015	• The project should consider a bridge or culvert at water crossings • Would like to see an iconic bridge structure	The project has bridge structures at water crossings to mitigate the impacts of flooding and impacts to nearby environmentally sensitive areas. The bridge structures are described in **Section 5.3.5**. The bridge structure (B05) between Tarro and Tomago minimises impacts on flooding across the Hunter River floodplain and would consist of a 2.6km viaduct, as discussed in **Section 5.3.5**. This structure would be a major new visual element in the landscape, as discussed in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**), and summarised in **Chapter 15** (urban design, landscape and visual amenity). This structure is likely to be an iconic bridge structure.
Lighting	2015	• Concern about light pollution from the road	Lighting is not required on the main alignment of the project but would be provided at interchanges and associated ramps. Lighting would be provided in accordance with the Australian Standards. The impact of lighting on wildlife is discussed in the Biodiversity Assessment Report (**Appendix I**) and summarised in **Chapter 9** (biodiversity). The impact of lighting on sensitive receivers is discussed in the Urban Design, Landscape Character and Visual Amenity Working Paper (**Appendix O**), and summarised in **Chapter 15** (urban design, landscape and visual amenity). Lighting impacts during project construction and operation are expected to be low.
Signage and line marking	2015	• Need to ensure signage is clear to motorists approaching new interchanges • Need to signpost Newcastle Airport and promote access	Signage and road marking to enforce road rules and regulations, provide information on direction of travel, posted speed limit and parking restrictions would be included as part of the project. As outlined in the Socio-economic Working Paper (**Appendix M**), signage will be provided in accordance with Transport signage policy to inform the travelling

Issue category	Consultation period	Issues raised	How issue has been addressed
	2016	• Consider using audio tactile line markings for road safety • Consider directional signage for Newcastle Airport • Consider directional signage for businesses in Heatherbrae, similar to tourist signage	public about services in Beresfield and Heatherbrae. Transport would also consider destinations such as Newcastle Airport, and tourist amenities when planning signage. All project signage and road marking would be designed in accordance with the current Australian Standards and Transport guidelines.
Rest areas	2016	• Consider acquiring nearby land for service centres, to provide rest stops and generate revenue for ongoing road maintenance • Location of rest areas and access to rest areas to consider heavy and oversized vehicles	There are no plans to provide additional rest areas or service centres as part of the project. Access to existing service centres and rest facilities would be via the new interchanges at Black Hill, Tarro, Tomago and Raymond Terrace.
Road safety	2015	• Concern about weather conditions, such as fog, affecting road safety along the project	Weather conditions have been considered during development of the project design. Elements of the project design, such as guidepost locations and spacings, speed restrictions and signage have been selected to improve safety along the project in times of adverse weather conditions. The safety and risks of the project are considered in **Chapter 22** (safety and risk).
M1 Pacific Motorway / Pacific Highway cross over	2015	• Consider whether the motorway be bridged over the Pacific Highway near the HRBG • Consider leaving the existing highway as is for ease of construction	There are many constraints at the location near the HRBG where the project and Pacific Highway would cross. The design through this area has minimised the impacts on adjoining land uses while achieving the appropriate road design requirements. A bridge over either the main alignment or the Pacific Highway needs to enable ongoing operation of the highway during construction and be cost-effective. The complexity and constructability of any bridge structure has been a key issue considered during design development. A new access road would be provided from the Pacific Highway to maintain direct access to the HRBG, passing under the bridge (B09) on the main alignment, as shown in **Figure 5-1** of **Chapter 5**.

Issue category	Consultation period	Issues raised	How issue has been addressed
Black Hill interchange	2015	• Southbound ramps from the motorway should be retained • Access to Lenaghans Drive should be adjusted and upgraded	The design as assessed in this EIS reduces the amount of southbound traffic exiting the motorway and travelling through the Weakleys Drive and John Renshaw Drive intersection. Southbound motorway traffic wishing to access John Renshaw Drive, Weakleys Drive, Lenaghans Drive or the New England Highway would exit the motorway at Tarro interchange. The left in/left out arrangement at Lenaghans Drive would be retained. The Black Hill interchange is described and shown in **Section 5.3.3**.
Raymond Terrace interchange	2015	• Request to consider a full interchange with all movements for improved access	A full interchange at the northern end of the project is not required. Motorists wishing to access the project's main alignment from Heatherbrae can continue south on the Pacific Highway and join the main alignment via the Tomago interchange. The Tomago and Raymond Terrace interchanges are shown and described in **Section 5.3.3**.
Tarro interchange	2015	• Concern about the existing and future operation of the New England Highway at the proposed Tarro interchange, particularly in relation to weaving and merging	Transport have considered existing and future merging and weaving issues on the New England Highway during the design of the Tarro interchange. Since the public display of the concept design, a number of design refinements have occurred at the Tarro interchange, as discussed and shown in **Section 5.3.3**. Tarro interchange would improve merge conditions at this location by providing six lanes along the New England Highway between John Renshaw Drive and the existing Tarro interchange, and extend the length of the existing eastbound merging lane from John Renshaw Drive. The current arrangements and locations for interchanges are the best options for the project and are considered to best connect to the existing road network
	2016	• Design changes to the Tarro interchange	
M1 Pacific Motorway / Weakleys Drive intersection	2015	• Concern about the proposed traffic lights. Further grade separation should be considered at the intersection	The M1 Pacific Motorway/Weakleys Drive intersection was upgraded from a roundabout to traffic signals as part of a separate project to improve the operational performance of the existing roundabout. The Weakleys Drive and John Renshaw Drive intersection upgrade was completed in March 2019.
Tomago Road intersections	2015	• Concern about the number of lanes on the proposed new link road from the Tomago interchange and connection with the existing road network	As a result of further design review identifying constraints, the link road at Tomago has been removed from the project. The Tomago interchange, which provides a major interchange at Old Punt Road to service traffic movements to and from Tomago and would cater for heavy and oversized vehicles, is described in **Section 5.3.2**.

Issue category	Consultation period	Issues raised	How issue has been addressed
	2016	• Concern over traffic congestion at the intersection of the new link road and Tomago Road • Request to provide access to the Pacific Highway from the new link road • Consider heavy and oversized vehicles in the design of the link road at Tomago • Ensure that new link road is designed in line with future growth requirements	Potential traffic and transport impacts have been addressed in the Traffic and Transport Working Paper (**Appendix G**). A summary of the assessment is provided in **Chapter 7** (traffic and transport). The assessment considered long term growth to ensure the project caters for the forecasted traffic volumes.
Masonite Road	2015 2016	• Bridging Masonite Road over the proposed motorway will cause traffic issues during construction	Masonite Road would be shifted slightly to the south where it crosses over the main alignment. This would allow the bridge (B10) to be built away from the existing road, reducing impacts to motorists during construction, as discussed in **Section 5.3.2**.
Community consultation			
Consultation	2015	• Consultation with stakeholders and community should continue	Transport will continue to engage with stakeholders and the community throughout the development and delivery of the project, as discussed in **Section 6.4**.
	2016	• Consultation with the community and business owners about the project should continue during construction and operation	

6.3.4 Issues raised by the Aboriginal community

Consultation with Aboriginal stakeholders was carried out to address the requirements of the relevant statutory requirements and Government policies, including the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a) with guidance from the PACHCI (Roads and Maritime Services 2011b) and has involved meetings with affected Aboriginal stakeholder groups, site surveys attended by RAPs, and test excavations attended by site officers. Key issues raised by the Aboriginal stakeholders and how they were addressed are outlined in the ACHAR (**Appendix L**) and summarised in **Chapter 12** (Aboriginal cultural heritage).

6.4 Future consultation

Following the EIS public display period, Transport will continue to identify and manage issues of interest or concern to the community during the EIS assessment and approval process, including during detailed design and construction. Ongoing consultation would be carried out to provide the community with:

- Accurate and accessible information regarding the processes and activities associated with the project
- Information in a timely manner
- Appropriate ways for providing comment or raising concerns
- A high level of responsiveness to their issues and concerns throughout development and delivery of the project.

6.4.1 Consultation during public display of the EIS

To guide ongoing communication and consultation, a draft Community Consultation Framework has been prepared and is provided in **Appendix E**. The draft Community Consultation Framework will guide the development of a Community Communication Strategy, as outlined in **Chapter 13** (socio-economic). The strategy will enable appropriate consideration and balancing of community and stakeholders' issues to achieve best project outcomes. Transport will continue to update the local community and identified stakeholders about relevant activities and other project updates using the engagement channels outlined in the CSEP.

DPIE will place this EIS on public display for a minimum of 28 days. During the public display period, government agencies, project stakeholders and community members will be able to review the EIS and provide feedback via a written submission to DPIE for consideration in its assessment of the project.

Advertisements will be placed in newspapers to advise the community of the public display and other relevant information. This will include any locations where the EIS can be viewed and details of planned consultation activities and information sessions.

Electronic copies of the EIS will be made available for viewing and download from the DPIE website.

Staffed displays and stakeholder/community meetings will be held during the public display of the EIS to enable community representatives to ask questions and to provide further information for consideration in the assessment process. During the EIS display, the community, government agencies and other interested parties are invited to make written submissions on the project to the DPIE.

Following public display of the EIS, the Secretary will provide copies of submissions to Transport or a report containing a summary of the issues raised. The Secretary may then require Transport to prepare a submissions report to respond to the issues raised in submissions or may require a Preferred Infrastructure Report (PIR) to outline any proposed changes to the project. If significant changes to the project are proposed the Secretary may make the PIR publicly available.

The Secretary will prepare a Secretary's environmental assessment report and provide it to the Minister for Planning and Public Spaces. The Minister for Planning and Public Spaces will then decide whether or not to approve the project and the conditions to be attached.

Preparation of the submissions report

At the end of the public display period, Transport will review any submissions received and prepare a submissions report and/or PIR if required. These reports will respond to the issues raised and outline any proposed changes to the project. This report will be made available to the public.

Refer to **Chapter 2** for further information on the approvals process following EIS public display.

6.4.2 Consultation during construction stages

Based on the expected timeframes for the project, the main construction activities are likely to begin in 2023, with some enabling work following project approval. Enabling work is further discussed in **Section 5.4.13**. Transport will continue to carry out further investigations and surveys before construction.

Consultation with stakeholders and the community during construction (including detailed design) will focus on providing updates on activities and program, responding to enquiries and concerns in a timely manner, and minimising potential impacts where possible.

Complaints management procedure

A dedicated community relations team will handle and investigate complaints during delivery of the project.

All contact relating to the project will be collected, documented and stored in the Consultation Manager database. This will include incoming and outgoing correspondence, phone and verbal contact, written submissions and any corresponding actions taken.

Regular reports summarising community issues and complaints will be used to help inform the delivery process. Consultation Manager will record the following details:

- Method of communication
- Full name, address and contact details of enquirer
- Date and time of enquiry
- Nature of the enquiry
- Names of people involved throughout
- Sentiment.

If a complaint is received the following details will be recorded in Consultation Manager as part of the complaints management record:

- Date and time complaint received
- Type of communication (letter/email/phone call)
- Name, address and contact number for complainant
- Nature of the complaint
- Action taken in response, including follow up with the complainant
- Details on whether a resolution was reached
- Details on whether mediation was required/used
- Monitoring to confirm the complaint was resolved.

Complaints will be acknowledged and responded to in a timely manner. When a complaint cannot be responded to immediately, a follow-up verbal response on what action is proposed will be provided to the complainant. A written response to the person raising a complaint will also be provided.

Regular meetings between the Transport Community and Stakeholder Engagement team and the dedicated contractor community relations team will help provide a forum for peer review and a basis for continual improvement in complaint management response.

Follow-up monitoring will be carried out to ensure any complaints are resolved satisfactorily.

The complaints management procedure outlined above will be in place for the duration of construction.