

Manns Road upgrade – Southbound approach to Stockyard Place intersection

Volume 1 Review of Environmental
Factors

Roads and Maritime Services | May 2019



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Volume 1 Review of Environmental Factors

Roads and Maritime Services | May 2019

Revision 2

Prepared by GHD Pty Ltd and Roads and Maritime Services

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Executive summary

This document is a Review of Environmental Factors (REF) for the upgrade of Manns Road at the southbound approach to Stockyard Place intersection, West Gosford (the proposal) as required under Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The purpose of this REF is to describe the proposal and its potential impact on the environment and to detail the protective measures (safeguards) which would be implemented during construction and operation.

The proposal

Roads and Maritime Services (Roads and Maritime) is planning a future upgrade of the southbound approach to Stockyard Place intersection on Manns Road, West Gosford (the proposal). The proposal is located within the Central Coast Council local government area (LGA) and extends along Manns Road for about 300 metres.

Key features of the proposal include:

- Providing an additional lane on Manns Road at the intersection for southbound traffic to provide:
 - a single dedicated right turn lane onto Stockyard Place
 - a single dedicated left turn lane into the Home Central commercial retail centre
 - dual through lanes
- Widening of Manns Road to the east from 270 metres north of the intersection to increase from one to two traffic lanes southbound
- Providing a central median on Manns Road from the intersection to about 125 metres north
- Providing a 1.5 metre wide footpath along the east of Manns Road north of the intersection
- Slight relocation of the shared pedestrian and cycle crossing on the east side of the intersection and retention of the shared pedestrian and cycle crossing on the north side of the intersection
- Upgrading and extending drainage infrastructure and stormwater management
- Relocating multiple public utility assets to allow road widening for the intersection upgrade, including undergrounding some existing overhead electricity cables
- Adjusting property boundary fencing, service connections and driveways to accommodate the road upgrade
- Asphalt pavement re-sheeting and line marking on Manns Road north of the intersection (southbound and northbound lanes) and across Stockyard Place to the east of the intersection.

Two construction compound areas are proposed for the work, one located between Dyer Crescent, Manns Road and the Pacific Highway and the other on the southwest corner of the Dell Road and Manns Road intersection.

The proposal is part of an ongoing larger plan to progressively upgrade Manns Road and the Pacific Highway between the Central Coast Highway at West Gosford and the M1 Pacific Motorway at Ourimbah.

Need for the proposal

The southbound approach to Stockyard Place intersection requires upgrade for the following reasons:

- **Congestion and delays** – there is currently congestion and delays experienced in the proposal footprint, particularly at the southbound approach to Stockyard Place during afternoon peak period. Upgrade of the southbound approach to Stockyard Place intersection would reduce congestion and delays by up to 62 seconds per vehicle and improve traffic flow with an increase in traffic speed to be more consistent with the posted speed limit of 60 kilometres per hour.

- **Safety** – there have been a number of crashes in the section between Carnarvon Road and Stockyard Place as a result of a turning vehicle or vehicle waiting to turn right in the centre lane. The proposal would improve the safety of Manns Road by reducing congestion and allowing a more consistent travel speed and also by providing a short length of raised central median between northbound and southbound lanes, which would reduce crashes from turning across oncoming traffic.
- **Public and active transport** – There is currently limited pedestrian and cycle facilities within the proposal footprint. The proposal would extend an existing pedestrian footpath and cycle lanes along the west of Manns Road to promote active transport opportunities.

As an early phase of the final Stage 5 upgrade between Stockyard Place and Narara Creek Road (currently in planning), it also contributes to the larger strategic objectives for the Pacific Highway and Manns Road corridor, which is being progressively upgraded to improve road user safety and road capacity to reduce travel time and meet forecast future traffic volumes.

Proposal objectives

The objectives of the proposal are to:

- Provide safer, more efficient travel and improved local access for motorists, pedestrians, cyclists and road freight operators
- Provide increased infrastructure capacity which promotes the long-term development of Manns Road on the Central Coast
- Improve facilities for the efficiency of public transport
- Encourage active transport alternatives
- Reduce vehicle operating costs by reducing delays
- Minimise disturbances and delays to traffic during construction.

The overall proposal goal is to achieve the best possible result for each of the objectives, while minimising the impact on the environment and local community.

Options considered

- **Option 1 – do nothing.** Retain the existing intersection as it is
- **Option 2 – do minimal.** Retain the existing road layout but incorporate more formalised pedestrian and cycle facilities through lane markings and traffic lights
- **Option 3 – upgrade the intersection.** Upgrade the intersection for one of the following three extents:
 - Option 3a: Upgrade Manns Road from Stockyard Place intersection to the un-named tributary of Narara Creek (northbound and southbound lanes)
 - Option 3b: Upgrade Manns Road from Stockyard Place intersection to about 300 metres north, northbound and southbound lanes
 - Option 3c: Upgrade Manns Road from Stockyard Place intersection to about 300 metres north, southbound lanes only.

Option 3c was selected as the preferred option, as it addresses the key objective of improving level of service for the lowest cost. The work remaining from other options would be addressed as part of future proposals in the remaining Manns Road upgrade, Stage 5, which would be assessed via a separate environmental impact assessment at a later date.

Statutory and planning framework

Clause 94 of *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is for road infrastructure facilities and is to be carried out by Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required. This review of environmental factors (REF) has been prepared as part of the assessment process.

Community and stakeholder consultation

Roads and Maritime has consulted with potentially affected property owners, community members, relevant government agencies and other stakeholders. Roads and Maritime has extensively consulted with Central Coast Council in accordance with the requirements of the Infrastructure State Environmental Planning Policy (ISEPP).

Consultation for development of the proposal included surveys with a sample of businesses along Manns Road between Stockyard Place and Carnarvon Road. Consultation with local Aboriginal stakeholders has also been carried out in accordance with the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation.

Roads and Maritime would continue to consult with the community and stakeholders as planning and construction progresses. Information about the wider program to upgrade the Pacific Highway and Manns Road on the Central Coast (Stages 1 to 5) is also available on the Roads and Maritime website at rms.nsw.gov.au/projects/centralcoast.

Environmental impacts

A number of detailed technical investigations were completed to assess the potential impacts of the proposal and to identify activities to manage and mitigate these impacts.

The beneficial effects of the proposal would include:

- Improved road safety at Stockyard Place intersection
- Improved pedestrian and cyclist safety through the provision of a shared pathway
- Reduced congestion and improved travel times for vehicles travelling both northbound and southbound on Manns Road through the intersection.

The key potential adverse effects of the proposal would include:

- **Noise and vibration –**

The operational noise assessment identified no sensitive receivers which would qualify for consideration of road traffic noise treatment as a result of the proposal.

During construction some temporary noise impact is anticipated, with up to 14 sensitive residential receivers predicted to be noise affected for work carried out during standard hours, with minor intrusive impacts of up to 10 dB(A). Given the distances to residential receivers from the proposal, general construction activities during standard hours are not expected to result in significant impacts. No sensitive residential receptors were predicted to be highly noise affected.

Up to 45 sensitive non-residential receivers (commercial buildings) are also predicted to be noise affected and exceed construction noise management levels. Impacts include those related to the operation of construction compounds located at distance from the main road construction activities.

If construction activities are carried out outside of standard hours (including compound operation), this has the potential for some temporary noise impacts on residential receivers outside of the industrial area including small exceedances (6 dBA) of night time construction noise levels at three residential properties on Boolari Road for road construction, but no highly noise affected levels. For construction compound operations it was predicted these would result in up to moderately intrusive impacts (up to 22 dBA) at night time across all the noise catchments described in the REF. Compound establishment including demolition, would not occur in evening and night periods as it is likely to cause moderately to highly intrusive noise impacts (more than 30 dB(A) above background levels).

It is highly unlikely all construction equipment would be operating at their maximum sound power levels at any one time and certain types of construction machinery would be present in the proposal footprint near to a receiver for only brief periods during construction activities. As a result, the REF findings represent a maximum noise level based on the noise modelling and are not necessarily representative of the continuous impact over a full construction period.

An assessment of predicted vibration levels from construction activities shows that there would be some small short-term increases in localised vibration levels, particularly for sensitive residential and non-residential receivers located close to the proposal site; however, the expected magnitude of ground vibrations should not be sufficient to cause damage if equipment operates at distances greater than 13 metres from standard residential buildings or structures of similar construction. Within this distance additional investigation of sensitivities of building types, alternative equipment and methods and monitoring for impacts would be required.

A Construction Noise and Vibration Management Plan will be prepared to manage noise and vibration caused by the proposal through implementing reasonable and feasible mitigation measures that would include selecting less noisy construction equipment, scheduling work to minimise out of hours work activities, providing respite periods and targeted community consultation, implementing buffer zones where practical and monitoring impacts.

- **Traffic and access –**

Upgrade of the southbound approach to Stockyard Place intersection would reduce congestion and delays by up to 62 seconds per vehicle and improve traffic flow with an increase in traffic speed to be more consistent with the sign posted 60 kilometre per hour speed limit.

Access for up to four commercial properties would become restricted to a left in – left out movement due to the necessary addition of the central median north of Stockyard Place. Alternative routes for access to these properties are available and would result in only a minor detour via nearby side streets. Ongoing engagement with affected businesses and properties would continue through design development and construction regarding alternative access.

During construction, short-term restricted access and congestion is likely within the proposal footprint. Areas affected by construction would be staged to minimise the impact to receivers as much as possible, with a requirement for maintaining temporary and alternative access for vehicles and pedestrians to commercial premises implemented through a *Traffic Management Plan*, at all times during construction.

- **Biodiversity –**

The proposal would remove and/or impact about 0.74 hectares of planted and exotic vegetation comprising exotic grassland and native planted and remnant trees. The proposal footprint comprises a highly modified, urban environment with limited fauna habitat values. No threatened species or communities were identified or would be impacted.

One medium sized tree with small hollows will be investigated further for preservation in design development and managed through the *Construction Environmental Management Plan*.

- **Socio-economic –**

During construction there would be a temporary inconvenience to the local community and businesses as a result of traffic congestion, altered access and reduced amenity due to noise and dust impacts. Ongoing engagement with property owners and businesses and a number of Management plans identified in this REF implemented through a *Construction Environmental Management Plan* will reduce impacts on the local community and businesses.

In the long-term, the community would benefit from reduced congestion, improved cycle and pedestrian facilities and a safer road.

Small strip acquisitions of five private commercial lots are anticipated. A small loss in area currently used for storage or car parking spaces would potentially occur for three of these commercial properties and there could be some loss of infrastructure such as fencing, although small reconfigurations such as line marking or concrete within properties as part of negotiated adjustments in design would alleviate some of these impacts.

Other impacts during operation would vary depending on individual owner circumstances, however, as the proposed acquisitions are small and restricted to open or landscaped property frontages along Manns Road, it is expected the activities currently conducted at the affected properties could be resumed and sustained on residual land not subject to acquisition.

Justification and conclusion

The southbound approach to the Manns Road Stockyard Place intersection is in a strategic location as it services the industrial area of West Gosford and is near the connection of Manns Road to the Central Coast Highway. It is currently an intersection controlled by traffic lights, and the proposal would create a safer approach to the intersection by providing an additional turning lane for better access to retail and industrial services along Manns Road surrounding the proposal.

The proposal is considered to be justified as it would reduce existing and forecast traffic delays and congestion along Manns Road near the intersection. The proposal would provide extended pedestrian footpaths and cycle lanes to promote a well-connected community with active transport opportunities.

The proposal is considered to be consistent with Government strategic planning at Commonwealth, State and regional levels as it would lead to improved efficiency and safety of the road network.

While there would be some environmental impacts as a consequence of the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards. The beneficial effects are considered to outweigh the adverse impacts and risks associated with the proposal.

The proposal is subject to assessment under Division 5.1 of the EP&A Act. This REF has examined and considered all matters affecting or likely to affect the environment by reason of the proposed activity.

Display of the review of environmental factors

This review of environmental factors is on display for comment between 20 May 2019 and 14 June 2019. You can access the documents in the following ways:

Internet:

The documents are available to view or download on the Roads and Maritime Services website at rms.nsw.gov.au/mannsroad.

Display:

The review documents can be viewed at the following locations:

- Central Coast Council's Gosford Office on Mann Street

How can I make a submission?

To make a submission on the proposal, please send your written comments to:

Roads and Maritime Services
Central Coast Office
Locked Bag 2030
Newcastle NSW 2300

Email: central.coast.office@rms.nsw.gov.au

Submissions must be received by 5pm 14 June 2019.

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Where the respondent indicates at the time of supply of information their submission should be kept confidential, Roads and Maritime Services will attempt to keep it confidential. However there may be legislative or legal justification for the release of the information, for example under the Government Information (Public Access) Act 2009 or under subpoena or statutory instrument.

The supply of this information is voluntary. Each respondent has free access at all times to the information provided by the respondent but not to any identifying information provided by other respondents if a respondent has indicated the representation should be kept confidential. Any respondent may make a correction to the information they have provided by writing to the same address the submission was sent.

The information will be held by Roads and Maritime Services, Level 2, 1 Bryant Drive, Tuggerah NSW 2259.

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Volume 2

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- Appendix F Socio-economic impact assessment
- Appendix G Aboriginal heritage assessment
- Appendix H Noise and vibration assessment
- Appendix I Traffic and transport report

1. Introduction

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) is planning a future upgrade of the southbound approach to Stockyard Place intersection on Manns Road, Gosford (the proposal). The proposal is located within the Central Coast Council Local Government Area (LGA) and extends along Manns Road for about 300 metres.

The surrounding land use comprises a well-developed general industrial area with warehouses, offices and commercial / retail buildings on both sides of the road.

The proposal comprises an early phase of work within Stage 5 (Stockyard Place, West Gosford to Narara Creek Road, Narara) of the larger ongoing program to upgrade the Pacific Highway and Manns Road corridor between the Central Coast Highway at West Gosford and the M1 Pacific Motorway at Ourimbah (Figure 1-1).

The proposal is about 300 metres in length, and extends north of the Manns Road / Stockyard Place intersection. Key features of the proposal would include:

- Provision of an additional lane on Manns Road at the intersection for southbound traffic to provide:
 - a single dedicated right turn lane onto Stockyard Place
 - a single dedicated left turn lane into the Home Central commercial retail centre
 - dual through lanes
- Widening of Manns Road to the east from 270 metres north of the intersection to increase from one to two traffic lanes southbound
- Providing a central median on Manns Road from the intersection to about 125 metres north
- Providing a 1.5 metre wide footpath along the east of Manns Road north of the intersection
- Slight relocation of the shared pedestrian and cycle crossing on the east side of the intersection and retention of the shared pedestrian and cycle crossing on the north side of the intersection
- Upgrading and extending drainage infrastructure and stormwater management
- Relocating of multiple public utility assets to allow road widening for the intersection upgrade, including undergrounding some existing overhead electricity cables
- Adjusting property boundary fencing, service connections and driveways to accommodate the road upgrade
- Asphalt pavement re-sheeting and line marking on Manns Road north of the intersection (southbound and northbound lanes) and across Stockyard Place to the east of the intersection.

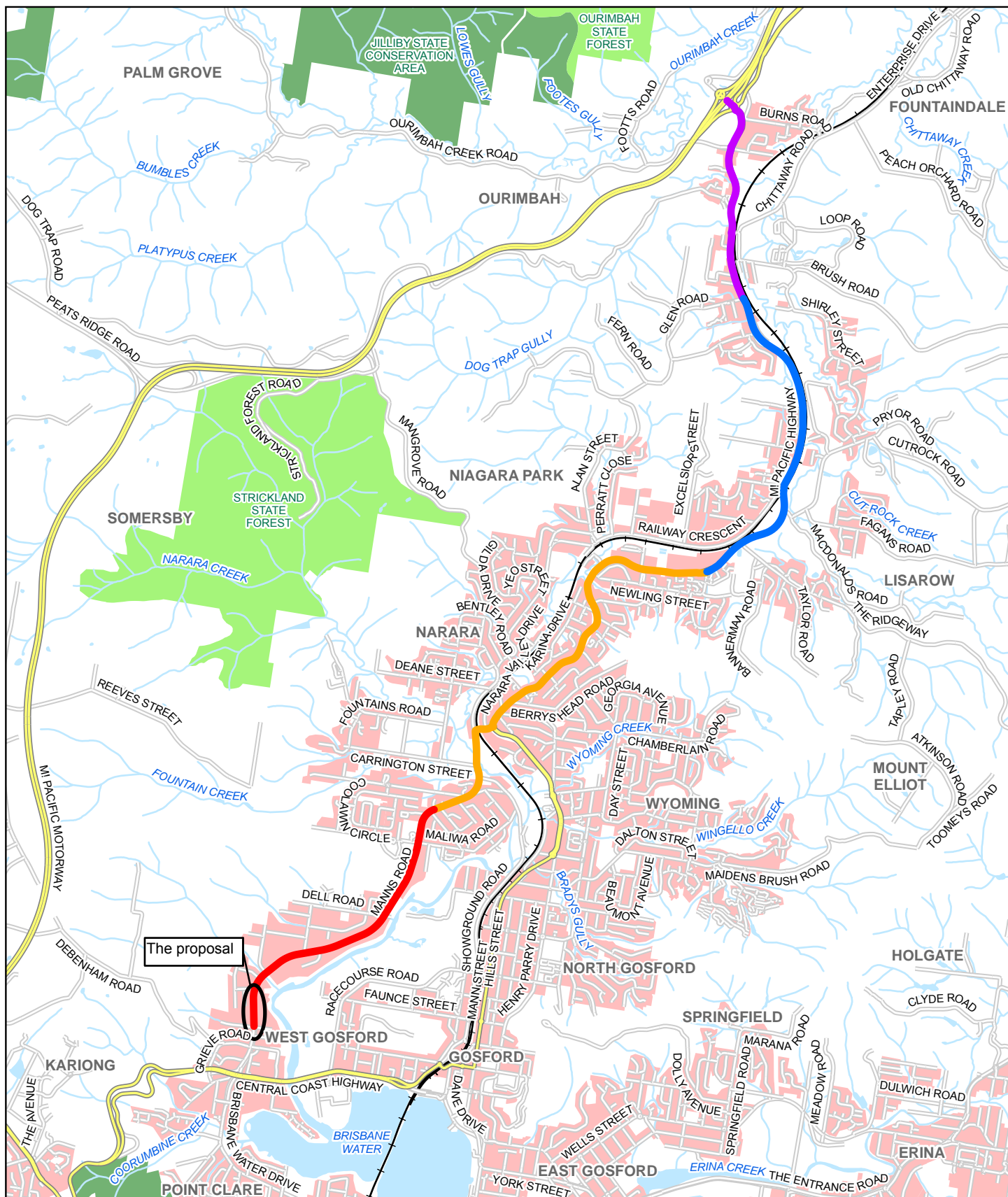
Two construction compound areas are proposed for the work, one located between Dyer Crescent, Manns Road and the Pacific Highway and the other on the southwest corner of the Dell Road and Manns Road intersection.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. Chapter 3 describes the proposal in more detail.

In this report, the following terms and definitions are used:

- Stage 5: the fifth stage of upgrade work for the Pacific Highway and Manns Road between the Central Coast Highway at West Gosford and the M1 Pacific Motorway at Ourimbah. Stage 5 comprises the Manns Road upgrade from Stockyard Place, West Gosford to Narara Creek Road, Narara (a)

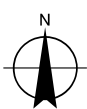
- The proposal: Manns Road upgrade – Southbound approach to Stockyard Place intersection, as outlined in Section 1.1 and Figure 1-2 of this REF
- Proposal footprint: areas which would be directly impacted by construction of the proposal including the operational design, additional areas for possible stockpiles and compounds, temporary public and construction access, private property adjustments such as driveways and fences, and public utility relocations.



LEGEND

The proposal	Stage 5 (this Project)	Railway	Waterbody
Stages 1 & 2	Major road	Watercourse	State Forest
Stage 3	Minor road	Built up area	Reserve
Stage 4			

Paper Size A4
0 350 700 1,050 1,400
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Roads and Maritime Services
Manns Road Upgrade
Review of Environmental Factors
for Stockyard Place Intersection Upgrade

Job Number 22-19033
Revision 1
Date 05/10/2018

Location of the proposal

Figure 1-1

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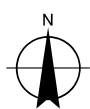
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LEGEND

- | | |
|--------------------|------------------------|
| Watercourse | Design Features |
| Proposal footprint | Earthworks |
| Concept design | Median |
| | Pavement |

Paper Size A4
 0 10 20 30 40
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



Roads and Maritime Services
 Manns Road Upgrade
 Review of Environmental Factors
 for Stockyard Place Intersection Upgrade

Job Number 22-19033
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 Date 05/10/2018

The proposal

Figure 1-2

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1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by GHD on behalf of Roads and Maritime. For the purpose of these work, Roads and Maritime Services is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and associated environmental impacts have been carried out in the context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act including that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the need for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in Section 1.7 of the EP&A Act and therefore the requirement for a species impact statement or a biodiversity development assessment report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility the proposal may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

Manns Road and the Pacific Highway between the Central Coast Highway at West Gosford and the M1 Pacific Motorway at Ourimbah is a strategic route for access to and from the M1 Pacific Motorway in the north and the light industrial areas accessed along this route. The Pacific Highway and Manns Road are being progressively upgraded to date in a north to south direction to improve road user safety and road capacity to reduce travel time and meet forecast future traffic volumes. The M1 Pacific Motorway to Ourimbah Street being Stages 1 to 3A have been constructed, Stage 3B between Ourimbah Street and Parsons Road is being prepared for construction starting in 2019 and Stage 4 is in early design planning, with the stage between Stockyard Place and Narara Creek Road (Stage 5), of which this proposal is part, now currently in planning.

The proposal at the southbound approach to Stockyard Place intersection is intended to be constructed before remaining Stage 5 work to contribute to an early improvement in the traffic flow and safety on Manns Road in a timely and economic manner and allows the time to fully plan, program, fund and complete other future work. The southbound approach to Stockyard Place intersection is in a strategic location as it services the industrial area of West Gosford and is near the connection of Manns Road to the Central Coast Highway. It is a signalised intersection, and the proposal would create a safer approach to the intersection by providing an additional turning lane for better access to retail and industrial services in the area.

The proposal is needed for the following key reasons:

- **Congestion and delays** – there is currently up to 22,000 vehicles per day using Manns Road within the proposal footprint, with congestion and delays being experienced during peak periods. The upgrade would reduce congestion at the Manns Road and Stockyard Place intersection, particularly during the weekday afternoon peak hour. Traffic modelling indicates by 2036, without implementation of the proposal, Stockyard Place intersection and the northbound and southbound approaches are predicted to operate at a low level of service “F” in peak travel times, with average delays of up to 102 seconds per vehicle. Upgrade of the southbound approach to Stockyard Place intersection would reduce congestion and delays by up to 62 seconds per vehicle and improve traffic flow with an increase in traffic speed through the proposal footprint to be more consistent with the signposted 60 kilometre per hour speed limit.
- **Safety** – Reduced congestion and a more consistent travel speed as a result of the upgrade would improve safety in the proposal footprint. Further, the existing northbound and southbound lanes on Manns Road are separated by road markings which can be crossed by road users, reducing safety for other motorists. In the five years between 2013 and 2017 there were 13 crashes on Manns Road between Carnarvon Road and Stockyard Place intersections. The majority of crashes occurred as a result of a turning vehicle or vehicle waiting to turn right in the centre lane. The proposal would improve the safety of Manns Road by providing a raised central median between northbound and southbound lanes, which would reduce crashes from turning across oncoming traffic.
- **Public and active transport** – There is currently limited pedestrian and cycle facilities within the proposal footprint. The proposal would extend the length of an existing pedestrian footpath and cycle lanes along the west of Manns Road to promote a well-connected community with active transport opportunities.

The proposal also addresses a number of plans and strategies for the region and the State, as described in the following sections.

2.1.1 NSW Future Transport Strategy 2056

The NSW Future Transport Strategy 2056 is an update of NSW's Long Term Transport Master Plan. The strategy sets the 40 year vision, directions and outcomes framework for customer mobility in NSW, which will guide transport investment over the longer term. It will be delivered through a series of supporting plans. The strategy includes regional NSW committed initiatives for the next 10 years (up to 2026), which specifies upgrade of the Pacific Highway and Manns Road from Central Coast Highway to Narara Creek Road. The proposal forms an integral part of this initiative.

2.1.2 NSW Road Safety Strategy 2012-2021

The NSW Road Safety Strategy 2012-2021 (NSW 2021) establishes the direction of road safety in NSW for the next 10 years. The strategy supports the short-term action of the National Road Safety Strategy 2011-2020. NSW 2021 aims to improve road safety by identifying and upgrading black spots, promoting safety features in cars, enforcing speed limits and other road rules, and education to encourage road users to take less risks on NSW roads.

The key directions identified within the national and state strategies are considered consistent with the objectives of the proposal (refer to Section 2.3) and the anticipated outcomes of the proposal, in particular the provision of a central raised median between northbound and southbound lanes north of the intersection. The proposal would also provide additional turning lanes, increasing capacity at the intersection, reducing traffic queues and potential crashes.

2.1.3 Central Coast Regional Plan 2036

The Central Coast Regional Plan 2036 is the NSW Government's 20 year plan which will guide land use planning priorities and decisions. The strategy identifies an additional 41,500 dwellings and 24,674 new jobs are to be generated on the Central Coast to provide for the additional 75,500 people predicted to be living on the Central Coast by 2036.

To achieve this vision, the NSW Government has set four goals for the region:

- A prosperous Central Coast with more jobs close to home
- Protect the natural environment and manage the use of agricultural and resource lands
- Well-connected communities and attractive lifestyles
- A variety of housing choice to suit needs and lifestyles.

The proposal is not specifically identified in the strategy, however, it would provide improved access between the M1 Pacific Motorway and the Central Coast Highway and increase pedestrian and cycle connections along the Southern Growth Corridor, which contributes to the goals of the plan.

2.1.4 Regional NSW Services Infrastructure Plan 2056

The Regional NSW Services Infrastructure Plan 2056 is an overarching strategy that provides a long term strategic vision at the state wide level for regional NSW. The strategy is a 40 year vision for how transport can support growth and the economy of NSW.

To achieve this vision, the NSW Government has set six outcomes to guide investment, policy and reform and service provision:

- Customer focused
- Successful places

- A strong economy
- Safety and performance
- Accessible services
- Sustainable.

The strategy identifies four goals for the Central Coast region:

- A prosperous Central Coast with more jobs close to home
- Protect the natural environment and manage the use of agricultural and resource lands
- Well-connected communities and attractive lifestyles
- A variety of housing choice to suit needs and lifestyles.

The proposal is not specifically identified in the strategy, however, it would provide improved access between the M1 Pacific Motorway and Manns Road and increase pedestrian and cycle connections, which contributes to the four goals for the Central Coast region.

2.1.5 Central Coast Regional Transport Plan 2013

The Central Coast Regional Transport Plan 2013 (NSW Government 2013a) outlines specific actions to address the unique challenges of the area and looks at population changes in the Central Coast region, including the expected 21 per cent increase in population projected over the next 20 years.

The plan commits to investment in the urban road network to:

- Improve road safety
- Make walking and cycling easier and safer
- Address capacity constraints which impact on travel time reliability and public transport operations.

While the proposal is not specifically mentioned in the plan, it is consistent with the key commitments as it would provide improved safety by adding a raised central median to prevent turning across oncoming traffic, provide walking facilities and reduce travel times for vehicles and public transport.

2.2 Existing infrastructure

This section describes the existing roads and infrastructure in the area, which has helped define the need for the proposal and options available.

2.2.1 Road configuration

Manns Road is a state road (MR349) providing a critical north-south link together with the Pacific Highway between M1 Pacific Motorway at Ourimbah and the Central Coast Highway at West Gosford. It has a posted speed limit of 60 kilometres per hour, while Stockyard Place is a 50 kilometres per hour zone. The existing Stockyard Place and Manns Road intersection is controlled with traffic lights which provide for all turning movements for both Manns Road and Stockyard Place. Line markings on Manns Road southbound identify a right turn bay onto Stockyard Place westbound, while no left turn bay is currently identified. The existing southbound kerbside through/left turn lane was initially provided by the Home Central commercial retail centre as part of their development application approval requirements. As an interim measure Roads and Maritime remarked this lane as part of the upgrade of the Central Coast Highway and Manns Road intersection upgrade project. Existing lane widths at the southbound approach to the intersection are 3.2 (right turn lane), 3.5 (through lane) and 3.5 (combined through and left turn lane) metres.

Manns Road to the north of the intersection is currently one lane (3.5 metres wide) in each direction with no central median and multiple access points including private business driveways. Remaining areas of roadside currently are grassed verges with open surface drainage.

South of the intersection, Manns Road has recently been upgraded as part of the Central Coast Highway / Manns Road intersection and comprises two lanes in each direction with a raised central median. The south, east and west legs of Stockyard Place intersection were also upgraded as part of the previous work. Eastbound from the intersection on Stockyard Place provides direct access to specialist retail premises, while westbound terminates in a cul-de-sac after about 300 metres.

The intersection of Carnarvon Road at the northern extremity of the proposal is not controlled by traffic lights and allows all movements on and off Manns Road. This local intersection is within the proposal footprint but not directly affected by the proposed upgrade design.

2.2.2 Bus facilities

There are three bus stops within the proposal footprint (Figure 2-1), namely:

- Two on the west of Manns Road about 70 and 270 metres north of Stockyard Place intersection
- One on the east of Manns Road about 250 metres north of Stockyard Place intersection.

All bus facilities comprise a bus stop sign only, with no shelter or bus bay.

2.2.3 Pedestrian and cycle facilities

The intersection at Stockyard Place has signals to control pedestrian crossing on all sides of the intersection. Currently pedestrian facilities in the proposal footprint are limited to about 80 metres of concrete footpath on the east of Manns Road from Stockyard Place northwards; otherwise there are no other formal pedestrian paths in the proposal footprint.

Manns Road has narrow road shoulders and one dedicated cycle facility consisting of a painted cycle lane along the northbound and southbound road shoulder throughout the proposal footprint. There currently are no dedicated cycle facilities on the intersecting local roads.

2.2.4 Parking facilities

There currently are no formal on-road parking facilities near the intersection. However, there is uncontrolled parking along the verge of Manns Road and on grassed areas in the road corridor on either side of Manns Road. Off-street parking exists within private businesses to the east and west of the proposal footprint.

2.2.5 Utilities

There are major public utility installations next to existing traffic lanes. Existing known utilities and corresponding authorities which are within the extents of the proposal are:

- Overhead and underground electricity – Ausgrid (11 kilovolt and low voltage)
- Water reticulation – Central Coast Council (diameter nominal 250 millimetre cast iron cemented lined pipe, diameter nominal 600 millimetre pipe)
- Sewer reticulation – Central Coast Council (525, 375 and 150 millimetre diameter pipe)
- Telecommunications – Telstra, NBN, NextGEN, Optus, TPG Communications (conduit and 11 pits)

- Gas reticulation– Jemena (high pressure 105 kilopascal 150 millimetre diameter pipe and 50 millimetre diameter medium pressure pipe 210 kilopascals).

2.2.6 Drainage

Stormwater drainage consists of a mixture of formal kerb and underground pipes and more informal overland flows including grass verges and swales. Manns Road grades in a north-south direction near the Stockyard Place intersection with a crest located just north of intersection. The southern portion of Manns Road in the proposal footprint therefore drains to the south and is collected by an existing drainage around the intersection while the northern portion is collected by existing drainage structures and conveyed to the unnamed creek between Yandina Road and Nells Road.

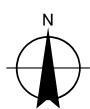
The western side of Manns Road is kerbed with existing pits located at regular intervals and conveyed by drainage pipes in each direction. There is limited existing drainage on the eastern side with only kerb and gutter and a concrete lined dish towards the north.



LEGEND

- Proposal footprint
- On-road cycleway
- Footpath
- Shared pedestrian and cycle crossing
- Bus Stop

Paper Size A4
0 10 20 30 40
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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Date 05/10/2018

Existing infrastructure

Figure 2-1

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2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal are to:

- Provide safer, more efficient travel and improved local access for motorists, pedestrians, cyclists and road freight operators
- Provide increased infrastructure capacity which promotes the long term development of Manns Road on the Central Coast
- Improve facilities for and the efficiency of public transport
- Encourage active transport alternatives
- Reduce vehicle operating costs by reducing delays
- Minimise disturbances and delays to traffic during construction.

The overall proposal goal is to achieve the best possible result for each of the objectives, while minimising the impact on the environment and local community.

2.3.2 Development criteria

The development criteria for the proposal includes:

- Provide a road with a level of service D or better for 2039 forecast traffic volumes
- Provide appropriate facilities for walking and cycling
- Cater for public transport during construction
- Maintain and provide safe access to commercial properties
- Upgrade stormwater drainage and ensure flood immunity is no worse than current
- Maintain existing utilities during construction.

2.3.3 Urban design objectives

Urban design objectives for the proposal are to:

- Ensure the road, intersections and approaches are a sensitive fit within the Manns Road corridor and its setting
- Minimise adverse impacts on surrounding development by considering existing built form and land uses
- Ensure the pedestrian and cycle connections are enhanced to provide better connectivity and improve safety
- Ensure the new roadwork is designed to be integrated with the existing road network and reflect the important role of the road corridor in wayfinding in the network
- Design for low maintenance by incorporating species which are native to the area and materials which are hard wearing and resistant to vandalism.

2.4 Alternatives and options considered

Alternatives and options for the proposal were identified and considered in developing the proposal. A description of each of the options considered and the methods for the selection of the preferred option is summarised in the following sections.

2.4.1 Methodology for selection of preferred option

Options assessment and review for the proposal was conducted throughout the larger Manns Road (Stockyard Place to Narara Creek Road) Stage 5 development, by a number of different methods including:

- Risk and opportunity workshop
- Value management workshop
- Health and safety in design workshop
- Constructability workshop.

At each stage of the options assessment process, a range of factors were considered which generally align with the broader Manns Road (Stockyard Place to Narara Creek Road) Stage 5 strategic objectives and the proposal objectives. These included:

- Improvements to the level of service, travel times and road user safety (including cyclists and pedestrians) for existing and future traffic scenarios
- Reducing property impacts including property access and acquisition
- Avoiding heritage impacts
- Avoiding or reducing flora and fauna impacts including impacts on the bushland area at the ridge
- Managing flooding and drainage impacts, including water quality and wetland impacts
- Constructability, including capacity to be constructed in stages
- Avoiding and reducing the extent of public utility impacts
- Urban design and visual impacts including earthwork on the ridge area.

The identified options for the proposal and an analysis of these options are provided in the following sections.

2.4.2 Identified options

No significant alternatives were investigated or apply to this proposal to upgrade the southbound approach to Stockyard Place intersection. However, the following three options were considered for the proposal:

- **Option 1 – do nothing.** Retain the existing intersection as it is
- **Option 2 – do minimal.** Retain the existing road layout but incorporate more formalised pedestrian and cycle facilities through lane markings and traffic lights
- **Option 3 – upgrade the intersection.** Upgrade the intersection for one of the following three extents:
 - Option 3a: Upgrade Manns Road from Stockyard Place intersection to the un-named tributary of Narara Creek (northbound and southbound lanes), incorporating Carnarvon Road and Yandina Road intersections. Total extent of about 500 metres
 - Option 3b: Upgrade Manns Road from Stockyard Place intersection to about 300 metres north (northbound and southbound lanes), with no upgrade to Carnarvon, Yandina or Nell Roads
 - Option 3c: Upgrade Manns Road from Stockyard Place intersection to about 300 metres north, southbound lanes only.

2.5 Preferred option

The intersection left in its current form (Option 1) or with minor changes to existing traffic lights and lane markings (Option 2) would not meet the current or projected growth in the area, has limited opportunities to further increase alternative transport options and limited capacity to provide for improved pedestrian and cycle connectivity and movements. However, Option 3 would improve safety for motorists, pedestrians and cyclists and improve existing congestion at the approach to the intersection. Option 3c was selected as the preferred option, as it addresses the key objective of improving level of service for the lowest cost, shortest timeframe and minimal disruption.

The remaining work would be carried out as part of the remaining Stage 5 work, which would be assessed via a separate environmental assessment at a later date.

2.6 Design refinements

There have been no major design refinements since selection of the preferred option. The concept design of the preferred option is provided in Chapter 3.

3. Description of the proposal

3.1 The proposal

Roads and Maritime proposes to upgrade about 300 metres of Manns Road at the southbound approach to Stockyard Place intersection.

The concept design is based on available information, site investigations and current Australian and Austroads standards and criteria. Some elements of the design may be further refined during detailed design. The main features are listed below and are shown in Figure 3-1:

- Increasing from three to four traffic lanes on the Manns Road north side of the intersection for southbound traffic to provide an additional through lane from about 200 metres north of the intersection. This adds to the existing single dedicated right turn lane, single dedicated left turn and single through lane
- Increasing the length and associated traffic storage capacity for:
 - the dedicated left turn lane by about 60 metres (from 50 to 110)
 - the dedicated right turn lane by about 30 metres (from 60 to 90)
- Providing a raised central median on Manns Road from the Stockyard Place intersection to about 125 metres north
- Providing a 1.5 metre wide footpath along the east of Manns Road north of the intersection
- Slight relocation of the shared pedestrian and cycle crossing on the east side of the intersection and retention of the shared pedestrian and cycle crossing on the north side of the intersection
- Upgrading and extending drainage infrastructure and stormwater management
- Relocating multiple public utility assets to allow road widening for the intersection upgrade, including undergrounding some existing overhead electricity cables
- Minor adjustments to driveways on the eastern side of Manns Road to limit property acquisition
- Asphalt pavement re-sheeting and line marking on Manns Road north of the intersection (southbound and northbound lanes) and across Stockyard Place to the east of the intersection.

Two construction compound areas are proposed for the work, one located between Dyer Crescent, Manns Road and the Central Coast Highway and the other on the southwest corner of the intersection of Dell Road and Manns Road. Subject to approval and funding availability, it is anticipated construction would start in 2021 and would take about nine to 12 months to complete, weather permitting.

The proposal has been designed to be able to be easily modified to tie into the concept for the future Stage 5 upgrade to the north, should it progress to further design and environmental assessment and construction.

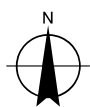
The concept design of the proposal is described in the *Stockyard Place, West Gosford to Narara Creek Road, Narara Concept Design Report* (GHD, 2018a) and the following sections are summarised from that report.



LEGEND

 Proposal footprint	Design Features
 Cadastre	 Verge
 Concept design	 Earthworks
	 Pavement

Paper Size A4
 0 7.5 15 22.5 30
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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Key features of the proposal

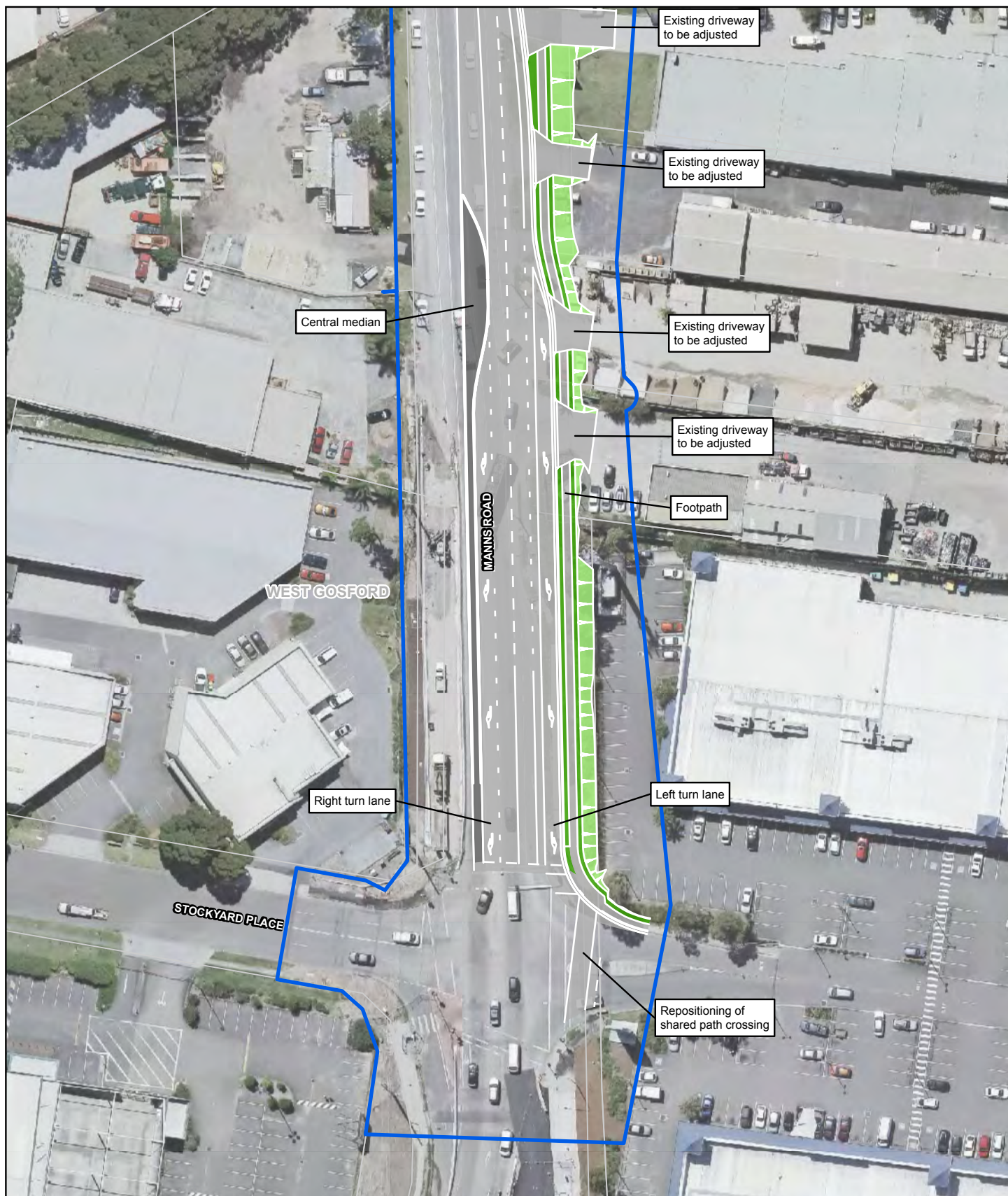
Figure 3-1a

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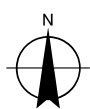
Data source: LPI: DTDB, 2017. RMS: Aerial Imagery, 2017. Created by:tmorton



LEGEND

 Proposal footprint	Design Features
 Cadastre	 Verge
 Concept design	 Earthworks
	 Median
	 Pavement

Paper Size A4
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 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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Key features of the proposal

Figure 3-1b

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3.2 Design

A description of the concept design is provided in the following sections and is illustrated in Figure 3-1, Section 3.1. Concept design plans are included in Appendix B. The concept design would be further refined during the detailed design phase.

3.2.1 Design criteria

Standards

The concept design was prepared in accordance with the following:

- Guide to Road Design – Austroads (Austroads, 2009)
- RTA Supplement to Austroads Guide to Road Design (2011)
- *Road Design Guide* (Roads and Traffic Authority of NSW (undated))
- *Road Safety Audit Manual and Checklist* (Roads and Traffic Authority of NSW, 2005)
- Beyond the Pavement, RTA urban design policy, procedures and design principles (Roads and Traffic Authority of NSW, 2009)
- Roads and Maritime Delineation Manual (Roads and Maritime Services, 2012a)
- Roads and Maritime Road Technical Directions
- *NSW Speed Zone Guidelines* (Roads and Traffic Authority of NSW, 2011a)
- Australian Standards: amended by Roads and Maritime Supplement (Roads and Maritime Services, 2012b).

Design criteria

Key design criteria for the proposal are summarised in Table 3-1. For other elements such as medians and grades, Austroads requirements were followed and supplemented with Roads and Maritime and Central Coast Council requirements where applicable.

Table 3-1: Design Criteria

Design elements	Design criteria (minimum)
Stockyard Place intersection	
Designed to accommodate vehicle size	19 metre semi-trailer
Manns Road	
Design speed	70 km/h
Posted speed	60 km/h
Lane width	3.5 metres
Median width	1.8 to 5.7 metres
Left turn auxiliary	3.5 metres
Right turn auxiliary	3.2 metres
Nearside (kerbside) shoulder width	1.5 metres

Design elements	Design criteria (minimum)
Pedestrian pathway (eastern side for length of proposal)	1.5 metres
Side Roads	
Design speed	60 km/h
Posted speed	50 km/h

Design life

The design life requirements for the proposal are defined in Table 3-2.

Table 3-2: Asset design life requirements

Asset	Minimum Design Life
Inaccessible drainage elements	100 years
Drainage elements which are accessible for refurbishment and maintenance including sedimentation and detention basins	40 years
Sign faces	10 years
Sign support structures and other roadside furniture	40 years
Fences including fauna fences	20 years
Lighting and electrical equipment	20 years
Retaining walls	100 years
Noise barriers, noise attenuation devices and headlight screens	50 years
Pavements <ul style="list-style-type: none"> - Main road including ramps - Local roads 	40 years 20 years
Local road embankment and support structures	100 years
Embankments	100 years
Cut slopes, including slope treatments	100 years
Timber furniture	30 years
Assets not detailed above	Typical industry values for similar assets of a high standard and quality
Intersection capacity improvements	20 years post opening

3.2.2 Engineering constraints

The engineering constraints to the design and construction of the proposal include:

- A constrained narrow road reserve corridor for design and construction, particularly relocation of utilities
- Existing intersection infrastructure to be retained where feasible
- Proximity of an existing timber retaining wall to the east of Manns Road for about 50 metres outside Beacon Lighting

- Grades on driveways for existing commercial / industrial properties to the east of Manns Road
- Provision of access to properties the eastern side of the proposal
- Access and tie-in levels with local road alignments
- Managing existing drainage infrastructure during design and construction
- Construction near to and under existing overhead power cables
- Construction over / near a high pressure gas main and relocation of gas pressure regulator
- Construction over and near to below ground high voltage power cables.

3.2.3 Major design features

This section describes each of the design elements of the proposal as they apply to the following main design features. The concept design described in this REF has been guided by the design criteria discussed in Section 3.2.1, environmental and community issues and constraints, and the principles of ecologically sustainable development. Further design refinements are anticipated during detailed design. Concept design drawings are included in Appendix B.

Limit of work

The proposal is about 300 metres in length and up to 24 metres in width on Manns Road and includes the southbound approach to Stockyard Place intersection only. Reconfiguration of the pedestrian crossing and utility adjustment would be required across the east limit of the intersection, although no road upgrades are proposed.

Road design

The traffic light controlled intersection at Stockyard Place would be upgraded with amendments to reflect the new traffic lane arrangement southbound on Manns Road allowing:

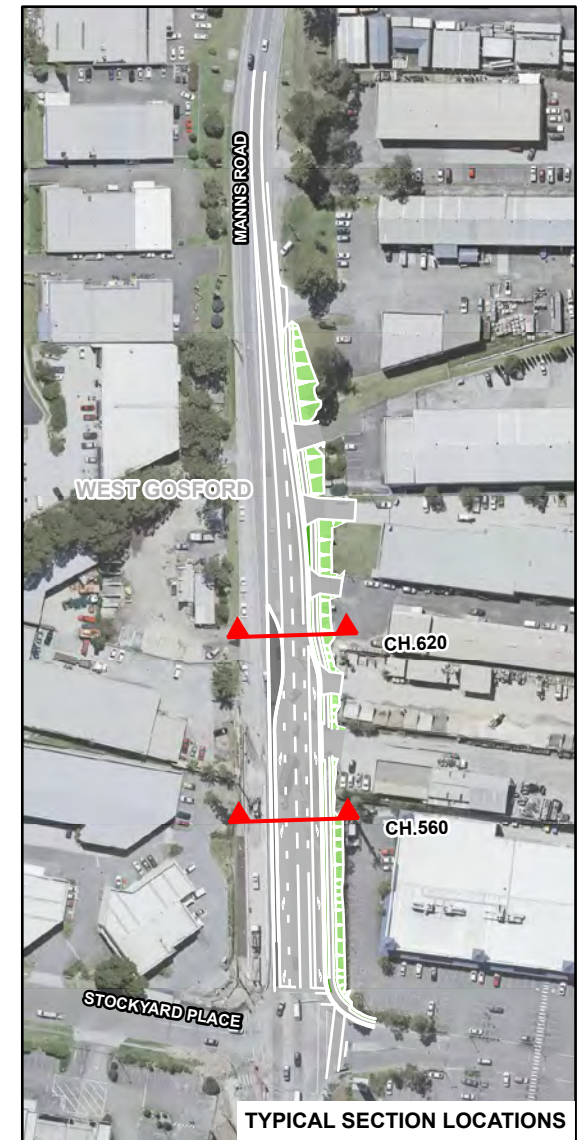
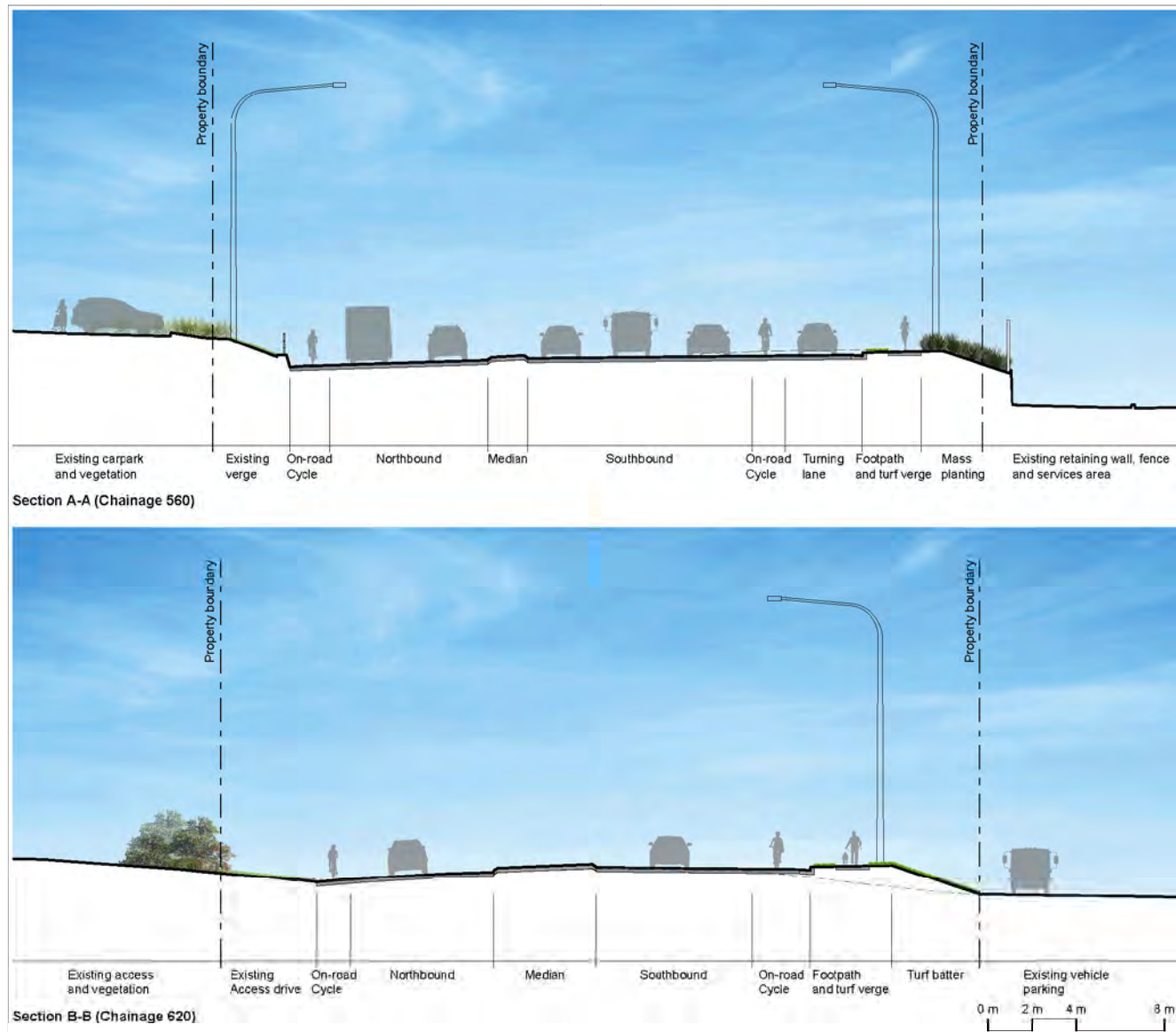
- Left turn lane into the Home Central commercial retail centre eastbound
- Right turn lane in Stockyard Place westbound
- Two through lanes to continue on Manns Road southbound.

The lane widths for the southbound approach to the intersection would be as follows:

- 3.2 metre right turn lane
- Two 3.5 metre through lanes
- 3.5 metre left turn lane
- 1.5 metre cycle lane
- Typically 1.8 metre wide median from the intersection to about 125 metres north.

The crest in Manns Road just north of the intersection would remain similar to existing levels. A typical cross section is shown in Figure 3-2. A standard slope of 4H:1V (four metres wide and one metre high) for areas of fill and 2H:1V for areas of cut have been adopted for the majority of the design. In constrained locations, slightly steeper fill slopes of 3H:1V and retaining walls have been utilised to reduce the limit of works and environmental impact. Typically, barrier kerbs and gutter have been provided at the edge of road pavement, with local adjustment for driveways, footpath crossings and where a median has been provided. Raised barrier kerbs are proposed to be used for the central median to prevent vehicles crossing into opposing traffic lanes.

Appropriate signage and road marking would be provided to suit the proposal in accordance with Australian Standard 1743 and Roads and Maritime guidelines including R141 and road delineation guidelines.



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Typical cross sections

Figure 3-2

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Retaining walls

Minor (short and low) retaining walls may be required to allow for driveway adjustments on private properties to the east of Manns Road. The details of the retaining walls would be designed during the detailed design phase.

Cyclists and pedestrians

Retention of a 1.5 metre wide on-road cycle lane and extension of a 1.5 metre wide pedestrian footpath by about 150 metres has been provided for within the extent of the proposal. Slight relocation of the shared pedestrian and cycle crossing on the east limit of the intersection is proposed to allow for road widening. Shared pedestrian and cycle crossings on the remaining three sides of the intersection would remain in the current condition.

Bus facilities

No alterations to existing bus stops in or near the proposal are proposed.

Stormwater drainage and flooding

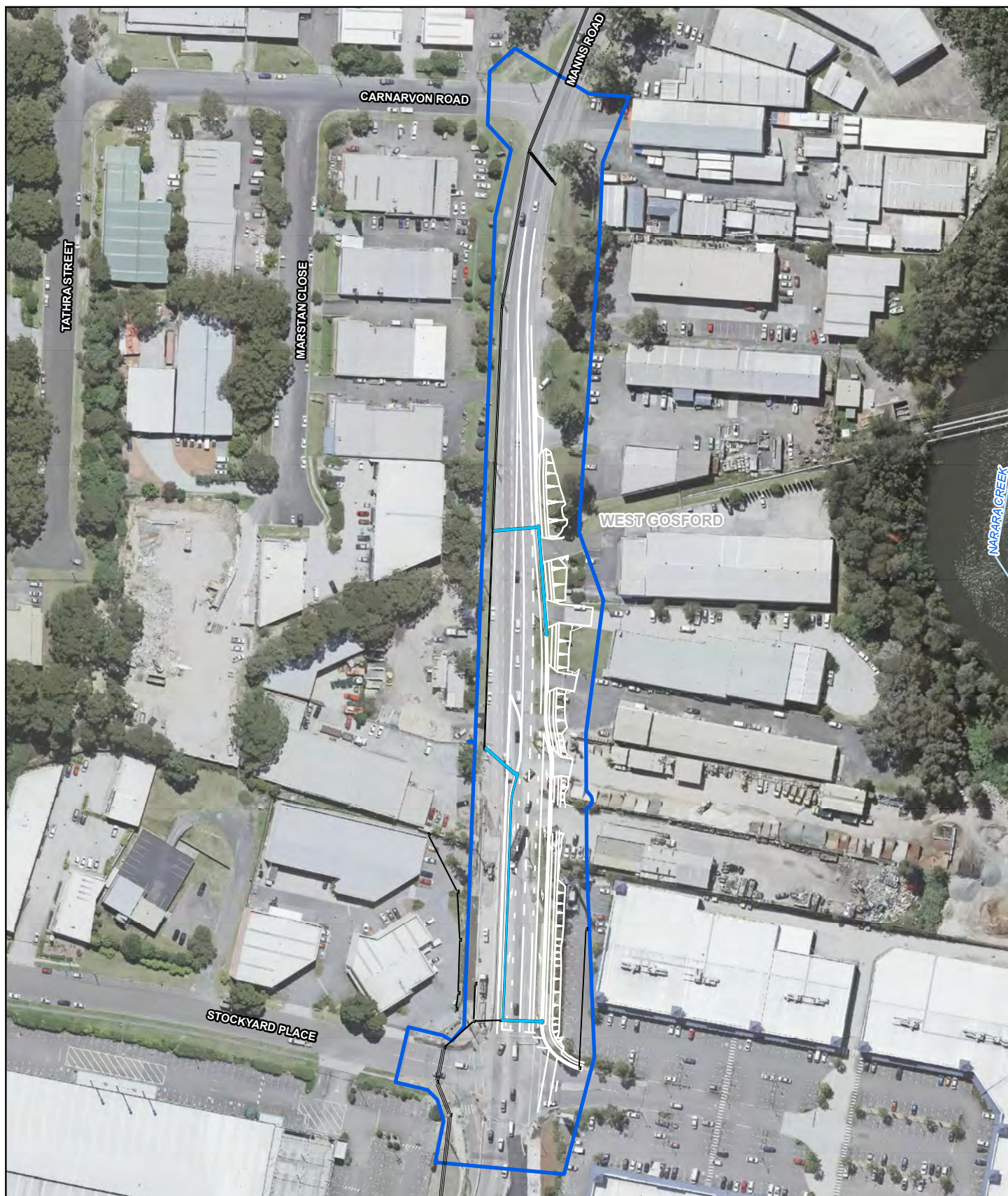
The proposed drainage network has been designed to cater for a 10 year average recurrence interval (ARI) rain event. Proposed drainage work includes the addition of a grated trench drain along the east of the central median kerb, which grades in a north and south direction. This drain would be connected at the southern extent of the proposal footprint to a 450 millimetre diameter pipe crossing underneath the Manns Road southbound lanes to a kerb inlet on the northeast corner of the intersection. To the north, the trench drain would connect into a sub-surface 450 millimetre stormwater pipe passing beneath the northbound lanes of Manns Road to connect to an existing truck line on the western kerb alignment of Manns Road.

From about 150 metres north of the intersection, the existing concrete channel next to the existing road shoulder on the east side is to be removed and a new kerb and gutter is proposed which would extend 40 metres along the east of Manns Road before passing underneath Manns Road via a sub-surface 375 millimetre stormwater pipe. Two new pits are proposed along the kerb alignment at the northern tie in to collect and discharge flows to an existing main underground stormwater pipe on the western kerb alignment.

The new proposed drainage infrastructure is shown in Figure 3-3.

Cost estimate

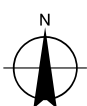
Initial estimates have calculated the proposal would cost about 20 million Australian Dollars.



LEGEND

- ▬ Proposal footprint
- ▬ Stormwater design
- ▬ Existing stormwater
- ▬ Concept design

Paper Size A4
 0 10 20 30 40
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



Roads and Maritime Services
 Manns Road Upgrade
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 for Stockyard Place Intersection Upgrade

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Proposed drainage infrastructure **Figure 3-3**

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3.3 Construction activities

3.3.1 Work methodology

Construction activities would be carried out in accordance with a *construction environmental management plan* to ensure work is carried out to Roads and Maritime specifications. Detailed work methodologies would be determined during detailed design and construction planning. A possible work methodology is described below noting the order of activities would vary to suit the final construction staging plans, which would be determined by the construction contractor and may change. Construction sequencing and methods would generally be as follows:

- Identify sensitive areas as defined by the REF, sensitive area maps and the *construction environmental management plan*
- Surveys, investigations and setting out work in accordance with design plans
- Mark trees which would need to be removed or trimmed, and mark any 'no-go' areas
- Install traffic management measures including temporary traffic signs and barricades
- Install temporary erosion, sediment and water quality controls, including silt fences, and stormwater diversion drains, with a focus on managing and diverting run-on water from higher areas away from the work
- Relocate, adjust, underground or protect existing utility services
- Clear and grub vegetation
- Identify suitable site topsoil and strip from work areas and stockpile (with controls to stabilise) for future use
- Import embankment, foundation and select materials and fill to the road formation levels
- Property adjustment work
- Classify and dispose of unsuitable and/or surplus material from the proposal footprint
- Install new culverts and subsoil drains
- Install new kerb and gutter
- Construct the pavements, including placing and compacting select fill, base course, and asphalt wearing surface
- Construct tie-ins to existing roads
- Install new street lights
- Rehabilitate disturbed areas and landscape in accordance with the landscaping plan
- Line marking and sign posting
- Final site clean-up.

3.3.2 Construction staging

Construction staging for the proposal will be finalised during the detailed design phase and is dependent on the contract delivery method and construction methodology selected by the construction contractor.

However, it is anticipated the staging would generally be as follows:

- Stage 1 – Footpath construction east side Manns Road
- Stage 2 – Full depth pavement construction east side of Manns Road, median drainage construction
- Stage 3 – Reconstruct pavement in sub stages to maintain traffic flow

- Stage 4 – Construct concrete median island
- Stage 5 – Re-sheet pavement in sub stages to maintain traffic flow.

An indication of the potential staging of the construction is shown in Figure 3-4, although this would be determined by the selected contractor so is indicative and conceptual only.

3.3.3 Construction hours and duration

It is anticipated construction would start in about late 2021, subject to relevant approvals and funding. Construction would take about 12 months (weather permitting). Some elements of the proposal may be carried out as early work packages and could start ahead of the main contract work.

Potential early and enabling work may include minor demolition of structures, property adjustments following acquisition and significant public utility relocations such as overhead power. Early and enabling work would be investigated further in detailed design and be implemented with relevant safeguards as outlined in this REF.

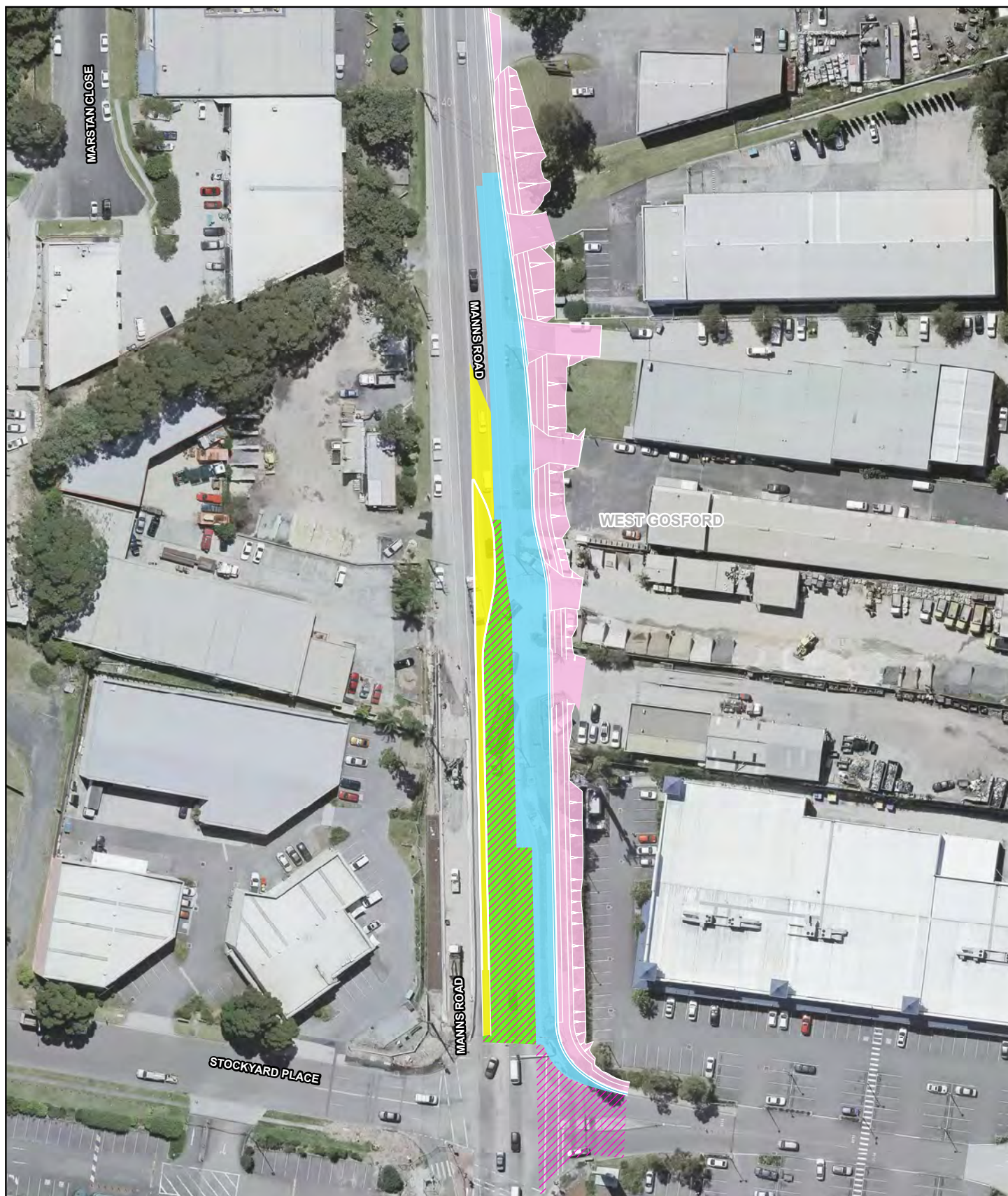
It is anticipated construction would generally be carried out during standard construction working hours in accordance with the *Interim Construction Noise Guideline* (DECC, 2009):

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sundays and public holidays: no work.

To minimise disruption to daily traffic and disturbance to surrounding businesses, it would be necessary to carry out some work outside of these hours. The following activities are likely to be carried out outside standard construction working hours:

- Removal of median islands at the existing intersection
- Milling and removal of the existing pavement on Manns Road through the intersection
- Placement of final (wearing) asphalt surface
- Tie-in activities on Manns Road to the north of the proposal
- Permanent line marking
- Stormwater drainage crossings
- Commissioning of new or upgraded traffic signals
- Road crossings and “cut over” of relocated utilities to existing alignments outside the proposal footprint
- Installation and adjustment of barriers and signage for construction zones during each construction stage and switching of traffic between temporary lanes and routes through the proposal between stages.

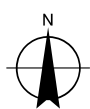
Any work carried out outside of standard working hours would be in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) and the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016). Prior advice would be given to the community for any work which is planned to be carried out outside standard construction hours and the construction contractor would be required to prepare and implement an out of hours work procedure in accordance with Roads and Maritime guidelines.



LEGEND

— Concept design	Stage	 Stage 3
	 Stage 1	 Stage 4
	 Stage 2	 Stage 5

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Metres
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Indicative construction staging

Figure 3-4

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3.3.4 Plant and equipment

A range of plant and equipment would be used during construction. The final equipment and plant requirements would be determined by the construction contractor. An indicative list of plant and equipment comprises:

- Asphalt paver
- Backhoe
- Bulldozer
- Compressor
- Concrete pump truck
- Concrete saw
- Concrete truck
- Crane
- Dozer
- Dump trucks
- Excavator 20 Tonne
- Excavator 30 Tonne
- Excavator 40 Tonne
- Franna crane
- Front end loader
- Generators
- Grader
- Hand tools (electric and pneumatic)
- Light vehicles
- Road profiling machine
- Road truck
- Rock crusher
- Roller (15 Tonne)
- Vibratory roller
- Water cart
- Piling rig (bored)

3.3.5 Earthwork

The estimated quantities of materials associated with earthwork are provided in Table 3-3. Earthwork would include excavation of pavements and underground drainage and utilities. Earthwork requirements would be confirmed again during detailed design.

Table 3-3: Indicative earthwork quantities

Material	Volume (cubic metres)
Top soil	1,000: 150 to be reused, 850 to be disposed off-site
Cut to fill	3,000
Imported general fill	0
Imported select fill	1,200
Imported heavily bound material	3,500

3.3.6 Source and quantity of materials

The imported road pavement including select fill and heavily bound materials would be sourced from appropriately licensed facilities (quarries). About 400 cubic metres of road surfacing (asphalt) materials would be required to be imported. Imported materials would be sourced from commercial suppliers in nearby areas, wherever possible. As part of the concept design a preliminary assessment of potential sources of material has been completed which has identified suitable material is available at local quarries.

Surplus or unsuitable material which cannot be used on-site would be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility.

Construction of the proposal would require water for various purposes such as dust suppression, site amenities and landscaping. It is proposed water would be obtained from the local water supply network. The amount of water required during construction would be confirmed during detailed design.

3.3.7 Traffic management and access

Construction of the proposal would generate both light and heavy vehicle movements. Heavy vehicle movements would mainly be associated with:

- Delivery of construction materials
- Spoil and waste removal
- Delivery and removal of construction equipment and machinery.

The main haul routes for the proposal would be Manns Road from the north and from the south, with an anticipated 50 per cent split from each direction. The estimated number of these heavy vehicle movements is shown in Table 3-4. Construction traffic would be prevented from hauling along local and minor roads. Haul routes would be defined in the Construction Traffic Management Plan (TMP).

Light vehicle movements would be required for the movement of construction personnel, including contractors, site labour force and specialist supervisory personnel (Table 3-4). Light vehicles used to transport staff to and from the site would park at the main site compound facility.

Table 3-4: Estimated construction vehicle movements

Number of movements	Heavy vehicles	Light vehicles
Average day time	66	100
Average night time	30	50
Peak day time (about one month duration)	80	130
Peak night time (about one month duration)	38	60

A detailed traffic management plan would be prepared in accordance with the *Traffic Control at Work Sites Technical Manual Version 5* (Roads and Maritime, July 2018) and approved by Roads and Maritime before implementation. The traffic management plan would provide details of the traffic management to be implemented during construction to ensure traffic flow on the surrounding network is maintained where possible. It is not anticipated there would not be any full road closures or diversions during the work and traffic flow through the intersection would be managed via lane closures and staging.

Property access would be maintained as far as practicable throughout construction and there would be no disruption to bus routes.

3.4 Ancillary facilities

Site compound facilities and laydowns would include portable buildings with amenities (such as lunch facilities and toilets), secure and bunded storage areas for site materials, including fuel and chemicals, office space for on-site personnel, and associated parking.

Two potential compound/laydown sites are being investigated for use during construction of the proposal as shown on Figure 3-5, while an additional compound is located to the north for use during the Narara Creek Road intersection upgrade and remaining Stage 5 work. The compounds proposed for the proposal include (from north to south):

- Compound 2 – located about 1.5 kilometres north of the proposal, on the southwest corner of the Dell Road and Manns Road intersection. This property comprises an existing motor registry office owned by Roads and Maritime
- Compound 3 – located about 350 metres south of the proposal, along Manns Road between the Central Coast Highway and Dyer Crescent. Compound 3 is positioned in three lots of remnant land which was acquired by Roads and Maritime for the Manns Road/Central Coast Highway intersection project. The buildings located at this site would be demolished prior to use of the site as a compound.

The potential impacts associated with these locations have been assessed in this REF. Stockpile locations would be further refined during the detailed design phase using the criteria set out in the *Stockpile Management Guideline* (RTA, 2011).

3.4.1 Site Selection

The potential compound sites have been selected with consideration to the following criteria:

- Near to the proposal footprint
- Not prone to excessive flooding and avoids drainage lines
- Relatively flat ground which does not require substantial reshaping
- Minimal disturbance to sensitive receivers
- In plain view of the public to deter theft and illegal dumping.

Should the construction contractor select alternative compound sites, the above criteria would be used to assess their suitability for the proposal.

3.4.2 Use and operation

Compounds 2 and 3 would be utilised for the following potential activities:

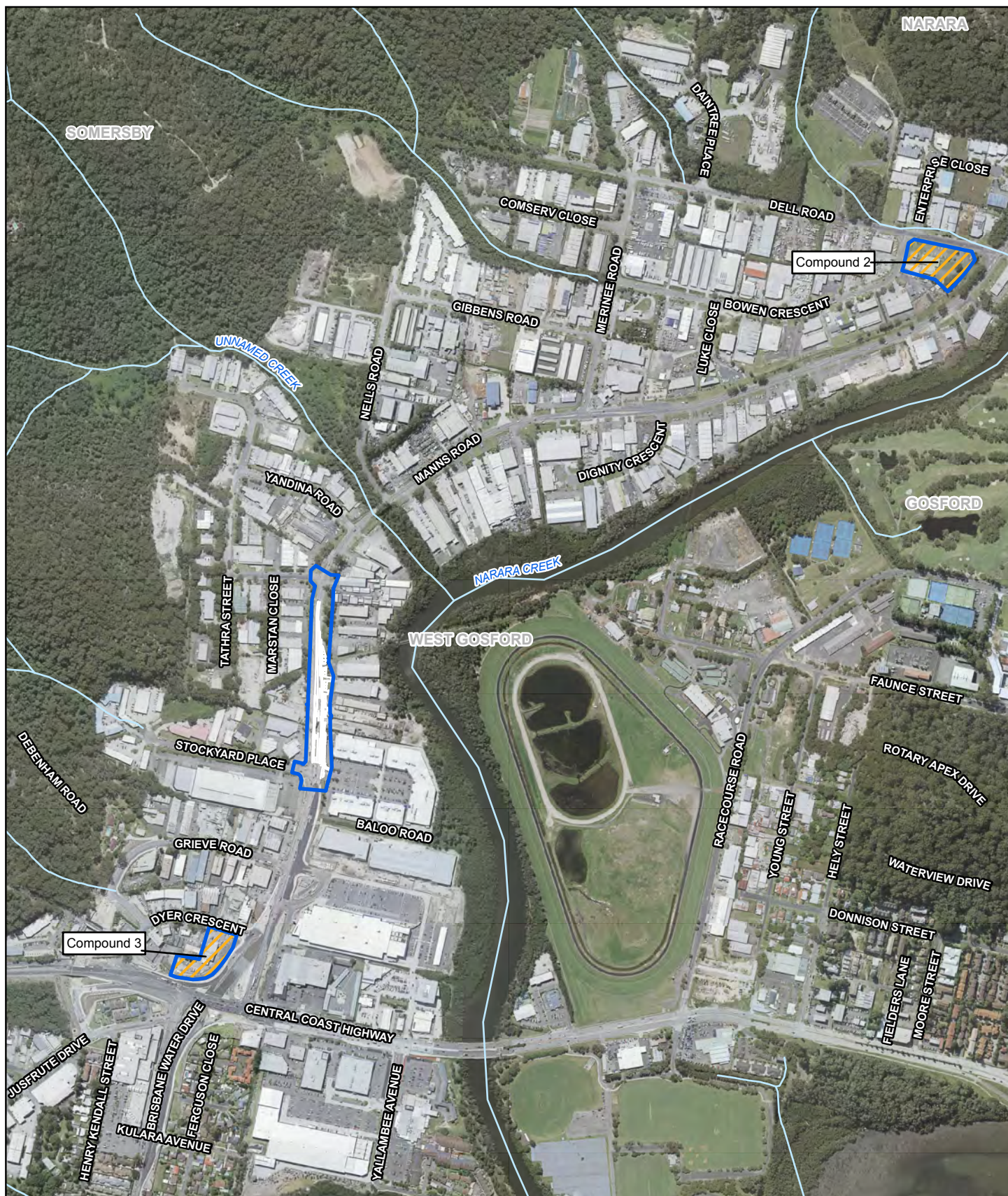
- Site facilities including office space, amenities, and lunch room
- Light vehicle parking
- Chemical storage
- Storage of bulk materials, equipment and machinery, including fuel storage
- Storage of earthwork materials.

The compound and site laydown areas would operate for the duration of construction. This would include some limited out of hours operation when the related weekend and night work takes place (refer to Section 3.3.3).

Clearing of vegetation for the establishment operation of stockpile/ compound sites would be limited to grasses, weeds and minor native vegetation regrowth.

To the extent practicable, those sites used for stockpiling would be established, operated and decommissioned consistent with the recommended work practices in the *Stockpile Management Guideline* (RTA, 2011).

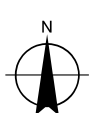
Sites would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of construction, the temporary site compounds and associated work areas and stockpiles would be removed, the site cleared of all rubbish and materials, and the area rehabilitated.



LEGEND

- Proposal footprint
- Compound
- Concept design
- Watercourse

Paper Size A4
 0 70 140 210 280
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 55



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Potential compound locations

Figure 3-5

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3.5 Public utility adjustment

Consultation with public utility authorities has been carried out as part of the development of the concept design to identify and locate existing utilities and incorporate utility authority requirements for relocations and/or adjustments. Preliminary investigations have indicated the following existing utilities and corresponding authorities are within the extents of the proposal:

- Overhead and underground electricity
- Water reticulation
- Sewer reticulation
- Telecommunications
- Gas reticulation (high and medium pressure).

Consultation with utility owners is ongoing and would continue throughout the detailed design phase. The final location of any relocated utilities is still subject to this consultation and has not been defined to date. The proposal footprint for the REF has been defined to allow for the anticipated location of all relocated or adjusted utilities.

A public utilities strategy report has been developed for the proposal and would inform the detailed design phase. Main utilities impacted by the proposal are summarised in Table 3-5. A brief overview of the location is given only as many utilities criss-cross through the study area and connect to local networks. Further assessment of utility locations and the extent of relocations within the proposal footprint will be finalised in detailed design.

Table 3-5: Utilities located in the proposal footprint

Utility	Provider	Description and existing location	Adjustment
Electricity	Ausgrid	<p>Underground</p> <ul style="list-style-type: none"> East side of Manns Road from Stockyard Place to substation just south of Carnarvon Road, connecting to nearby electrical pole East side of Manns Road just south of Carnarvon Road from nearby electrical pole to a sewer pumping station behind the businesses along Manns Road. <p>Overhead</p> <ul style="list-style-type: none"> 11kV and low voltage transmission line the on eastern side of Manns Road from south of Stockyard Place intersection to an electrical easement north of the proposal footprint. 	<p>Underground Ausgrid utilities would be moved further east, next to the southbound left turning lane, underneath the proposed footpath.</p> <p>Overhead Ausgrid utilities located on the eastern side of Manns Road would be relocated further east to about five metres away from the traffic lane. Electricity poles would be replaced with new poles of the same or better material.</p>
Gas	Jemena	<p>High pressure</p> <ul style="list-style-type: none"> A 150 millimetre diameter high-pressure (1050kPa) secondary gas main is located along the western side of Manns Road for the full extent of the proposal Eastern side of Manns Road from Stockyard Place for about 100 metres north before crossing to the western side, and extending to the proposal footprint extent. <p>Medium pressure</p> <ul style="list-style-type: none"> 50 millimetre main on the southern side of Carnarvon Road 50 millimetre main on the western side of Manns Road from Stockyard Place to Carnarvon Road. 	Existing gas utility services would not be relocated as a result of the proposal.
Water	Central Coast Council	<ul style="list-style-type: none"> 250 millimetre diameter pipe on the eastern side of the road which runs along the extent of work from the intersection with Stockyard Place to the proposal footprint extent Dual 600 millimetre diameter underground pipe intersects Manns Road midway between Carnarvon Road and Stockyard Place. 	<p>Water utilities running along the eastern side of Manns Road would be moved further east underneath the proposed footpath.</p> <p>Water utilities which transect Manns Road midway between Carnarvon Road and Stockyard Place would not be relocated, but would be reinforced with concrete encasement.</p>

Utility	Provider	Description and existing location	Adjustment
Sewer	Central Coast Council	<ul style="list-style-type: none"> Rising main running along the eastern side of Manns Road, runs under Stockyard Place intersection and connects to the gravity network about 100 metres north of Stockyard Place intersection 525 millimetre diameter pipe running along the eastern side of Manns Road 150 diameter pipe running along the western side of Manns Road to the northern extent of the proposal footprint Undetermined sized pipe crossing Manns Road about 120 metres north of Stockyard Place intersection 375 millimetre diameter line located about 200 metres north of Stockyard Place intersection 150 millimetre diameter pipe crossing Manns Road on the southern side of Carnarvon Road. 	<p>Sewer utility services on the eastern side of Manns Road near Stockyard Place intersection would be relocated to just west of the proposed kerb alignment, underneath the proposed cycle lane. Pipe would be reconstructed with stronger material to reduce maintenance and access needs in the future.</p> <p>Sewer utility services which intersect Manns Road about 120 metres north of Stockyard Place intersection would not be relocated, but reinforced with concrete encasement.</p> <p>Sewer utility on the western side of Manns Road would not be relocated as a result of the proposal.</p>
Telecommunications	Telstra	<ul style="list-style-type: none"> Mains cable laid under left turn lane. Cover not provided on Dial Before You Dig. This utility would need further assessment to identify location and cover of cable Multiple Telstra assets under Carnarvon Road intersection. Commercial property connections are located east of Carnarvon Road. Cover unknown. Cables sized P50 & P100 Multiple dead end and unused conduits located under the Stockyard Place intersection. Two P8 size pits located within upgraded intersection. Dual P100 conduits on eastern side of Manns Road running through Carnarvon Road intersection Telstra conduit crosses Manns Road joined by footpath access chambers on both sides of the road. Footpath access chambers are located within Manns Road footprint. 	<p>Telecommunication services located on the eastern side of Manns Road underneath the left turn lane would be relocated east to underneath the proposed footpath, about 4 to 5 metres away from the travelling lane.</p> <p>Services which cross Manns Road would be moved slightly north where they will connect with existing services on the west side of Manns Road and to relocated services on the east side of Manns Road. Telecommunications would be replaced with a similar, if not better material.</p>

Utility	Provider	Description and existing location	Adjustment
	NBN	<ul style="list-style-type: none"> Pits and conduits from Stockyard Place to Carnarvon Road on both sides of Manns Road. Seven NBN pits are identified as conflicting work with relocation required Carnarvon intersection upgrade contains four pits. Three are outside influence of work and possibly be retained. One pit on eastern side is within the proposal footprint facility and will require relocation. 	
	Optus	<ul style="list-style-type: none"> Optus Dial Before You Dig plans indicate the presence of major optic fibre within the limits of the project, located on the western side of Manns Road from Stockyard Place intersection. The optic fibre crosses Manns Road in the southern extent of the proposal footprint, where the fibre crosses from west to east footpath Optic fibre is located in the eastern footpath of Manns Road throughout the proposal extent. 	

3.6 Property acquisition

The proposal would require partial acquisition of property for road widening on the east of Manns Road as shown in Table 3-6 and Figure 3-6. All five properties which require partial acquisition are privately owned and are zoned IN1 – General Industrial. The extent of property acquisition would be confirmed during detailed design. Land acquisition would be carried out in accordance with the *Land Acquisition Information Guide (Roads and Maritime 2014)* and the *Land Acquisition (Just Terms Compensation) Act 1991*. Roads and Maritime would carry out ongoing consultation with all affected landholders.

Table 3-6: Proposed property acquisition

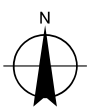
Lot and DP	Total area (ha)	Area of lot directly impacted (ha)
Lot 91, DP773515	0.716	0.101
Lot 4, DP244383	0.381	0.013
Lot 5, DP244383	0.346	0.008
Lot 6, DP244383	0.413	0.03
Lot 7, DP773545	0.491	0.025



LEGEND

- Property impacted
- Impacted area
- Cadastre
- Watercourse
- Concept design

Paper Size A4
0 10 20 30 40
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Revision 1
Date 05/10/2018

Proposed property acquisition

Figure 3-6

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4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is for road infrastructure facilities and is to be carried out by Roads and Maritime, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by State Environmental Planning Policy (Coastal Management) 2018, State Environmental Planning Policy (State and Regional Development) 2011, State Environmental Planning Policy (State Significant Precincts) 2005, or State Environmental Planning Policy (Major Development) 2005.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the start of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in Chapter 5 of this REF.

State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP)

State Environmental Planning Policy (Coastal Management) 2018 updates and consolidates into one integrated policy, the former SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5 of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The Coastal Management SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone. Coastal Management SEPP defines the four coastal management areas in the Act through detailed mapping and specifies assessment criteria which are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development which falls within one or more of the mapped areas.

The proposal does not directly impact areas identified as 'coastal wetlands' or 'littoral rainforest' on the Coastal Wetlands and Littoral Rainforests Area Map. However, a very small area of the proposal footprint in the location of a driveway adjustment is within a mapped proximity area for coastal wetlands. Division 1, Clause 11 of the Coastal Management SEPP outlines requirements for development on land in proximity to coastal wetlands or littoral rainforest and specifically the aspects which must be considered by the consent authority before granting development consent.

Further, the entire proposal (including both compound locations) is located on land identified as a coastal environment area. Division 3, Clause 13 of the Coastal Management SEPP outlines requirements for development on land within the coastal environment area and the aspects which must be considered by the consent authority before granting development consent.

The majority of the proposal is also situated within land mapped as a coastal use area. Division 3, Clause 14 of the Coastal Management SEPP outlines requirements for development on land within the coastal use and considerations for the consent authority before granting development consent.

Considerations of the proximity area for coastal wetlands, coastal environment area and coastal use area and potential adverse impacts have been addressed in the following Sections:

- Section 6.1 – Surface water and flooding
- Section 6.4 – Biodiversity
- Section 6.6 – Landscape character and visual impacts
- Section 6.10 – Groundwater
- Section 6.10 – Aboriginal heritage
- Section 6.10 – Non-Aboriginal heritage.

Site-specific safeguards and management measures are provided in Section 7.2. These measures would mitigate the identified potential impacts and subsequently address the criteria identified by Division 1 (Clause 11) and Division 3 (Clause 13 and 14) under the Coastal Management SEPP.

State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44)

The *State Environmental Planning Policy 44 – Koala Habitat Protection* (SEPP 44) encourages the conservation and management of natural vegetation areas which provide habitat for koalas to ensure permanent free living populations are maintained over their present range.

The policy applies to land within local government areas listed under Schedule 1 of the SEPP. The proposal is located wholly within the former Gosford local government area, which now forms part of the Central Coast local government area. Gosford local government area is listed under Schedule 1 and therefore the policy applies to the proposal.

SEPP 44 requires before granting consent for development on land over one hectare in area, a consent authority must be satisfied as to whether or not the land is 'potential' and 'core' koala habitat. These are defined as follows:

- 'Core Koala Habitat' is an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings and historical records of a population
- 'Potential Koala Habitat' is an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component.

No evidence of koalas were recorded within the proposal footprint, and the proposal does not include core koala habitat as defined in the SEPP. This is discussed further in Section 6.1.

None of the trees listed in Schedule 2 of SEPP 44 would be impacted by the proposal. Therefore, SEPP 44 Local Environmental Plans.

Gosford Local Environmental Plan 2014

The proposal is located wholly within the former Gosford local government area, which now forms part of the Central Coast local government area. There is no current local environmental plan for the Central Coast local government area, therefore, the *Gosford Local Environmental Plan 2014* (the LEP) applies to the proposal. The proposal footprint is within two land use zones under the LEP. The provisions of the LEP provide the proposal would be permitted with consent under the zones within the proposal footprint (Table 4-1).

Table 4-1: Gosford LEP zoning

Land use zone	Location	Consistency with the LEP objectives
SP2: Infrastructure	Existing Manns Road corridor	Yes – The proposal provides infrastructure and is compatible with the desired future character of the zone
IN1: General Industrial	Compound 2 and 3	Yes – Upgrading the road supports and improves access to and from this industrial area.

However, clause 5.12 of the LEP states '*...this Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under State Environmental Planning Policy (Infrastructure) 2007*'.

As the proposal is permitted without consent under ISEPP (Section 4.1), the consent requirements of the LEP do not apply.

4.2 Other relevant NSW legislation

4.2.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes the procedures for issuing licences for environmental protection in relation to aspects such as waste, air, water and noise pollution control. The owner or occupier of premises engaged in scheduled activities is required to hold an environment protection licence and comply with the conditions of that licence.

Under Part 3.2 of the POEO Act, the carrying out of scheduled development work as defined in Schedule 1 requires an environmental protection licence.

Schedule 1, Clause 19 (extractive industries) specifies that land-based extractive activity is considered a scheduled activity if it involves the extraction, processing or storage of more than 30,000 tonnes per year of extractive materials. The proposal would involve the excavation of a minor quantity of earthwork material during construction (Section 3.3.5), significantly below the 30,000 tonnes trigger level. As such, an EPL for land-based extractive activity would not be required.

Section 6 of the POEO Act indicates the EPA is the appropriate regulatory authority for development by public authorities, which would be Roads and Maritime for the proposal. Roads and Maritime would be required to notify the EPA immediately of any 'pollution incident' which is likely to have an impact on the environment.

4.2.2 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) aims to conserve nature, objects, places or features (including biological diversity) of cultural value within the landscape. The NP&W Act also aims to foster public appreciation, understanding and enjoyment of nature and cultural heritage, and provides for the preservation and management of national parks, historic sites and certain other areas identified under the Act. The NP&W Act is administered by the NSW Office of Environment and Heritage (OEH).

A search of the Aboriginal Heritage Information Management System (AHIMS) database on 30 November 2017 revealed no Aboriginal heritage items or places which have previously been recorded within the proposal footprint (including a buffer zone of 250 metres). One registered Aboriginal site was identified within the broader search area, AHIMS site (45-3-0561) however it would not be impacted by the proposal footprint.

Section 6.10 includes further information on the potential for impact on items protected under the *National Parks and Wildlife Act 1974* including a preliminary Aboriginal cultural heritage assessment for the proposal carried out in accordance with Stage 2 of the *Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime, 2011).

4.2.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The proposal footprint does not contain any protected marine vegetation, such as seagrass, mangroves or saltmarsh and there is no instream work proposed. The proposal footprint was assessed for the potential presence of threatened aquatic species and concluded there is no potential for impacts to threatened aquatic species.

One of the objectives of the FM Act is to 'conserve key fish habitats', which includes aquatic habitats which are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species.

Key fish habitat recorded or likely to occur within and around the proposal footprint is detailed further in Section 6.1. The biodiversity assessment concluded the proposal would not cause a significant impact to key fish habitats and therefore a Part 7 fisheries permit application is not required.

4.2.4 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on 25 August 2017 and replaces the *Threatened Species Conservation Act 1995*, *Native Vegetation Act 2003* and NP&W Act (animal and plant provisions only); and makes amendments to the *Local Land Services Act 2013* (LLS Act).

Public authorities may elect to include a biodiversity development assessment report (BDAR) for development under Part 5 of the EP&A Act, and to be subject to the new biodiversity offsets scheme. Alternatively Section 7.3 of the BC Act requires a test of significance for determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. If a test of significance determines the proposal would result in significant impacts to threatened biota, a Species Impact Statement is required.

Threatened biota recorded or likely to occur in the proposal footprint are detailed further in Section 6.4. No threatened biota are likely to occur in the proposal footprint as determined in a likelihood of occurrence assessment (included in the Biodiversity Assessment Report, Appendix E (Volume 2)). As no threatened biota were identified as being likely to occur in the proposal footprint, Assessments of Significance under Section 7.3 of the BC Act are not required and a Species Impact Statement or BDAR is not required.

4.2.5 Water Management Act 2000

The *Water Management Act 2000* aims to ensure water resources are conserved and properly managed for sustainable use benefitting both present and future generations. It also provides formal protection and enhancement of the environmental quality of waterways and in-stream uses as providing protection of catchment conditions. The *Water Management Act 2000* applies where a water sharing plan, issued under the Act, has started.

The proposal is located within areas subject to the following water sharing plans:

- Water Sharing Plan for the Central Coast Unregulated Water Sources 2009
- Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016
- Relevant approvals under the Act include water use approvals (Section 89), water management work approvals (Section 90) and activity approvals (Section 91).

Water use approvals

Section 56 of the Act establishes access licences for the taking of water within a water management area. Clause 18 (1) identifies the instances where a person is exempt from Section 60A (1) and (2) of the Act in relation to the taking of water from a water source.

Schedule 5 Part 1 (2) of the *Water Management (General) Regulation 2011*, states Roads and Maritime, as a roads authority, is exempt from the need to obtain an access licence in relation to water required for road construction and road maintenance.

Water management work approvals

Water management work approvals are required for water supply work, drainage work and flood work. The proposal does not constitute water supply work but does include the upgrade of drainage infrastructure to manage overland flows and prevent inundation of the road. However, under Clause 41E(2) of the *Water Management (General) Regulation 2011*, Roads and Maritime, as a roads authority, is exempt from the need to obtain a water management work (flood work) approval if it constructs or uses a flood work for the purposes of a public road.

Activity approvals

Activity approvals are required when a certain activity is likely to affect waterfront land (controlled activity approval) or interfere with an aquifer (aquifer interference approval). Clause 38 of the *Water Management (General) Regulation 2011* provides Roads and Maritime, as a roads authority, is exempt from requiring controlled activity approval for all controlled activities which it carries out in, on or under waterfront land.

The aquifer interference approval requirements of the *Water Management Act 2000* have not yet started and aquifer interference is still regulated under the *Water Act 1912*.

4.2.6 Water Act 1912

The *Water Act 1912* facilitates development and use of water, by controlling the extraction of water, the use of water, the construction of work, such as dams and weirs, and the carrying out of activities in or near sources in NSW. Part 5 of the *Water Act 1912* applies to water supply work or aquifer interference approvals within the meaning of that Act.

As discussed in Section 6.10, groundwater dewatering is not likely to be required. A licence from DPI Water for groundwater dewatering during construction would therefore not be required. Should groundwater be intercepted or should the construction contractor have the need to establish bores for the purposes of investigation, extraction, dewatering, testing or monitoring, an aquifer interference approval would be obtained from the relevant agency prior to the installation of the bores.

4.2.7 Biosecurity Act 2015

The *Biosecurity Act 2015* aims to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants. The Act provides for modern, flexible tools and powers which allow effective, risk-based management of biosecurity in NSW.

Amongst other things, the Act provides for the declaration of priority weeds and biosecurity zones by the Minister for Primary Industries. The Act also lists plant pests and diseases which are prohibited and notifiable in NSW.

No priority weed species were recorded in the study area.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions which have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and Chapter 6 of the REF.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land.

A referral is not required for proposed road activities which may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

The assessment of the proposal's impact on nationally listed threatened species, endangered ecological communities and migratory species found there is unlikely to be a significant impact on relevant matters of national environmental significance.

Potential impacts to these biodiversity matters are also considered as part of Chapter 6 of the REF and Appendix A.

4.3.2 Other relevant Commonwealth legislation

Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. It provides that native title cannot be extinguished contrary to the Act. Essentially, this Act covers actions affecting native title and the process for determining whether native title exists and compensation for actions affecting native title.

A Native Title search was carried out of the National Native Title Tribunal on 3 December 2017 identified no determined native title determinations within the proposal footprint.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP, the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under Section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity. Consent from Central Coast Council is not required.

5. Consultation

5.1 Consultation strategy

A community and stakeholder engagement plan has been prepared for the Manns Road upgrade – Stockyard Place, West Gosford to Narara Creek Road, Narara of which this proposal is a part. The plan demonstrates Roads and Maritime's commitment to meeting the reasonable needs and desires of the community for information and considering its views on the proposal.

The communication and engagement objectives for the proposal as contained in the plan, are to:

- Provide regular and targeted information to the community and stakeholders on the progress of the proposal and construction activities, including the likely impacts and benefits
- Provide clear direction to the community and stakeholders on whether we are providing information or seeking feedback so expectations are clear
- Ensure community and stakeholder feedback and issues are considered in the decision-making process
- Ensure issues relating to project delivery are identified early and managed effectively
- Manage stakeholder feedback and complaints in a timely, respectful way
- Monitor and evaluate stakeholder feedback and communication activities to measure success, and review planning and delivery as required
- Collaborate with government agencies and local council to ensure a whole-of-government approach to managing issues and providing consistent messages
- Build stakeholder and community confidence in Roads and Maritime and its decisions.

Initial stakeholder engagement through a “have your say” and display of strategic design plans has been conducted for the larger Stage 5 planning, including this proposal in early development. This will continue to be delivered for this proposal through a number of communication methods including, but not limited to:

- Community updates and newsletters
- Website updates and information
- Notification letters
- Media releases
- Advertisements (print and broadcast)
- Drop-in and door-knocking sessions
- Use of a proposal-specific email, resourced phone number and mail address.

This proposal and the REF will be publicly displayed and Roads and Maritime will seek comments, feedback and suggestions from the community. Roads and Maritime will then respond to this feedback in the form of a submissions report. Concerns, issues and solutions arising from the submissions report will contribute to the development of a detailed design for this proposal.

While the proposal is being built, road users, businesses and the community would be kept informed ahead of planned traffic changes, night work, lane closures and detours by using message signs onsite, website information, bulk-distribution emails and letterbox drops. Those residents, businesses and landowners which potentially would be affected by the work would be notified and kept informed of work impacts including noise. Notification methods would include contact by phone, email and by holding face-to-face meetings to discuss specific issues such as driveways, bus stops and access.

5.2 Community involvement

Community consultation has been carried out as part of the wider program to upgrade the Pacific Highway and Manns Road on the Central Coast (Stages 1 to 5). The Roads and Maritime website provides community updates relating to the Stage 5 work, which includes Manns Road between Stockyard Place, West Gosford and Narara Creek Road, Narara.

Roads and Maritime is committed to working with stakeholders and the community during the planning process. Information regarding the work is progressively updated as the proposal progresses. For more information, please visit <http://www.rms.nsw.gov.au/projects/central-coast/west-gosford-to-narara/index.html>

The proposal is currently in concept design and Roads and Maritime has carried out ongoing targeted consultation with Central Coast Council and other key stakeholders including affected land owners, business owners and utility providers. Roads and Maritime has consulted with the owners of the private land which would be partially acquired as part of the proposal (Section 3.6). As required, feedback from this consultation has been incorporated into the proposal.

To understand the potential impacts to businesses as a result of the proposal, surveys were carried out with a sample of businesses along Manns Road between Stockyard Place and Carnarvon Road. It is estimated around 40 to 50 businesses are located along this area. Of these, 24 businesses were invited to complete the business survey and a total of 15 business surveys were received. The business types which provided a response included:

- Museum/retail
- Outdoor power equipment
- Automotive dealer
- Upholstery
- Two landscape supplies businesses
- Five automotive repairs businesses
- Metal recycler
- Retail/trade plumbing
- Wholesale trader
- Retail/trade supplies.

The outcome of the consultation with businesses to date is discussed in the socio-economic section of this report (Section 6.6) and within the Socio Economic Impact Assessment Report (Appendix D). During initial display of the strategic design for the overall Stage 5 project, key issues raised by the public included:

- Access constraints due to the inclusion of a raised central median and locations to safely turn around
- Safety of road users, including pedestrians and cyclists, during and after construction
- Concerns the upgrade would result in further congestion of Manns Road.

The above issues have been considered during concept design development and would be considered further during detailed design.

5.3 Aboriginal community involvement

Consultation with local Aboriginal stakeholders has been carried out in accordance with the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011) and Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010).

Representatives from the Darkinjung Local Aboriginal Land Council (DLALC) were involved in the Aboriginal heritage assessment investigations and provided vital information about the Aboriginal cultural heritage of the region. DLALC did not express any objections to the proposal. A copy of the PACHCI report is located in Appendix G (Volume 2).

There are no approved native title determinations over the proposal footprint.

5.4 ISEPP consultation

Central Coast Council has been consulted about the proposal as per the requirements of clause 13 and 15 of ISEPP via letter, dated 28 February 2018. This is due to the potential impacts on stormwater infrastructure, flood liable lands, road excavation and associate construction-phase traffic. An email response was received from Central Coast Council on 29 March 2018.

Appendix C contains an ISEPP consultation checklist which documents how ISEPP consultation requirements have been considered. It also contains a copy of the letters which have been issued as part of the statutory consultation for the proposal. Key items which were raised by Central Coast Council are outlined in Table 5-1 along with a response.

Table 5-1: ISEPP consultation with Central Coast Council

Issue raised	Response/where addressed in REF
Manns Road is an identified cycle route and the provision for both on road and off road cycle lane is considered a high priority	The proposal would provide an on road cycle lane, as discussed in Section 3.2. The off road cycle lane provision is allowed for on the west side of Manns Road, outside of the proposal footprint for this REF.
Manns Road is a bus route and the upgrade should consider disability access to all bus stops and shelters at stops which are frequently used.	No bus facilities would be impacted or amended as part of this proposal as discussed in Section 3.2.3. Existing bus stops near the proposal would be retained.
Any road work should not adversely impact on drainage secondary flow paths	The proposal incorporates flow paths to minimise impact on drainage as discussed in Section 6.1.
Any road works should not raise flood level by more than 10 millimetres	The proposal would not impact flood immunity, as discussed in Section 6.1.
Any impact on Council's local road network must be approved by Council's representative	Central Coast Council would be consulted at each design stage and before display to advise of any proposed changes.
Any impact on Council's water and sewer services must be reviewed and approved by Council's representative	Utility adjustment is discussed in Section 3.5.

5.5 Government agency and stakeholder involvement

5.5.1 Government agencies

The following Government agencies were consulted for the Manns Road Upgrade – Stockyard Place to Narara Creek Road, including this proposal:

- NSW Department of Primary Industries (Fisheries)
- Department of Planning and Environment.

Appendix D contains a copy of the letters which have been issued as part of the consultation for the proposal and relevant responses. Key aspects which were raised during consultation with these agencies are outlined in Table 5-2.

Table 5-2: Issues raised through government agency consultation

Agency	Issue raised	Response/where addressed in REF
NSW Department of Primary Industries	<p>Ensuring fish stocks are conserved and there is no net loss of key fish habitats upon which they depend.</p> <p>Fisheries NSW has no objections to the proposal, provided:</p> <ul style="list-style-type: none"> • Environmental safeguards (silt curtains, booms etc.) are to be used during the work to ensure there is no escape of turbid plumes into the adjacent aquatic environment • Fisheries NSW (1800 043 536) and the Environment Protection Authority (131 555) are notified immediately if any fish kills occur near the work. In such cases, all work other than emergency response procedures are to cease until the issue is rectified and approval is given by Fisheries NSW and/or the Environment Protection Authority for the work to proceed. 	<p>There are no waterways impacted by this proposal. This issue mostly relates to the broader strategic development of the Manns Road Upgrade – Stockyard Place to Narara Creek Road which is not being assessed as part of this REF.</p>
Department of Planning and Environment	<p>The Department supports this proposal, and suggests Roads and Maritime consider the recent NSW Government Architects work regarding Gosford City, specifically the document titled GOSFORD – Urban Design and Implementation Framework. http://gogosford.engagementhq.com/</p> <p>In this document the connectivity of Gosford City to its neighbouring areas is explored and encouraged. Emphasis is given to connecting pedestrians from Gosford City to the industrial areas of West Gosford through alternative east west links, potentially over Narara Creek.</p> <p>Additional work has been conducted by both the Department and Central Coast Council on the opportunities for growth within the defined 'Southern Corridor', which runs from Somersby in the west to Erina in the east. West Gosford is identified within this corridor as being an industrial centre, with the aims of the corridor to improve access to and through these centres and to allow surrounding communities to access services and infrastructure more effectively.</p>	<p>Issues addressed in the Urban Design Report and Sections 6.6 and 7.2.</p> <p>The issue of connectivity over Narara Creek to the east is outside the scope of this proposal which is limited to the southbound approach to Stockyard Place intersection and will be explored in the future as part of any development of the larger Stage 5 strategic design.</p>

5.5.2 Stakeholders

Meetings with community facilities, emergency service providers and Gosford Erina and Coastal Chamber of Commerce were carried out during February 2018. The purpose of the meetings was to gain an understanding of the existing facility or service, its users, and any potential impacts to the facility, service or users as a result of the proposal.

Issues which have been raised as a result of consultation with these stakeholders are outlined in Table 5-3 and in a Socio Economic Impact Assessment provided in Appendix F (Volume 2).

Consultation with public utility authorities has been carried out as part of the development of the concept design to identify and locate existing utilities and incorporate utility authority requirements for relocations and/or adjustments. Consultation with utility owners is ongoing and would continue throughout the detailed design phase.

Table 5-3: Issues raised through stakeholder agency consultation

Stakeholder	Issue raised	Response/where addressed in REF
Gosford Erina and Coastal Chamber of Commerce	<ul style="list-style-type: none"> West Gosford is a key industrial area for the Central Coast region. Manns Road provides access to other important employment areas in the region, such as Gosford and Woy Woy Stage 5 would provide long-term economic benefits for West Gosford and the Central Coast region by improving access to surrounding suburbs and the region, which would overall benefit businesses in the region There may be potential economic impact to local businesses along Manns Road between Stockyard Place and Narara Creek Road during the construction and operation of Stage 5 The proposed central median along Manns Road would limit the road area where trucks currently reverse into driveways and require drivers to conduct a left reverse. They considered this would make it more difficult and less safe for customers and deliveries to access the businesses, impacting business operations There is potential for disrupted utility services for businesses during construction Strategies to reduce impacts to businesses include providing clear signage, and retaining existing parking spaces or provide parking bays along Manns Road. 	Issues addressed in Sections 6.3, 6.6 and 7.2, and in the attached SEIA Report.
Rural Fire Service NSW	<ul style="list-style-type: none"> The proposal footprint is not within their jurisdiction. Fire & Rescue NSW (FRNSW) typically responds to emergencies within the proposal footprint While the Rural Fire Service may access Manns Road during emergencies, it is not considered a significant emergency route The construction of the proposal would have a minor impact on their services 	Issues addressed in Sections 6.3 and 7.2.

Stakeholder	Issue raised	Response/where addressed in REF
	<ul style="list-style-type: none"> During operation, Rural Fire Service considered the proposal would improve traffic flow, benefiting the community. 	
NSW Police	<ul style="list-style-type: none"> The construction of the proposal would have a minor impact on their services They considered the operation of the proposal would improve traffic flow. 	Issues addressed in Section 6.3.
Fire and Rescue NSW	<ul style="list-style-type: none"> Manns Road is a main emergency route The closest FRNSW facilities are located in Kariong, Wyoming and Gosford. Gosford Fire Station typically responds to motor vehicle crashes within the proposal footprint The construction of the proposal would have a minor impact on their services. They noted if the proposed central median is high or incorporates fencing, it may be a barrier for emergency vehicles if they require right-turn access to properties along the proposal footprint in an emergency. They recommended any fencing should provide access points for emergency vehicles Any road changes should be communicated to the local emergency management committee The operation of the proposal would increase traffic flow and improve safety for the community. It would also improve emergency access to surrounding suburbs, such as Narara and Ourimbah The proposed central median would improve road safety by limiting the turning traffic along Manns Road An increase in speed from 60 kilometres per hour to 70 kilometres per hour along Manns Road may reduce safety. 	Issues addressed in Sections 6.3, 6.6 and 7.2 and in the attached SEIA Report.
NSW Ambulance	<ul style="list-style-type: none"> Manns Road is a key access route. If Manns Road is partially closed, alternate routes include Showground Road and the Pacific Highway The closest ambulance facility is located at Point Clare, within the North Sydney/Central Coast district. Emergency vehicles are also stationed at Gosford Hospital, which will typically service West Gosford The construction of the proposal would have a minor impact on ambulance services, as they generally receive information from Roads and Maritime or contractors regarding significant roadwork or road changes. They also do not expect any impacts on community safety The operation of the proposal would improve traffic flow and response times for emergency vehicles, benefiting the community in the long term. 	Issues addressed in Sections 6.3, 6.6, 7.2 and in the attached SEIA Report.

5.6 Ongoing or future consultation

This section describes the ongoing and future consultation which would take place during and following the REF display and during construction, should the proposal be approved to proceed.

5.6.1 Response to submissions

This REF will be placed on public display for comment by Government agencies, stakeholders and the community. Following the public display period, Roads and Maritime will collate submissions and respond to the comments.

After considering the submissions, Roads and Maritime will determine whether the proposal should proceed as described or whether any alterations are necessary. It will also decide if additional environmental assessment has to be carried out or additional environmental safeguards or management measures need implementing.

A community update advising the community and stakeholders of the outcome of consultation will be distributed and Roads and Maritime will also meet with affected residents, businesses and other stakeholders.

5.6.2 Detailed design and pre-construction consultation

If the proposal is built, the community consultation and stakeholder engagement plan (refer to Section 5.1) would be updated to support the detailed design and pre-construction stages to ensure:

- There would be an integrated response to traffic management including provision for emergency vehicle access at all times while the proposal is being built
- Any necessary detours would be effectively managed to reduce impacts to general traffic and public transport
- Suitable and appropriate environmental safeguards and management measure refinements are made to account for design changes and refinements
- Ongoing meetings with Central Coast Council and other relevant stakeholders, including government agencies, utility providers, adjacent landowners, business owners and community stakeholders
- Relevant project information is available and updated regularly on the Roads and Maritime website.

5.6.3 Construction consultation

The appointed construction contractor would also be required to consult with the local community before and while the proposal is being built. This process would be managed through the *construction environmental management plan* (CEMP, refer to Section 7.1). It would include:

- Issuing notices before starting work and relaying information on traffic management controls, temporary road closures, temporary access restrictions and planned noisy activities
- Door-knocking with affected residents
- Ongoing consultation with affected parties comprising meetings, letter-drops, posters and notifications.

All ongoing consultation would be carried out by Roads and Maritime in accordance with the Roads and Maritime's *Community Involvement Practice Notes and Resource Manual* and the project specific stakeholder engagement plan (Roads and Maritime, September 2016).

6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal have been considered. This includes assessment of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the guidelines *Is an EIS required?* (DUAP 1995/1996) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000 and the *Roads and Related Facilities EIS Guideline* (DUAP 1996). The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also addressed in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Surface water and flooding

6.1.1 Existing environment

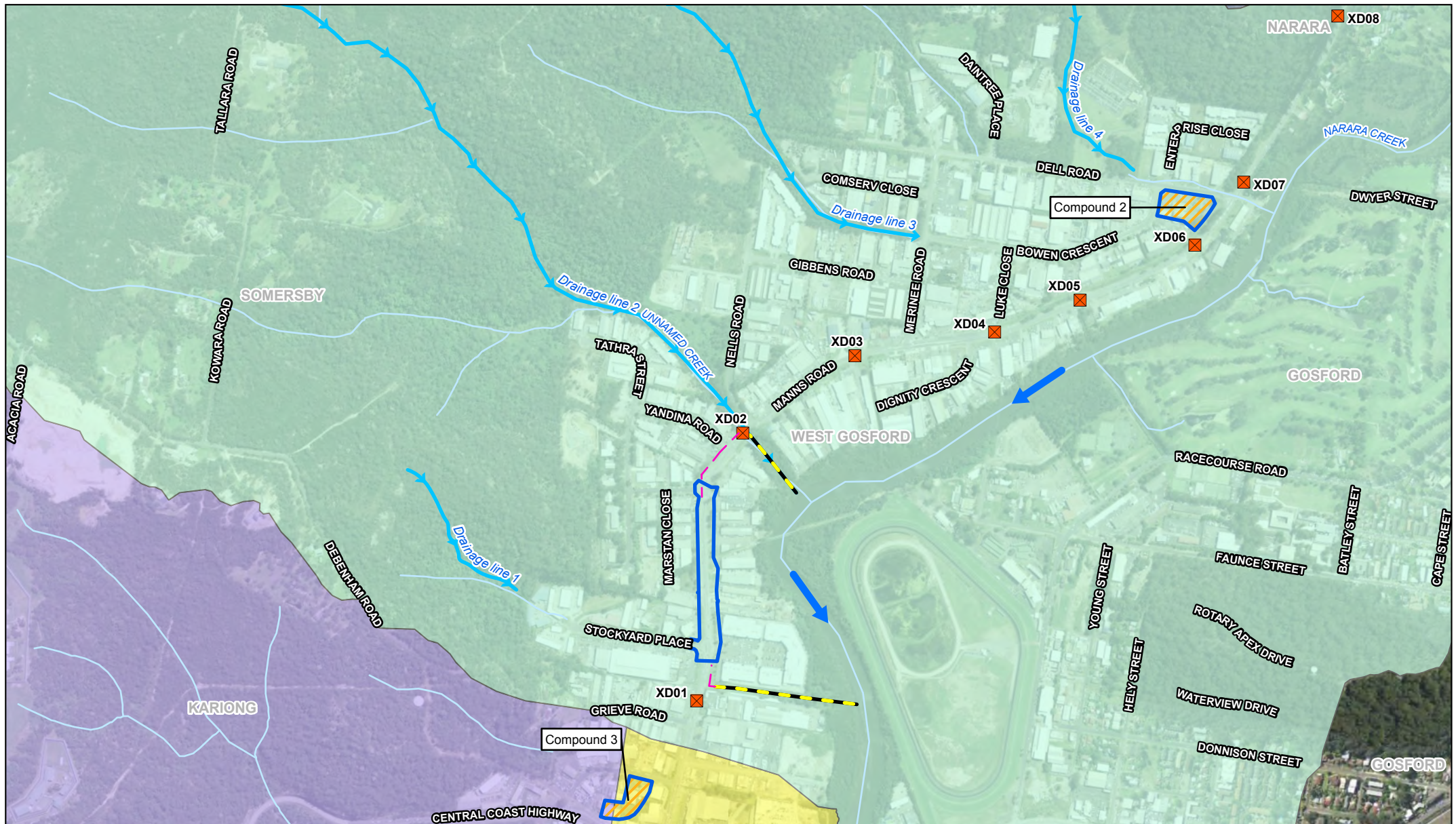
Surface water

Manns Road grades in a north south direction in the proposal footprint, with a small crest located about 50 metres north of Stockyard Place intersection. To the north of the proposal footprint, the topography is flatter and comprises a strip of floodplain and valley floor. To the west there is a steep incline to the Somersby plateau, while Narara Creek is about 100 metres downslope of the proposal footprint to the east. Narara Creek comprises a tidal creek with fringing mangroves, saltmarsh and swamp vegetation and discharges to Brisbane Water estuary about 1.2 kilometres south of the proposal. Narara Creek flows in a southerly direction. The proposal footprint does not directly impact on Narara Creek or Brisbane Water.

There are key drainage lines from the broader sub-catchment to the north and south of the proposal footprint, one comprising an unnamed tributary to Narara Creek located about 140 metres north of the proposal footprint and another flowing into the west of Stockyard Place cul-de-sac Figure 6-1.

The proposal footprint and immediate surrounds is generally urbanised with established stormwater drainage infrastructure already in place. Surface water north of the small crest in Manns Road drains to existing drainage pipes and dish drains towards the unnamed creek before outletting into Narara Creek, while surface water south of the crest is directed to an existing drainage channel 70 metres south of Stockyard Place intersection, which also outlets to Narara Creek. Sub-catchments along the Manns Road corridor along with existing cross-drainage structures and approximate discharge points are shown in Figure 6-1.

Compound 2 is connected to existing stormwater drainage which outlets directly into Narara Creek via a dish drain, while drainage from Compound 3 likely connects into Narara Creek via an existing drainage channel about 350 metres south of the proposal footprint.



Paper Size A4

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

- Cross drainage structure
- Proposal footprint
- Compound
- Drainage line
- Watercourse
- Narara Creek flow direction
- Approximate discharge point
- Existing stormwater pipe

- Coorumbine Creek sub-catchment
- Fountain Creek sub-catchment
- Kulara Avenue sub-catchment
- Lower Narara Creek sub-catchment

Roads and Maritime Services
Manns Road Upgrade
Review of Environmental Factors
for Stockyard Place Intersection Upgrade

Job Number 22-19033
Revision 1
Date 05/10/2018

Sub-catchment plan **Figure 6-1**

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

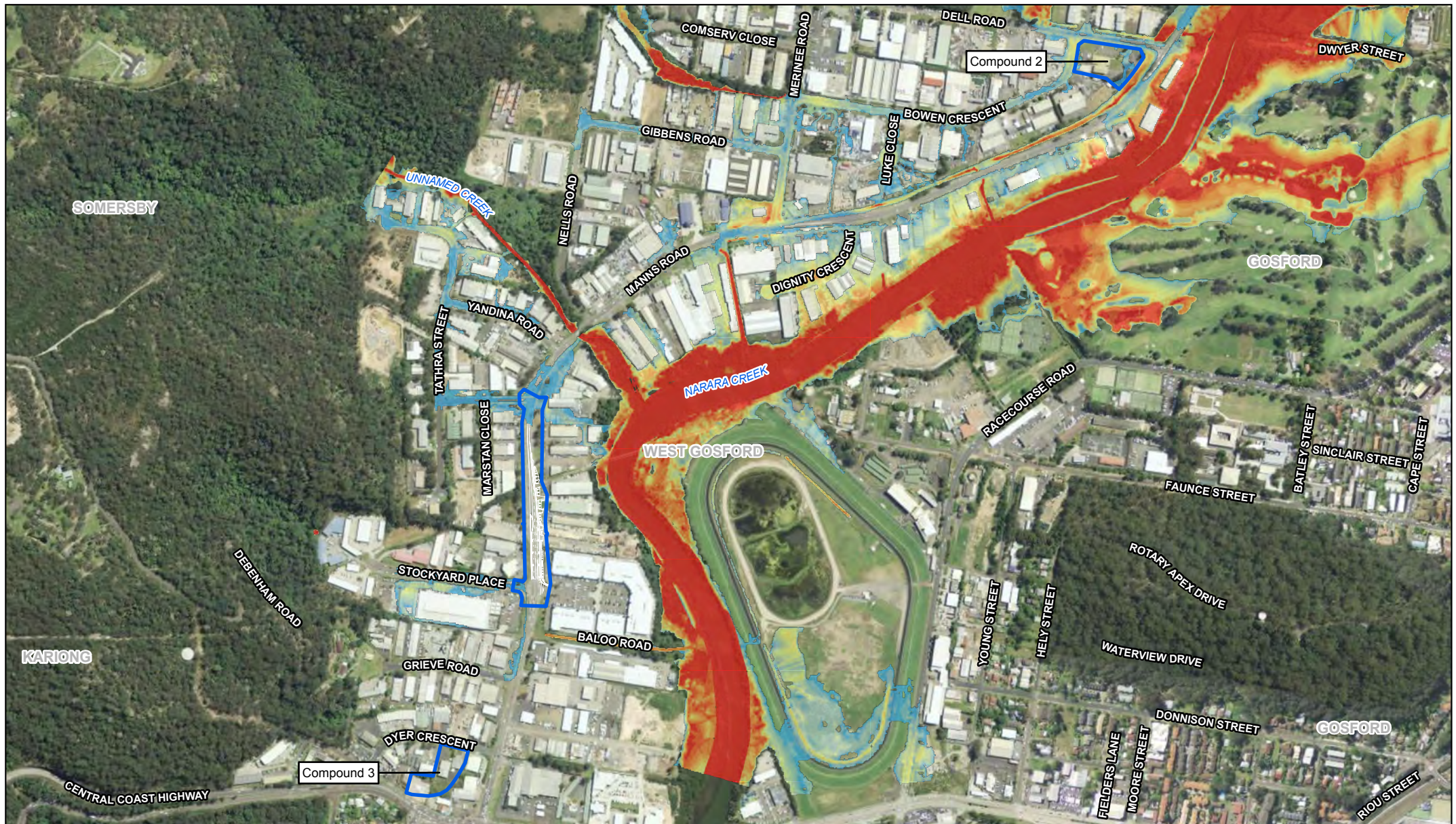
<FNT size="7">©</FNT> 2018. Whilst every care has been taken to prepare this map, GHD, LPI and Lyall & Associates make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Lyall & Associates: Flood Data, 2018; LPI: DTDB / DCDB / Aerial Imagery, 2017. Created by: tmorton

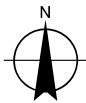
Flooding

The most common forms of flooding in the Gosford region are flash flooding due to intense rainfall within the catchment, tidal action such as a king tide, and storm surge associated with storms off the east coast of Australia. Baseline hydrologic and hydraulic modelling was conducted by Lyall and Associates for the proposal (Lyall and Associates, 2018) to compare drainage and flooding behaviour for the larger Manns Road Upgrade Stockyard Place to Narara Creek Road, Stage 5 concept design, which also covers the proposal area. Existing flood extents within the proposal footprint during the 10 and 100 year annual recurrence interval (ARI) flood events are shown in Figure 6-2 and Figure 6-3. The flood extents under existing conditions are:

- The road upgrade and Compound 3 are not impacted under the 10 or 100 year ARI event
- Small areas outside of direct work but within the proposal footprint near Carnarvon Road and Stockyard Place are subject to minor levels of inundation (less than 0.05 metres) for both the 10 and 100 year ARI event
- Compound site 2 is affected by up to 0.2 metres of inundation for the 10 year ARI and 0.6 metres for the 100 year ARI. While the existing building is not modelled as affected, the surrounding car park area is.



Paper Size A4
0 35 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



LEGEND

- Proposal footprint
- Concept design

Indicative depth of inundation (m)

■ 0 - 0.05

■ 0.05 - 0.1
■ 0.1 - 0.2
■ 0.2 - 0.3
■ 0.3 - 0.4

■ 0.4 - 0.5
■ 0.5 - 0.6
■ 0.6 - 0.7
■ 0.7 - 0.8

■ 0.8 - 0.9
■ 0.9 - 1.0
■ > 1.0



Roads and Maritime Services
Manns Road Upgrade
Review of Environmental Factors
for Stockyard Place Intersection Upgrade

Job Number 22-19033
Revision 1
Date 05/10/2018

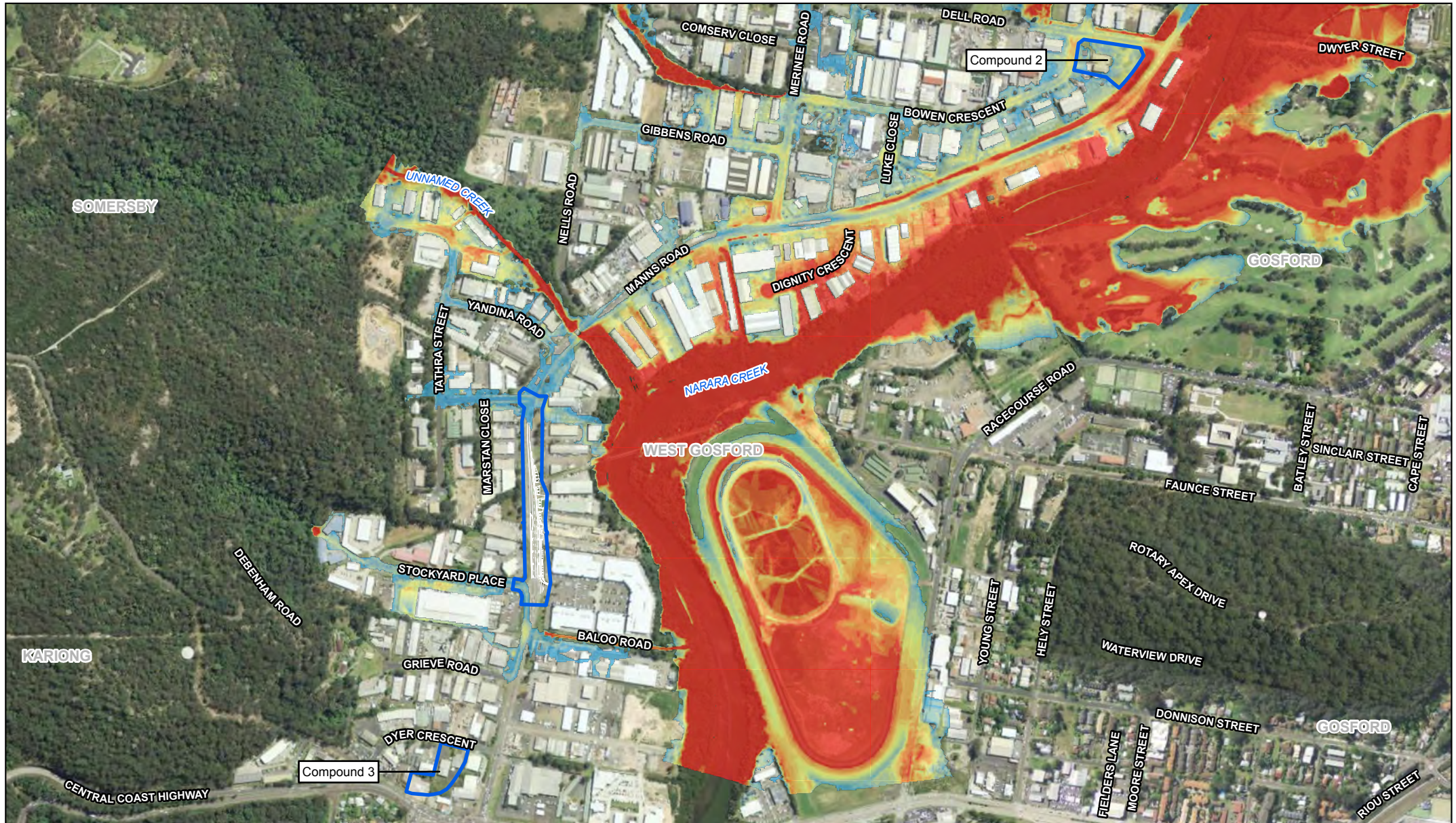
Existing flood conditions
for a 10 year ARI flood event

Figure 6-2

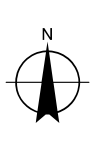
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

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Data source: Lyall & Associates: Flood Data, 2018; LPI: DTDB / DCDB / Aerial Imagery, 2017. Created by: tmorton



Paper Size A4
0 35 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



LEGEND

 Proposal footprint

Concept design

Indicative depth of inundation (m)

0 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.3

0.3 - 0.4

0.4 - 0.5

0.5 - 0.6

0.6 - 0.7

0.7 - 0.8

0.8 - 0.9

0.9 - 1.0

> 1.0



Roads and Maritime Services
Manns Road Upgrade
Review of Environmental Factors
for Stockyard Place Intersection Upgrade

Job Number 22-19033
Revision 1
Date 05/10/2018

Existing flood conditions
for a 100 year ARI flood event **Figure 6-3**

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Data source: Lyall & Associates: Flood Data, 2018; LPI: DTDB / DCDB / Aerial Imagery, 2017. Created by: tmorton

6.1.2 Potential impacts

Construction

Flooding

The construction work would include upgrade of existing drainage, during which there is potential for short durations where existing drainage facilities would be out of use. In the event a rainfall event occurred during this time, there could be an increase in localised flooding. Applying a staged construction would prevent all stormwater drains and pipes from being offline at the same time, which would reduce this impact. The duration of drainage facilities being out of operation would also be short-term.

Flooding from overland flows during construction has the potential to impact on water quality due to erosion and sedimentation and contamination, particularly during any excavation work. However, the intersection is located outside of predicted flood areas, so with the implementation of safeguards recommended in Section 6.1.3, this impact is not likely to be significant and remain localised to the construction area. The proposed construction Compound 2 is located within the mapped 10 and 100 year flood event. Should a flood event occur which affects the compound, there is risk of mobilisation of fines from stockpiled materials, or chemicals and fuels which may be stored within the site, which could be transported and discharged into Narara Creek. Safeguards specified in Section 6.1.3 would mitigate this risk.

Surface water

Construction activities have the potential to impact on water quality as described in Table 6-1. Water quality degradation could impact aquatic habitats and Coastal Management SEPP Wetlands, should appropriate controls not be in place. However, due to the size of the receiving environments and the distances from the proposal these are not expected to be substantial.

With the implementation of safeguards for pollution and sediment controls recommended in Section 6.1.3, this impact is not likely to be significant.

Table 6-1: Summary of key surface water hazards and impacts

Activity	Hazard	Potential impact
<ul style="list-style-type: none">Vegetation clearingTopsoil strippingBulk earthwork	Sediment laden runoff from disturbed areas and stockpiles	Reduced water quality in local waterways due to increased turbidity and sediment loading
<ul style="list-style-type: none">Drainage work including clearing of culvert debrisServices/utilities relocationMaterial stockpiling.	Mobilisation of soil nutrients into waterways	Eutrophication of aquatic habitat
<ul style="list-style-type: none">Construction equipment and machinery operationStorage of fuels or chemicals within compoundsPaving activities.	Accidental fuel or chemical spill	Contamination of surface and groundwater by petroleum hydrocarbons or other hazardous materials
Utility relocation and commissioning	Release of chlorinated water	Alter the water quality of receiving waters and potential toxicity of aquatic biota

Activity	Hazard	Potential impact
Concreting activities including drainage culvert construction	Concrete slurry spills	Contamination of surface water with concrete slurry
General construction	Accidental release of waste into waterways	Aquatic fauna injury / mortality

Operation

Flooding

The road upgrade is located outside the 10 and 100 year ARI flood extent and therefore would not impact on or be impacted by significant flooding during operation. The flood immunity would not be affected by the proposed upgrade and therefore it would remain similar to existing conditions.

Hydrology and drainage

One objective of the design of the proposal has been to maintain the existing hydraulic regime of the watercourses near the proposal footprint. As described in Section 3.2.3, new gated trench drains and drainage pipes are proposed along and underneath Manns Road to achieve hydraulic design standards as described in Table 6-2. Stormwater run-off from the widened sections of road pavement would be managed by the new pavement drainage systems, which would discharge to the existing stormwater drainage system and subsequent outlet points as described in Section 6.1.1. As such, no significant impact to hydrology is likely as there is no change to the locations where existing and upgraded drainage lines discharge and no significant diversion of flow between catchments and watercourses.

The drainage design is still under development and would be further refined during the detailed design stage.

Table 6-2: Minimum average recurrence interval requirements

Item	Minimum average recurrence interval
Channels and open drains	5 years
Piped system (including pits)	10 years
Culverts where surcharge is allowable	50 years
Structures where surcharge is undesirable	100 years
Nil width of flow spread onto traffic lanes	10 years
Gross pollutant traps	1 year
Pavement drainage wearing surface	10 years
Major storm event check for no property damage	100 years
Major storm event check for no structural damage	2000 years
Cycleway	1 year
Temporary drainage	2 year

6.1.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface water pollution	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Construction contractor	Construction	Core standard safeguard Section 2.1 of QA G38 <i>Soil and Water Management</i>
Soil and water	A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the SWMP. The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Construction contractor	Construction	Core standard safeguard Section 2.2 of QA G38 <i>Soil and Water Management</i>
Water quality	Specific measures to be incorporated into the SWMP include: <ul style="list-style-type: none"> • Use existing grass lined drainage channels for clean water diversion where available • Install additional stabilised diversion drains where necessary to separate clean and dirty areas and incorporate necessary sediment and erosion controls • Treat highly chlorinated water prior to release in accordance with water company guidelines. 	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flooding and hydrology impacts	<p>The SWMP would include measures to maintain surface water flows during work on existing and new drainage and avoid localised flooding of the road and adjacent properties including:</p> <ul style="list-style-type: none"> • The provision of temporary alternative drainage arrangements during works on existing drainage lines • Removing debris, soil/gravel, equipment and other obstructions routinely following periods of work and before forecast wet weather • Not stockpiling materials below the mapped 10 year flood level in accordance with blue book requirements • Regular inspection during high rainfall events • Scheduling works wherever possible during low rainfall periods. 	Construction contractor	Construction	Additional safeguard

Other safeguards and management measures which would address hydrology and flooding impacts are identified in Section 6.5.4.

6.2 Noise and vibration

A summary of the noise and vibration methodology, existing environment, impacts and mitigation measures are provided in Sections 6.2.1 to 6.2.5, while a detailed noise report is provided in Appendix H (Volume 2).

6.2.1 Methodology

A noise and vibration assessment was carried out to quantify the noise and vibration impacts associated with the proposal. The assessment was carried out with consideration to the following key guidelines:

- Noise Criteria Guideline (Roads and Maritime 2014) (NCG) and application notes
- Noise Mitigation Guideline (Roads and Maritime 2014) (NMG)
- Road Noise Policy (DECCW 2011) (RNP)
- Model Validation Guideline (Roads and Maritime 2016)
- Construction Noise and Vibration Guideline (Roads and Maritime 2016) (CNVG)
- Environmental Noise Management Manual (RTA 2001) (ENMM)
- Interim Construction Noise Guideline (DECC 2009) (ICNG)
- German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures
- British Standard BS 6472: 2008, Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting
- British Standard BS 5228-2:2009, Code of practice for noise and vibration on construction and open sites – Part 2: Vibration
- Assessing Vibration: A Technical Guideline (DEC 2006)
 - AS 2702 Acoustic Methods of Measurement of Road Traffic Noise
- AS 1055 Acoustics – Description and Measurement of Environmental Noise.

Further detail on the methodology for noise and vibration for construction and operation phase impacts is provided under Sections 6.2.3 and 6.2.4.

6.2.2 Existing environment

The existing noise environment was assessed through monitoring at selected locations within and around the proposal footprint to measure the existing road traffic noise and the background and ambient noise environment. The results provided a basis for validation of the noise model and the development of proposal specific noise criteria. Long-term unattended noise monitoring was conducted between 23 February 2018 and 10 March 2018 at two locations considered to be representative of the local noise environment (Figure 6-4).

Noise receivers within the study area were identified and grouped into noise catchment areas (Table 6-3). Receivers within each noise catchment area are expected to experience similar existing background noise levels based on the results of site observations and the background noise monitoring. Receivers and noise catchment areas within the noise assessment study area are shown on Figure 6-4.

Table 6-3: Noise catchment areas

Noise catchment area	Location
NCA1	Receivers located between Manooka Road off Brisbane Water Drive and Dell Road. Area is mostly commercial with three residential receivers at Boolari Road (about 400 metres from the proposal) and additional residential receivers located south of the Central Coast Highway (about 500 metres south of the proposal).
NCA2	Receivers located north-west of the proposal, on the west side of Manns Road. Area is mostly residential and has been included to assess the impacts of compound site 3.

A summary of the monitoring results (with all invalid weather affected data removed) from the unattended monitoring is provided in Table 6-4 and Table 6-5. The existing noise environment was dominated by the existing road traffic noise from Manns Road. Other identified noise sources in the area included commercial and industrial activities in the area.

Table 6-4: Summary of background noise levels, rating background level 90th percentile dB(A)

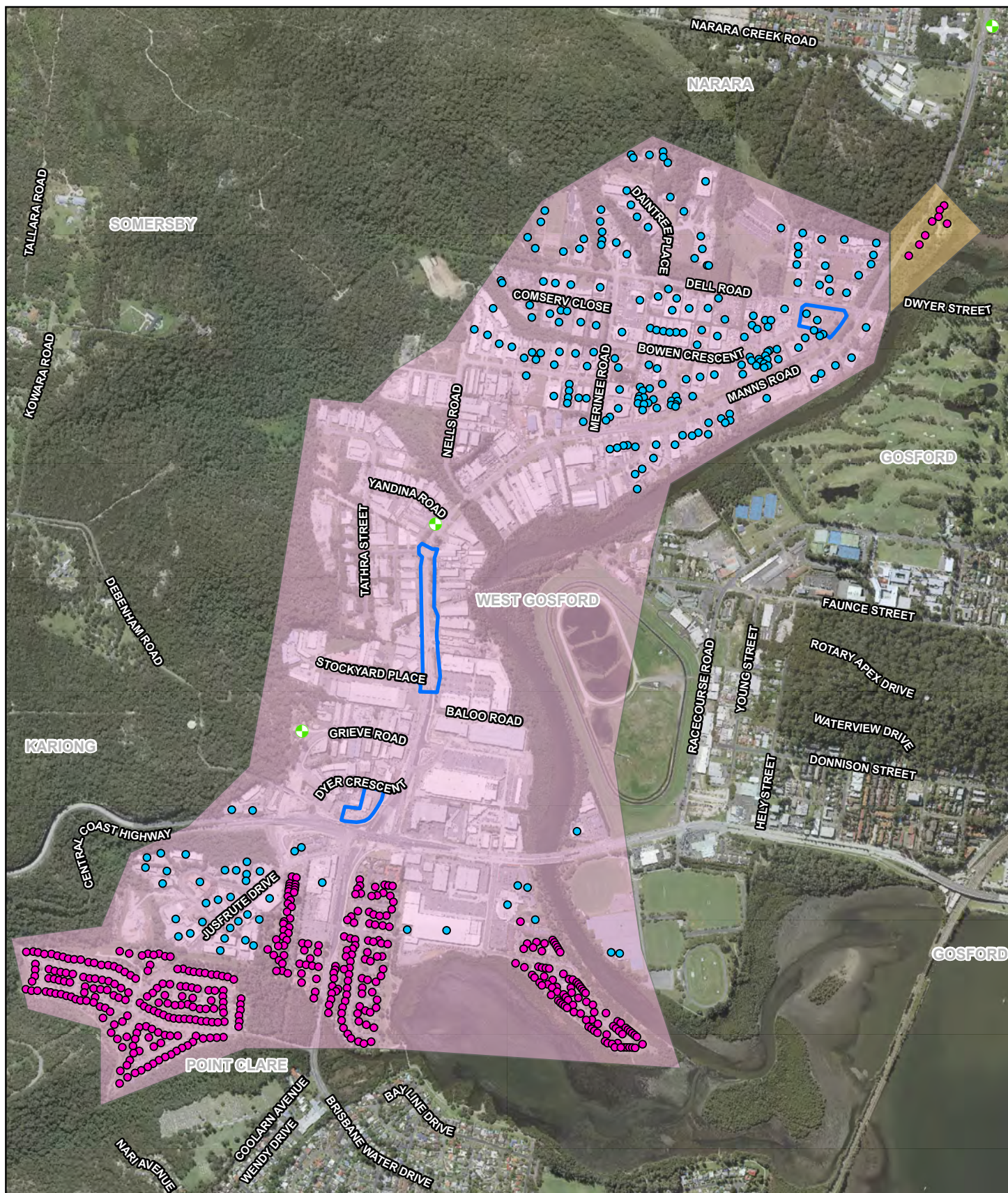
Noise logging location	Day L _{A90} (15min)	Evening L _{A90} (15min)	Night L _{A90} (15min)
L01: 90 Manns Road	48	39	33
L02: 1 Boolari Road	48	46	41

Note: NPI defines day, evening and night-time periods as:

- Day: the period from 7 am to 6 pm Monday to Saturday; or 8 am to 6 pm on Sundays and Public Holidays
- Evening: the period from 6 pm to 10 pm
- Night: the period from 10 pm to 7 am.

Table 6-5: Summary of road traffic noise descriptors – equivalent sound pressure level dB(A)

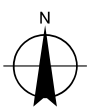
Noise logging location	L _{Aeq} (15hr) (7 am to 10 pm weekdays)	L _{Aeq} (9hr) (10 pm to 7 am weekdays)	L _{Aeq} (1hr) Day	L _{Aeq} (1hr) Night
L01: 90 Manns Road	64	57	65	62
L02: 1 Boolari Road	58	51	56	53



LEGEND

- | | |
|---|--|
|  Proposal footprint | Receiver type |
|  Noise catchment area 1 |  Commercial |
|  Noise catchment area 2 |  Residential |
| |  Noise logger locations |

Paper Size A4
0 130 260 390 520
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



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Noise catchment areas and logger locations **Figure 6-4**

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Data source: LPI: DTDB / Aerial Imagery, 2017. Created by:tmorton

6.2.3 Operation assessment

Methodology

An operational noise assessment has been conducted to quantify the noise and vibration impacts resulting from operation of the proposal, which would predominantly comprise noise generated from the passing traffic. Operational noise modelling for the proposal was carried out for the following scenarios:

- Existing 2018 – the current year existing noise model was used to verify the operational noise model. It considered data obtained from the road traffic noise monitoring and simultaneous traffic counts
- Future year traffic, ten years from the original base case – ‘Build’ 2026 and ‘no build’ 2026
- Future year traffic, twenty years from the original base case – ‘Build’ 2036 and ‘no build’ 2036.

The ‘no build’ (or ‘do nothing’) scenarios are required to assess the increase in total traffic noise associated with the proposal (ie the ‘build’ scenario).

Criteria

The Noise Criteria Guideline (Roads and Maritime Services, 2014) establishes a consistent approach to the application of the Road Noise Policy (DECCW, 2011) to Roads and Maritime projects.

Using this guideline, the relevant noise criteria for residential and non-residential land uses applying to this proposal are shown in Table 6-6. Most buildings provide a noise reduction of at least 10 dB(A) when windows are left 20 per cent open, without providing additional treatment. Therefore where the noise goals are internal, a 10 dB(A) reduction from external noise levels to internal noise levels has been adopted to allow for an external assessment. Note that there is no operational noise criteria applicable to commercial premises.

There is also a cumulative limit criteria from the Noise Criteria Guideline (Roads and Maritime Services, 2014), which is triggered if a sensitive receiver is predicted to exceed the Noise Criteria Guideline by five dB(A) or more in the build year, even if this exceedance is not directly caused by the proposal. The purpose of the cumulative limit is to prevent a sensitive receiver with an existing high noise level that exceeds the noise criteria guideline from remaining at this high noise level after the proposal is opened.

Table 6-6: Road traffic noise assessment criteria

Existing sensitive land use	Criteria, day (dB(A)) 7am – 10pm	Criteria, night (dB(A)) 10pm – 7am	Additional considerations
Residential	60	55	
Open space (active use)	L _{Aeq,15hour} 60 (external) when in use	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants making them less sensitive to external noise intrusion.

Sleep disturbance criteria

The road noise policy provides a literature review for the assessment of sleep arousal due to traffic noise, however, does not set a sleep disturbance assessment criterion. Sleep disturbance impacts are likely to be dependent on the following:

- Maximum noise level of an event
- Number of occurrences
- Duration of the event
- Level above background or ambient noise levels.

For continuous rather than intermittent traffic flow, the *Environmental Noise Management Manual* (RTA, 2001) recommends L_{Amax} noise pass-by events should not exceed $L_{Aeq(1hr)}$ noise levels by more than 15 dB(A). The *Environmental Noise Management Manual* (RTA, 2001) advises maximum noise levels can be used as a tool to prioritise and rank mitigation strategies, but should not be applied as a decisive criterion in itself.

Noise levels measured at L02 (1 Boolari Road) are representative of the nearest residential dwellings to the proposal, being the residences along Boolari Road and 21 Grieve Close. The sleep disturbance criteria for this proposal using the above methodology is therefore L_{AFmax} 68 dB(A).

Operational noise impact

The operational noise assessment shown in Table 5-16 of the Noise Assessment (Appendix H (Volume 2)) identified that there were no sensitive residential receivers qualifying for consideration of operational noise treatment. The closest sensitive residential receivers are located at least 250 metres away from the proposal and the limited extent of works is not anticipated to noticeably increase noise in the study area.

Sleep disturbance impact

The closest residential receiver to the proposed upgrade is 275 metres from the western road edge and is located at 21 Grieve Close. At this distance, the predicted maximum noise level due to traffic on Manns Road would be less than L_{AFmax} 68 dB(A) (refer to the detailed noise assessment results in Appendix H (Volume 2)). Additionally, the road configuration which this resident is exposed to (southern end of project boundary) is not proposed to be altered with the upgraded road configuration (in either width or alignment). Therefore, the maximum noise level at this location is not predicted to increase.

The closest residences to the east of the upgraded road configuration are greater than 600 metres from the eastern road edge. At this distance, significant impacts are unlikely and a maximum noise level assessment to these receivers is not required.

As such, no adverse sleep disturbance impacts are anticipated due to the proposal when assessed at the nearest residential receivers.

6.2.4 Construction assessment

Construction noise methodology

A construction noise assessment has been conducted to quantify the noise impacts resulting from construction of the proposal. Noise levels for the proposal have been predicted at nearby receivers using CadnaA noise modelling software.

The noise modelling has been carried out to assess the maximum noise level of an activity when it is closest to any given receiver. The duration of construction activities, associated equipment and their locations within the site would constantly vary and it is unlikely any receiver would be impacted from the maximum noise level for long periods or regularly throughout construction, but it does provide a guide for predicting the potential for disruption of impacts.

Using the indicative construction staging (Section 3.3.2) and experiences from similar projects in the past, the proposal is anticipated to involve the following general work methodology, which have been modelled as the following separate scenarios for the purposes of predicting noise levels:

- Scenario 1 (S01) – Mobilisation and site establishment
- S02 – Utility, property, service adjustment
- S03 – Widen verge and form footpath
- S04 – Install new full depth pavement on west
- S05 – Install new full depth pavement at eastern widening
- S06 – Install new kerb and gutter, driveways and footpath
- S07 – Install new medians
- S08 – Asphalt re-sheet and line marking
- S09 – Compound set-up
- S10 – Compound operations
- S11 – Compound removal.
- S12 – Demolition at site compounds.

Each scenario contains a range of standard road construction activities predicted to occur, including vegetation clearing, earthwork, concrete work, and so on. A detailed description of the activities assessed under each scenario is provided in Table 5-14 of the specialist report in Appendix H (Volume 2).

Construction noise criteria

Construction noise criteria were developed in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) for each noise catchment area. Construction of the proposal is expected to generally occur during standard construction hours. Standard hours as defined in the guideline are:

- 7am to 6pm Monday to Friday
- 8am to 1pm on Saturday
- No work on Sundays or public holidays.

However, as the proposal is within an industrial area, it is likely work would also be conducted outside of these hours to minimise disruption to daily traffic and disturbance to surrounding land owners and businesses. The following activities, as a minimum, are likely to be carried out outside standard construction working hours:

- The delivery of oversized plant or structure
- Emergency work
- Work for which it can be demonstrated there is a need to operate outside the recommended standard hours
- Work which maintain noise levels at receivers below the night time noise affected construction noise management levels.

These include the following project specific activities also likely to be conducted outside standard construction working hours:

- Removal of median islands at the existing intersection
- Milling and removal of the existing pavement on Manns Road through the intersection
- Placement of final (wearing) asphalt surface
- Tie-in activities on Manns Road to the north and south of the proposal
- Permanent line marking
- Stormwater drainage crossings
- Commissioning of traffic signals
- Crossings and 'cut over' of relocated utilities to existing alignments outside the proposal footprint
- Installation and adjustment of barriers and signage for construction zones during each construction stage and switching of traffic between temporary lanes and routes through the proposal between stages.

For recommended standard hours the following terms are used in relation to establishment of construction noise criteria:

- The 'noise affected level' represents the point above which there may be some community reaction to noise. For standard construction hours this level is established with reference to the measured background noise levels plus 10 dB(A)
- Outside standard construction hours this level is the background plus 5 dB(A)
- The 'highly noise affected level' represents the point above which there may be strong community reaction to noise. This level is set at $L_{Aeq(15min)}$ 75 dB(A).

The noise management levels which apply to sensitive residential receivers within each noise catchment area during construction of the proposal are presented in Table 6-7.

Table 6-7: Summary of construction noise management levels at sensitive residential receivers, L_{Aeq} dB(A)

Time	NCA1	NCA2
During standard recommended hours		
Highly noise affected	75	75
Noise affected	58	58
Outside of standard recommended hours (OOHW)		
Day 7am to 8am and 1 pm to 6pm Saturday, 8m to 6pm Sunday & public holidays	53	53
Evening 6pm to 10pm Monday to Sunday & public holidays	51	44
Night 10pm to 7am, Monday to Saturday; 10pm to 8am Sunday & public holidays	46	38

The construction noise management levels which apply to other sensitive non-residential receivers (when they are operating) in the study area are:

- Active recreation – 65 dB(A) external noise level
- Commercial / industrial receivers – 70 dB(A) external noise level.

The highly affected noise level of $L_{Aeq(15min)}$ 75 dB(A) also applies to other sensitive receivers.

Construction traffic criteria

The Road Noise Policy (DECCW, 2011) provides traffic noise target levels for receivers near existing roads. These levels are applied to construction work to identify potential construction traffic impacts and the subsequent need for reasonable and feasible mitigation measures.

For the assessment of impacts it has been reasonably assumed the majority of the proposal would be constructed with traffic and access maintained along Manns Road and the surrounding local road network. Table 6-8 presents the applicable criteria relating to noise due to additional traffic generated during construction of the proposal.

Based on the Road Noise Policy (DECCW, 2011) it is considered where road traffic noise levels already exceed the assessment criteria, an increase of less than two dB(A) represents a minor impact which is barely perceptible to the average person.

Table 6-8: Construction traffic noise criteria, $L_{Aeq(period)}$, dB(A)

Type of development	Day 7am to 10pm	Night 10pm to 7am
Existing sensitive residential receivers affected by additional traffic on arterial roads generated by land use developments	60 $L_{Aeq(15hr)}$	55 $L_{Aeq(9hr)}$
Existing sensitive residential receivers affected by additional traffic on local roads generated by land use developments	55 $L_{Aeq(1hr)}$	50 $L_{Aeq(1hr)}$
Sensitive non-residential receivers: open space (active use)	$L_{Aeq,15hour}$ 60 (external) when in use	-

Construction vibration methodology

Safe buffer distances for vibration activities associated with the proposal have been calculated using the following methodology:

- Typical vibration levels for difference plant have been sourced from the *Environmental Noise Management Manual* (ENMM) (2001), British Standard *BS 5228.1 Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration* and the *Construction Noise Strategy* (Transport for NSW 2012)
- Safe working distances have been calculated to comply with the structural damage criteria (heritage and standard structures) and the human comfort criteria detailed below.

Construction vibration Criteria

Human comfort

Vibration has been assessed based on the criteria provided in the *British Standard (BS) 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings* (provided in the attached technical noise report, Appendix H (Volume 2)), which is recognised as the preferred standard for assessing 'human comfort criteria'.

Humans are capable of detecting vibration at levels well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in *BS 5228.2 – 2009, Code of Practice for noise and vibration on construction and open sites – Part 2: Vibration*, as shown in Table 6-9. Due to the variable nature of vibration magnitudes and unknown duration of exposure for this proposal, guidance from BS 5228-2 (which uses a peak vibration value) has been used to provide an indication of potential human comfort impacts.

Table 6-9: Guidance on effects of vibration levels for human comfort (BS 5228.2 – 2009)

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely vibration at this level in residential environments would cause complaints, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

Structural damage

Currently, there is no Australian Standard which sets the criteria for the assessment of building damage caused by vibration. Cosmetic damage criteria are provided in *German Standard DIN 4150-3: 1999-02 Structural Vibration – Part 3: Effects of vibration on structures*, as summarised in Table 6-10.

Table 6-10: DIN 4150-3: 1999 Guideline values for short-term vibration on structures (mm/s)

Type of structure	Vibration at the foundation at a frequency of:		
	1 to 10 Hz	10 to 50 Hz	50 to 100 Hz ¹
Buildings used for commercial purposes, industrial buildings, and buildings of similar design.	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy.	5	5 to 15	15 to 20
Structures which, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (for example listed buildings under preservation order).	3	3 to 8	8 to 10

Note 1: At frequencies above 100 Hz, the values given in this column may be used as a minimum value.

Construction noise impacts

This section provides a summary of the construction noise impacts predicted for the proposal; based on Section 5.4 of the specialist noise assessment provided in Appendix H (Volume 2) which has the full details of project specific construction noise management levels, number of exceedances and maximum exceedance for residential and non-residential receivers.

The number of exceedances of the trigger levels of the construction noise and vibration guidelines for each noise catchment area are presented in Table 6-11 for standard hours and Table 6-12 for OOHW night period.

The results show construction activities would result in a short-term increase in localised noise levels, particularly for sensitive residential and sensitive non-residential receivers located close to the proposal site.

The magnitude of the off-site noise impact associated with construction activities would be dependent upon a number of factors, namely:

- The intensity and location of construction activities
- The type of equipment used
- Existing local noise sources
- Intervening terrain
- Time and duration of construction activities
- The prevailing weather conditions.

It is highly unlikely all construction equipment would be operating at their maximum sound power levels at any one time and certain types of construction machinery would be present in the proposal footprint near to the receiver for only brief periods during construction activities. As a result, the following findings represent a maximum noise level based on the noise modelling and are not necessarily representative of the continuous impact over a construction period.

The final staging and construction methodology including plant and equipment needed for the proposal would be determined by the construction contractor and equipment timing and duration of activities may change, but this would be further assessed in a construction noise and vibration management plan prepared prior to construction.

In summary:

- No sensitive residential receivers were modelled as potentially highly noise affected
- Up to 14 sensitive residential receivers may be impacted (exceed the construction noise management level of $L_{Aeq(15min)}$ 58 dB(A) for work carried out during standard hours, with predicted exceedances of up to 10 dB(A)
- Up to 45 sensitive non-residential receivers (commercial buildings) were also predicted to exceed their construction noise management level of $L_{Aeq(15min)}$ 70 dB(A), with predicted exceedances of up to 49 dB(A).

The number of exceedances for compound establishment and installing new full depth pavement are shown visually in Figure 6-5 and Figure 6-6. Given the distances to residential receivers from the proposal, general construction activities during standard hours are not expected to result in significant impacts.

However, it is anticipated some construction work for the proposal may be carried out outside of standard hours to minimise daytime disruption to pedestrians, business access and through traffic from traffic controls, obstructions to driveways and temporary lane closures.

If construction activities are carried out outside of standard hours (including compound operation), this has the potential for temporary noise impacts on residential receivers outside of the industrial area including:

- Full alignment works
 - Up to three exceedances at residential properties on Boolari Road with exceedances up to 6 dB(A)
- Construction compound operations
 - Up to 80 exceedances at residential properties within NCA1 with exceedances of up to 22 dB(A)
 - Up to eight exceedances at residential properties within NCA2 with exceedances of up to 22 dB(A)

Any work carried out outside of standard working hours would be in accordance with the Interim Construction Noise Guideline (DECC, 2009) and the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016). Prior advice would be given to the community if any work is planned to be carried out outside standard construction hours and the construction contractor would be required to prepare and implement an out of hours work procedure in accordance with Roads and Maritime guidelines.

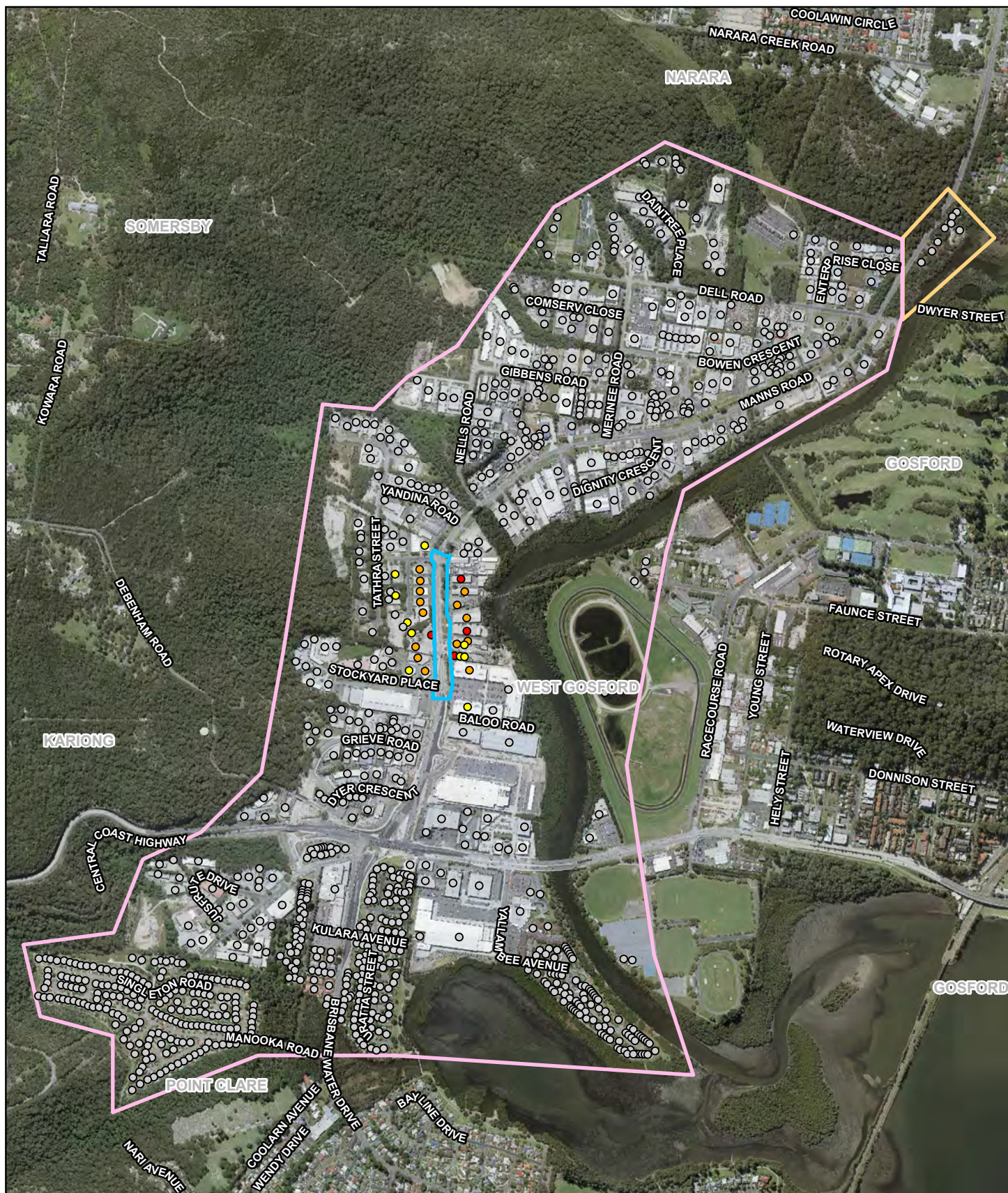
Depending on the type of activity within the compounds, there could be potential for sleep disturbance on some of these residential properties at night. As such, compound set-up and demolitions is recommended to be conducted during standard working hours only.

Table 6-11: Number of exceedances – CNVG trigger level (standard hours)

NCA	Trigger level – Predicted airborne LAeq(15 min) noise level at receiver			Construction scenarios (defined under methodology section)											
	Perception	dBA above RBL	dBA above NML	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12
NCA1	Noticeable	5 to 10	0	9	8	6	9	6	5	5	6	16	16	14	28
	Clearly audible	10 to 20	< 10	9	4	10	12	10	11	11	10	14	6	9	40
	Moderately intrusive	20 to 30	10 to 20	10	17	14	15	14	13	13	14	5	5	5	10
	Highly intrusive	> 30	> 20	4	1	5	5	5	4	4	5	4	4	4	8
NCA2	Noticeable	5 to 10	< 5	0	0	0	0	0	0	0	0	0	0	0	0
	Clearly audible	10 to 20	5 to 15	0	0	0	0	0	0	0	0	0	0	0	1
	Moderately intrusive	20 to 30	15 to 25	0	0	0	0	0	0	0	0	0	0	0	0
	Highly intrusive	> 30	> 25	0	0	0	0	0	0	0	0	0	0	0	0

Table 6-12: Number of exceedances – CNVG trigger levels (OOHW night period)

NCA	Trigger level – Predicted airborne LAeq(15 min) noise level at receiver			Construction scenarios (defined under methodology section)											
	Perception	dBA above RBL	dBA above NML	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12
NCA1	Noticeable	5 to 10	0	4	2	9	4	9	10	10	9	15	15	12	52
	Clearly audible	10 to 20	< 10	15	15	14	18	14	13	13	14	23	9	13	58
	Moderately intrusive	20 to 30	10 to 20	4	4	7	9	7	7	7	7	3	3	4	8
	Highly intrusive	> 30	> 20	1	1	2	4	2	1	1	2	4	4	4	7
NCA2	Noticeable	5 to 10	< 5	0	0	0	0	0	0	0	0	4	2	1	1
	Clearly audible	10 to 20	5 to 15	0	0	0	0	0	0	0	0	2	1	2	6
	Moderately intrusive	20 to 30	15 to 25	0	0	0	0	0	0	0	0	0	0	0	1
	Highly intrusive	> 30	> 25	0	0	0	0	0	0	0	0	0	0	0	0

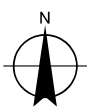
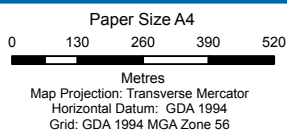


LEGEND

- Construction
- Noise catchment 1
- Noise catchment 2

Scenario S04 - Standard hours

- Highly intrusive (>20 dBA above NML)
- Moderately intrusive (10-20 dBA above NML)
- Clearly Audible (<10 dBA above NML)
- Receiver



Roads and Maritime Services
Manns Road Upgrade - Review of Environmental Factors
for Stockyard Place Intersection Upgrade

**Construction Noise Impacts
pavement installation**

Job Number 22-19033
Revision 1
Date 05/10/2018

Figure 6-5

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Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

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Data source: LPI: DTDB / Aerial Imagery, 2017. Created by:tmorton



LEGEND

- Noise catchment 1
- Noise catchment 2
- Compound

Scenario S09 - Standard hours

- Highly intrusive (>20 dBA above NML)
- Moderately intrusive (10-20 dBA above NML)
- Clearly audible (>10 dBA above NML)
- Receiver

Paper Size A4
0 130 260 390 520
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Roads and Maritime Services
Manns Road Upgrade - Review of Environmental Factors
for Stockyard Place Intersection Upgrade
**Construction Noise Impacts
compound setup**

Job Number 22-19033
Revision 1
Date 05/10/2018

Figure 6-6

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Construction traffic noise Impacts

The predicted increase in noise level due to construction traffic on the haulage routes has been calculated based on the total construction vehicle movements relative to the existing traffic volumes. The predicted results from these calculations are shown in Table 6-13 and Table 6-14.

Noise increases due to construction traffic on the haulage routes is predicted to be less than 2 dB on all proposed roads. This change is not expected to be significant or perceptible above the existing noise environment to most receivers and therefore specific mitigation measures for construction traffic noise would not be required for the proposal.

A traffic management plan would still be prepared and implemented as part of the CEMP to manage haulage routes to and from the proposal and movement of construction traffic throughout the proposal and minimise the impact of construction traffic noise on the community.

Table 6-13: Predicted increase in noise due to construction traffic – day time

Road	Existing volumes – light vehicles	Existing volumes – heavy vehicles	Construction generated volumes – light vehicles	Construction generated volumes – heavy vehicles	Predicted relative increase in total traffic noise (dB)
Manns Road – Stockyard Place	21055	1676	65	40	0.1

Table 6-14: Predicted increase in noise due to construction traffic – night time

Road	Existing volumes – light vehicles	Existing volumes – heavy vehicles	Construction generated volumes – light vehicles	Construction generated volumes – heavy vehicles	Predicted relative increase in total traffic noise (dB)
Manns Road – Stockyard Place	2796	222	30	19	0.2

Construction vibration Impacts

Predicted construction activities would result in some short-term increases in localised vibration levels, particularly for sensitive residential and sensitive non-residential receivers located close to the proposal site. The final staging and construction methodology for the proposal would be determined by the construction contractor and the equipment, timing and duration of activities may change, but this would be further assessed in a construction noise and vibration management plan prior to construction.

Vibration impacts focus on potential structural damage in close proximity to construction activities with vibration levels falling as receiver distance from the source increases. Table 6-15 provides working buffer distances based on equipment likely to be used for the proposal, where monitoring, alternative methods or extra controls for construction activities would be needed to reduce vibration to levels that comply with the human comfort, cosmetic damage, standard dwelling and heritage building structural damage criteria.

Table 6-15: Construction vibration buffer distances

Activity	Human comfort (1 mm/s)	Standard dwelling – Potential structural damage (5 mm/s)
Roller	90 metres	13 metres
7 tonne compactor	140 metres	13 metres
7 tonne compactor	120 metres	13 metres
Pavement Breaker	90 metres	13 metres
Dozer	90 metres	8 metres
Backhoe	60 metres	2 metres
Jackhammer	10 metres	1 metres
Excavator	4 metres	4 metres

Note 1: Guidance from BS 5228-2 has been used to provide an indication of potential human comfort impacts.

Note 2: Guidance from DIN 4150-3 has been used to provide an indication of structural damage impacts

With consideration to the potential for structural damage to adjacent buildings, the expected magnitude of ground vibrations should not be sufficient to cause damage if the equipment operates at distances greater than 13 metres from standard residential buildings or structures of similar construction. A figure highlighting the areas with potential for structural damage impacts for standard residential buildings is provided in the noise report in Appendix H (Volume 2). The noise and vibration mitigation measures detailed in Section 6.2.5 would be implemented to manage potential construction vibration impacts.

With consideration to human comfort vibration impacts, where rolling and compacting activities occur within 140 metres of adjacent receivers including residences, schools and places of worship, there is the potential vibration levels could be intrusive for some activities. It is possible local sensitive receivers may perceive construction vibration at times. The level of annoyance, however, would depend on individuals tolerance and activity occurring at the time.

It is recommended where reasonable and feasible, buffer distances are implemented as per values shown in the corresponding activities. It is recommended the noise and vibration mitigation measures detailed in Section 6.2.5 be implemented to manage potential construction vibration impacts.

6.2.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction noise and vibration management	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the Interim <i>Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented, taking into account Beyond the Pavement: urban design policy, process and principles (Roads and Maritime Services, 2014) • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Construction contractor	Construction	<p>Core standard safeguard</p> <p>Section 4.6 of QA <i>G36 Environment Protection</i></p> <p><i>Interim Construction Noise Guideline</i> (DECC, 2009)</p> <p><i>Beyond the Pavement: urban design policy, process and principles</i> (Roads and Maritime, 2014)</p>
	<p>Include measures in the NVMP to shield sensitive receivers from noise, including:</p> <ul style="list-style-type: none"> • Placement and layout of construction compounds to locate primary noise sources away from sensitive receivers • Use solid structures (sheds, containers, etc.) at shields for sensitive receivers • Enclose fixed noise sources such as pumps, compressors, fans, screens (where practicable). 	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Where exceedances of construction noise management levels remain after the implementation of standard noise mitigation measures, additional noise mitigation measures are to be outlined in the construction NVMP, which will be implemented where reasonable and feasible. Guidance on suggested additional noise mitigation measures for each receiver are provided in the specialist noise report attached to this REF.	Construction contractor	Construction	Additional safeguard
	Include a complaints procedure in the NVMP to address complaints and corrective actions. This should include the requirement to undertake noise monitoring if applicable.	Construction contractor	Construction	Additional safeguard
	All sensitive receivers (for example local residents) likely to be affected will be notified at least five calendar days prior to start of any works associated with the activity which may have an adverse noise or vibration impact. The notification will provide details of: <ul style="list-style-type: none"> • The proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information. 	Construction contractor	Construction	Core standard safeguard
	An out-of-hours work procedure for assessing and managing activities requiring work outside of standard hours will be developed and would include the following: <ul style="list-style-type: none"> • Five working days prior to the activity starting, contact the receivers from the local community which are potentially affected by the proposed work and inform them by letter of the proposed work, location, type of work, days and dates of work and hours involved. The contact will be made before the start of work • A 24-hour community liaison phone number and permanent site contact will be provided so complaints can be received and addressed in a timely manner • Measures to investigate and respond to any valid noise complaints. 	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction vibration impacts	Building condition surveys will be conducted at receivers (as required) within 50 metres of proposed vibration generating activities (buildings and other structures).	Construction contractor	Construction	Additional safeguard
	Where construction activities are scheduled to use vibration generating equipment, and there are occupied buildings within the relevant buffer distances specified in Table 5-27 of the Manns Road upgrade – Southbound Approach to Stockyard Place Intersection Noise and Vibration Assessment, a notification to the affected properties would occur prior to the start of the construction activity.	Construction contractor	Construction	Additional safeguard
	Develop a monitoring plan in the NVMP that covers potential high vibration activities including works within 13 metres of sensitive receivers. The plan would include trial monitoring to determine actual vibration levels likely from the activity and a procedure for dealing with exceedances of the vibration criteria, which would include ceasing activities and investigation of alternative work methods	Construction contractor	Construction	Additional safeguard
Construction noise impacts - machinery	Where practical, construction equipment and machines will be selected to minimise noise emissions, fitted with appropriate silencers and be maintained in good working order.	Construction contractor	Construction	Additional safeguard

6.3 Traffic and transport

This section addresses the potential traffic and transport impacts associated with the proposal and details the management measures proposed to mitigate these impacts.

6.3.1 Methodology

The traffic and transport assessment comprised the review of existing conditions through surveys and a traffic modelling and simulation analysis by Cardno (Cardno, 2018). The full traffic and transport report for this proposal and another nearby upgrade proposal (Manns Road Upgrade: Narara Creek Road Intersection) is provided in a specialist technical report in Appendix J.

Traffic surveys

Traffic surveys were conducted across the proposal footprint to survey existing conditions, which comprised:

- Automatic tube counts to identify 24 hour traffic volumes
- Intersection counts to identify peak hour turning volumes at intersections
- Origin destination survey to understand where traffic is coming from and going to
- Travel time survey to understand how long it takes to travel along specific sections of road.

These surveys informed traffic demands for the traffic model and the creation of peak hour profiles.

Modelling

Traffic modelling was conducted to assess intersection performance for existing conditions/base case (2017), plus future case for 2026 and 2036 based on projected traffic growth under both a low and high growth scenario. In all cases a comparison was also provided for the 'with proposal' (build) and 'do nothing' (no build) scenarios. The modelling considered three peak hours, comprising weekday morning, weekday evening and Saturday peak hour. Traffic performance was assessed in terms of level of service, as defined in Table 6-16.

Table 6-16: Level of service definitions

Level of service	Intersection performance – average delay per vehicle (seconds)	Road performance (relating to a specific section of road) – average travel speed as a percentage of the allowable sign-posted speed
A	0 – 14	More than 85 % (ie above 51 kilometres per hour for a 60 kilometre per hour zone)
B	14 – 28	67 – 85 %
C	29 – 42	50 – 67 %
D	43 – 56	40 – 50 %
E	57 – 70	30 – 40%
F	More than 70	0 – 30%

6.3.2 Existing environment

Road network

Manns Road is an arterial road in West Gosford which allows traffic to bypass the Gosford central business district for vehicles travelling between the Pacific Motorway and Gosford's northern suburbs.

Manns Road is utilised as a B-Double freight route between the Central Coast highway and Merinee Road intersection, which includes the section of Manns Road in the proposal footprint. Manns Road is generally one 3.5 metre traffic lane in each direction with a sealed shoulder of varying widths of between 1.4 to 1.9 metres, and a posted speed limit of 60 kilometres per hour.

There are two intersections within the proposal footprint, namely the signalised Stockyard Place and un-signalised Carnarvon Road intersections, but permanent work would only occur on the southbound lanes towards and including part of the Stockyard Place intersection.

Formalised pedestrian and cycling facilities on Manns Road within the proposal footprint are limited to:

- About 80 metres of footpath on the eastern side of the road
- Road markings for cyclists on the sealed shoulder both sides of the road.

While there are no formal marked on-road parking facilities in the proposal footprint, there is the opportunity for informal car parking on the sealed shoulder and grass verge of Manns Road in the proposal footprint, especially on the eastern side. No stopping signs are in place on the approaches to intersections along the shoulder of Manns Road for safety, visibility and to maintain local traffic flow.

Traffic and road safety

There is currently up to 22,000 vehicles per day using Manns Road within the proposal footprint, with heavy congestion and delays experienced during peak periods due to a high proportion of vehicles turning right, a lack of acceleration lanes and the high proportion of heavy vehicles originating from the industrial area. In the five years between 2013 and 2017 there were 13 crashes on Manns Road between Carnarvon Road and Stockyard Place intersections. The majority of crashes occurred as a result of a turning vehicle or vehicle waiting to turn right in the centre lane.

The hourly traffic profile over a 24-hour surveyed period indicates the Manns Road corridor has a typical weekday traffic pattern with morning and afternoon peak periods between 8am to 9am and 3pm to 4pm. There is also a significant Saturday peak hour between 11am and 12pm, likely due to the high concentration of retail and industrial/commercial properties in the local area.

Traffic surveys for the existing section of Manns Road southbound to Stockyard Place show there is significant queuing of through traffic in the afternoon peak period back from Carnarvon Road. Modelling of existing conditions showed an average traffic speed through the proposal falling to a low 17 kilometres per hour, equating to a level of service F for the section of Manns Road between Carnarvon Road and Stockyard Place (Cardno, 2018). This congestion also impacts on the performance of Manns Road to the north of the proposal footprint, with other local road intersections such as Carnarvon, Yandina and Nells Road having low level of service intersections (F, as described in Table 6-16). Further, existing congestion obstructs local business access and access to turning lanes at Stockyard Place.

Traffic modelling showed the Stockyard Place intersection would continue to suffer a decline in performance, particularly for southbound traffic.

Public transport

Two public bus routes service Manns Road in the proposal footprint. Bus Services 33 and 55 run in both directions from Brisbane Water Drive via the proposal footprint to the Narara Creek Road/Maliwa Road intersection and then further north of the proposal.

Within the proposal footprint there are two bus stops on the western side and one on the east of Manns Road, all comprising a bus stop sign only, with no shelter or bus bay.

6.3.3 Potential impacts

Construction

Partial road closures and construction speed limits

Temporary traffic arrangements would be planned and implemented during work to provide for the safety of road users and construction staff. These could include modification to lane widths or road shoulders, use of separation barriers, detours and temporary signage.

Construction speed limits (typically 40 kilometres per hour) may apply to road segments in and directly next to the construction site. These could lead to short-term travel delays for motorists, but given the limited extent of the proposal and the existing congestion, it is anticipated these impacts would be localised and of a short duration.

Construction is expected to take up to about 12 months and impacts would be variable throughout this period depending on the construction stage. Construction staging would be developed to minimise impacts on the road network. Where possible, construction activities which could substantially affect traffic congestion would be carried out outside peak periods, as far as is practicable. Safeguards and management measures to address this are provided in Section 6.3.4.

Construction traffic generation

Construction of the proposal would generate heavy vehicle movements. These heavy vehicle movements would mainly be associated with:

- Delivery of construction materials
- Spoil and waste removal
- Delivery and removal of construction equipment and machinery.

Light vehicle movements would be required for the movement of construction personnel, including contractors, site labour force and specialist supervisory personnel. As detailed in Section 3.3.7, peak construction traffic (with a likely duration of about one month) is expected to be in the order of:

- Up to 118 heavy vehicle movements per day
- Up to 190 light vehicle movements per day.

Construction vehicles would access the site via Manns Road from the north and south. It is not anticipated local roads would be utilised to access the proposal footprint as most are not suitable. Heavy vehicle traffic would be restricted, as much as possible, to main roads such as Manns Road to minimise impacts on local roads.

The estimated construction traffic movements are small when compared to the existing traffic volumes in the area of up to 22,000 vehicle movements per day and are therefore not expected to impact the traffic and transport environment of the proposal footprint. However, the impact would be more noticeable to road users during local peak periods between 8am and 9am, and 3pm and 4pm.

Short-term manual traffic control may be used to manage heavy vehicle entry and exit from the construction site and compounds. This may result in minor traffic delays for motorists, however, these delays would be localised and of a short duration. Potential impacts would be managed through the development of a construction traffic management plan and appropriate consultation with affected parties.

Access

Potential impacts associated with construction of the proposal may include access disruptions at existing intersections near the proposal (for example, Carnarvon Road) and accesses for property owners within the proposal footprint. Vehicular access to some properties may be restricted for short periods during the construction work following appropriate consultation with impacted property owners.

Where access to property / businesses would be disrupted for an extended period, alternative access would be provided.

On-road parking

Informal parking on both the eastern and western verge of Manns Road may be temporarily restricted during construction to allow space for traffic diversions and construction work. Parking on verges is informal and uncontrolled, but may inconvenience some road users such as staff, customers and/or delivery vehicles to the businesses within the proposal footprint.

The loss of informal on-road parking within the proposal footprint would be minimal and on-street parking is available on side streets on Carnarvon Road and Stockyard Place in addition to opportunities for off-street parking within businesses along Manns Road.

Public transport

There is no expected impact on public transport. All existing bus services and stops would be maintained during construction. Bus detours would not be required, although bus stops may require temporary relocation to accommodate construction work.

Pedestrians and cyclists

The existing footpath on the west of Manns Road would be maintained during construction. To enable construction of the proposal and any adjustments to eastern properties, pedestrians and cyclists on the east of Manns Road may need to temporarily cross the road at the existing traffic lights at Stockyard Place to use the footpath on the west, which would create a short-term minor diversion. Safe access for pedestrians and cyclists would be addressed in the traffic management plan for the proposal, described in Section 6.3.4.

Operation

Future intersection performance

While the proposal only improves the southbound approach to Stockyard Place intersection, this would allow an overall adjustment to the phasing (timing) of the existing traffic lights to allow a phase with northbound through and right turn movements occurring at the same time followed by another phase with southbound through and right turn movements occurring at the same time. This would result in an improvement to intersection performance as confirmed by traffic modelling, which predicted an improvement for afternoon peak hours of at least two levels of service (reduction in delay of up to 62 seconds per vehicle) with the upgrade (Table 6-17).

Table 6-17: Stockyard Place intersection level of service with and without the proposal, afternoon peak hour

Scenario	No proposal	With proposal
2026 – low growth	D	B
2026 – high growth	F	C
2036 – low growth	F	B
2036 – high growth	F	D

Refer to Table 6-16, Section 6.3.1 for level of service definitions.

With the longer periods of through traffic on Manns Road through the intersection, an associated reduction in congestion to the north and south of the proposal is as predicted. Modelling predicted an improvement to the southbound and northbound traffic flow between Carnarvon Road and Stockyard Place intersection of at least three levels of service (Table 6-18) and an increase in travel speed of up to 43 kilometres per hour, to be more consistent with the signposted 60 kilometre per hour speed limit. This would have associated benefits to the level of service for intersections to the north of Stockyard Place, including Carnarvon Road, Yandina Road, Merinee Road and Dignity Crescent intersections, which have predicted improvements of up to three levels of service with the proposed upgrade. Further information is provided in Section 5 of the attached Traffic and Transport report (Appendix I (Volume 2)).

Table 6-18: Manns Road level of service between Carnarvon Road and Stockyard Place with and without the proposal, afternoon peak hour

Scenario	No proposal	With proposal
Southbound		
2026 – low growth	F	A
2026 – high growth	F	B
2036 – low growth	F	A
2036 – high growth	F	E
Northbound		
2026 – low growth	E	A
2026 – high growth	F	C
2036 – low growth	F	A
2036 – high growth	F	C

Refer to Table 6-16, Section 6.3.1 for level of service definitions.

Road user safety

An improvement in traffic flow would result in less queuing and a more consistent travel speed, which would improve the general safety of Manns Road within and outside of the proposal footprint. Further, the raised central median to the north of the intersection would prevent right in / out from three industrial properties, decreasing the number of vehicles (including heavy vehicles) turning across oncoming traffic, which currently comprises the most frequent type of crash in the proposal footprint.

The safety of pedestrians, cyclists and motorists would be improved as a result of extending the pedestrian footpath and cycle lane on the east of Manns Road by about 170 metres to the north.

Access

The proposal would require minor alterations to existing accesses for five properties along the east of Manns Road to accommodate the proposal, such as new surfacing, minor drainage and changes to next to kerb and gutter laybacks. Affected properties comprise:

- Lot 3, DP 622251
- Lot 4, DP 244383
- Lot 5, DP 244383
- Lot 6, DP 244383
- Lot 7, DP 244383.

No existing accesses would be closed or significantly relocated from their existing positions. Any minor alterations would be designed to continue to accommodate the existing vehicle types accessing the properties at present.

However, existing access arrangements to four properties within the proposal footprint would be impacted due to the extension of a raised concrete median north of Stockyard Place which would prevent vehicles from turning right into and out of the accesses, as follows:

- East of Manns Road
 - Lot 6, DP 244383
 - Lot 7, DP 244383
- West of Manns Road
 - SP66332
 - Lot 30, DP634563 (partial – one of two access points would be affected).

The median extension is required to accommodate additional turning lane capacity and road drainage at the existing traffic signals.

Options are available via Stockyard Place and Carnarvon and Yandina roads for vehicles to find safe turning options to access the impacted properties under the new access arrangements (illustrated in Section 6 of the Socio economic technical report, Appendix F (Volume 2)). The detours are not long deviations from existing routes and the longest alternative route is 700 metres.

Restricted access to left in-left out would be a long-term, negligible impact on a very small proportion of businesses in the West Gosford area. Further targeted consultation with businesses next to the proposal would be carried out to identify any significant impacts on accesses through the design process and the availability of appropriate alternate options/routes for long vehicles.

The upgrade of pedestrian and cycle facilities would improve connections to the existing traffic signal crossings at Stockyard and the existing footpath network south to the retail precinct of West Gosford.

On-road parking

Access to informal parking on the eastern grass verge of Manns Road within the proposal footprint would be permanently lost as part of the proposal. The loss of access to the verge for parking may inconvenience some road users such as staff, customers and/or delivery vehicles to the businesses along this section if they have been accessing this area for short-term parking.

The loss of informal on-road parking within the proposal footprint would be minimal, as available areas of the verge are also currently used for advertising signage and trailers, driveways and a bus stop. Most businesses have alternative on-site car parking and existing on-street parking is available on side streets on Carnarvon Road and Stockyard Place which would not be affected by the proposal.

Further targeted consultation with businesses in the proposal footprint would be carried out to identify any potential impacts on onsite parking as the design is refined.

Public transport

No existing bus stops would be permanently removed or substantially relocated as a result of the proposal. The proposal would benefit public transport by:

- Improving traffic flow through the intersection, which would reduce travel time for buses
- Creating a more formalized shoulder
- Providing safer access through the proposal footprint via a concrete footpath on the east of Manns Road, which would connect the bus stops on the east of Manns Road to the traffic lights at Stockyard Place.

6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and QA <i>Specification G10 Control of Traffic</i> (Roads and Maritime Services, 2008). The TMP will include:</p> <ul style="list-style-type: none"> • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network and any local parking changes • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction traffic incident • Consideration of other developments which may be under construction to minimise traffic conflict and congestion which may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms. 	Construction contractor	Construction	<p>Core standard safeguard</p> <p>Section 4.8 of QA <i>G36 Environment Protection</i></p> <p><i>Traffic Control at Work Sites Manual</i> (RTA, 2010)</p> <p>QA <i>Specification G10 Control of Traffic</i> (Roads and Maritime Services, 2008)</p>
Traffic congestion	Construction activities which could substantially affect traffic congestion will be carried out outside peak periods, as far as is practicable.	Construction contractor	Construction	Additional safeguard
	Heavy vehicle traffic will be restricted, as much as possible, to the existing main roads (such as Manns Road) to minimise impacts on local roads and streets.	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Access	Property and access adjustments would be designed to cater for the required vehicles accessing each site.	Detailed designer	Detailed design	Additional safeguard
	Further consultation with businesses would be carried out to identify appropriate alternate options/routes for long vehicles.	Detailed designer	Detailed design	Additional safeguard
	Where access to property / businesses would be disrupted for an extended period, alternative access would be provided.	Construction contractor	Construction	Additional safeguard

Other safeguards and management measures which would address traffic and transport impacts are also identified in Section 6.6.

6.4 Biodiversity

This section addresses the potential terrestrial and aquatic biodiversity impacts associated with the proposal and details the management measures proposed to mitigate these impacts. The information relevant to the proposal footprint and presented in this section is sourced from the Manns Road Upgrade – Stockyard Place to Narara Creek Road, Biodiversity Assessment Report prepared by GHD, which is provided in Appendix E (Volume 2).

6.4.1 Methodology

The Biodiversity Assessment was based on desktop review of available documents and field surveys conducted from 28 February to 2 March 2018. The assessment includes the following:

- Database searches and literature review
- Assessment of the likelihood of occurrence of threatened species in the proposal footprint
- Field survey – vegetation, targeted flora, opportunistic fauna and targeted fauna surveys
- Assessment of significance and associated impacts
- Recommendation of mitigation measures.

Database searches and literature review

Background searches pertaining to the proposal footprint and locality (within a 10 kilometre radius of the site, shown in Figure 6-7) were carried out to determine whether any threatened flora and fauna species, populations, ecological communities, migratory species and critical habitats as detailed in State and Commonwealth legislation occur or are likely to occur within the proposed work area. The database searches were conducted on 11 July 2018 for the proposal, and are summarised in Table 6-19, while the results of the database searches are provided in the likelihood of occurrence table in the Biodiversity Assessment (Appendix E (Volume 2) of this REF).

Table 6-19: Database searches

Resource	Target	Search Area
BioNet (website for the Atlas of NSW Wildlife and OEH BioBanking Threatened Species Profile Database)	Threatened flora and fauna species, populations and ecological communities listed under the BC Act	10 kilometre radius around the proposal footprint (study locality, Figure 6-7)
Department of the Environment and Energy (DoEE) Protected Matters Search Tool Act which may occur in the area (DoEE 2018a), DoEE online species profiles and threats database (DoEE 2018b)	Threatened flora and fauna species, populations and communities, and matters of national environmental significance listed under the EPBC Act	Study locality
Department of Primary Industries freshwater threatened species profiles and online database	Threatened freshwater fish and key fish habitat	Study locality
OEH and DoEE critical habitat registers (OEH 2018d, DoEE 2018c)	Critical habitat	Study locality

Resource	Target	Search Area
Department of Primary Industries NSW WeedWise – Priority weed declarations (DPI 2018c)	Priority weeds	Central Coast LGA

In addition to the database searches, literature and resources relevant to this assessment which were also reviewed include:

- Construction methodology and concept design
- Vegetation mapping completed by Bell (2013) for the Gosford Shire Council to identify native vegetation types occurring within the proposal footprint and the likely presence of any threatened ecological communities
- Reports for previous ecological studies completed within or close to the proposal footprint
- Biobanking Assessment Methodology and Credit Calculator Operation Manual
- Satellite imagery.

Likelihood of occurrence of threatened species

Following collation of database records, literature reviews and species and community profiles, a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the area. The likelihood of threatened and migratory biota occurring in the proposal footprint was assessed based on presence of records from the locality, species distribution and habitat preferences, and quality of potential habitat present. The results of this assessment are provided in the Biodiversity Assessment Report in Appendix E (Volume 2).

Field survey

Field surveys were conducted by three ecologists on 28 February to 2 March, 2018. The proposal footprint was surveyed as shown in Figure 6-7. Survey effort included flora and fauna survey methods as listed in Table 6-20.

Table 6-20: Biodiversity survey methods

Fauna survey methods	Flora survey methods
<ul style="list-style-type: none"> • Fauna habitat assessment • Bird surveys • Koala habitat assessment • Nocturnal call playback and spotlighting • General fauna surveys • Opportunistic threatened fauna observations. 	<ul style="list-style-type: none"> • Random meander flora surveys • Plot/transects in accordance with the Biodiversity Assessment Methodology • Vegetation mapping • Opportunistic threatened flora observations • Random meander searches for threatened plants including <i>Melaleuca biconvexa</i> which is a known species in the wider area.

The objectives of the flora surveys were to:

- Determine all vegetation communities present within the proposal footprint, their condition and extent, with reference to the OEH plant community type (PCT) classification
- Identify potential Endangered Ecological Communities (EECs) within the proposal footprint and determine their condition and extent
- Identify whether threatened flora species are present within the proposal footprint, and whether it is likely any have the potential to occur within the habitats present
- Identify areas of high weed infestation.

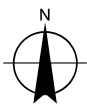
Survey techniques and effort were conducted with reference to Department of Environment and Conservation (2004) survey guidelines and as appropriate to the habitats present and landscape context. The location of survey sites are shown in Figure 6-7. Further details on survey methodology and weather conditions during field surveys are provided in the Biodiversity Assessment Report (Appendix E(Volume 2)).



LEGEND

- Proposal footprint
- Survey locality
- Concept design
- Watercourse
- ✱ Random meander flora survey
- ✱ Flora transect
- Fauna habitat assessment

Paper Size A4
 0 60 120 180 240 300
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



Roads and Maritime Services
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Survey effort

Figure 6-7

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Data source: LPI: DTDB, 2017, Aerial Imagery, 2015; OEH: Melaleuca biconvexa mapping, 2016. Created by: fmacKay, tmorton

6.4.2 Existing environment

The proposal is located along Manns Road in Gosford within the Central Coast Council LGA. Gosford lies to the north of Brisbane Water, and supports industrial land uses. The proposal is located in the Sydney Basin Bioregion, on soils consistent with the Wyong Soil Landscape on poorly drained floodplains and alluvial flats, influenced by Narara Creek which is located 100 metres east of the proposal footprint.

Vegetation in the proposal footprint has been influenced by road infrastructure and commercial and industrial development. Grassed road verges and remnant or planted native trees comprise the majority of vegetation in the proposal footprint.

Vegetation

Exotic grassland with scattered native and planted trees is the only vegetation type present in the proposal footprint, which has no significant biodiversity status and is associated with road verges and alongside development in industrial areas (Figure 6-8).

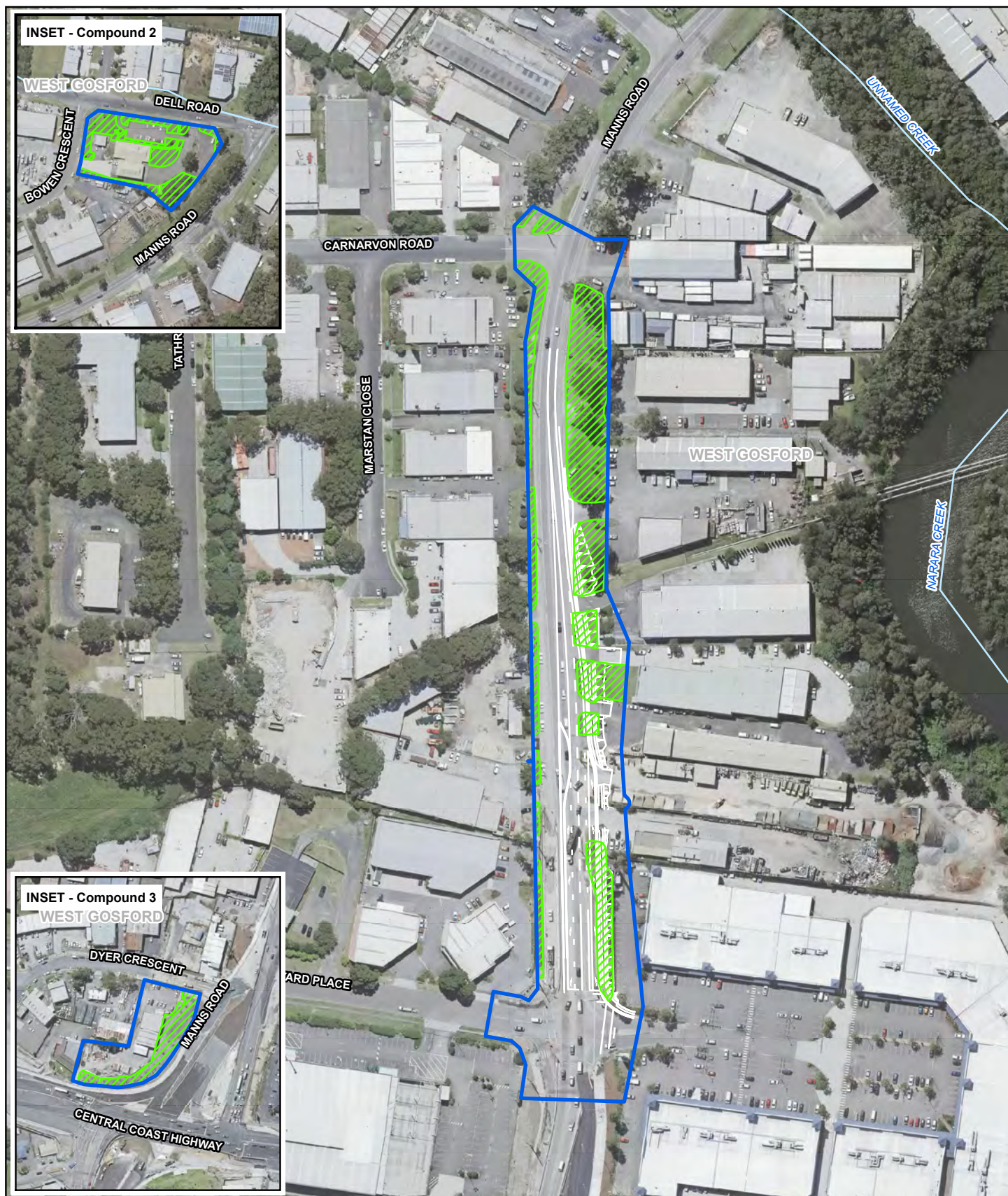
There was a total of 30 species of flora recorded within the proposal footprint, comprising 13 native and 17 exotic. No threatened species or endangered ecological communities were recorded in the proposal footprint.

The biodiversity assessment also found there was no suitable habitat in the proposal footprint for any threatened flora species, as vegetation in the proposal footprint is limited, in a very disturbed condition on the roadside of Manns Road and surrounded by commercial development.

Weeds

No priority weeds for the Gosford local government area were identified within the proposal footprint.

The biodiversity assessment identified there were a number of exotic species which can be considered as environmental weeds. Environmental weeds pose a threat to native biodiversity by competing and utilising valuable resources. It is important to prevent the spread of these weeds to protect native communities and reduce the need for future restoration activities. These include exotic invasive species like Paddy's Lucerne (*Sida rhombifolia*), Catsear (*Hypochaeris radicata*) and Flaxleaf Fleabane (*Conyza bonariensis*). Mitigation measures to prevent the spread of these weeds are described in Section 6.4.4.



Fauna

Fauna species

No threatened fauna species were identified in the proposal footprint during field investigations.

A number of more common native bird species were identified in the proposal footprint during field survey, including the Australian Magpie (*Cracticus tibicen*), Whistling Kite (*Haliastur sphenurus*) and the Noisy Miner (*Manorina melanocephala*). The exotic grassland habitat in the proposal footprint would also attract exotic species like the Common Miner (*Sturnus tristis*), although none of these were recorded during field survey.

Habitat types

The habitat assessment identified one habitat types across the proposal footprint, described in Table 6-21 and shown in Plate 6-1:

- Maintained grassland and landscaped garden beds with scattered planted and native remnant trees.

While there is one hollow bearing tree within the proposal footprint, there are a number of hollow-bearing trees located just outside of the proposal footprint, including four to the east of Compound 2, and one to the north of the proposal footprint near Carnarvon Road (Figure 6-9). There is also aquatic habitat located about 100 metres northeast of the proposal at the closest point, comprising Narara Creek and an unnamed tributary of Narara Creek. The ecology of Narara Creek is characterized by riparian vegetation including mangroves and surface water dependent ecosystems like Swamp Oak Floodplain Forest. It is classed as key fish habitat, although it is not considered as significant habitat for any specific threatened fish species. While this aquatic habitat is outside of proposal footprint, it is nearby so could be affected by indirect impacts as discussed in Section 6.4.3.

Table 6-21: Maintained grassland and landscaped garden beds with scattered planted and native remnant trees

Location	Habitat resources	Habitat condition	Fauna species recorded and/or likely to occur
A narrow strip to the east and west of most of the Manns Road corridor and the intersecting local roads, next to roads and amongst buildings.	<ul style="list-style-type: none"> • Mature trees • Landscaped garden beds • Shedding bark • 1 hollow-bearing tree. 	<p>Poor habitat for native fauna species due to its exposed nature and isolated condition of trees.</p> <p>Moderate value habitat for common species typical of urban fragments.</p> <p>As the hollow bearing tree in the proposal footprint is isolated, small and exists in a frequently disturbed, well-lit area, it is unlikely this hollow would be inhabited by fauna.</p>	<p>Birds</p> <ul style="list-style-type: none"> • Australian Magpie (<i>Cracticus tibicen</i>) • Australian Raven (<i>Corvus coronoides</i>) • Noisy Miner (<i>Manorina melanocephala</i>) • Common Myna (<i>Acridotheres tristis</i>) • Galah (<i>Eolophus roseicapillus</i>) • Sulphur-crested cockatoo (<i>Cacatua galerita</i>). <p>Mammals</p> <ul style="list-style-type: none"> • Common Brushtail Possum (<i>Trichosurus vulpecula</i>) • Ringtail Possum (<i>Pseudocheirus peregrinus</i>).



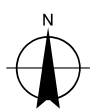
Plate 6-1: Maintained grassland and landscaped garden beds with scattered planted and native remnant trees



LEGEND

- Proposal footprint
- Concept design
- Watercourse
- Hollow Bearing Tree

Paper Size A4
0 25 50 100 150 200
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



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Threatened biota and habitat resources

Figure 6-9

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Data source: LPI: DTDB, 2017, Aerial Imagery, 2015; OEH: Melaleuca biconvexa mapping, 2016. Created by: fmacKay, tmorton

6.4.3 Potential impacts

Construction

Potential construction phase impacts for biodiversity include:

- Removal of vegetation
- Injury and mortality of fauna
- Sedimentation of nearby waterways
- Pollution
- Noise, light and vibration.

These impacts are described in the following sections.

Removal of vegetation

The proposal would remove about 0.74 hectares of common and exotic species comprising exotic grassland and scattered native planted and remnant trees with little ecological significance. No threatened flora species or their habitat would be removed.

Environmental safeguards in accordance with the Roads and Maritime Service Biodiversity Guidelines (RTA, 2011) to minimise the clearing of native vegetation are described in Section 6.1.4. These would include marking of clearing boundaries and vegetation not required for construction.

There is not anticipated to be any impacts on important fauna habitats.

One hollow-bearing tree is located within the proposal footprint. This tree is located on the eastern roadside of Manns Road opposite Carnarvon Road and while it is within the proposal footprint, it is outside of physical work and is therefore unlikely to be directly impacted.

Injury and mortality of fauna

There is potential for injury to or mortality of native fauna where native vegetation is to be cleared or disturbed.

Birds have been observed in the proposal footprint but are relatively mobile and so most individuals would be able to avoid vegetation clearing or construction operations. There is a low potential for mortality of terrestrial animals less able to avoid the disturbance such as reptiles which may hide in woody debris of garden beds. Other smaller mammals or birds which may be sheltering in the small tree hollow may also be subject to injury or mortality, although habitation of this tree is unlikely due to its isolated and disturbed situation. The tree is also unlikely to be removed, although construction activities would occur nearby.

Environmental safeguards in accordance with the Roads and Maritime Service Biodiversity Guidelines (RTA, 2011) to reduce the potential for fauna mortality associated with clearing and ground disturbance, are described in Section 6.4.4.

Sedimentation of nearby waterways

The proposal has the potential to result in sedimentation and erosion within the proposal footprint through soil disturbance and construction activities.

Sediment laden runoff to waterways can alter water quality and adversely affect aquatic life. There are no waterways directly impacted by the proposal, however there is potential for some offsite impacts to Narara Creek if soil disturbance and stockpiles are left uncontrolled.

Environmental safeguards to reduce the potential impacts associated with erosion and sedimentation are described in Section 6.5.4.

Pollution

The proposal has the potential to result in pollution and contaminated runoff, in particular as a result of hydrocarbon leaks or spills from vehicles or equipment used in construction. The introduction of pollutants from the proposal into the surrounding environment, if uncontrolled, could potentially impact on water quality and habitat values of nearby waterways.

Environmental safeguards to reduce the potential impacts associated with pollution are described in Section 6.5.4, and include appropriate location of stockpiles and bunding of chemicals, and the provision of sedimentation basins.

Noise, light and vibration

Construction of the proposal would temporarily increase noise levels and vibration near the proposal footprint during construction, through plant and machinery operation and earth moving activities. Native fauna may temporarily vacate or avoid areas disturbed by noise and vibration.

The proposal footprint currently has little to no significant habitat values and experiences ongoing noise and vibration, primarily from heavy traffic flows along Manns Road and existing commercial and industrial activities. Therefore, any temporary increase in noise levels as a result of construction is unlikely to substantially impact native biota.

Operation

Operation of the proposal is likely to have little impact on native biodiversity values. There may be some introduction of weeds as a result of movement of vehicles; however, this would not differ substantially from current levels of weed introduction from surrounding urban development, landscape maintenance and the existing Manns Road. Operation of the proposal would result in noise, lights and vibration along the route, but this would be similar to the levels currently experienced by fauna in the area from Manns Road. The risk of fauna mortality as a result of vehicle strike is unlikely to increase as a result of the proposal as the number of vehicles is not anticipated to increase as a result of the proposal.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994* and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

6.4.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Environmental management	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas Requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) Pre-clearing survey requirements Procedures for unexpected threatened species finds and fauna handling Procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI, 2013). Protocols to manage weeds and pathogens. 	Construction contractor	Construction	<p>Core safeguard <i>Landscape Guideline</i> (RTA, 2008)</p> <p><i>Policy and guidelines for fish habitat conservation and management</i> (DPI, 2013)</p> <p><i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011)</p>

Impact	Environmental safeguards	Responsibility	Timing	Reference
Habitat loss	Measures to further avoid and minimise the proposal footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Detailed designer	Detailed design	Core standard safeguard
	The hollow-bearing tree within the proposal footprint opposite Carnarvon Road will be investigated during detailed design for preservation from disturbance.	Detailed designer	Detailed design	Additional safeguard
	If the hollow-bearing tree does not need to be removed, it will be demarcated and avoided during construction work in accordance with the <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).	Construction contractor	Construction	Additional safeguard <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).
Weed removal and spread	Protocols for preventing or minimising the spread of priority and environmental weeds will be developed and implemented in accordance with the <i>Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management)</i> (RTA 2011).	Construction contractor	Construction	Additional safeguard <i>Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management)</i> (RTA 2011).
Weed invasion and edge effects	Ongoing weed management and control in accordance with the <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).	Roads and Maritime	Operation	Additional safeguard <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).

Other safeguards and management measures which would also address biodiversity impacts are identified in sections 6.5, 6.3, 6.1 and 6.9.

6.5 Soils and geology

6.5.1 Methodology

A desktop review was carried out to inform the geotechnical investigation design and existing environmental conditions using the following sources of information:

- Site history review including available desktop information and historical aerial photographs
- Review of geology, hydrology and topography information for the proposal footprint
- Review of NSW EPA record of notices and sites notified to the EPA under the *Contaminated Land Management Act 1997* (CLM Act) POEO Environmental Protection Licence (EPL) Register
- Review of Gosford City Council database for Development Applications
- A general inspection of the proposal footprint to identify areas of potential contamination concern.

Geotechnical investigations, were conducted within the proposal footprint between October and December 2017 at the locations shown in Figure 6-10. Sampling methodology is described in Table 6-22 below.

Table 6-22: Geotechnical investigation methodology

Geotechnical investigation type	Number	Testing carried out
Pavement cores (300 millimetre depth)	8 (PC01 – PC08)	Photographed and tested for geological composition of sample
Test pits (2 metres depth)	12 (TP01 – TP12)	Cone penetrometer testing for: <ul style="list-style-type: none">• Relative soil density/strength• Laboratory analysis of contamination• Acid sulphate soil• Chromium reducible sulphate analysis.
Hand augers	2 (HA04 and HA05)	Laboratory analysis of contamination parameters

6.5.2 Existing environment

Soil landscape

Reference to the 1:100,000 scale Gosford-Lake Macquarie Soil Landscapes Sheet indicates the proposal is underlain by Erina erosional landscape. The Erina erosional landscape is characterised by undulating to rolling rises and low hills on the Terrigal Formation. Local relief is typically less than 60 metres and slope gradients are generally less than 25 per cent. Landforms include rounded narrow crests with moderately inclined slopes.

Soil profiles are typically moderately deep to deep (100 centimetres to greater than 200 centimetres) with dominant soils comprising sandy loam and/or clayey loam horizons overlying medium sandy clay, light to medium strongly pedal clay and medium and or massive sandy clay loam. These soil types were confirmed during geotechnical field investigation and sample testing. Potential limitations include localised mass movement, high soil erosion, foundation hazard (localised), seasonal waterlogging of footslopes, strong acidity and high plasticity / moderate shrink-swell potential.

During geotechnical investigations, fill materials were observed near existing road pavements, embankments, shoulder and verge areas, while topsoil materials were encountered in 'undisturbed' areas outside of the existing road corridor. Within the proposal footprint, pavement materials were generally observed to be 0.4 – 0.6 metres deep, and then underlain by general fill to around one metre depth. General fill was observed in pits to be comprised of variable materials ranging from clayey sand, gravelly sand, sandy gravel, sand and clayey gravel 'non-cohesive' soils to clay, sandy clay and gravelly clay 'cohesive' soils.

Alluvium sand and clay was mostly encountered below all fill layers, although residual soil (soil formed in-situ by rock decay) was encountered in four of the 12 test pits (mostly at the southern extent of the proposal), with sandstone bedrock encountered at 0.85 and 1.35 metres respectively in the two southernmost test pits.

Acid sulphate soil

Reference to the 1:25,000 scale Acid Sulphate Soil (ASS) Risk Map for Gosford (Department of Land and Water Conservation, ref. 9131-S2, Edition 2) shows there are no mapped risks of ASS in the proposal footprint. However, field screening tests during geotechnical investigations found potential ASS is present within alluvial, remnant topsoil, residual and fill materials (deeper than about 0.4 metres depth at its most shallow point in the proposal footprint).

Chromium reducible sulphur tests were also carried out on alluvial, remnant topsoil and fill samples from geotechnical investigations, which also confirmed the presence of ASS within deeper alluvial materials, but none within shallow remnant topsoil and fill materials.

Alluvial materials were detected in seven of the 12 test pits within the proposal area and was encountered underneath the existing pavement and general fill, at around one metre below ground level.

Land Contamination

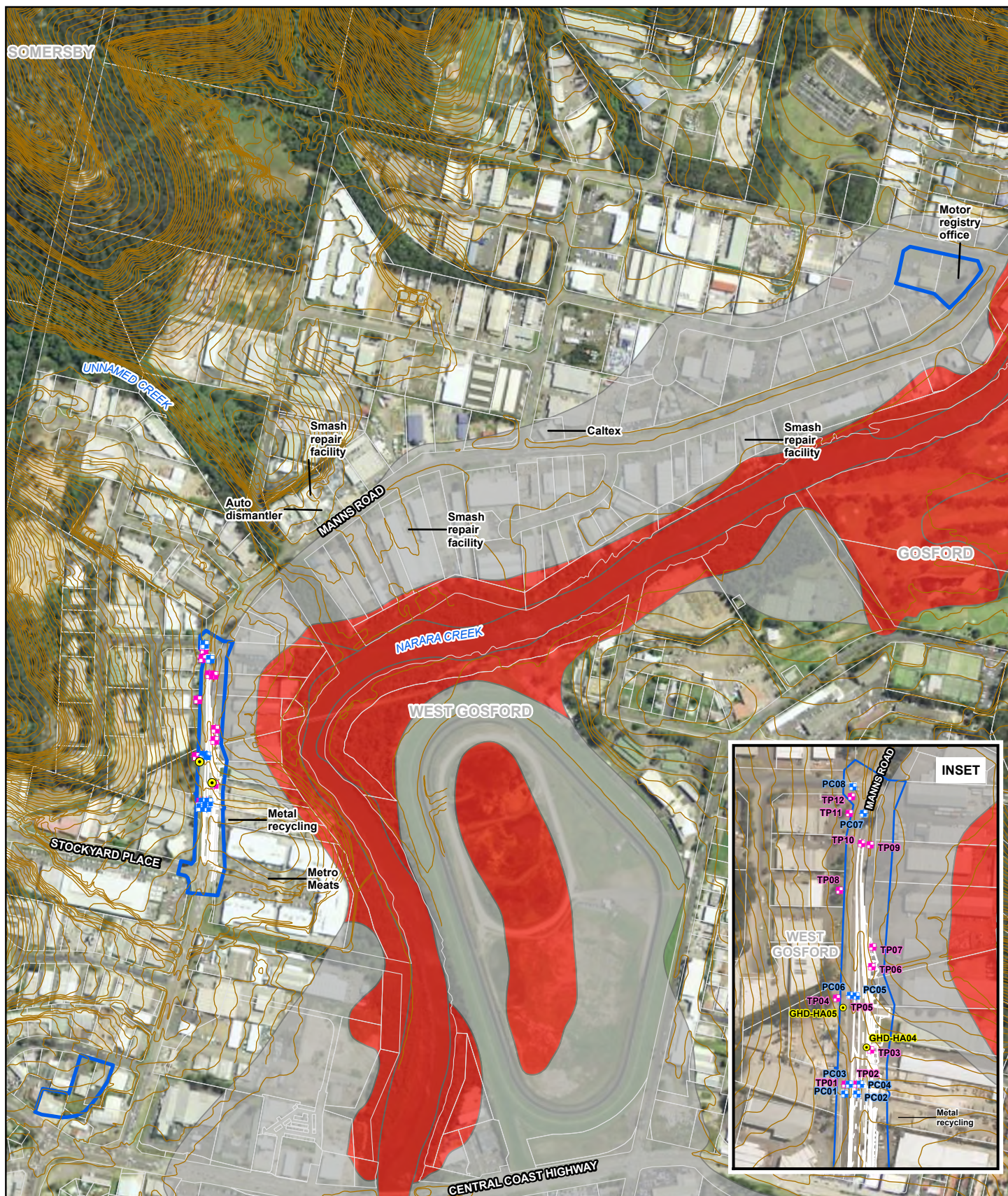
The search of contaminated land record of notices notified to the EPA revealed one documented historical contaminated site within or directly next to the proposal. The site is a former abattoir site (Metro Meats Ltd) previously located at 356 Manns Road. This site now comprises the Home Central commercial retail centre (eastern side of Stockyard Place intersection).

Further, the following potential existing sources of contamination have been identified across the proposal footprint and surrounds:

- Historical use of herbicides and pesticides
- Spillage or leakage of oils, fuels
- Fill material from unknown sources
- Existing bitumen and road base
- Illegal dumping of waste along the road corridor
- Acid sulphate soils
- Migration of contamination (surface water and groundwater) from adjoining commercial/industrial properties including:
 - Motor registry office located at the corner of Dell and Manns Road (Compound 2)
 - Auto dismantler located at 317 Manns Road
 - Metal recycling located at 354 Manns Road
 - Smash repairs facilities at 234, 284 and 317 Manns Road
- Other Commercial/industrial properties which may store fuels and chemicals.

Soil samples from geotechnical investigations were tested for a variety of contaminants, with the following findings:

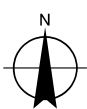
- No odours or staining was observed during the collection of soil samples
- There were no visual signs of contamination noted within the boreholes and test pits excavated during the assessment
- All soil samples reported concentrations below the adopted assessment criteria for all parameters, with the exception of one test pit (TP07) and one hand auger (HA5) location (Figure 6-10), where zinc concentrations exceeded the ecological investigation level for Commercial/Industrial land-use. Due to the levels and distribution of the zinc, widespread contamination is not anticipated and it is likely the concentrations are attributable to natural levels in the regional soils and is therefore not considered significant. Further, the levels are within the health assessment criteria levels and do not represent a risk to human health.



LEGEND

- | | | |
|--|--|---|
| Proposal footprint | High probability of acid sulphate soil | ● hand auger |
| Contour | Disturbed Terrain | + pavement core |
| Cadastre | | + test pit |

Paper Size A4
0 60 120 180 240
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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Job Number 22-19033
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Date 05/10/2018

Existing soil environment

Figure 6-10

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Data source: LPI: DTDB / Aerial Imagery, 2017. Created by:tmorton

6.5.3 Potential impacts

Construction

Exposure of soil to erosion

Small areas of grassed verge between the existing road and industrial premises would be cleared during construction, which would expose and disturb soil which is currently covered and increase the risk of erosion. Soil erosion could cause downstream impacts, including siltation of watercourses and water storages and reduction in the water quality of creeks and other waterways. However, the maximum area of potential exposure is soil is small, at about 0.3 hectares and this would likely be less dependent on confirmation of detailed design. In addition, the exposed areas of the site have limited connectivity to nearby waterways and watercourses.

Temporary stockpiles of a small amount of topsoil and fill material may be susceptible to wind erosion if not appropriately stabilised with covering or seeding. Further, stockpiles would be susceptible to erosion if located within flood affected areas or drainage lines, although the majority of the proposal footprint is outside of the mapped 10 year AEP flood extent.

The safeguards and management measures relating to sediment and erosion control and progressive restoration of soil cover during work described in Section 6.5.4 would be implemented to mitigate the potential impacts identified above.

Disturbance of acid sulphate soils

Disturbance of potential ASS during construction may lead to the production of acidic run-off and cause the release of trapped heavy metals in sediments and soils (NSW OEH, 2017). The acid and heavy metals can have damaging effects on the receiving environment, including reducing survival and growth rates for aquatic flora and fauna, corrosion of materials and health impacts to humans and animals from toxic water and dust.

Acid Sulphate Soils have been identified as likely at soil depths below about one metre. Given the limited amount of sampling completed within the proposal footprint and the inherent variability in soil conditions, it is recommended as a precautionary approach all soil excavated below the topsoil and general fill layers (0.6 to 1.0 metre depth) would require management in accordance with an ASS Management Plan (ASSMP) prepared for the work during detailed design and construction.

The safeguards and management measures as described in Section 6.5.4, would be implemented to mitigate the potential impacts identified above.

Mobilisation of existing or unexpected contamination

Results from the geotechnical investigation reported contaminant concentrations below the adopted health assessment criteria for commercial/industrial land use for all samples analysed in the proposal footprint. However, zinc levels in two locations were above the ecological criteria, and could present a potential environmental risk to nearby waterways if mobilised into waterways outside the proposal footprint. Mitigation measures to prevent erosion and sedimentation would reduce this impact (Section 6.5.4).

As no significant human health or environmental risks to construction workers or future site users have been identified, no remediation within the proposal footprint is required at this stage.

There is, however, a risk to encounter previously unknown contamination in the proposal footprint during construction, particularly given the surrounding commercial / industrial land use. In particular, Compound 3 was not able to be included in the original site investigation because it is currently operating as a commercial / industrial premise. In the event this area is utilised as a compound for construction, there is potential for contamination to be present which could be uncovered during demolition of the existing buildings and set up of the area for use as a compound.

There is also the potential for soil contamination from accidental spills or leaks of fuels, oils and other chemicals from equipment and vehicles during construction, or to introduce contamination in unsuitable fill material.

The safeguards and management measures outlined in Section 6.5.4 would be implemented to mitigate the potential impacts identified above.

Operation

Operation of the proposal is not likely to result in any significant impacts on soil landscapes. The risk of soil erosion during operation would be minimal as all areas impacted during construction would be sealed or rehabilitated and landscaped to prevent soil erosion.

6.5.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Construction contractor	Construction	Core standard safeguard Section 4.2 of QA G36 <i>Environment Protection</i>
	If compound 3 will be utilised as a construction compound, a site investigation for potential contamination will be completed prior to use to ensure suitability.	Roads and Maritime	Detailed design	Additional safeguard
Exposure of soil to erosion	A soil and water management plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 prior to the start of construction. The SWMP will address the following: <ul style="list-style-type: none"> • Roads and Maritime <i>Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure</i> • The NSW Soils and Construction – <i>Managing Urban Stormwater Volume 1 'the Blue Book'</i> (Landcom, 2004) and Volume 2 (DECC, 2008) • <i>Roads and Maritime Stockpile Site Management Guideline</i> (Roads and Maritime, 2015) • <i>Technical Guideline: Temporary Stormwater Drainage for Road Construction</i>, (Roads and Maritime 2011) • <i>Technical Guideline: Environmental Management of Construction Site Dewatering</i>, (Roads and Maritime 2011). 	Construction contractor	Construction	Additional safeguard QA G36 <i>Environment Protection</i>
	Prepare and implement a progressive erosion and sediment control plan prior to the start of each stage of construction.	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Develop an inspection and maintenance programme to check the adequacy of controls, particularly after a rainfall event.	Construction contractor	Construction	Additional safeguard
	Disturbed areas of the site would be progressively scheduled for ground stabilisation and / or final landscaping treatment where possible at the end of each construction stage.	Construction contractor	Construction	Additional safeguard
	Erosion and sediment controls would be retained and maintained until effective soil cover (at least 70 per cent coverage) is achieved.	Construction contractor	Construction	Additional safeguard
	Controls will be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces. Any material transported onto pavement surfaces will be swept and removed at the end of each working day.	Construction contractor	Construction	Additional safeguard
Accidental spill	A site specific emergency spill plan will be developed for inclusion in the CEMP, and include spill management measures in accordance with the Roads and Maritime <i>Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Construction contractor	Construction	Core standard safeguard Section 4.3 of QA G36 <i>Environment Protection</i> Roads and Maritime <i>Code of Practice for Water Management</i> (RTA, 1999)
	Fully equipped emergency spill kits will be kept on-site at all times	Construction contractor	Construction	Additional safeguard
Storage and disposal of construction materials	Excess spoil not required or able to be used for backfilling will be stockpiled in a suitable location before being reused or removed from the site, and disposed of appropriately in accordance with the NSW EPA <i>Waste Classification Guidelines</i> (2014).	Construction contractor	Construction	Additional safeguard NSW EPA <i>Waste Classification Guidelines</i> (2014)

6.6 Landscape character and visual impacts

6.6.1 Methodology

A landscape character and visual impact assessment for Manns Road upgrade, Stockyard Place to Narara Creek Road was prepared by Peter Andrews and Associates (2018). The assessment was prepared in accordance with the Roads and Maritime *EIA-N04 Environmental Impact Assessment Practice Note – Landscape Character and Visual Impact Assessment*. A summary of the report is provided in the following sub-sections.

6.6.2 Existing environment

The proposal footprint is bordered on both sides by industrial areas and comprises an urban road corridor with little or no street tree plantings. There are power poles, overhead lines, directional road signs and business / industrial land use signs along the road corridor on either side (Plate 2).

The industrial area contains a wide range of different uses from light industrial to heavy manufacturing, commercial and retail uses such as cafes, bulky goods and fitness centres as well as a business park. The built form within the industrial area is generally setback from Manns Road with car parking, access ways and signage located within the front setback, contributing to the visual clutter of the industrial area. This landscape area generally incorporates one and two storey industrial buildings of varying sizes, outdoor storage, display and parking areas.

The industrial and commercial areas have been fully developed apart from the western most edges where some areas of native vegetation occur along drainage corridors.

From the proposal footprint, vegetation is visible on the surrounding hillsides to the north, south and west and along the edges of Narara Creek to the east of Manns Road. Hillside vegetation consists of undeveloped parcels of bushland, public reserves and privately owned land. In some areas the bushland extends south and east into the industrial areas, generally along existing water courses including at Manns Road between Yandina and Nells Road where an unnamed tributary passes under Manns Road connecting with Narara Creek to the east.

Within and directly next to the proposal vegetation is generally restricted to the boundaries of the properties or remnant pocket stands of trees and grass along drainage corridors. Verge areas generally consist of turf with few tree plantings due to the presence of overhead power lines.



Plate 2: Viewpoint from Stockyard Place intersection looking north along Manns Road

6.6.3 Potential impacts

Construction

During construction, positioning of plant and equipment within the view of neighbouring properties and existing road users would result in temporary minor visual impacts. The use of lighting towers during any night work may result in light spill impacting adjoining properties but this would be periodic and short-term and limited to commercial receivers which may not be operational at the time.

The proposal would require removal of some vegetation within the boundaries of the proposal footprint. This would include trimming and/or clearing of some planted and remnant native trees. Some of this vegetation contributes to the amenity and character of the local area. Earthwork would also expose areas of historical fill and alluvial soils with variable characteristics. Clearing and earthwork would lead to temporary visual impacts during construction until the work are complete and disturbed areas rehabilitated.

Potential visual impacts during construction would be short-term and temporary and minimised through implementation of the safeguards and management measures outlined in Section 6.6.4.

Operation

The landscape and visual impact of the proposal is assessed as low as the proposal is visually consistent with the existing landscape character of the area, which is already heavily influenced by large commercial buildings, advertising and road and utility infrastructure.

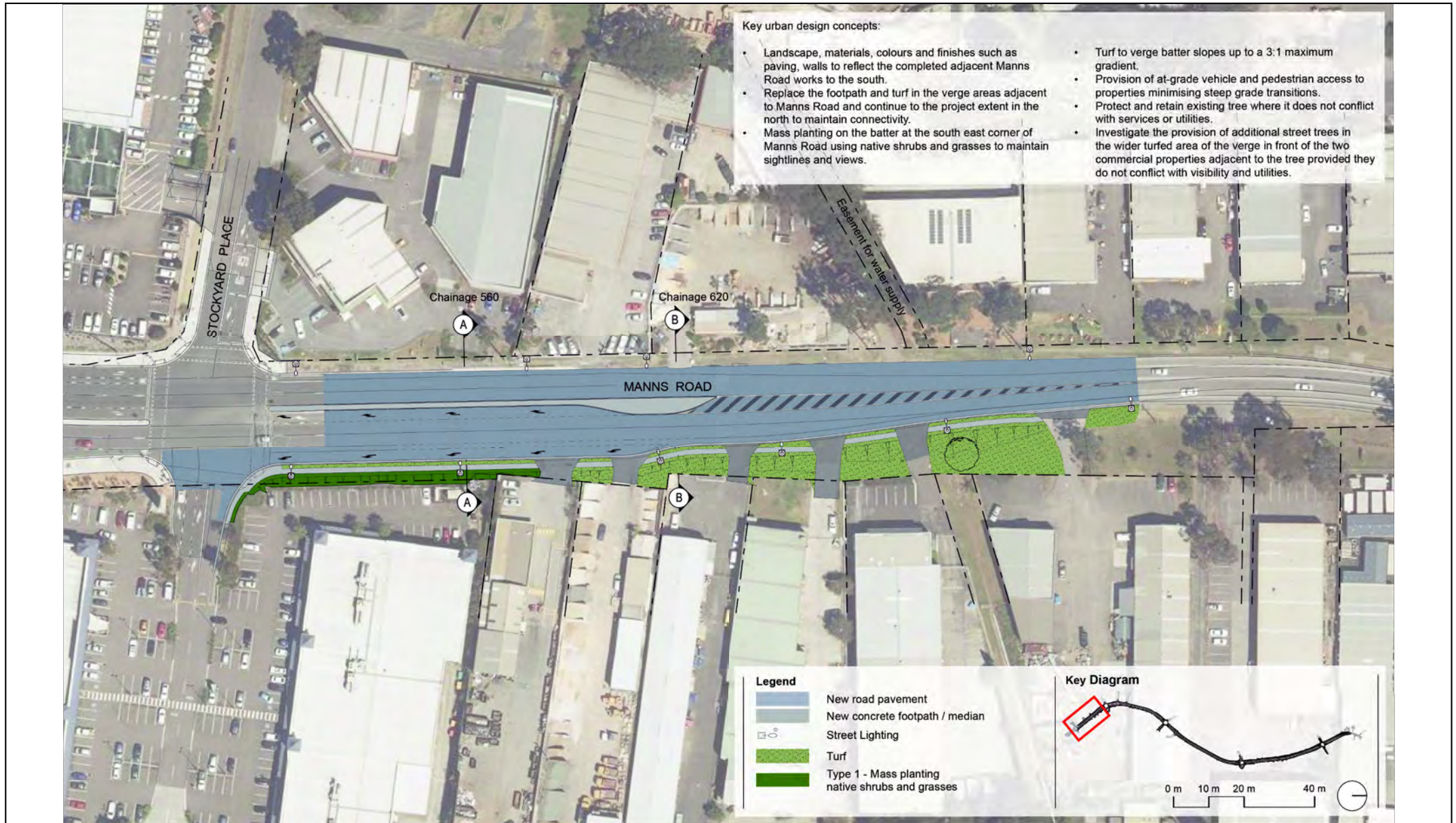
The proposal has been designed to the following concepts:

- Landscape, materials, colours and finishes such as paving, walls and soft landscape would reflect the completed Manns Road upgrade to the south
- All new design elements would be robust and designed to meet graffiti/vandal resistant standards

- The footpath and turf in the verge areas along Manns Road would be replaced throughout the proposal footprint to maintain connectivity
- Mass planting on the slope at the south east corner of Manns Road between Stockyard Place (eastbound) and Manns Road (southbound) would be conducted using native shrubs and grasses to improve the visual landscape (Figure 6-11)
- Turf would be provided along the verge slopes up to a 3H:1V maximum gradient (Figure 6-11)
- Provision of at-grade vehicle and pedestrian access to properties minimising steep grade transitions.

The existing large tree currently located within the verge of the proposal footprint about 200 metres north of the intersection would be investigated for long-term retention in landscape design, provided it doesn't pose a hazard to road or pedestrian safety and doesn't conflict with any relocated utilities or adjusted footpaths and accesses.

The above concepts would provide an improved and consistent landscape character, resulting in a positive visual and amenity impact compared with existing conditions. The positive change in landscape resulting from the proposal would mainly affect owners and customers of businesses, residents of properties near the proposal footprint, and future road users.



Paper Size A4



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Urban concept design

Figure 6-11

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Data source: Peter Andrews & Associates: Urban Design Image, 2018. Created by: tmorton

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the final detailed proposal design and implemented as part of the CEMP.</p> <p>The Urban Design Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape work taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas. <p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> • Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014) • Landscape Guideline (RTA, 2008) • Bridge Aesthetics (Roads and Maritime 2012) • Shotcrete Design Guideline (RTA, 2016) <p>The Urban Design Plan will also take this environmental assessment and the urban design principles.</p>	Detailed designer	Detailed design	<p>Standard core safeguard</p> <p>Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014)</p> <p><i>Landscape Guideline</i> (RTA, 2008)</p> <p>Bridge Aesthetics (Roads and Maritime 2012)</p> <p>Shotcrete Design Guideline (RTA, 2005)</p>

Impact	Environmental safeguards	Responsibility	Timing	Reference
Visual impacts	Develop a limited range of materials, colours and textures for all built elements to achieve a simple uncluttered design. The types of materials proposed are to reflect the locality and be appropriate for its intended application.	Detailed designer	Detailed design	Additional safeguard
	Compounds, storage areas, stockpiles and associated work areas will be located in cleared or disturbed areas as far as possible.	Construction contractor	Construction	Additional safeguard
	The construction site will be kept tidy and rubbish free.	Construction contractor	Construction	Additional safeguard
	Work areas will be restored progressively and maintained until established.	Construction contractor	Construction	Additional safeguard
	The site will be rehabilitated and landscaped in accordance with an approved landscape plan.	Construction contractor	Construction	Additional safeguard
Vegetation removal	Existing vegetation will be maintained and protected wherever possible. Trimming of trees rather than clearing will be carried out where possible. The existing large tree currently located within the verge of the proposal footprint about 200 metres north of the intersection will be investigated for long-term retention in landscape design	Construction contractor	Construction	Additional safeguard
Light spill	Temporary lighting for construction will be sited and designed to minimise light spill into identified sensitive receptors.	Construction contractor	Construction	Additional safeguard

Other safeguards and management measures which would address landscape character and visual amenity impacts are identified in Section 6.1.

6.7 Property and land use

6.7.1 Existing environment

The proposal is located within the Central Coast local government area within a commercial / industrial area, comprising a range of industries including automotive dealers and repairs, landscape supplies, building materials, wholesale traders and metal recyclers. Land uses next to the proposal (Figure 6-12) include:

- Home Central commercial retail centre 20 metres east of the proposal
- Gosford Classic Car Museum 100 metres west of the proposal
- House of Praise Christian Church 160 metres west of the proposal
- Gosford Racecourse, 350 metres east of the proposal
- Gosford tennis complex 900 metres north east of the proposal
- Gosford golf course one kilometre north east of the proposal.

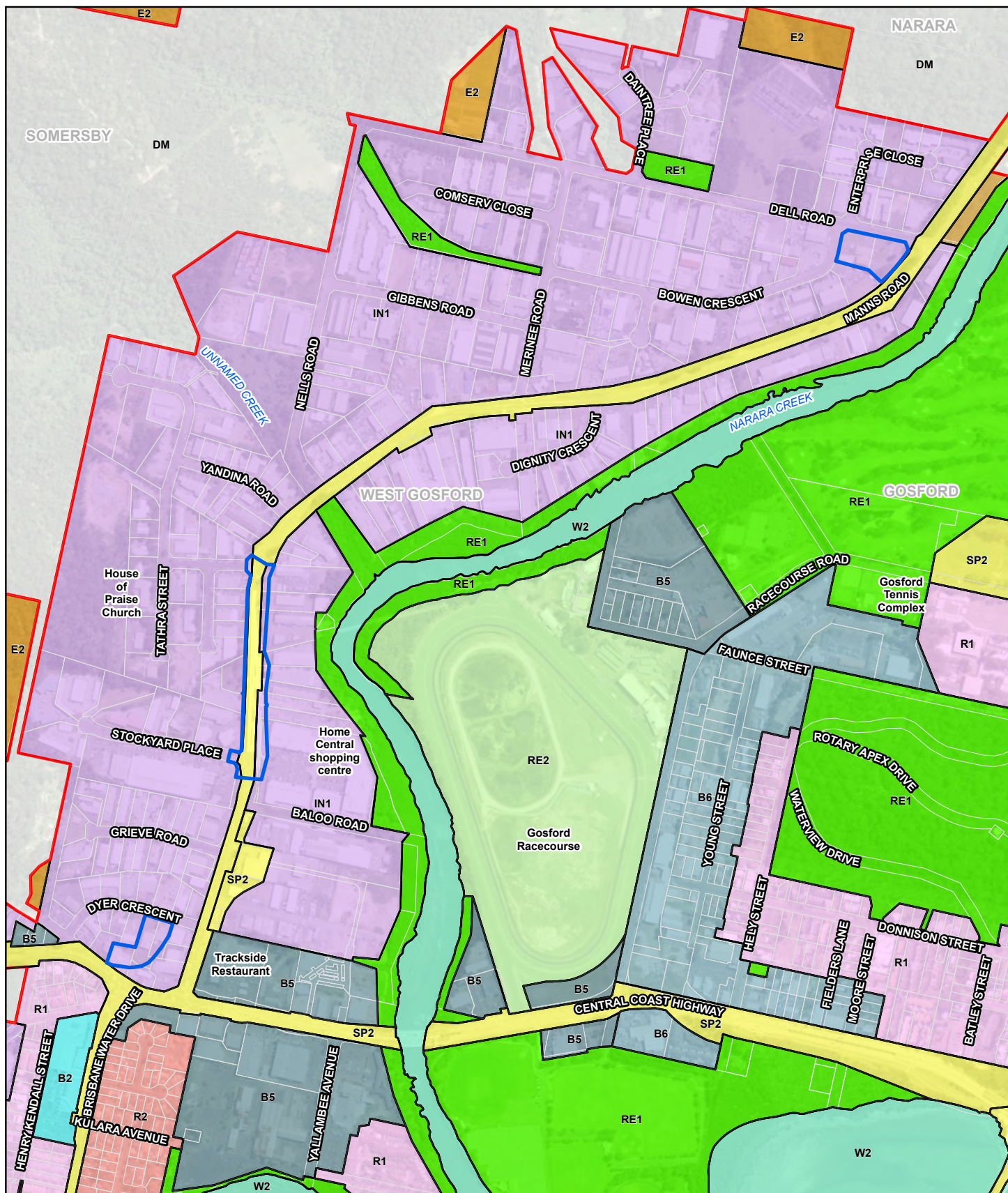
As outlined in section 4.1.2, the proposal is within the following zones under the LEP (Figure 6-12):

- SP2 (Infrastructure), comprising the existing road corridor
- IN1 (General industrial).

The majority of land surrounding the proposal is also zoned IN1, although the vegetated area alongside Narara Creek is zoned RE1, public recreation, while the creek itself is zoned W2, recreational waterway. The road reserve currently contains the existing road and grassed areas with some stands of trees scattered throughout (Plate 6-3).



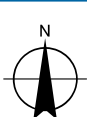
Plate 6-3 Manns Road north of Stockyard Place



LEGEND

Proposal footprint	B5 Business Development	R1 General Residential	W2 Recreational Waterways
Concept design	B6 Enterprise Corridor	R2 Low Density Residential	DM Deferred matters
Cadastre	E2 Environmental Conservation	RE1 Public Recreation	
B2 Local Centre	E3 Environmental Management	RE2 Private Recreation	POI_REF
	IN1 General Industrial	SP2 Infrastructure	

Paper Size A4
0 70 140 210 280
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55



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Land use zoning

Figure 6-12

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6.7.2 Potential impacts

Construction

The road reserve in the proposal footprint would not provide sufficient area for construction of the road upgrade. While no full property acquisition would be required, four partial property acquisitions would need to occur (see Section 3.6 and the following *Operation* section for detail).

In addition, a number of temporary access agreements and leases would be needed, where Roads and Maritime would consult with private lot owners to gain temporary access to properties. This would include gaining temporary agreed access to properties for:

- Utility adjustments
- Minor driveway adjustments and restoration of private structures, such as fencing, on property boundaries
- Work on adjacent properties to where adjustments are required.

Negotiated leases would also be required for potential site compounds where lots are not already owned by Roads and Maritime.

All affected lots are zoned IN1 (General Industrial), with no buildings or residential properties proposed to be impacted.

The proposal footprint is on land zoned IN1 (General industrial) and SP2 (Special Infrastructure). In the long term, the proposal is in accordance with the objectives of these zones, as improving access and road safety improves overall amenity of each zone. During construction, there may be negative impacts to amenity of these land use zones in the short-term (excluding SP2 infrastructure). Negative impacts would be mitigated using measures described in Section 6.7.3.

Construction of the proposal including driveway adjustments on private properties has the potential to temporarily impact the amenity of the property due to traffic and access issues, increases in noise, visual impacts, closures for safety reasons and potential dust generation during construction of the proposal. These potential impacts and safeguards issues have been addressed in other sections of this REF, as follows:

- Traffic and access (Section 6.3)
- Noise and vibration (Section 6.1)
- Visual impacts (Section 6.6)
- Socio-economic effects (Section 6.6)
- Air quality (Section 6.9).

Roads and Maritime would consult with potentially affected landholders before and during construction to minimise the potential for impacts on existing land use, as described in the safeguards and management measures (Section 6.5.3).

Operation

The proposal would involve the upgrade of an existing road, rather than construction of a new road. As such, there would be no alteration of land use from existing conditions. A small area of currently general industrial zoned land would be rezoned as infrastructure where partial strip acquisition is required to accommodate road widening.

Based on the concept design and subject to negotiations in accordance with the *Land Acquisition Information Guide* (Roads and Maritime Services, 2013) and the *Land Acquisition (Just Terms Compensation) Act 1991*, the following property adjustments may be required for the proposal:

- Five individual lots would be directly impacted for the road widening, all of which are privately owned and would be subject to partial acquisition (see Section 3.6, Figure 3-6).
- All of the five individual lots subject to acquisition are zoned IN1 (General Industrial) and comprise wholesalers, mechanics and industrial services
- The five lots subject to partial acquisition are owned by five separate owners
- No residential properties or buildings would be subject to acquisition.

Details of direct property acquisition are provided in Section 3.6, which shows an average of 6.4 per cent of each property would be affected by the proposal, ranging in area from 0.008 to 0.1 hectares. The area and percentage acquisition of each property is relatively low and would not involve any direct impact to existing buildings. However, some adjustments to driveways would be required with associated retaining wall construction, or the use of slopes to account for the slight slope in topography. A resultant small loss in area currently used for storage or car parking spaces would therefore potentially occur for three of the properties and there could be some loss of infrastructure such as fencing, although small reconfigurations such as line marking or concrete within properties as part of negotiated adjustments in design could alleviate some of these impacts. The impacts during operation would vary depending on individual owner circumstances, however, as the proposed acquisition are small and restricted to property frontages along Manns Road, it is expected the activities currently conducted at the affected properties could be resumed and sustained on residual land not subject to acquisition.

During operation, existing access arrangements for commercial properties would be restored. The additional lane on Manns Road would likely alleviate traffic-related impacts to these properties.

Further consultation with property owners about impacts to their property and operations would be carried out prior to construction to further inform the proposal as described in the safeguards and management measures (Section 6.7.3).

6.7.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Property acquisition	All property acquisition will be carried out in accordance with the <i>Land Acquisition Information Guide</i> (Roads and Maritime, 2012) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime	Detailed design	Standard core safeguard <i>Land Acquisition Information Guide</i> (Roads and Maritime, 2012) <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .
	Carry out regular and ongoing engagement with the property owners affected by property acquisition.	Roads and Maritime	Detailed design	Additional safeguard
Land use impacts	Consult with potentially affected landholders before and during construction in accordance with the Communications Plan described in Section 6.8.4 to minimise the potential for impacts on land use.	Roads and Maritime	Detailed design	Additional safeguard
Neighbouring properties	Maintain safe access to impacted properties along Manns Road during construction. Any disruption to access and properties will be minimised and will only be carried out following consultation and agreement with individual property owners affected by the work.	Construction contractor	Construction	Additional safeguard

6.8 Socio-economic

A socio-economic impact assessment (SEIA) was prepared by GHD (2018) on behalf of Roads and Maritime for a larger study area for the Stage 5 strategic planning from Stockyard Place to Narara Creek Road, which also covers the smaller proposal footprint from this REF (Appendix F (Volume 2)). Information relevant to the proposal footprint is presented in Chapter 6 of the SEIA provided in Appendix F (Volume 2), and summarised in this section.

6.8.1 Methodology

The SEIA process was guided by the requirements of a moderate level assessment as per *Environmental Impact Assessment Practice Note - Socio-economic assessment* (Roads and Maritime Services, 2013). The process was also informed by social impact assessment principles and methods endorsed by the International Association for Impact Assessments (Vanclay, 2003 and Vanclay F, *et. al.*, 2015). Where applicable, principles from the Department of Planning and Environment (2016) *Social Impact Assessment – Draft Guidelines for State Significant mining, petroleum production and extractive industry development* were also applied.

The following methodology was carried out to develop the SEIA:

- Review of background documents and other technical studies
- Determining the socio-economic area where direct and indirect impacts may occur as a result of the proposal
- Preparing a socio-economic baseline through a desktop review of relevant demographic and economic data to understand the existing conditions of the local and regional areas
- A site visit conducted on 21 February 2018 to confirm the location of existing community infrastructure, observe land uses and traffic movements in the area
- Targeted consultation with stakeholders, including local community facilities, the Gosford Erina and Coastal Chamber of Commerce and emergency service providers
- Survey of 24 businesses near the proposal to assess perceived impacts to customer access, customers and revenue and delivery vehicles
- Identification, description and assessment of impacts based on the findings of these tasks.

6.8.2 Existing environment

Overview

West Gosford is an established mixed use area which is located to the west of the Gosford Central Business District. The suburb is divided by Narara Creek. To the west of Narara Creek is a significant industrial and commercial area. Manns Road is the main access road within this commercial and industrial area connecting the Central Coast Highway to the south and Pacific Highway to the north in Narara. Beyond the Central Coast Highway to the south is also a low-density residential area and the West Gosford Shopping Centre.

There are existing high levels of traffic including trucks along Manns Road through the industrial area. Manns Road is used by various road users passing through to other parts of the Central Coast, including commuters, deliveries, residents and visitors. Manns Road in the proposal footprint is an established heavy vehicle and B-double truck route.

Demographic profile

In 2016, 1,335 people lived in West Gosford, mainly within the residential areas to the east of Narara Creek and south of the Central Coast Highway. However, closer to the proposal in the West Gosford commercial and industrial area, there are only three residential properties on the western boundary at Boolari Road (over 250 metres from the proposal).

West Gosford's community is characterised by a relatively high median age of 49, high proportion of rented properties, lower average household size and low proportion of family households.

Community infrastructure

Community infrastructure facilities and services located within one kilometre of the proposal footprint are shown in Figure 6-13 and include:

- An aged care facility
- Six child care centres
- Two health service facilities
- Two community centres / spaces
- A cultural facility
- An employment support service
- Two large open space / active recreation areas.

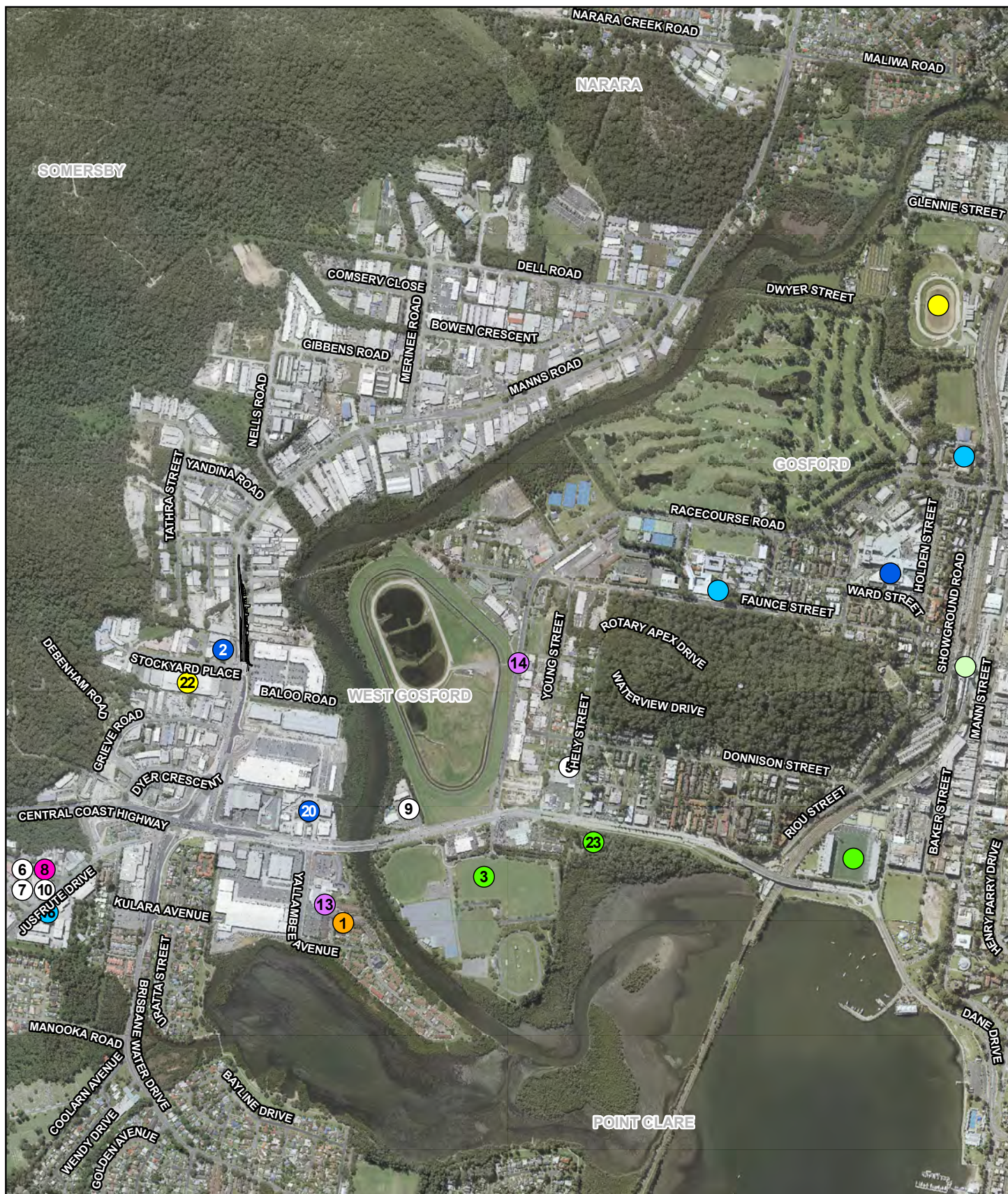
Several emergency services servicing the West Gosford region are located beyond one kilometre of the proposal footprint. The Gosford Public Hospital is the closest hospital, about four kilometres away from the proposal. Emergency services including Point Clare Ambulance Station (3.5 kilometres away), Gosford Fire Station (six kilometres away) and Gosford Police Station (four kilometres away) also service the West Gosford community.

Businesses

The West Gosford commercial and industrial area is a large economic area in the Central Coast region. Manns Road is the main access road in the area connecting the Central Coast Highway to the south and Pacific Highway to the north and providing freight links, utility services and customers.

Based on the Central Coast NSW economic profile, there are about 392 businesses within the industrial area. The most common types of business include retail trade and bulky goods showrooms, repair workshops, construction and manufacturing services and supplies. Businesses are located within warehouses, offices and commercial/retail buildings, some of which have multiple businesses operating in them.

Based on a desktop review, there are about 30 businesses with direct access onto Manns Road between Stockyard Place and Carnarvon Road. Many of the businesses are visible from Manns Road. About 15 businesses share a driveway with other businesses onto Manns Road and have signage near the road. Further, there are about 20 sites with direct access onto side streets of Stockyard Place and Carnarvon Road.



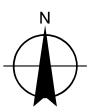
LEGEND

- Concept design
- Aged Care
- Child Care

- Community Centres and Spaces
- Education
- Health

- Library and Cultural Spaces
- Open Space and Recreation
- Employment Services

Paper Size A4
0 55 110 220 330 440
Metres
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



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Community infrastructure

Figure 6-13

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Data source: LPI: DTDB, 2017; RMS: Aerial Imagery, 2017. Created by: fmacKay

6.8.3 Potential impacts

To understand the potential impacts to businesses as a result of the southbound approach to Stockyard Place intersection proposal, business surveys were carried out along Manns Road between Stockyard Place and Carnarvon Road. In total, 15 businesses responded to the survey out of 24 businesses which were invited. Table 6-23 summarises the key issues raised in the business surveys. Detailed survey results are provided the SEIA provided in Appendix F (Volume 2).

Table 6-23: Key issues raised during business surveys

Key issue	Detail
Perceived impacts to customer access	<ul style="list-style-type: none">• Concern the proposal would deter customers from accessing their business, due to the removal of the right turn into sites as a result of the proposed central median• Concern there could be potential for some customers to access a competitor as a result of access changes.
Perceived impacts to customers and revenue	<ul style="list-style-type: none">• Concern the implementation of the proposal would result in a potential loss of customers and revenue.
Perceived impact to delivery vehicles	<ul style="list-style-type: none">• Concern the proposal would change the usual routes of delivery vehicles to/from their business, due to the proposal central median potentially restricting vehicle access and requiring some vehicles to use side streets to come back to businesses increasing travel• Concern there are no opportunities to turn around on Manns Road between Stockyard Place and the Central Coast Highway.

Construction

Increased traffic delays

Construction work would result in increased light and heavy construction vehicle traffic on Manns Road and the surrounding local road network, particularly to and from compounds. This may also result in increased heavy construction vehicles using local streets that usually cater to residential traffic. This may lead to temporary delays for road users, including:

- Motorists using Manns Road to travel to other areas
- Bus users
- Emergency services
- Customers and delivery vehicles to businesses within the industrial area
- Users of local Mend Services
- People travelling to community facilities to the north and south of the proposal.

Given the existing traffic volumes along Manns Road, this would be a temporary, negligible to low impact to these road users. This would be more noticeable to road users during local peak periods. Based on the traffic and transport report (Cardno, 2018), peak times occur between 8 am and 9 am, and 3 pm and 4 pm.

Mitigation measures for impacts to increased traffic delays are included in Section 6.8.4.

Changed access and connectivity

Construction of the southbound lanes to Stockyard Place would temporarily affect the access to/from businesses along Manns Road within the proposal area, including the access of customers and delivery vehicles. This may potentially affect about 21 businesses on either side of the construction works. Construction activities would move along the proposal area, so it is unlikely that the access to all the businesses would be affected at any one time. Access would also be maintained throughout construction, possibly through diversions. Therefore, access impacts are expected to be temporary and negligible. Direct access impacts are not expected on businesses north of Carnarvon Road or within side streets of the industrial area.

Construction may temporarily affect the access of some bus users, cyclists and pedestrians. Cyclist and pedestrian access including to/from bus stops would be maintained during construction, possibly through diversions or temporary relocations. Given that the level of cycling and walking within West Gosford is low, and pedestrian facilities are not provided along most of the proposal area, this is expected to be a temporary, negligible impact.

Safeguards and management measures for changed access and connectivity during construction are provided in Section 6.8.4.

Property impacts

As discussed in Section 6.7, the proposal would require a temporary construction access agreement to small strips of privately owned land within the proposal footprint to accommodate construction work. This may involve temporary impact on existing features within the properties (for example some private car parks / storage space, signage, fencing).

Property impacts for construction compound use is not anticipated as land currently owned by Roads and Maritime is proposed to be utilised. However, the contractor may negotiate separately for use of other privately controlled land, which would be investigated and assessed further as part of final proposal design and construction.

Safeguards and management measures for property impacts are discussed in Section 6.8.4.

Parking

Informal parking on the verges of Manns Road within the proposal area would be unavailable during construction. Parking on verges is informal and uncontrolled and largely periodic for visitors to businesses.

The loss of informal on-road parking within the proposal would be minimal and on-street parking will still be available on side streets outside the immediate proposal footprint such as Stockyard Place. Pedestrian crossings and access through the proposal would also be maintained which will support some alternative options for short-term parking outside the proposal footprint.

If construction vehicles park along local roads this would reduce the parking available for staff/visitors to local businesses.

Safeguards and management measures for impacts to parking during construction of the proposal are discussed in Section 6.3.4.

Local amenity

As discussed in Section 6.2, construction will generate noise impacts during the day, when the businesses along Manns Road generally operate. Potential noise and vibration impacts are likely to be less noticeable on the industrial type businesses which may have an elevated baseline noise level, such as construction, manufacturing and automotive services. However, there are other businesses which are more sensitive which could be affected by elevated noise levels during the day time, such as occupational therapy services. Noise impacts from construction for commercial and industrial premises have been previously discussed in Section 6.2 and are not significant.

Increased construction traffic would be small compared to existing traffic volumes and there is existing heavy vehicles traffic in the area. Therefore, construction traffic noise is not likely to be noticeable in the proposal footprint.

Dust generated by construction vehicles, equipment or disturbed soil may have short-term, negligible to low impacts on air quality, which may affect businesses surrounding the proposed works, including customers, staff and delivery personnel. Dust impacts depend on the intensity and duration of the construction activity. As the proposal is within an industrial area away from residences, residents are unlikely to be affected by dust impacts. This is discussed further in Section 6.9, Air Quality.

The proposal requires the removal of a small area of vegetation beside the existing road corridor which would slightly reduce the visual amenity of the area. These impacts have been discussed previously in Section 6.6 Landscape and Visual Impact.

Community values

Although the proposal is within an existing industrial area with high traffic volumes, there is still potential construction could alter the community's perception of the amenity, safety and accessibility of Manns Road. This could discourage some community members, including residents, cyclists, commuters and visitors, from using Manns Road to visit usual facilities, services and social networks to the north and south of the proposal during construction. This impact would be reduced with the implementation of safeguards and management measures provided in Section 6.8.4.

Economy

The proposal is expected to create construction jobs which would be available for local and regional residents. The construction workforce would result in increased expenditure in local goods and services, such as food and beverage services. The proposal is also expected to increase the demand of goods for construction, such as construction materials. This would be temporary, however would still be of benefit to the local and regional economy.

The proposal has the potential to temporarily impact local businesses next to the construction work due to the restricted access during construction for customers and deliveries. Depending on the type of business and customer base, there may be varying impacts to the operation of these businesses as a result of potential access changes. The proposal is likely to deter some customers from businesses:

- Who rely on walk-in/passing trade, such as landscape supplies and retail trade supplies
- Where their current level of visibility is reduced due to construction activities
- With competitor businesses close to and not directly affected by construction who provide similar products/services, such as construction/trade supplies, automotive repair and manufacturing.

However, it is considered the proposal is unlikely to deter most customers from the majority of businesses given most businesses:

- Provide specialist products and services within an existing industrial/commercial cluster
- Offer a portion of customer appointments
- Receive customers from around the Central Coast region

Therefore, the proposal is not expected to impact the overall viability of these businesses in the longer term. Further consultation with businesses would be carried out to minimise potential impacts.

Operation

Improved traffic flow and safety

As discussed in Section 6.3, the proposal would increase the capacity of Manns Road at the intersection. This would reduce delays for users of Manns Road, providing a positive impact. The central median would improve traffic flow and road safety by decreasing the number of vehicles turning across oncoming traffic into properties.

The proposal would provide a long term, positive benefit for cyclists and pedestrians. The provision of new pedestrian facilities would improve the walking connections between bus stops and parking on side streets and businesses along this section. These improvements, particularly in safety, would benefit local businesses and nearby community facilities.

Altered access to businesses to left in / left out only

The construction of a section of the central median, necessary for safety at the improved traffic lights would restrict right turn access to/from up to four businesses along Manns Road. According to the consultation carried out with local businesses, concern was raised this altered access may deter a portion of customers from accessing businesses along this section as well as limiting the road area making it difficult for trucks to reverse into properties along Manns Road. The current reversing of trucks to access businesses along Manns Road is one of the periodic safety and congestion issues that implementation of this proposal will help to manage.

There was also concern trucks with trailers may have difficulty turning around in side streets. Any vehicles seeking to enter businesses would be required to plan their travel route and obey the traffic rules. Providing a raised median would improve safety in the long-term, and would not cause major diversions or complete loss of access.

Further consultation with businesses would be carried out to identify appropriate alternate options/routes for long vehicles (Section 6.8.4).

Property impacts

Road widening would require the partial strip acquisition of land around five private properties, which may result in some loss of on-site car parks, fencing or other infrastructure as discussed in Section 6.7. Driveway adjustments to some properties along the eastern side of Manns Road may affect the usual access of customers, staff and deliveries, causing an inconvenience to businesses. However, all existing accesses to businesses would be maintained and reinstated to suit the new road formation and adjustments would be designed to cater for the required vehicles. Mitigation measures for property and land use impacts are addressed in Section 6.7.

Parking

Informal parking on the verges of Manns Road within the proposal footprint would be permanently removed during operation. While existing parking on verges is informal, uncontrolled and in places potentially unsafe for pedestrians, road users and local residents, the loss of informal parking spaces may still affect some road users, such as local businesses and visitors. However, the provision of a footpath would improve access and safety for pedestrians, as vehicles would no longer be able to park within pedestrian areas.

Given the overall community benefit through the removal of informal parking along verges to accommodate new pedestrian facilities, this would be a negligible impact affecting a small proportion of businesses in West Gosford.

6.8.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
General construction impacts	<p>A Communication Plan will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The Communication Plan will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008) and include (as a minimum):</p> <ul style="list-style-type: none"> • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for enquiries and complaints. <p>The Communication Plan will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Construction Contractor	Construction	<p>Standard core safeguard</p> <p><i>Community Involvement and Communications Resource Manual</i> (RTA, 2008) Additional safeguard</p>
	<p>Additional aspects to be considered in the Communication Plan would comprise:</p> <ul style="list-style-type: none"> • Communication with the community with timely and relevant information to enable them to understand the likely nature, extent and duration of vibration, dust, noise and utility impacts, access changes, and changes to parking • Communications will include roadside signage, letterbox dropped newsletters, newspaper advertisements, construction hoarding or project signs including contact details, Roads and Maritime web based information and project enquiries line. 	Construction Contractor	Construction	Additional safeguard
Traffic delays	<p>A detailed traffic management plan would be prepared. The plan would provide details of the traffic management to be implemented during construction to ensure traffic flow on the surrounding network is maintained where possible. Consult with Council regarding traffic management and parking.</p>	Construction contractor	Pre-construction and construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Altered access	Access to properties would be maintained at all times. Further consultation with businesses would be carried out to identify appropriate alternate routes within the local road network for long vehicles. Further, appropriate temporary alternative access and if necessary temporary signage regarding changed access, will be provided for affected residents and visitors of community facilities during construction.	Construction Contractor	Construction	Additional safeguard
	Provide safe alternative pedestrian access to designated crossing points on Manns Road and local properties at all times during construction. Supply signage for pedestrians to road crossings and properties as required.	Construction Contractor	Construction	Additional safeguard
Property impacts	Carry out targeted consultation with property owners regarding potential strip acquisition of properties and any impacts to car parking and infrastructure within the properties.	Roads and Maritime	Detailed design and construction	Additional safeguard
Parking impacts	Construction personnel/vehicle parking would be provided in construction compounds or the work site.	Construction contractor	Construction	Additional safeguard
	All construction personnel will be informed that parking should be within the compounds or work sites, and to avoid parking on local roads.			

Impact	Environmental safeguards	Responsibility	Timing	Reference
Business impacts	<p>Roads and Maritime will carry out targeted consultation with local businesses next to the proposal to develop appropriate strategies to manage</p> <ul style="list-style-type: none"> • Access and visibility during construction • Identification and clear signage for alternate access (pedestrian and vehicle) routes <p>Ongoing consultation will provide specific information with regard to:</p> <ul style="list-style-type: none"> • Timing and duration of work • Changes to access in/out of the property for customers and deliveries • Alternate routes of travel • Alternate parking available on side streets. • Design of property/access adjustments to reduce loss of parking and visibility. 	Roads and Maritime	Detailed design	Additional safeguard

Other safeguards and management measures which would address socio-economic impacts are identified in Sections 6.3, 6.1, 6.6 and 6.7.

6.9 Air Quality

6.9.1 Existing environment

Sensitive receivers

The study area for the desktop qualitative analysis includes an area within one kilometre of the proposal footprint. Sensitive receivers identified in this area are shown in Section 6.7 and include:

- Commercial / industrial receivers (within the proposal footprint)
- Health facilities (from 50 metres away from the proposal)
- Churches (located from 160 metres away from the proposal)
- Cultural facilities (from 200 metres away from the proposal)
- A small number of residential receivers located about 400 metres south west of the proposal
- Residential receivers located about 500 metres south of the proposal
- Aged care facilities (from 750 metres away from the proposal)
- Open space and recreation (from 770 metres away from the proposal)
- Child care (from 800 metres away from the proposal)
- Community centres and spaces (from 800 metres away from the proposal)
- Employment support services (from 830 metres away from the proposal).

Ambient air quality

Air quality standards and goals are provided as cumulative values which are made up of the incremental impact from the proposal as well as background concentration levels of pollutants. Therefore, to assess impacts against the relevant air quality standards and goals it is useful to have information on existing air quality pollution levels in the area.

Long term fine particulate matter (PM₁₀) data was obtained from the nearest OEH air quality monitoring station, which is located at Wyong, about 20 kilometres north east of West Gosford. PM₁₀ data recorded at the Wyong monitoring station indicate an average daily concentration of 26.6 µg/m³, which is typical of a semi-rural residential environment with industrial activities. Based on similar types of land use, this data is considered representative of the proposal footprint.

The National Pollutant Inventory holds a database of facilities and emissions to air in the Central Coast region. A search of the National Pollutant Inventory for a two kilometre radius around the proposal identified one reported facility, namely Elgas located 750 metres south west of the proposal footprint with reported emissions of Total Volatile Organic Compounds.

The primary source of air emissions close to the proposal is expected to be vehicles and industrial activities, generating particulate matter and products of combustions. Manns Road carries the majority of existing traffic within the proposal footprint.

Local meteorology

The relative exposure of sensitive receptors to air emissions from a source generally varies dependent on the wind climate, in particular wind direction(s). Poor dispersion for ground based sources is characterised by light winds and stable atmospheres. Wind directions which have these characteristics would have greater risk of air quality impact. Strong winds become important for the construction phase where dust from unconsolidated and stockpiled sources requires mitigation measures to be implemented.

The proposal is located about two kilometres east of the nearest Bureau of Meteorology Automatic Weather Station at Peats Ridge (Waratah Road). Wind data from this station is considered to be the best available for the site.

The annual and seasonal average wind rose for a thirty year period (1981 to 2011) was assessed and is shown in Figure 6-14 and Figure 6-15 with the following features:

- The predominate morning wind directions are from the north west and south west
- The predominant afternoon wind directions are from the east, north east and north west
- The strongest winds of a morning are from the north west and south west with an average speed of between 5.9 and 7.3 kilometres per hour
- The strongest winds of an afternoon are from the north west with an average speed of between 6.8 and 8 kilometres per hour.

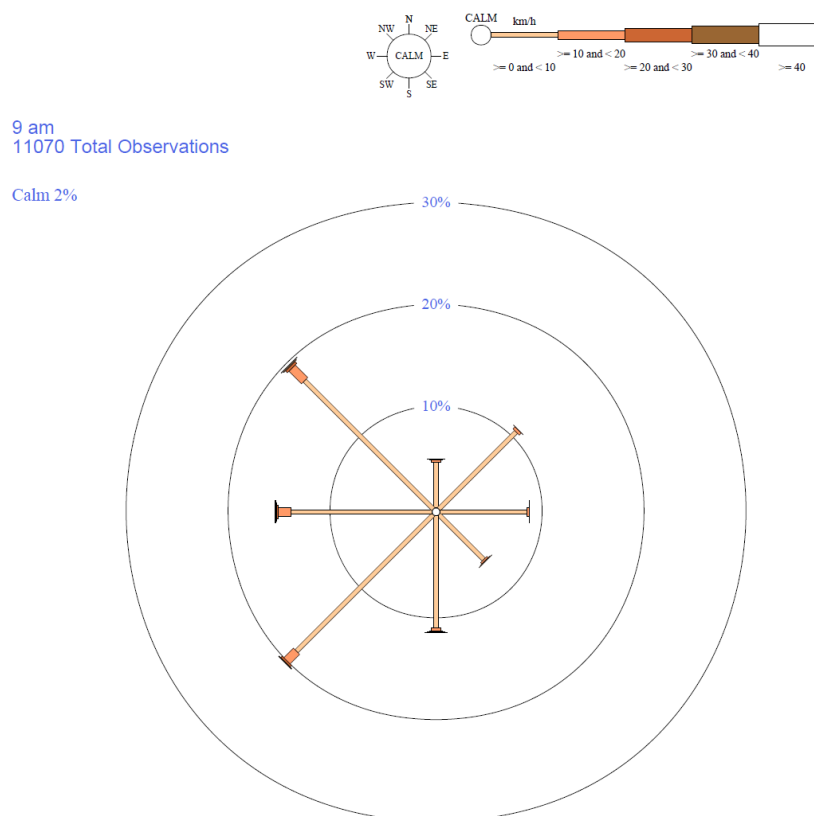


Figure 6-14: 9 am wind direction and strength from Peats Ridge (Waratah Road)

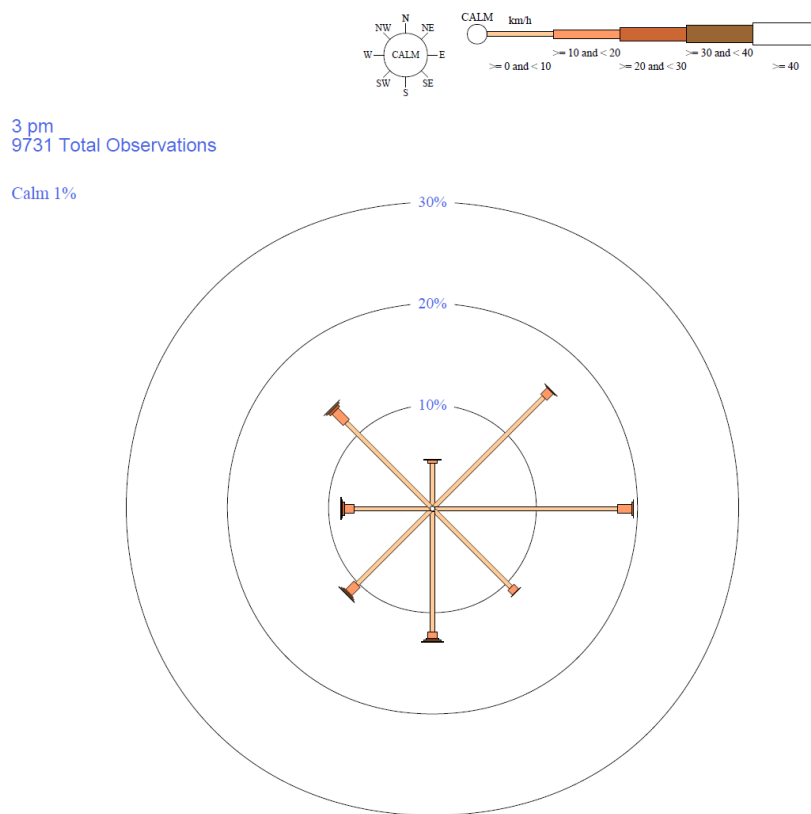


Figure 6-15: 3 pm wind direction and strength from Peats Ridge (Waratah Road)

6.9.2 Potential impacts

Construction

Construction of the proposal may have short-term localised impacts on air quality, primarily due to dust generation. Dust (Total suspended particulates, including PM₁₀) would be the primary emission to air generated during the construction of the proposal.

The individual processes which generate dust are:

- Mechanical disturbance – dust emissions brought about by the operation of construction and maintenance vehicles and equipment
- Wind erosion – dust emissions from exposed, disturbed soil surfaces under high wind speeds during construction.

The potential for exposure to dust emissions is dependent on the local weather conditions, intensity of construction work (ie the amount of dust generated and material transfer volumes occurring), duration and frequency of the operations in any given locality and the relative location of nearby sensitive receptors.

Dust emission sources to consider are:

- Material handling during earthwork
- Loading and dumping of material
- Levelling, grading and compacting of disturbed soil surfaces
- Wind erosion of exposed unstable soil surfaces and localised stockpiles.

Sensitive receptors closest to the construction work area have the highest potential for adverse air quality impacts. As the proposal is within an industrial area and a minimum of 350 metres from residences, residential receivers are unlikely to be affected by dust emissions during construction.

However, the employees and visitors of the businesses along Manns Road could be impacted during construction and dust could also accumulate on displayed goods and equipment in businesses near the proposal. Existing air quality in the area is influenced by industrial land uses so with the implementation of mitigation measures, impacts to the sensitive receptors are not anticipated to be significant.

Dust emissions during construction are typically sufficiently managed through the application of mitigation measures. Dust management measures have been outlined in Section 6.9.3 to assist in minimising off-site impacts during the construction phase of the proposal.

Vehicle exhaust emissions during the construction phase have the potential to impact on air quality; however, the impact is likely to be negligible given the limited amount of equipment, distance to receptors and the short-term construction period. Further, the number of construction vehicles and equipment would be insignificant compared with the existing traffic numbers on Manns Road (20,000 to 25,000 per day). All construction and administrative vehicles are expected to be maintained in a serviceable condition so exhaust emissions are reduced to manufacturer specified levels.

Operation

The proposal would reduce congestion, and in turn, decrease the time vehicles are idling at the intersection. This would reduce vehicle emissions in the localised area of the proposal footprint.

6.9.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
General air quality impacts	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: <ul style="list-style-type: none"> • Potential sources of air pollution • Air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • Mitigation and suppression measures to be implemented • Methods to manage work during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces. 	Construction contractor	Construction	Core standard safeguard
Dust emissions	Dust suppression measures will be implemented in accordance with the CEMP. This will include watering down the site, covering trucks when transporting dust generating material and covering, placing and managing stockpiles in accordance with <i>Stockpile Management Guideline</i> (RTA, 2011b).	Construction contractor	Construction	Additional safeguard <i>Stockpile Management Guideline</i> (RTA, 2011b)
Exhaust emissions	Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality and plant and machinery will be turned off when not in use.	Construction contractor	Construction	Additional safeguard
Impacts on sensitive receivers	Local residents will be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.	Construction contractor	Construction	Additional safeguard

6.10 Other impacts

The existing environment, potential impacts and associated safeguards and management measures for environmental factors with negligible to minor impacts is provided in Section 6.10.1 and 6.10.2.

6.10.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Aboriginal heritage	<p>An archaeological baseline assessment completed by Virtus Heritage to meet the Roads and Maritime Stage 1 PACHCI (Roads and Maritime 2011) was initially completed in February 2018, to assess the risk of impact to Aboriginal Cultural Heritage.</p> <p>Following the findings in that report, additional assessment of the potential for Aboriginal heritage in the proposal footprint has been conducted in a Stage 2 PACHCI investigation completed by OzArk. This included a site investigation, accompanied by Roads and Maritime personnel and two representatives of the Darkinjung Local Aboriginal Land Council (DLALC) on Tuesday 1 May 2018. The full assessments are included as Appendix G (Volume 2). The proposal footprint makes up a portion of the entire archaeological study area covered in these reports.</p> <p>The proposal footprint is a well-developed urban landscape which has been impacted by previous and current vegetation clearance for commercial and industrial development and associated infrastructure such as roads and utilities, including extensive excavation, filling and levelling. The field survey did not record any new Aboriginal sites and no landforms within the proposal footprint were assessed as having potential to contain subsurface archaeological deposits. No portions of the proposal footprint were identified as having specific cultural values by the DLALC representatives.</p>	<p>There is potential to impact previously unrecorded Aboriginal sites during construction while carrying out activities which involve ground disturbance and excavation.</p> <p>However, the proposal footprint has a low archaeological potential and a low archaeological significance and the proposed work would be contained within areas identified as having high levels of past and present disturbance. The impact assessment has therefore found the proposal would have no impact on known Aboriginal sites, places or areas of potential.</p> <p>There are no expected impacts during operation.</p>

Environmental factor	Existing environment	Potential impacts
Non-Aboriginal heritage	<p>A preliminary historical heritage assessment was conducted by Virtus Heritage for the broader Manns Road upgrade – Stockyard Place to Narara Creek Road, which included the proposal footprint. The assessment included database searches and a site inspection.</p> <p>Historical heritage database searches did not identify any historical or Indigenous heritage places within the proposal footprint.</p> <p>The proposal locality was once significant for timber retrieval and the railway industry, with timber felling and sawmills comprising significant industries throughout the nineteenth century. The heritage assessment determined no historical heritage items or potential work or relics were identified in the proposal footprint.</p>	<p>No known historical heritage items or places would be impacted by construction of the proposal. During construction the proposal does have the potential to impact any unidentified relics or areas of predicted occupation deposit within the proposal footprint, however given the extent of development in the area the risk of this is very low.</p> <p>The proposal footprint is mostly urbanised development with no original uncompromised views in the landscape due to recent twentieth century housing and development. The proposal would not impact any historical views or settings to heritage items in the broader landscape, as these views are compromised heavily already.</p> <p>If during excavation successive horizontal logs, commonly called historical 'corduroy log roads', are noted in the sub-surface then work should stop as defined in the safeguards in Section 6.10.2.</p> <p>There would be no operation impacts to non-Aboriginal heritage as a result of the proposal.</p>

Environmental factor	Existing environment	Potential impacts
Groundwater	<p>Groundwater was assessed through desktop review and geotechnical investigations comprising either pavement cores (PC01 – PC08) and 12 test pits (TP01 – TP12) at the locations shown in Figure 6-10, Section 6.5. No boreholes or groundwater monitoring wells were installed within the proposal footprint.</p> <p>Based on the bore usage information reviewed as part of the groundwater bore search, it is possible groundwater within the area could be used for either drinking water, recreational, irrigation or stock watering purposes.</p> <p>Groundwater was only encountered in one of the test pits in the proposal footprint (TP03 located on the eastern verge of Manns Road about 130 metres north of Stockyard Place intersection). Groundwater inflow occurred at 2.9 metres below ground level. The proposal footprint is on a slight rise, where bedrock is located at or near the ground surface.</p>	<p>The depth of excavation for the road alignment would be down to about one metre below ground level, which is not expected to intersect with groundwater. In the unlikely event dewatering is required, it would need to be carried out in accordance with the <i>Roads and Maritime Technical Guideline for dewatering</i>.</p>
Waste and resource use	<p>The proposal footprint is currently comprised of the existing Manns Road, with grassed road verge and private commercial / industrial premises. With the exception of those generated within the private properties alongside Manns Road, the proposal footprint is not currently subject to any waste generating activities.</p>	<p>Construction</p> <p>Construction of the proposal would require the use of a number of resources, including:</p> <ul style="list-style-type: none"> • Resources associated with the operation of construction machinery and motor vehicles (eg use of diesel and petrol) • Material required for road surface and pavements (such as road base, asphalt, spray seal, sand, concrete and aggregate) • Fill required to meet design levels • Materials required for road signage and traffic signals • Construction water (eg for concrete mixing and dust suppression). <p>The materials required for construction of the proposal are not currently limited in availability. However, materials such as metal and fuel are non-renewable and would be used conservatively. Excess</p>

Environmental factor	Existing environment	Potential impacts
		<p>spoil not suitable for reuse would be disposed of in accordance with the safeguards and mitigation measures outlined in Section 6.5.4.</p> <p>The proposal has the potential to generate waste from the following activities:</p> <ul style="list-style-type: none"> • Vegetation to be removed as part of the proposal • Earthwork • Utility adjustments • Waste from the removal of the existing road alignment. <p>Waste streams likely to be generated during construction of the proposal include:</p> <ul style="list-style-type: none"> • Excess spoil • Green waste as a result of vegetation clearing • Roadside materials (for example fencing, guard posts, guard rails) • Packaging and general waste from staff (for example lunch packaging, portable toilets) • Chemicals and oils • Waste water from wash-down and bunded areas • Excess concrete • Redundant erosion and sediment controls. <p>The potential to reuse materials would be investigated during detailed design. Unsuitable fill material which cannot be used on site would be classified in accordance with the EPA's Waste Classification Guidelines (2014) and disposed of at an approved materials recycling or waste disposal facility.</p> <p>Operation</p> <p>The proposal would not result in an increase in waste generation or resource use during operation.</p>

Environmental factor	Existing environment	Potential impacts
Utilities	<p>Preliminary investigations have indicated the following existing utilities and corresponding authorities are within the extents of the proposal:</p> <ul style="list-style-type: none"> • Overhead and underground electricity – Ausgrid • Water reticulation – Central Coast Council • Sewer reticulation – Central Coast Council • Telecommunications – Telstra /NBN, NextGEN, Optus, TPG Communications • Gas reticulation (high and medium pressure) – Jemena. 	<p>Construction</p> <p>Construction activities have the potential to impact on existing utilities and services, in particular underground services such as electricity, gas, and telecommunications. Accidental strike of any of these utilities could result in spills, pollution, injury to workers, damage to infrastructure and / or disruption to businesses and nearby residents as a result of the temporary disconnection of services.</p> <p>Roads and Maritime would consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use.</p> <p>Operation</p> <p>No impact to utilities is anticipated during operation of the proposal as utilities will be relocated away from the proposed design, or appropriately protected.</p>

Environmental factor	Existing environment	Potential impacts
Hazard and risk management	Existing hazards and risks in the proposal footprint are generally associated with operation of the road network.	<p>Construction</p> <p>Potential hazards and spills associated within construction include:</p> <ul style="list-style-type: none"> • Spills or leakage of contaminants such as fuels, chemicals and hazardous substances entering surface and groundwater or contaminating soils • Discharge of turbid run-off, resulting in pollution of waterways • Encountering utilities or contaminated material during earthwork such as asbestos) • Flood of the area during extreme rain events • Changes to traffic conditions resulting in traffic incidents. <p>These potential impacts have been addressed in other sections of this REF.</p> <p>Construction risks would be temporary and appropriately managed with the relevant safeguards provided in the relevant sections. Hazards and risk to the local area would be localised and limited to areas immediately next to the proposal site.</p> <p>Operation</p> <p>Operational hazards and risks relating to the proposal could include:</p> <ul style="list-style-type: none"> • Fuel and oil spills during maintenance activities polluting the natural environment • Vehicle incidents. <p>Vehicle crashes are an inherent aspect of the operation of any road. The proposed upgrade of Manns Road would improve the safety of road users and subsequently reduce the risk of vehicle crashes at the proposal site.</p>

Environmental factor	Existing environment	Potential impacts
Energy and greenhouse gas	<p>The Commonwealth Department of the Environment estimates annual greenhouse gas emissions for Australia. Australia's and NSW's total greenhouse gas for 2016 were estimated as 524.0 and 131.6 metric tonnes of carbon dioxide equivalent, respectively. The major emission sources for NSW were fuel combustion for stationary energy purposes and fuel combustion for transport purposes.</p> <p>The Australian Government has agreed to reduce emissions in Australia by 26-28 per cent below 2005 levels by 2030.</p> <p>Key Commonwealth legislation relevant to the proposal includes:</p> <ul style="list-style-type: none"> • National Greenhouse and Energy Reporting Act 2007 • Carbon Credits (Carbon Farming Initiative) Act 2011. <p>The implications of the above legislation would be assessed during detailed design when the resource extraction schedule has been determined.</p>	<p>Construction</p> <p>Key sources of greenhouse gas emissions associated with the construction of the proposal would include:</p> <ul style="list-style-type: none"> • Vegetation removal, resulting in release of stored carbon dioxide to the atmosphere • Operation of construction equipment, resulting in release of fugitive carbon dioxide and nitrous oxide emissions from fuel (petrol, diesel) • Possible fugitive methane emissions from the use of natural gas for operating construction equipment • Use of materials that require a large amount of energy content to create, such as concrete • Landfilling and carbon-based waste, resulting in emissions of methane • On-site electricity use. <p>It is anticipated construction equipment, concrete production and vehicles would be the main emission source during construction. The amount of greenhouse gas emissions associated with the construction of the proposal would be heavily dependent on the quantity of bulk earthwork required as well as the extent of vegetation removal, which are both expected to be negligible and therefore a significant impact is not anticipated.</p> <p>Operation</p> <p>The primary source of greenhouse gas emissions during operation would be associated with vehicles using Manns Road. As the traffic volume is not predicted to increase as a result of the proposal, the amount of exhaust emissions emitted is not expected to increase. Other greenhouse gas emission sources likely to be associated with the operational phase of the proposal include maintenance activities and any electricity used for lighting and/or signals.</p>

6.10.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Unexpected find of an Aboriginal heritage	The <i>Standard Management Procedure – Unexpected Heritage Items</i> (Roads and Maritime, 2015) would be followed in the event an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work would only restart once the requirements of the Procedure have been satisfied.	Construction contractor	Construction	Core standard safeguard. Section 4.9 of QA <i>G36 Environment Protection</i> Unexpected Heritage Items (Roads and Maritime, 2015)
Non-Aboriginal heritage	The <i>Standard Management Procedure – Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered Work will only restart once the requirements of the Procedure have been satisfied.	Construction contractor	Construction	Core standard safeguard Section 4.10 of QA <i>G36 Environment Protection</i>
Unexpected groundwater inflow	In the event groundwater is encountered unexpectedly during excavation, dewatering will be carried out in accordance with the <i>Roads and Maritime Technical Guideline for dewatering</i> .	Construction contractor	Construction	Additional safeguard <i>Roads and Maritime Technical Guideline for dewatering</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> Measures to avoid and minimise waste associated with the proposal Classification of wastes and management options (reuse, recycle, stockpile, disposal) Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions Procedures for storage, transport and disposal Monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the <i>Environmental Procedure – Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Construction contractor	Construction	<p>Core Standard safeguard</p> <p><i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime Services, 2014)</p>
	<p>The following resource management hierarchy principles will be followed:</p> <ul style="list-style-type: none"> Avoid unnecessary resource consumption as a priority Avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). <p>Disposal will be a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>).</p>	Construction contractor	Construction	Additional safeguard
Utilities	<p>Prior to the start of work:</p> <ul style="list-style-type: none"> The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners If the scope or location of proposed utility relocation work falls outside of the assessed proposal scope and footprint, further environmental assessment will be conducted. <p>Roads and Maritime will consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use.</p>	Roads and Maritime	Detailed design	Core standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Hazards and risk management	<p>A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • Details of hazards and risks associated with the activity • Measures to be implemented during construction to minimise these risks • Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • A monitoring program to assess performance in managing the identified risks • Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. <p>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or Office of Environment and Heritage publications.</p>	Construction contractor	Construction	Core standard safeguard
Demand on resources	<p>Procurement and planning of construction will incorporate the following strategies:</p> <ul style="list-style-type: none"> • Procurement will endeavour to use materials and products with a recycled content where material or product is cost and performance effective • Excavated material will be reused on-site for fill where feasible to reduce demand on resources. • Any additional fill material required will be sourced from appropriate local sources and/or other Roads and Maritime projects. 	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
Energy efficiency	<p>Vehicles, plant and equipment would be selected and managed according to the following:</p> <ul style="list-style-type: none"> • The selection process for vehicle and plant will consider energy efficiency and related carbon emissions • Equipment will be serviced frequently to ensure it is operating efficiently • Machinery will be operated efficiently to ensure optimal performance, minimise downtime and improve fuel efficiency. 	Construction contractor	Construction	Additional safeguard

6.11 Cumulative impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of other external projects. Roads and Maritime is required under Clause 228 (2) of the EP&A Act, to take into account potential cumulative impacts as a result of the proposal.

This section describes the cumulative impacts and benefits likely to arise from the combination of the construction and operation of the proposal with other projects being carried out in the area, in particular the suburbs of West Gosford and Narara.

6.11.1 Broader program of work

The proposal is part of a broader program of work to upgrade the Pacific Highway between the M1 Pacific Motorway and the Central Coast Highway. The work are being conducted over five stages, comprising:

- Stage 1 and 2 between the M1 Pacific Motorway and Ourimbah
- Stage 3A and 3B from Ourimbah to Lisarow
- Stage 4 from Lisarow to Narara
- Stage 5 from Narara to West Gosford, near the interchange with Central Coast Highway.

Construction of these stages over a long duration across the Manns Road corridor between the M1 Pacific Motorway and the Central Coast Highway could result in long term impacts associated with increased travel time and a reduction in the level of community participation throughout the road corridor due to community members avoiding this route. However, the Stage 1 to 4 works are all located to the north of the proposal, and have already been finished, in construction, or in planning and are not anticipated to be conducted concurrent to the proposal.

The Stage 5, Narara to West Gosford planning covers:

- This proposal at the southbound approach to the Stockyard Place intersection
- Another nearby proposal to upgrade the Manns Road – Narara Creek Road intersection
- Remaining upgrades in Stage 5, between Stockyard Place (northbound lanes) and about 300 metres south of Narara Creek Road/Maliwa Road intersection, currently only in planning and with no detailed proposals.

6.11.2 Potential impacts

It is not expected there would be significant cumulative impacts associated with the proposal and the potential construction of other projects in the area. The proposal would be conducted prior to and separately from any other potential proposals in the remaining Stage 5 work between Stockyard Place (northbound lanes) and about 300 metres south of Narara Creek Road/Maliwa Road intersection. In addition, none of these potential proposals have been planned or confirmed at this time and will require further development and approvals.

It is also uncertain whether the proposal and another nearby section of the Manns Road upgrade – Narara Creek Road intersection, would be constructed at the same time, or consecutively. If these happen to be constructed at the same time, it is unlikely there would be substantial overlapping impacts to traffic, sensitive receptors or property and business access as they are located about two kilometres away from each other.

Potential short-term and local amenity impacts may arise if the construction of other projects occur simultaneously with the proposal, although cumulative impacts would be minimised through the application of proposal specific environmental safeguards and management measures as summarised in Section 7.2. Consultation with the relevant stakeholders would be carried out during construction planning to ensure potential cumulative impacts are minimised. Any additional mitigation measures from the consultation would be included in relevant construction management plans for the proposal. Potential cumulative impacts which could occur in relation to the proposal are provided in Table 6-24.

Table 6-24: Potential cumulative impacts

Environmental factor	Construction	Operation
Traffic	<p>If other projects (such as other stages / phases of the road upgrade or new commercial developments) were constructed concurrently with the proposal, there is a potential for traffic to be increased due to additional heavy and light vehicles and machinery required to deliver plant, equipment and personnel to the relevant project sites. This would result in increased traffic delays due to additional road construction / diversions or as a result of increased traffic causing congestion.</p> <p>Cumulative traffic impacts would only occur during construction, which is of relatively short duration (about nine to 12 months).</p>	<p>Construction of the proposal would improve the flow of traffic and provide improved pedestrian and cycle facilities in the proposal footprint. As such, the proposal would reduce cumulative impacts of other projects during operation. Adjoining road upgrades would also result in a broader improvement in travel times and reduce congestions, increasing the positive cumulative impact for the area.</p>
Air Quality	<p>Air quality would decrease during construction of the proposal and other projects if dust levels are exceeded. The proposal would implement mitigation measures to ameliorate impacts caused by dust.</p>	<p>Longer term changes to air quality would be negligible during the operation of the proposal and therefore cumulative impacts with other projects are not anticipated.</p>
Noise	<p>Sensitive residential receivers are located at least 250 metres away from the proposal and the proposal is not anticipated to noticeably increase noise in the study area. As such, cumulative impacts relating to noise from other projects are not expected.</p>	
Socio-economic	<p>Although the proposal is within an existing industrial area with high traffic volumes, there is potential construction could alter the community's perception of the amenity, safety and accessibility of Manns Road. This could discourage some community members from using Manns Road to visit usual facilities, services and social networks to the north and south of the proposal during construction. Should additional construction start either on other road upgrade stages or for other developments in the area, this could increase the problem and further discourage members of the community from using facilities in the area.</p>	<p>Operation of the proposal would increase connectivity and decrease traffic wait times for residents of West Gosford and surrounds, increasing satisfaction of road users including residents. Adjoining road upgrades would increase this positive cumulative impact, resulting in a greater improvement in travel times and the community's perception of the amenity, safety and accessibility of Manns Road.</p>

6.11.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative impacts	The <i>construction environmental management plan</i> will consider potential cumulative construction impacts from surrounding development activities, such as traffic and dust as they become known.	Construction contractor	Construction	Additional safeguard
	Ongoing coordination and consultation will be carried out with other proponents to ensure potential cumulative impacts are appropriately assessed and managed.	Roads and Maritime	Detailed design	Additional safeguard

7. Environmental management

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Project Environmental Management Plan (PEMP) and a *Construction Environmental Management Plan* (CEMP) would be prepared to describe the safeguards and management measures identified. The CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The PEMP and CEMP would be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Central Coast, prior to the start of any on-site work. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The PEMP and CEMP would be developed in accordance with the specifications set out in the QA Specification G36 – *Environmental Protection (Management System)*, QA Specification G38 – *Soil and Water Management (Soil and Water Plan)*, QA Specification G10 – *Traffic Management*.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures would minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General – minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to start of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • Any requirements associated with statutory approvals • Details of how the project will implement the identified safeguards outlined in the ref • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Construction contractor	Construction	Core standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN2	General – notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to start of the activity.	Construction contractor	Construction	Core standard safeguard
GEN3	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular 'toolbox' style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. This includes the hollow bearing tree in the northeast of the proposal footprint.</p>	Construction contractor	Construction	Core standard safeguard
HYD1	Surface water pollution	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Construction contractor	Construction	<p>Core standard safeguard</p> <p>Section 2.1 of QA G38 Soil and Water Management</p>
HYD2	Soil and water	<p>A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the SWMP.</p> <p>The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.</p>	Construction contractor	Construction	<p>Core standard safeguard</p> <p>Section 2.2 of QA G38 Soil and Water Management</p>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
HYD3	Water quality	<p>Specific measures to be incorporated into the SWMP include:</p> <ul style="list-style-type: none"> • Use existing grass lined drainage channels for clean water diversion where available • Install additional stabilised diversion drains where necessary to separate clean and dirty areas and incorporate necessary sediment and erosion controls • Treat highly chlorinated water prior to release in accordance with water company guidelines. 	Construction contractor	Construction	Additional safeguard
HYD4	Flooding and hydrology impacts	<p>The SWMP would include measures to maintain surface water flows during work on existing and new drainage and avoid localised flooding of the road and adjacent properties including:</p> <ul style="list-style-type: none"> • The provision of temporary alternative drainage arrangements during works on existing drainage lines • Removing debris, soil/gravel, equipment and other obstructions routinely following periods of work and before forecast wet weather • Not stockpiling materials below the mapped 10 year flood level in accordance with blue book requirements • Regular inspection during high rainfall events • Scheduling works wherever possible during low rainfall periods. 	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
N&V1	Construction noise and vibration management	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the Interim <i>Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented, taking into account Beyond the Pavement: urban design policy, process and principles (Roads and Maritime Services, 2014) • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Construction contractor	Construction	<p>Core standard safeguard</p> <p>Section 4.6 of QA <i>G36 Environment Protection</i></p> <p><i>Interim Construction Noise Guideline</i> (DECC, 2009)</p> <p><i>Beyond the Pavement: urban design policy, process and principles</i> (Roads and Maritime, 2014)</p>
N&V2		<p>Include measures in the NVMP to shield sensitive receivers from noise, including:</p> <ul style="list-style-type: none"> • Placement and layout of construction compounds to locate primary noise sources away from sensitive receivers • Use solid structures (sheds, containers, etc.) at shields for sensitive receivers • Enclose fixed noise sources such as pumps, compressors, fans, screens (where practicable). 	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
N&V3		Where exceedances of construction noise management levels remain after the implementation of standard noise mitigation measures, additional noise mitigation measures are to be outlined in the construction NVMP, which will be implemented where reasonable and feasible. Guidance on suggested additional noise mitigation measures for each receiver are provided in the specialist noise report attached to this REF.	Construction contractor	Construction	Additional safeguard
N&V4	Construction vibration impacts	Include a complaints procedure in the NVMP to address complaints and corrective actions. This should include the requirement to undertake noise monitoring if applicable.	Construction contractor	Construction	Additional safeguard
N&V5		<p>All sensitive receivers (for example local residents) likely to be affected will be notified at least five calendar days prior to start of any works associated with the activity which may have an adverse noise or vibration impact. The notification will provide details of:</p> <ul style="list-style-type: none"> • The proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information. 	Construction contractor	Construction	Core standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
N&V6		<p>An out-of-hours work procedure for assessing and managing activities requiring work outside of standard hours will be developed and would include the following:</p> <ul style="list-style-type: none"> • Five working days prior to the activity starting, contact the receivers from the local community which are potentially affected by the proposed work and inform them by letter of the proposed work, location, type of work, days and dates of work and hours involved. The contact will be made before the start of work • A 24-hour community liaison phone number and permanent site contact will be provided so complaints can be received and addressed in a timely manner • Measures to investigate and respond to any valid noise complaints. 	Construction contractor	Construction	Additional safeguard
N&V7		Building condition surveys will be conducted at receivers (as required) within 50 metres of proposed vibration generating activities (buildings and other structures).	Construction contractor	Construction	Additional safeguard
N&V8		Where construction activities are scheduled to use vibration generating equipment, and there are occupied buildings within the relevant buffer distances specified in Table 5-27 of the Manns Road upgrade – Southbound Approach to Stockyard Place Intersection Noise and Vibration Assessment, a notification to the affected properties would occur prior to the start of the construction activity.	Construction contractor	Construction	Additional safeguard
N&V9		Develop a monitoring plan in the NVMP that covers potential high vibration activities including works within 13 metres of sensitive receivers. The plan would include trial monitoring to determine actual vibration levels likely from the activity and a procedure for dealing with exceedances of the vibration criteria, which would include ceasing activities and investigation of alternative work methods.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
N&V10	Construction noise impacts – machinery	Where practical, construction equipment and machines will be selected to minimise noise emissions, fitted with appropriate silencers and be maintained in good working order.	Construction contractor	Construction	Additional safeguard
TRA1	Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime Services, 2008). The TMP will include:</p> <ul style="list-style-type: none"> • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network and any local parking changes • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction traffic incident • Consideration of other developments which may be under construction to minimise traffic conflict and congestion which may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms. 	Construction contractor	Construction	<p>Core standard safeguard</p> <p>Section 4.8 of QA <i>G36 Environment Protection</i></p> <p><i>Traffic Control at Work Sites Manual</i> (RTA, 2010)</p> <p><i>QA Specification G10 Control of Traffic</i> (Roads and Maritime Services, 2008)</p>
TRA2	Traffic congestion	Construction activities which could substantially affect traffic congestion will be carried out outside peak periods, as far as is practicable.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TRA3	Access	Heavy vehicle traffic will be restricted, as much as possible, to the existing main roads (such as Manns Road) to minimise impacts on local roads and streets.	Construction contractor	Construction	Additional safeguard
TRA4		Property and access adjustments would be designed to cater for the required vehicles accessing each site.	Detailed designer	Detailed design	Additional safeguard
TRA5		Further consultation with businesses would be carried out to identify appropriate alternate options/routes for long vehicles.	Detailed designer	Detailed design	Additional safeguard
TRA6		Where access to property / businesses would be disrupted for an extended period, alternative access would be provided.	Construction contractor	Construction	Additional safeguard
BIO1	Environmental management	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas Requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) Pre-clearing survey requirements Procedures for unexpected threatened species finds and fauna handling Procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI, 2013). Protocols to manage weeds and pathogens. 	Construction contractor	Construction	<p>Core safeguard</p> <p><i>Landscape Guideline</i> (RTA, 2008)</p> <p><i>Policy and guidelines for fish habitat conservation and management</i> (DPI, 2013)</p> <p><i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011)</p>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO2	Habitat loss	Measures to further avoid and minimise the proposal footprint and native vegetation or habitat removal will be investigated during detailed design and implemented where practicable and feasible.	Detailed designer	Detailed design	Core standard safeguard
BIO3		The hollow-bearing tree within the proposal footprint opposite Carnarvon Road will be investigated during detailed design for preservation from disturbance.	Detailed designer	Detailed design	Additional safeguard
BIO4		If the hollow-bearing tree does not need to be removed, it will be demarcated and avoided during construction work in accordance with the <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).	Construction contractor	Construction	Additional safeguard <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).
BIO5	Weed removal and spread	Protocols for preventing or minimising the spread of priority and environmental weeds will be developed and implemented in accordance with the <i>Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management)</i> (RTA 2011).	Construction contractor	Construction	Additional safeguard <i>Roads and Maritime Biodiversity Guidelines (Guide 6: Weed Management)</i> (RTA 2011).
BIO6	Weed invasion and edge effects	Ongoing weed management and control in accordance with the <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).	Roads and Maritime	Operation	Additional safeguard <i>Roads and Maritime Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011).

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SOIL 1	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Construction contractor	Construction	Core standard safeguard Section 4.2 of QA G36 <i>Environment Protection</i>
SOIL 2		If compound 3 will be utilised as a construction compound, a site investigation for potential contamination will be completed prior to use to ensure suitability.	Roads and Maritime	Detailed design	Additional safeguard
SOIL 3	Exposure of soil to erosion	A soil and water management plan (SWMP) will be prepared as part of the CEMP in accordance with the requirements of Roads and Maritime contract specification G38 prior to the start of construction. The SWMP will address the following: <ul style="list-style-type: none"> • Roads and Maritime <i>Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure</i> • The NSW Soils and Construction – <i>Managing Urban Stormwater Volume 1 'the Blue Book'</i> (Landcom, 2004) and Volume 2 (DECC, 2008) • <i>Roads and Maritime Stockpile Site Management Guideline</i> (Roads and Maritime, 2015) • <i>Technical Guideline: Temporary Stormwater Drainage for Road Construction</i>, (Roads and Maritime 2011) • <i>Technical Guideline: Environmental Management of Construction Site Dewatering</i>, (Roads and Maritime 2011). 	Construction contractor	Construction	Additional safeguard QA G36 <i>Environment Protection</i>
SOIL 4		Prepare and implement a progressive erosion and sediment control plan prior to the start of each stage of construction.	Construction contractor	Construction	Additional safeguard
SOIL 5		Develop an inspection and maintenance programme to check the adequacy of controls, particularly after a rainfall event.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SOIL 6		Disturbed areas of the site would be progressively scheduled for ground stabilisation and / or final landscaping treatment where possible at the end of each construction stage.	Construction contractor	Construction	Additional safeguard
SOIL 7	Accidental spill	Erosion and sediment controls would be retained and maintained until effective soil cover (at least 70 per cent coverage) is achieved.	Construction contractor	Construction	Additional safeguard
SOIL 8		Controls will be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces. Any material transported onto pavement surfaces will be swept and removed at the end of each working day.	Construction contractor	Construction	Additional safeguard
SOIL 9		A site specific emergency spill plan will be developed for inclusion in the CEMP, and include spill management measures in accordance with the <i>Roads and Maritime Code of Practice for Water Management</i> (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Roads and Maritime and EPA officers).	Construction contractor	Construction	Core standard safeguard Section 4.3 of QA G36 <i>Environment Protection</i> <i>Roads and Maritime Code of Practice for Water Management</i> (RTA, 1999)
SOIL 10		Fully equipped emergency spill kits will be kept on-site at all times	Construction contractor	Construction	Additional safeguard
SOIL 11	Storage and disposal of construction materials	Excess spoil not required or able to be used for backfilling will be stockpiled in a suitable location before being reused or removed from the site, and disposed of appropriately in accordance with the <i>NSW EPA Waste Classification Guidelines</i> (2014).	Construction contractor	Construction	Additional safeguard <i>NSW EPA Waste Classification Guidelines</i> (2014)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
L&V1	Landscape character and visual impact	<p>An Urban Design Plan will be prepared to support the final detailed proposal design and implemented as part of the CEMP.</p> <p>The Urban Design Plan will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for:</p> <ul style="list-style-type: none"> • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as seating, lighting, fencing and signs • Details of the staging of landscape work taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas. <p>The Urban Design Plan will be prepared in accordance with relevant guidelines, including:</p> <ul style="list-style-type: none"> • Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014) • Landscape Guideline (RTA, 2008) • Bridge Aesthetics (Roads and Maritime 2012) • Shotcrete Design Guideline (RTA, 2016) <p>The Urban Design Plan will also take this environmental assessment and the urban design principles.</p>	Detailed designer	Detailed design	<p>Standard core safeguard</p> <p>Beyond the Pavement urban design policy, process and principles (Roads and Maritime, 2014)</p> <p><i>Landscape Guideline</i> (RTA, 2008)</p> <p>Bridge Aesthetics (Roads and Maritime 2012)</p> <p>Shotcrete Design Guideline (RTA, 2005)</p>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
L&V2	Visual impacts	Develop a limited range of materials, colours and textures for all built elements to achieve a simple uncluttered design. The types of materials proposed are to reflect the locality and be appropriate for its intended application.	Detailed designer	Detailed design	Additional safeguard
L&V3		Compounds, storage areas, stockpiles and associated work areas will be located in cleared or disturbed areas as far as possible.	Construction contractor	Construction	Additional safeguard
L&V4		The construction site will be kept tidy and rubbish free.	Construction contractor	Construction	Additional safeguard
L&V5		Work areas will be restored progressively and maintained until established.	Construction contractor	Construction	Additional safeguard
L&V6		The site will be rehabilitated and landscaped in accordance with an approved landscape plan.	Construction contractor	Construction	Additional safeguard
L&V7	Vegetation removal	Existing vegetation will be maintained and protected wherever possible. Trimming of trees rather than clearing will be carried out where possible. The existing large tree currently located within the verge of the proposal footprint about 200 metres north of the intersection will be investigated for long-term retention in landscape design.	Construction contractor	Construction	Additional safeguard
L&V8	Light spill	Temporary lighting for construction will be sited and designed to minimise light spill into identified sensitive receptors.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
PRP1	Property acquisition	All property acquisition will be carried out in accordance with the <i>Land Acquisition Information Guide</i> (Roads and Maritime, 2012) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime	Detailed design	Standard core safeguard <i>Land Acquisition Information Guide</i> (Roads and Maritime, 2012) <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .
PRP2		Carry out regular and ongoing engagement with the property owners affected by property acquisition.			Additional safeguard
PRP3	Land use impacts	Consult with potentially affected landholders before and during construction in accordance with the Communications Plan described in Section 6.8.4 to minimise the potential for impacts on land use.	Roads and Maritime	Detailed design	Additional safeguard
PRP4	Neighbouring properties	Maintain safe access to impacted properties along Manns Road during construction. Any disruption to access and properties will be minimised and will only be carried out following consultation and agreement with individual property owners affected by the work.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SOC1	General construction impacts	<p>A Communication Plan will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The Communication Plan will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008) and include (as a minimum):</p> <ul style="list-style-type: none"> • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for enquiries and complaints. <p>The Communication Plan will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Construction Contractor	Construction	Standard core safeguard <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008) Additional safeguard
SOC2		<p>Additional aspects to be considered in the Communication Plan would comprise:</p> <ul style="list-style-type: none"> • Communication with the community with timely and relevant information to enable them to understand the likely nature, extent and duration of vibration, dust, noise and utility impacts, access changes, and changes to parking • Communications will include roadside signage, letterbox dropped newsletters, newspaper advertisements, construction hoarding or project signs including contact details, Roads and Maritime web based information and project enquiries line. 	Construction Contractor	Construction	Additional safeguard
SOC3	Traffic delays	A detailed traffic management plan would be prepared. The plan would provide details of the traffic management to be implemented during construction to ensure traffic flow on the surrounding network is maintained where possible. Consult with Council regarding traffic management and parking.	Construction contractor	Pre-construction and construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SOC4	Altered access	Access to properties would be maintained at all times. Further consultation with businesses would be carried out to identify appropriate alternate routes within the local road network for long vehicles. Further, appropriate temporary alternative access and if necessary temporary signage regarding changed access, will be provided for affected residents and visitors of community facilities during construction.	Construction Contractor	Construction	Additional safeguard
SOC5		Provide safe alternative pedestrian access to designated crossing points on Manns Road and local properties at all times during construction. Supply signage for pedestrians to road crossings and properties as required.	Construction Contractor	Construction	Additional safeguard
SOC6	Property impacts	Carry out targeted consultation with property owners regarding potential strip acquisition of properties and any impacts to car parking and infrastructure within the properties.	Roads and Maritime	Detailed design and construction	Additional safeguard
SOC7	Parking impacts	Construction personnel/vehicle parking would be provided in construction compounds or the work site. All construction personnel will be informed that parking should be within the compounds or work sites, and to avoid parking on local roads.	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SOC8	Business impacts	<p>Roads and Maritime will carry out targeted consultation with local businesses next to the proposal to develop appropriate strategies to manage:</p> <ul style="list-style-type: none"> • Access and visibility during construction • Identification and clear signage for alternate access (pedestrian and vehicle) routes <p>Ongoing consultation will provide specific information with regard to:</p> <ul style="list-style-type: none"> • Timing and duration of work • Changes to access in/out of the property for customers and deliveries • Alternate routes of travel • Alternate parking available on side streets. • Design of property/access adjustments to reduce loss of parking and visibility. 	Roads and Maritime	Detailed design	Additional safeguard
AIR1	General air quality impacts	<p>An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • Potential sources of air pollution • Air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • Mitigation and suppression measures to be implemented • Methods to manage work during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces. 	Construction contractor	Construction	Core standard safeguard
AIR2	Dust emissions	<p>Dust suppression measures will be implemented in accordance with the CEMP. This will include watering down the site, covering trucks when transporting dust generating material and covering, placing and managing stockpiles in accordance with <i>Stockpile Management Guideline</i> (RTA, 2011b).</p>	Construction contractor	Construction	Additional safeguard <i>Stockpile Management Guideline</i> (RTA, 2011b)

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AIR3	Exhaust emissions	Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality and plant and machinery will be turned off when not in use.	Construction contractor	Construction	Additional safeguard
AIR4	Impacts on sensitive receivers	Local residents will be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.	Construction contractor	Construction	Additional safeguard
OTH1	Unexpected find of an Aboriginal heritage	The <i>Standard Management Procedure – Unexpected Heritage Items</i> (Roads and Maritime, 2015) would be followed in the event an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work would only restart once the requirements of the Procedure have been satisfied.	Construction contractor	Construction	Core standard safeguard. Section 4.9 of QA G36 <i>Environment Protection</i> Unexpected Heritage Items (Roads and Maritime, 2015)
OTH2	Non-Aboriginal heritage	The <i>Standard Management Procedure – Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only restart once the requirements of the Procedure have been satisfied.	Construction contractor	Construction	Core standard safeguard Section 4.10 of QA G36 <i>Environment Protection</i>
OTH3	Unexpected groundwater inflow	In the event groundwater is encountered unexpectedly during excavation, dewatering will be carried out in accordance with the <i>Roads and Maritime Technical Guideline for dewatering</i> .	Construction contractor	Construction	Additional safeguard <i>Roads and Maritime Technical Guideline for dewatering</i>

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
OTH4	Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> Measures to avoid and minimise waste associated with the proposal Classification of wastes and management options (reuse, recycle, stockpile, disposal) Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions Procedures for storage, transport and disposal Monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the <i>Environmental Procedure – Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Construction contractor	Construction	<p>Core Standard safeguard</p> <p><i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime Services, 2014)</p>
OTH5		<p>The following resource management hierarchy principles will be followed:</p> <ul style="list-style-type: none"> Avoid unnecessary resource consumption as a priority Avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) Disposal will be a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>). 	Construction contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
OTH6	Utilities	<p>Prior to the start of work:</p> <ul style="list-style-type: none"> The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners If the scope or location of proposed utility relocation work falls outside of the assessed proposal scope and footprint, further environmental assessment will be conducted. <p>Roads and Maritime will consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use.</p>	Roads and Maritime	Detailed design	Core standard safeguard
OTH7	Hazards and risk management	<p>A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to:</p> <ul style="list-style-type: none"> Details of hazards and risks associated with the activity Measures to be implemented during construction to minimise these risks Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials A monitoring program to assess performance in managing the identified risks Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. <p>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or Office of Environment and Heritage publications.</p>	Construction contractor	Construction	Core standard safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
OTH8	Demand on resources	<p>Procurement and planning of construction will incorporate the following strategies:</p> <ul style="list-style-type: none"> • Procurement will endeavour to use materials and products with a recycled content where material or product is cost and performance effective • Excavated material will be reused on-site for fill where feasible to reduce demand on resources. • Any additional fill material required will be sourced from appropriate local sources and/or other Roads and Maritime projects. 	Construction contractor	Construction	Additional safeguard
OTH9	Energy efficiency	<p>Vehicles, plant and equipment would be selected and managed according to the following:</p> <ul style="list-style-type: none"> • The selection process for vehicle and plant will consider energy efficiency and related carbon emissions • Equipment will be serviced frequently to ensure it is operating efficiently • Machinery will be operated efficiently to ensure optimal performance, minimise downtime and improve fuel efficiency. 	Construction contractor	Construction	Additional safeguard
CUM1	Cumulative impacts	The <i>construction environmental management plan</i> will consider potential cumulative construction impacts from surrounding development activities, such as traffic and dust as they become known.	Construction contractor	Construction	Additional safeguard
CUM2		Ongoing coordination and consultation will be carried out with other proponents to ensure potential cumulative impacts are appropriately assessed and managed.	Roads and Maritime	Detailed design	Additional safeguard

7.3 Licensing and approvals

A summary of the licensing and approvals required for the proposal is provided in Table 7-2.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Water Management Act 2000</i> (s91C)	Drainage work approval from DPI (Water).	Prior to start of the activity.

8. Conclusion

8.1 Justification

The southbound approach to Stockyard Place intersection is in a strategic location as it services the industrial area of West Gosford and is near the connection of Manns Road to the Central Coast Highway. It is a signalised intersection, and the proposal would create a safer approach to the intersection by providing an additional turning lane for better access to retail and industrial services in the area.

The proposal is considered to be justified as it would reduce existing and forecast increasing traffic delays and congestion along Manns Road near the intersection. Without construction of the proposal, traffic modelling determined Stockyard Place intersection would continue to suffer a decline in performance, particularly for southbound traffic with peak hour journey times predicted to increase by about 250 per cent. Construction of the proposal would cater for existing and future traffic volumes, reduce congestion and delays currently experienced by motorists during peak travel time and improve road user safety.

While there would be environmental impacts as a consequence of the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards summarised in Section 7.2.

8.2 Objects of the EP&A Act

Table 8-1 identifies the objects of the EP&A Act and their relevance to the proposal.

Table 8-1: Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	<p>The proposal is needed to improve the travel times and safety for the Manns Road southbound approach to Stockyard Place intersection. The proposal would result in reduced traffic delays and would extend existing cyclist and pedestrian facilities within the proposal footprint.</p> <p>The proposal would result in some traffic and amenity impacts during construction and would require strip acquisition of five commercial properties. A number of mitigation measures would be implemented to minimise any socio economic impacts associated with the proposal.</p>
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	<p>Construction of the proposal would require the removal of a small amount of common and exotic species comprising 0.74 hectares of exotic grassland and native planted and remnant trees. No threatened species or communities were identified. Discussed further in Section 8.2.3.</p>
1.3(c) To promote the orderly and economic use and development of land.	<p>The proposal is needed as part of a broader upgrade designed to progressively improve Manns Road to reduce travel time and improve safety, which would provide for future growth and development in Gosford.</p>

Object	Comment
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	<p>The project has been subject to a comprehensive biodiversity assessment as described in Section 6.1 of this REF. Within the proposal footprint, only a small amount (0.74 hectares) of exotic grassland would be cleared as a result of the proposal.</p> <p>There are no threatened species or native vegetation communities which would be impacted by the proposal, and as such, impacts to areas of significant biodiversity value would not occur.</p> <p>The proposal would not significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the BC Act, EPBC Act or FM Act.</p>
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	A Stage 1 and 2 Roads and Maritime PACHCI assessment and inspection confirmed no Aboriginal archaeological sites or areas of cultural significance are likely to occur within the proposal footprint and therefore no impact to cultural heritage would occur. No heritage buildings occur within the proposal footprint.
1.3(g) To promote good design and amenity of the built environment.	The proposal has considered community amenity and urban design principles, with a specialist landscape and urban design report having been completed to inform the proposal design. The urban design concepts would provide an improved and consistent landscape character, resulting in a positive visual and amenity impact compared with existing conditions.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the project.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	The proposal has involved extensive consultation with relevant stakeholders during the preparation of the proposal REF. Consultation carried out is discussed in Section 5 of this REF. Consultation would be ongoing during detailed design and construction.

8.2.1 The precautionary principle

This principle states '*if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*'.

Consultation considered issues raised by stakeholders and a range of specialist studies were carried out for key issues to provide accurate and impartial information to assist in the development process.

The concept design has sought to minimise impacts while maintaining engineering feasibility and safety for all road users. A number of safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during detailed design, construction and operation of the proposal. No safeguards have been postponed as a result of lack of scientific certainty.

A construction environment management plan would be prepared before construction starts. This would ensure the proposal achieves its required level of environmental performance. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

This principle states, *'the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'*.

The proposal would result in some amenity impacts during construction, however, it would not result in any impacts which are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by ensuring road safety and travel time is improved, with this being a positive benefit for all road users.

A construction environment management plan would be prepared before construction starts. This requirement would ensure the proposal achieves a high-level of environmental performance. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.3 Conservation of biological diversity and ecological integrity

This principle states the *'diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'*.

The environment in which the proposal would be located is predominantly exotic and/or planted vegetation. A small number of remnant and planted native trees would be impacted. The small area of vegetation to be removed (0.74 hectares) has very little ecological significance. An assessment of the existing biodiversity was carried out to identify and manage any potential impacts of the proposal on local biodiversity.

The proposal would not have a significant impact on biological diversity and ecological integrity. A biodiversity assessment and appropriate site-specific safeguards are provided in Section 6.1.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires *'costs to the environment should be factored into the economic costs of a project'*.

The REF has examined the environmental impacts and benefits of the proposal and identified mitigation measures to manage the potential for adverse impacts. The requirement to implement these mitigation measures would result in an economic cost to Roads and Maritime. The implementation of mitigation measures would increase both the capital and operating costs of the proposal. This signifies environmental resources have been given appropriate valuation.

The concept design has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates the proposal is being developed with an environmental objective in mind.

8.3 Conclusion

The proposed upgrade of the southbound approach to Stockyard Place intersection at West Gosford is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the proposal objectives but would still result in some impacts including;

- Some temporary noise impacts are anticipated for sensitive residential receivers
- Disrupted access and parking for businesses during construction
- Up to four properties would become restricted to a left in – left out movement due to the addition of the central median north of Stockyard Place. Access to these properties would be via a minor detour and would promote a safer movement than crossing multiple traffic lanes near an intersection.

Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve safety and reduce travel times. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment and Energy is not required.

9. Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.




Katie Ward

Senior Environmental Scientist

GHD Pty Ltd

Date: 01 May 2019

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.



Teresa Ting

Project Manager

Roads and Maritime Services Central

Coast Date: 15 May 2019

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Terms and acronyms used in this REF

Term / Acronym	Description
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average recurrence interval
ASS	Acid Sulphate Soils
BC Act	<i>Biodiversity Conservation Act 2016</i>
CEMP	Construction Environmental Management Plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CNML	Construction Noise Management Levels
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
EPA	NSW Environmental Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	Environment protection licence
ESCP	Erosion and Sediment Control Plan
DPI	Department of Primary Industries
FM Act	<i>Fisheries Management Act 1994</i> (NSW).
GHD	GHD Pty Ltd.
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i> .
km/h	Kilometres per hour
LA90(period)	The sound pressure level exceeded for 90% of the measurement period.
L _{Aeq} (15 hr)	The L _{Aeq} noise level for the period 7.00 to 22.00 hours.
L _{Aeq} (1hr)	The highest hourly L _{Aeq} noise level during the day and night periods.
L _{Aeq} (9 hr)	The L _{Aeq} noise level for the period 22.00 to 7.00 hours.
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
m ³ /s	cubic metres per second

Term / Acronym	Description
MNES	Matters of national environmental significance
NPI	National Pollutant Inventory
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW).</i>
NSW	New South Wales
OEH	Office of Environment and Heritage
Phase 1	Upgrade of Narara Creek Road intersection and the southbound approach to Stockyard Place intersection
Phase 2	Remaining work within Stage 5, between Stockyard Place (northbound lanes) to about 300 metres south of Narara Creek Road / Maliwa Road intersection
PM ₁₀	Particulate matter
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
The proposal	Upgrade the southbound approach to Stockyard Place intersection
Proposal footprint	Areas which would be directly impacted by construction of the proposal including the operational design, additional areas for possible stockpiles and compounds, temporary public and construction access, private property adjustments such as driveways and fences, and public utility relocations
QA Specifications	Specifications developed by Roads and Maritime for use with roadwork and bridgework contracts let by Roads and Maritime
REF	Review of environmental factors.
Roads and Maritime	Roads and Maritime Services
RTA	NSW Roads and Traffic Authority which now forms part of Roads and Maritime.
Stage 5	The fifth stage of upgrade work for the Pacific Highway and Manns Road between the Central Coast Highway at West Gosford and the M1 Pacific Motorway at Ourimbah. Stage 5 includes all upgrade work between 300 metres north of Narara Creek Road, Narara, and the Stockyard Place intersection in Gosford
SEPP 44	State Environmental Planning Policy 44 Koala Habitat Protection



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Customer feedback
Roads and Maritime
Locked Bag 928,
North Sydney NSW 2059

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