

Mooring piles at Wisemans, Webbs Creek and Sackville Ferry crossings

Review of Environmental Factors

April 2024



Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the installation of mooring piles at Wisemans, Webbs Creek and Sackville ferry crossings is proposed.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.





Approval and authorisation

Title	Flood piles at Wisemans, Webbs Creek and Sackville Ferry crossings	
Accepted on behalf of Transport for NSW by:	[REDACTED]	
Signed	[REDACTED]	
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Executive summary

The proposal

Transport for NSW ('Transport') proposes to install mooring piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry. Transport also proposes to install a pontoon and walkway at Wisemans Ferry, improving access to ferries for maintenance. Key features of the proposal include:

- Remove existing timber piles at all ferries
- Install 12 new mooring piles at Wisemans Ferry
- Clear about 51 m² of reedbed, a threatened ecological community
- Install a floating pontoon at Wisemans Ferry
- Install seven mooring piles at Webbs Creek Ferry
- Install four mooring piles at Sackville Ferry.

The piles would be installed using a barge-mounted drilling rig. Wisemans Ferry has a main and relief ferry, one of which would remain operational throughout the work. A ferry closure and detour would be required at Webbs Creek Ferry and Sackville Ferry from 10am to 3pm Monday to Friday during the work.

Construction is expected to commence in early 2024 and would take around three months (one month at each ferry) to complete.

Need for the proposal

The ferries that currently operate at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry replaced older ferries during the period of 2007 – 2015. The existing mooring piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry were designed to moor the older, smaller ferries and do not have adequate capacity for the ferries currently in use. Floods in 2022 flood were higher than any flood in the last 20 years and caused significant damage to ferries and ferry assets on the river. The current piles need to be replaced with piles that can secure the ferries during large flood events.

Ferry maintenance teams require access for routine work when ferries are moored at Wisemans Ferry. Currently the moored ferries are accessed by boat. This is not a safe or efficient way of providing teams with equipment access to the ferries. Transport proposes to install a floating pontoon to provide safe access to moored ferries at Wisemans Ferry.

Proposal objectives

The objectives of the proposal are:

- Provide mooring piles that can safely moor ferries during floods at all ferry crossings
- Provide safe access to moored ferries at Wisemans Ferry for maintenance.

Options considered

Two options were considered:

- Option 1 – 'Do nothing': The existing mooring facilities would not be adequate to secure the ferries during very high floods. This option would need meet the proposal objectives
- Option 2 - remove existing timber mooring piles and install steel mooring piles at Wisemans, Webbs Creek and Sackville ferries; and install a floating pontoon at Wisemans Ferry: This option would install new steel mooring piles at the three ferry crossings with adequate height to secure the ferries in large floods and install a floating pontoon at Wisemans Ferry. This option would meet the proposal objectives.

Option 2 is the preferred option.

Statutory and planning framework

The proposal is for road infrastructure facilities and is to be carried out by Transport for NSW and can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)*. Development consent from council is not required.

Community and stakeholder consultation

Transport would carry out community engagement in accordance with the Roads and Maritime Community Engagement e-Toolkit. The key points of engagement would be:

- Informing all potentially impacted stakeholders (emergency services and Busways) of the proposal in advance of the start date of the work
- Informing all ferry users of the disruptions to ferry operations and of the detours that would be put in place.

The community engagement would be managed by Transport's community and engagement team.

Transport notified DPI Fisheries of dredging work in accordance with section 199 of the Fisheries Management Act. The Hawkesbury River is a Crown waterway. Transport consulted with Crown Land about a licence to work in the waterway.

Environmental impacts

The main environmental impacts of the proposal are:

Biodiversity

A Biodiversity Assessment Report (BAR) was prepared for the proposal.

There are five plant community types (PCT) located in the study area, provided in the table below. The proposed work would require clearing of 51.2m² of reedland at Wisemans Ferry for construction of the pontoon walkway and trimming of one tree at Sackville Ferry. A Test of Significance concluded that the removal of 51 m² of PCT 3962 would not be a significant impact.

Plant community type	Threatened ecological community	Ferry	Study area (ha)	Impact to vegetation (m ²)
PCT 3962 <i>Coastal Floodplain Phragmites Reedland</i>	Endangered, BC Act	Wisemans Ferry	0.17	51.2
PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Endangered, BC Act	Wisemans Ferry	0.14	-
PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Endangered, BC Act	Webbs Creek Ferry	0.06	-
PCT 4025 <i>Cumberland Red Gum Riverflat Forest</i>	Endangered, BC Act	Sackville Ferry	0.04	Tree trimming
PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	Not a TEC	Wisemans Ferry	0.02	-

There is Glossy black cockatoo (*Calyptorhynchus lathami*) habitat located in close proximity to the proposed works. Glossy black cockatoos are listed as vulnerable under State and Federal legislation. A ToS and Significant Impact Criteria assessment were carried out and concluded that there would be no significant impact on Glossy black cockatoos.

Mangroves would not be impacted and a permit under the *Fisheries Management Act 1994* would not be required. The proposal would require work in the Hawkesbury River. However, there would be no more than minor impacts to aquatic ecosystems.

Surface water and flooding

The removal of the existing pile and installation of new piles would disturb sediment in the river. An increase in turbidity has potential to impact aquatic organisms. A silt curtain would be used to contain the sediment until it settles to an acceptable level.

Installation of mooring piles that can secure the ferries during large flood events is a positive impact.

Soil

There is potential to encounter acid sulfate soils in the river bed and bank during the work. Spoil generated during pile removal/installation and construction of anchor blocks would be managed to minimise any impact from acid sulphate soils.

Concrete works would be managed to minimise the risk of concrete entering the river.

Traffic

The proposed work at Webbs Creek Ferry and Sackville Ferry would need ferry closures from 10am to 3pm Monday to Friday. Substantial detours would be needed to be in place at both ferries. This would impact ferry users during the proposed works. This impact would be minimised by keeping the ferries operating during peak periods and providing advance notice of the work to the community and potentially impacted businesses. One of the two ferries at Wisemans Ferry would remain operational throughout the work. Minimal impact to traffic at Wisemans Ferry is anticipated.

Noise

There is potential for construction noise impacts at each ferry crossing:

- Wisemans Ferry – predicted noise levels up to 17 dB(A) at the café beside the ferry. Café staff and customers are predicted to be highly noise affected (>75dB) during the proposed work
- Webbs Creek Ferry – predicted noise levels up to 26 dB(A) at a residence at 3014 River Road
- Sackville Ferry – predicted noise levels up to 22 dB(A) at a residence at 897 Sackville Road.

There is no construction vibration or operational noise anticipated. A Noise and Vibration Management Plan would be prepared to identify reasonable and feasible mitigation to minimise noise impacts on sensitive receivers.

Justification and conclusion

The ferries are key transport crossings of the Hawkesbury River. Their continued operation is important for the local and wider community. Ensuring that the ferries can be safely secured during floods is in the public interest. The assessment of the environmental impacts has determined the proposal is not likely to have a major impact and therefore assessment under Division 5.2 of the EP&A Act is not required.

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1. Introduction

This chapter introduces the proposal and provides context for the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

1.1 Proposal identification

Transport for NSW ('Transport') proposes to install mooring piles at Wisemans Ferry, Webbbs Creek Ferry and Sackville Ferry. The piles are needed to safely moor the ferries, particularly when the Hawkesbury River is in flood. Transport also proposes to install a pontoon and walkway at Wisemans Ferry, improving access to ferries for maintenance.

Wisemans Ferry, Webbbs Creek Ferry, and Sackville Ferry are cable ferry crossings on the Hawkesbury River (Figure 1-1). Wisemans Ferry has two crossings, a main crossing with capacity for 24 vehicles and a relief ferry with capacity for 18 vehicles. The ferry connects Old Northern Road and Wisemans Ferry Road. Webbbs Creek Ferry has capacity for 24 vehicles and connects River Road to St Albans Road. Sackville Ferry crosses the Hawkesbury River, north of Sackville on Sackville Road. The ferry connects the roads linking Windsor and Wisemans Ferry and can carry 15 cars every trip across the river. All three ferries operate 24 hours a day, seven days a week.

Key features of the proposal would include:

Wisemans Ferry (southern approach) (Figure 1-2)

- Remove 11 existing timber mooring piles
- Install 12 new steel mooring piles
- Construct two new anchor blocks to secure the moored ferries
- Clear about 51 m² of reedbed, a threatened ecological community
- Install a floating pontoon and walkway. Four piles would secure the walkway and pontoon and would be located east of the ferry ramps to provide access to moored ferries. The walkway would be secured on the bank with an anchor block.

Webbbs Creek Ferry (eastern approach) (Figure 1-3)

- Remove two existing timber mooring piles
- Install seven new steel mooring piles
- Construct a new anchor block to secure the moored ferry.

Sackville Ferry (southern approach) (Figure 1-4)

- Remove one existing timber mooring pile
- Install sleeve over three existing piles to raise the height of the piles
- Trim branches from one tree
- Install four new steel mooring piles
- Construct a new anchor block to secure the moored ferry.

The existing mooring piles at each ferry do not have adequate capacity to safely moor the ferries during floods. Transport proposes to remove existing timber piles at all ferries and install new steel mooring piles. Transport's Ferry Maintenance team need safe access to ferries moored at Wisemans Ferry. A hinged walkway from the land to a pontoon setup next to the new mooring piles is proposed.

The proposal is located in the following local government areas (LGAs)

- Wisemans Ferry – The Hills Shire LGA and Hornsby Shire LGA
- Webbbs Creek Ferry – Hornsby Shire LGA
- Sackville Ferry – Hawkesbury City LGA.



Figure 1-1: Location of the proposal (source: Six maps)

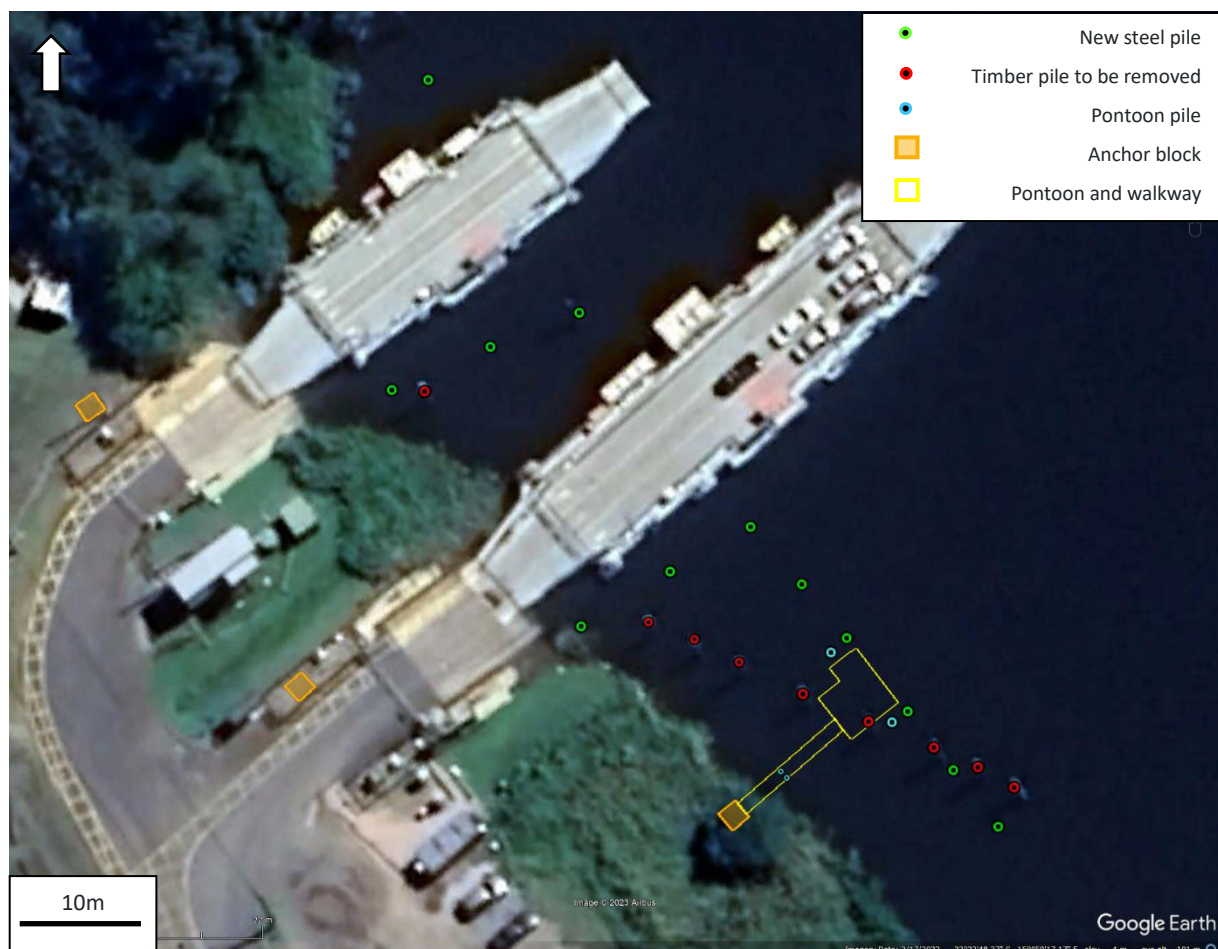


Figure 1-2: The proposal – Wisemans Ferry (source: Google Earth)

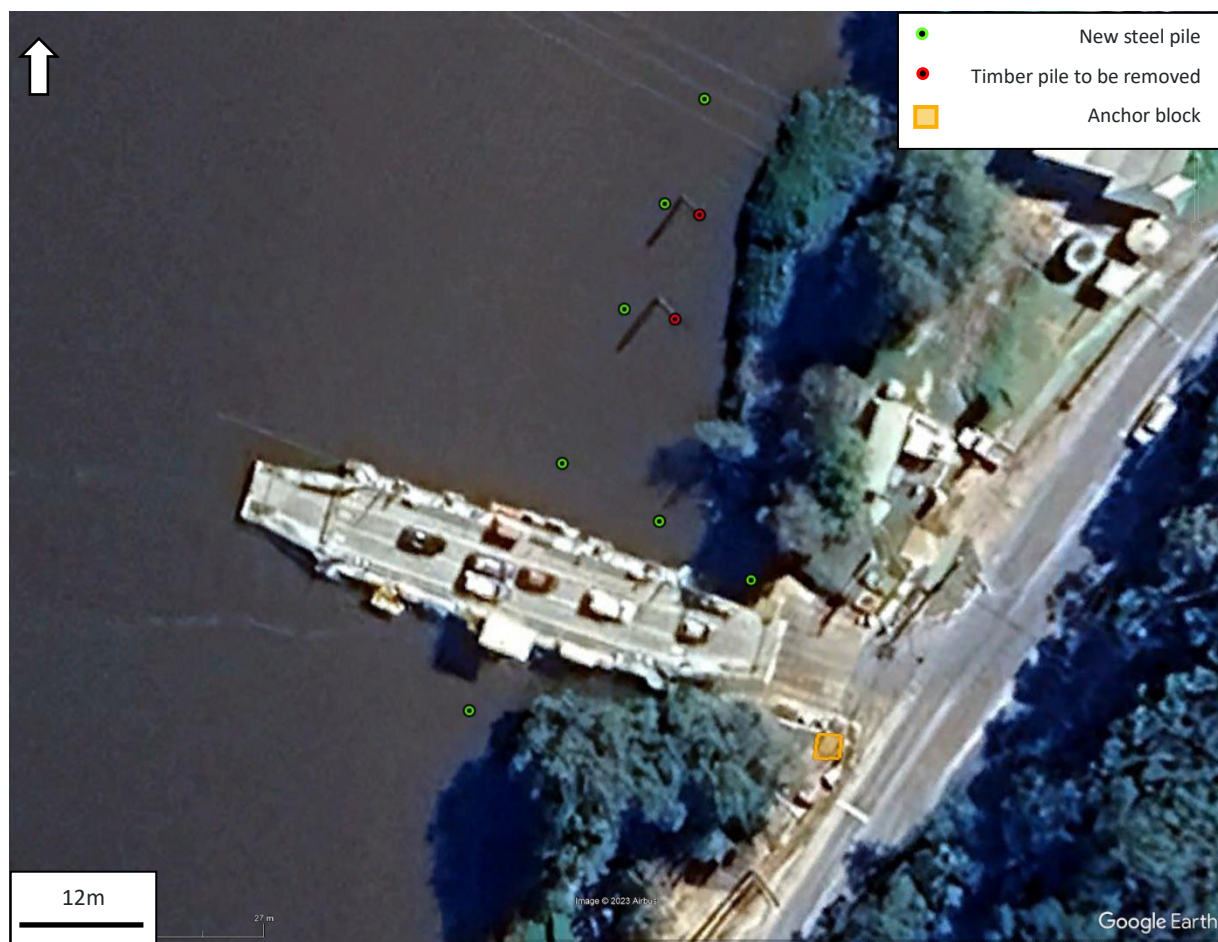


Figure 1-3: The proposal – Webb's Creek Ferry (source: Google Earth)



Figure 1-4: The proposal – Sackville Ferry (source: Google Earth)

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by Sure Environmental on behalf of Transport. For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (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 assessment of associated environmental impacts has been undertaken in the context of Section 171 of the Environmental Planning and Assessment Regulation 2021, the factors in *Guidelines for Division 5.1 assessments*, (DPE 2022), *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 (Commonwealth)* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport 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 necessity for an environmental impact statement to be prepared and approval 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 <https://www.awe.gov.au/environment/epbc> EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if 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 Department of Climate Change, Energy, the Environment and Water 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

The cable ferries at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry are key crossings of the Hawkesbury River and are crucial to transport in the area. Wisemans Ferry and Webbs Creek Ferry provides vehicular access to towns on the north side of the river. Wisemans ferry is regularly used by cyclists and bushwalkers accessing Dharug National Park and in particular the heritage listed Old Great North Road between Devine's Hill and Mount Manning. Sackville Ferry provides an east-west vehicular crossing of the river.

There has been significant rainfall in the Hawkesbury River catchment resulting in significant flooding. Flood waters during the July 2022 flood were higher than any flood in the last 20 years and caused significant damage to the ferries and ferry assets on the river.

The ferries that currently operate at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry replaced older and smaller ferries during the period of 2007 – 2015. The existing mooring piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry were designed to moor the older ferries and do not have adequate capacity for the ferries currently in use. These piles must be replaced to ensure that ferries can be safely moored during future floods.

Ferry maintenance teams need access for routine work when ferries are moored at Wisemans Ferry. Currently the moored ferries are accessed by boat. This is not a safe or efficient way of providing teams with equipment access to the ferries. Transport proposes to install a floating pontoon to provide safe access to moored ferries at Wisemans Ferry.

NSW State Infrastructure Strategy

The Strategy (INSW 2022) sets out Infrastructure NSW's independent advice to the NSW Government on the State's needs and strategic priorities for infrastructure over the long term. The strategy is framed around nine long-term objectives. Objective 5 is 'Embed reliability and resilience'. Many infrastructure assets have long lifecycles and need to withstand shocks and stresses such as natural hazards such as severe weather events. While a key focus of this objective is on investing in improving the resilience of vulnerable and critical assets, the proposal is broadly consistent with this objective.

NSW Long Term Transport Master Plan

The Master Plan (Transport 2012) is the framework for the NSW Government to deliver an integrated, modern transport system that puts the customer first. The Master Plan identified the challenges that the transport system in NSW needs to address and guides decision-makers to prioritise actions that address the most pressing challenges. Maintaining transport infrastructure is identified as a challenge in Chapter 8 Statewide Actions, with specific reference to responding to maintenance needs arising from natural disasters such as floods. maintain infrastructure assets. Providing ferry mooring facilities to protect the ferries during large floods is consistent with the Master Plan.

2.2 Limitations of existing infrastructure

The existing mooring piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry do not have adequate capacity to safely moor the ferries during floods. Transport proposes to remove existing piles at each ferry and install new mooring piles at all three ferry locations.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Provide mooring piles that can safely moor ferries during floods at all ferry crossings

- Provide safe access to moored ferries at Wisemans Ferry for maintenance.

2.3.2 Development criteria

The development criteria for the proposal include:

- Height of mooring piles and pontoon piles (two piles that the pontoon is secured to) must be above the 1 in 100 year flood level. This level varies between ferries:
 - Wisemans Ferry – 7.1 metres Australian Height Datum (AHD)
 - Webbs Creek Ferry – 7.2 metres AHD
 - Sackville Ferry – 13.5 metres AHD.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

Transport identified options and assessed each option's ability to meet the proposal objectives. The identified options are as follows:

Option 1 - 'Do nothing'

The 'do nothing' option involves maintaining the existing conditions:

- 11 mooring piles at Wisemans Ferry that are not high enough to safely secure the ferries during large floods
- Two mooring piles at Webbs Creek Ferry that are not sufficient to moor the ferry in high flows
- Three piles at Sackville Ferry that is not high enough to safely secure the ferry during large floods. There is one steel ferry that has adequate height
- Maintenance teams would continue to access moored ferries at Wisemans Ferry by boat.

Option 2 – Remove existing timber mooring piles and install steel mooring piles at Wisemans, Webbs Creek and Sackville ferries; and install a floating pontoon at Wisemans Ferry

This option would install new steel mooring piles at the three ferry crossings with adequate height to secure the ferries in large floods and install a floating pontoon at Wisemans Ferry.

2.4.2 Analysis of options

Table 2-1 provides an assessment of the options.

Table 2-1: Assessment of options

Options	Objectives	
	Provide mooring piles that can safely moor ferries during floods at all ferry crossings	Provide safe access to moored ferries at Wisemans Ferry for maintenance
Option 1	This option would not provide secure mooring facilities at any of the ferries. Ferries would continue to be at risk of damage or loss during large floods and there would be no maintenance access provided at Wisemans Ferry. The existing mooring facilities would not be adequate to secure the ferries during very high floods. This could result in damage to the ferries or in the worst case the loss of a ferry. This option would have no construction impacts but could have operational impacts if ferries are lost or damaged during floods. Does not meet proposal objective	Maintenance access to ferries moored at Wisemans Ferry would continue to be inadequate and unsafe. Does not meet proposal objective
Option 2	Yes – this option would provide safe mooring facilities at all ferries. Meets the proposal objectives	Yes – this option would provide maintenance access to moored ferries at Wisemans Ferry. Meets the proposal objectives

Option 1 does not meet the proposal objectives as it will not provide safe ferry mooring facilities at any of the ferries or provide maintenance access to ferries moored at Wisemans Ferry. Option 2 best meets the proposal objectives.

2.5 Preferred option

Option 2 is the preferred option because it best meets the proposal objectives and option assessment criteria:

- The new steel mooring piles would provide safe mooring facilities at all three ferries and provide safe access to moored ferries at Wisemans Ferry for maintenance purposes
- Impact to ferry operations would be minimised by always keeping one ferry at Wisemans Ferry operational during the work and restricting the ferry closures at Webbs Creek and Sackville to outside peak periods
- Construction impacts would be minimised and the provision of adequate mooring facilities would minimise the potential for operational impacts in the future.

The principles of ecologically sustainable development (ESD) were considered during proposal planning, particularly minimising the impact to the community by limiting any ferry closures to outside peak periods.

3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

3.1 The proposal

Transport proposes to remove timber mooring piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry and install new steel mooring piles at each ferry location. Transport also proposes to construct a floating pontoon and walkway at Wisemans Ferry to provide access to moored ferries for maintenance. The proposal is shown in Figure 3-1, Figure 3-2 and Figure 3-3.

Key features of the proposal would include:

Wisemans Ferry

- Remove 11 existing timber mooring piles
- Construct two new two cubic metre concrete mooring blocks, one at each of the main and relief ferry ramps
- New ground chain and 30 metre long anchor rope from the mooring blocks to secure the ferries during floods
- Four new steel piles at the relief ferry at a height of 8.5 metres AHD. Three piles would have a 10 degree offset from the ferry ramp. These piles would be used to moor the ferry during floods
- Three new steel piles at the main ferry at a height of 8.5 metres AHD. Three piles would have a 10 degree offset from the ferry ramp. These piles would be used to moor the ferry during floods
- Five new steel piles parallel to the bank at a height of 8.5 metres AHD. These piles would be used to moor ferries for maintenance or storage
- All new mooring piles would have reflective tape and mooring rings with rope
- The piles would have a total length of 24-26 metres. A 12 metres long high density polyethylene (HDPE) sleeve would be installed around the pile. The sleeve would cover the piles from a minimum of two metres below the river bed to the top of the pile
- New floating pontoon. This would include:
 - Remove 51 m² of vegetation
 - 6.2 metre wide pontoon attached to two steel piles. The pontoon would rise and fall with the tide
 - Access would be via a 1.5 metre wide and eight metres long walkway attached to a precast jetty. The jetty would be about four metres long and be supported by two 12 metre long piles. The walkway would be attached to the jetty using a hinge allowing it to rise and fall with the pontoon
 - The jetty would be attached to a two cubic metre concrete mooring block. Scour protection rock would be installed at the sides of the block. The concrete mooring block and scour protection would be constructed in the construction area identified in Figure 3-1.

Webbs Creek Ferry

- Remove two existing timber piles and retain one existing steel pile located on the bank
- Construct a new two cubic metre concrete mooring block at the ferry ramp
- New ground chain and 30 metre long anchor rope from the mooring blocks to secure the ferries during floods
- Four new steel piles at the ferry ramp at a height of 8.5 metres AHD. Three piles would have a 10 degree offset from the ferry ramp. These piles would be used to moor the ferry during floods
- Three new steel piles parallel to the bank, south of the crossing, at a height of 8.5 metres AHD
- All new mooring piles would have reflective tape and mooring rings with rope

- The piles would have a total length of 28-30 metres. A 12 metres long HDPE sleeve could be installed around the pile. The sleeve would be cover the piles from a minimum of two metres below the river bed to the top of the pile.

Sackville Ferry

- Remove one existing timber piles and retain three existing steel piles located on the bank. A HDPE sleeve would be installed on two of the steel piles to remain (the third pile has a HDPE sleeve) (Figure 3-3)
- Construct a new two cubic metre concrete mooring block at the ferry ramp
- New ground chain and 30 metre long anchor rope from the mooring blocks to secure the ferries during floods
- Trim branches of large Swamp Oak (*Casuarina glauca*) at ferry ramp to install the piles
- Four new steel piles at the ferry ramp at a height of 14.5 metres AHD. Three piles would have a 10 degree offset from the ferry ramp. These piles would be used to moor the ferry during floods
- All new mooring piles would have reflective tape and mooring rings with rope
- The piles would have a total length of 32-36 metres. A 21.5 metres long HDPE sleeve could be installed around the pile. The sleeve would be cover the piles from a minimum of 2.5 metres below the river bed to the top of the pile.

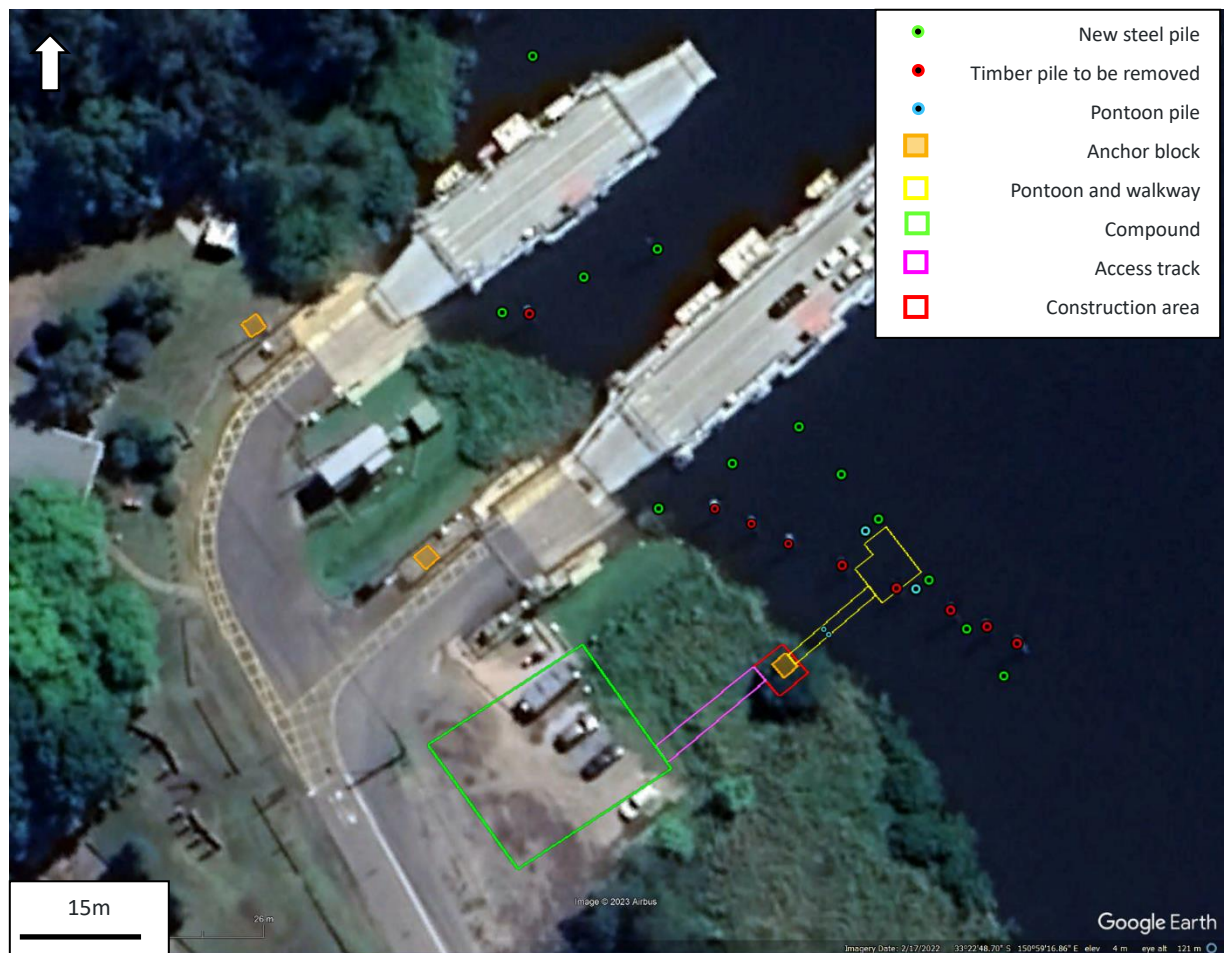


Figure 3-1: Key features of the proposal – Wisemans Ferry (source: Google Earth)



Figure 3-2: Key features of the proposal – Webbs Creek Ferry (source: Google Earth)



Figure 3-3: Key features of the proposal – Sackville Ferry (source: Google Earth)

3.2 Design

The proposed mooring piles were designed to secure the ferries against at all three ferry crossing during large floods. Therefore, the mooring piles must be tall enough to secure the ferries as the Hawkesbury River rises in large floods. The 1 in 100 year flood level was used.

A typical cross-section of the mooring piles is shown in Figure 3-4 and the floating pontoon design is shown in Figure 3-5.

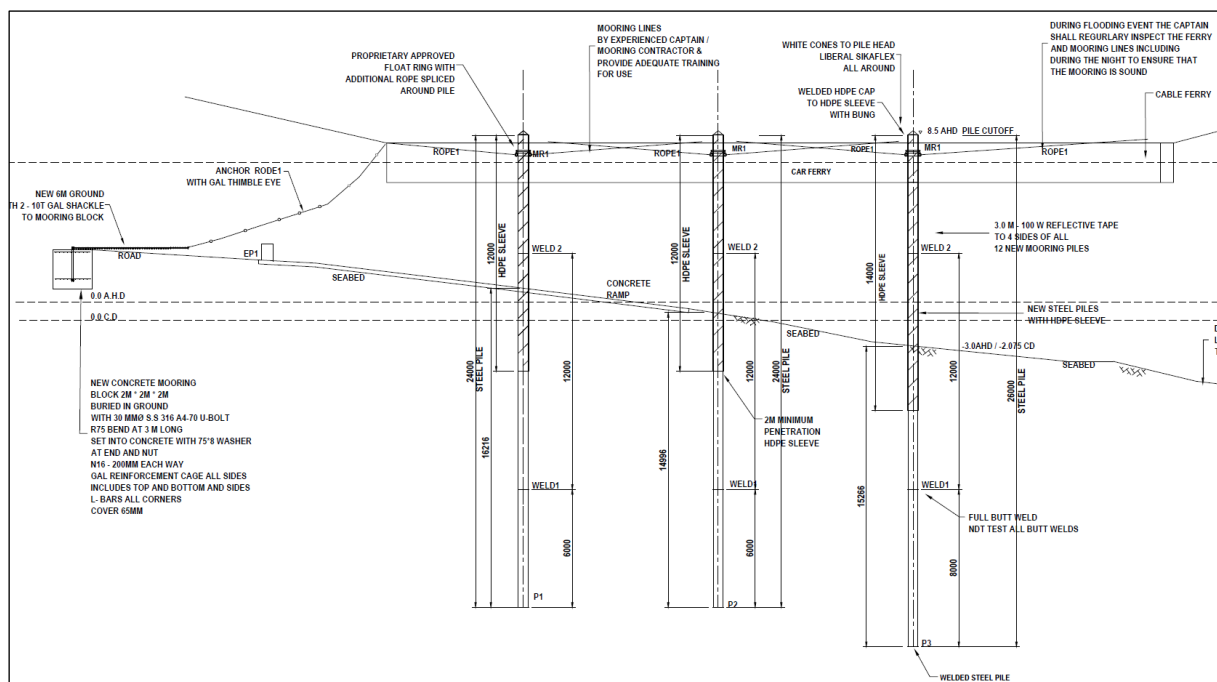


Figure 3-4: Typical cross-section of the mooring pile arrangement (Wisemans Ferry)

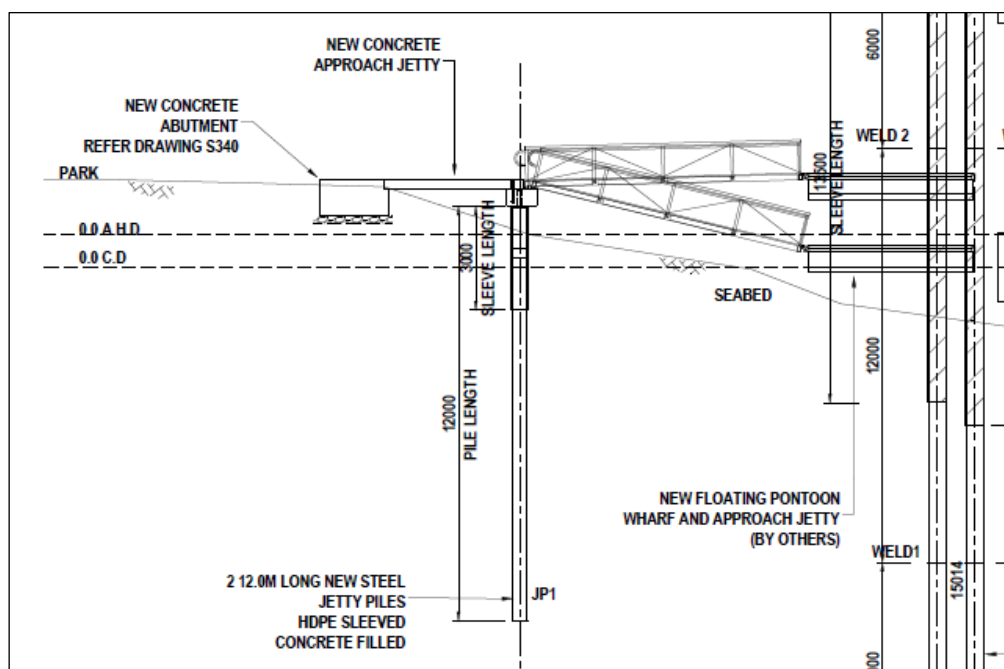


Figure 3-5: Floating pontoon design (Wisemans Ferry)

3.2.1 Design criteria

The design flood level for the piles was the 1 in 100 year flood level at each ferry crossing is:

- Wisemans Ferry – 7.1 metres AHD
- Webbs Creek Ferry – 7.2 metres AHD
- Sackville Ferry – 13.5 metres AHD.

In order to withstand the strong flows in the river during large floods the piles would be driven into the riverbed according to the following criteria:

- 15 metres below the river bed when the substrate is sand
- Three metres below rock, where it is encountered.

3.2.2 Engineering constraints

The key engineering constraint is the quality of the river bed material. Design criteria were identified to ensure that the piles would be installed deep enough to withstand high flows in the river during large floods.

3.3 Construction activities

3.3.1 Work methodology

The following work methodology would be used:

Wisemans Ferry

- Launch barge from a boat ramp at Brooklyn and travel to Wisemans Ferry. The barge would contain an excavator and drilling rig
- Establish a compound on existing gravel surface. The compound would be used to facilitate work at Wisemans Ferry and Webbs Creek Ferry
- Take the first ferry (main or relief) out of operation
- Install the silt curtain around the work area, including the barge
- Position the barge and lower 'spuds' to the river bed to keep the barge in position. A three metre clearance between the barge and the ferry cable of the operating ferry would be maintained at all times to ensure there is no interruption to ferry services
- Use the barge-mounted excavator with clamp to remove the existing timber piles
- Remove sediment from the piles and store the sediment in an impervious container located on the barge
- As the pile removal progresses the operation of the ferries would be switched. This would involve:
 - Allow sediment contained by the silt curtain to settle
 - Remove the silt curtain
 - Begin operation of the other ferry
 - Reinstall the silt curtain
 - Take the second ferry out of operation
- Transfer the timber piles to the river bank at the ferry crossing for offsite disposal. The transfer method would be identified by the contractor. Vegetation removal to facilitate the transfer is not permitted
- Transfer the steel piles from the river bank to the barge
- Install new mooring piles:
 - Position the barge and lower 'spuds' to the river bed to keep the barge in position
 - Use the drilling rig to drive the piles into place. The final three metres would be driven using a drop hammer or hydraulic hammer
 - Weld the HDPE sleeve to the pile
 - Install pile cap and rope
- Repeat the pile installation process. The currently operating ferry would be taken out of operation and the other ferry would operate, following the process above. The silt curtain would be installed around all work with potential to disturb sediment and not be moved until all sediment has settled
- Construct two anchor blocks:
 - Install erosion and sediment controls

- Excavate a two square metres area
- Install formwork and pour concrete to construct the three cubic metre anchor block
- Installation of the floating pontoon would occur as follows:
 - Install silt curtain around the work area, including the barge
 - Position the barge and lower 'spuds' to the river bed to keep the barge in position
 - Use the drilling rig to hammer the piles
 - Weld the HDPE sleeve to the pile
 - Install brackets on the piles
 - Install erosion and sediment controls around the anchor block location
 - Clear about 51 m² of vegetation of reeds
 - Excavate a two square metres area to install the concrete anchor for the walkway
 - Install formwork and pour concrete to construct the three cubic metre anchor block
 - Install geotextile fabric and scour protection rock at the anchor block. The scour protection would extend about one metre from the anchor block. The rock would have a slope of 1:2
 - Construct the jetty from the anchor block to two of the piles. The jetty would be a section of precast concrete
 - Install the floating pontoon with articulated hinges and attach to the piles
 - Install the walkway. The walkway would be attached to the pontoon and to the jetty with hinges
 - Remove the silt curtain when the sediment has settled.
- Remove environmental controls

Webbs Creek Ferry

- Transfer the barge from Wisemans Ferry to Webbs Creek Ferry. The barge will contain an excavator and drilling rig
- A laydown/storage area would not be required at Webbs Creek Ferry. The compound site at Wisemans Ferry would be used to facilitate the proposed work
- Install the traffic detour and take the ferry out of operation from 10am to 3pm each work day
- Install the silt curtain around the work area, including the barge
- Position the barge and lower 'spuds' to the river bed to keep the barge in position
- Use the barge-mounted excavator with clamp to remove the existing timber piles. Piles would be stored on the barge and transferred to the river bank at Wisemans Ferry
- Remove sediment from the piles and store sediment in an impervious container located on the barge
- Transfer the timber piles to the river bank at the Wisemans Ferry for offsite disposal
- Transfer the steel piles from the river bank at Wisemans Ferry to the barge
- Install new mooring piles:
 - Position the barge and lower 'spuds' to the river bed to keep the barge in position
 - Use the drilling rig to drive the piles into place. The final three metres would be driven using a drop hammer or hydraulic hammer
 - Weld the HDPE sleeve to the pile
 - Install pile cap and rope
- Repeat the pile installation process
- Construct anchor block:
 - Install erosion and sediment controls

- Excavate a two square metres area
- Install formwork and pour concrete to construct the three cubic metre anchor block
- Remove the traffic detour at the end of each shift
- Remove environmental controls.

Sackville Ferry

- Transfer the barge from Webbs Creek Ferry to Sackville Ferry. The barge will contain an excavator and drilling rig
- A laydown/storage area would not be required at Sackville Ferry
- Install the traffic detour and take the ferry out of operation from 10am to 3pm each work day
- Install the silt curtain around the work area, including the barge
- Position the barge and lower 'spuds' to the river bed to keep the barge in position
- Use the barge-mounted excavator with clamp to remove the existing timber piles. The piles would be stored on the barge until work is complete
- Remove sediment from the piles and store sediment in an impervious container located on the barge
- The timber piles would be stored on the barge until all mooring pile work is complete and then disposed of offsite
- Transfer the steel piles from the river bank to the barge. The piles would be delivered to Sackville and transferred directly to the barge
- Trim tree branches
- Install new mooring piles:
 - Position the barge and lower 'spuds' to the river bed to keep the barge in position
 - Use the drilling rig to drive the piles into place. The final three metres would be driven using a drop hammer or hydraulic hammer
 - Weld the HDPE sleeve to the pile
 - Install pile cap and rope
- Repeat the pile installation process
- Construct anchor block:
 - Install erosion and sediment controls
 - Excavate a two square metres area
 - Install formwork and pour concrete to construct the three cubic metre anchor block
- Install a HDPE sleeve on the two existing piles and weld to seal
- Remove the traffic detour at the end of each shift
- Remove environmental controls.

The construction workforce would be decided by the contractor but is likely to involve the following:

- Site supervisor
- Piling rig operator
- Excavator operator
- Spotter
- Surveyor
- Three site workers.

3.3.2 Construction hours and duration

The proposed work is planned to start in early 2024 and would take about one month at each ferry crossing. The work would be carried out during standard weekday working hours:

Working hours:

Monday-Friday: 7:00am to 6:00pm

Saturday: 8:00am to 1:00pm

Sunday and Public Holidays: no work.

3.3.3 Plant and equipment

Plant and equipment required for the proposal would include:

- Barge
- Silt curtain
- Piling rig
- Excavator with clamp attachment
- Concrete truck
- Tilt tray truck
- Bogies
- Truck and dogs
- Hand tools.

3.3.4 Earthworks

The proposal would involve no more than minor earthworks. Five anchor blocks would require excavation of around two square metres each:

Wisemans Ferry

- Pontoon walkway anchor block
- Anchor block at the main ferry ramp
- Anchor block at the relief ferry ramp

Webbs Creek Ferry

- Anchor block at the ferry ramp

Sackville Ferry

- Anchor block at the ferry ramp.

The total area of disturbance would be about 20 square metres.

3.3.5 Source and quantity of materials

Materials required for the proposal include:

- 27 steel piles
- 1.5 to two tonnes of one metre diameter rock
- About three to four tonnes of rock - 200 millimetres to 600 millimetres in diameter.

The steel piles and rock would be sourced by the contractor.

3.3.6 Traffic management and access

Traffic detours would be required at Webbs Creek Ferry and Sackville Ferry from 10am to 3pm, Monday to Friday during the proposed work. The duration of work at both ferries would be about one month each. The ferry closures would occur outside peak periods to minimise impact on ferry users. The impact of the ferry closures are assessed in section 6.4.

One ferry would remain operation at Wisemans Ferry at all times during the proposed work.

3.4 Ancillary facilities

A compound would be established at Wisemans Ferry (Figure 3-1). The compound would include laydown, storage areas and site offices. Stockpiling of sediment would not occur at the compound. The area currently has a gravel base and no vegetation clearing or importing of material would be required. The area is currently only used by Transport and Transport's contractors. This compound area would also be used as a laydown/storage area for the proposed work at Webbs Creek Ferry.

A laydown and storage area would be required at Sackville Ferry. This area would be identified by the contractor. The laydown/storage area would be located in an area that is:

- of low ecological and heritage conservation significance
- at least 100 metres away from residential dwellings and other land uses that may be sensitive to noise
- on relatively-level ground
- outside the 1 in 10-year ARI floodplain.

The laydown/storage area would likely be located close to the river to allow piles and materials to be easily transferred to and from the barge.

3.5 Public utility adjustment

Public utility adjustment would not be required.

3.6 Property acquisition

Property acquisition would not be required.

4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.109 of SEPP (Transport and Infrastructure) 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 Transport, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW). 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 require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Central River City)
- State Environmental Planning Policy (Precincts – Eastern Harbour City)
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in chapter 5 of this REF.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 6 (Water catchments) of the SEPP (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation)) relates to development in water catchments, including the Hawkesbury-Nepean Catchment. The proposal is located in this catchment. While the Transport and Infrastructure SEPP prevails over the SEPP consistency with the general and specific development controls is demonstrated in Table 4-1 and specific controls in Table 4-2.

Table 4-1: General development controls

General development controls	Demonstration of consistency
Water quality and quantity	
(a) whether the development will have a neutral or beneficial effect on the quality of water entering a waterway	The proposal would not affect water entering the Hawkesbury River and would have a neutral effect.
(b) whether the development will have an adverse impact on water flow in a natural waterbody	The proposal would not affect water flow in the river.
(c) whether the development will increase the amount of stormwater run-off from a site	The proposal would not increase stormwater runoff.

General development controls	Demonstration of consistency
(d) whether the development will incorporate on-site stormwater retention, infiltration or reuse	On-site stormwater retention, infiltration or reuse would not be required.
(e) the impact of the development on the level and quality of the water table	The proposal would not impact the level of quality of the water table.
(f) the cumulative environmental impact of the development on the regulated catchment	The proposal would result in localised sedimentation. A silt curtain would be used to minimise this impact and a cumulative impact on the regulated catchment is not anticipated.
(g) whether the development makes adequate provision to protect the quality and quantity of ground water	The proposal would not impact groundwater.
Aquatic ecology	
(a) whether the development will have a direct, indirect or cumulative adverse impact on terrestrial, aquatic or migratory animals or vegetation	The proposal would remove 51 m ² of reedbed at Wisemans Ferry. This impact was assessed as no significant. Impact to aquatic vegetation would be minimal. Migratory animals would not be impacted by the proposal. Cumulative impacts are not anticipated.
(b) whether the development involves the clearing of riparian vegetation and, if so, whether the development will require— (i) a controlled activity approval under the Water Management Act 2000, or (ii) a permit under the Fisheries Management Act 1994	The proposal would require clearing of riparian vegetation. The proposal would not be a controlled activity. No mangroves, or other protection marine vegetation, would be impacted. A permit under the Fisheries Management Act is not required.
(c) whether the development will minimise or avoid— (i) the erosion of land abutting a natural waterbody, or (ii) the sedimentation of a natural waterbody	The proposal would not cause erosion of land abutting the river. However, the desilting work would result in sedimentation. This would be minimised by using a silt curtain to contain sediment. Work would also be scheduled to allow adequate time for the sediment to settle before the silt curtain is moved.
(d) whether the development will have an adverse impact on wetlands that are not in the coastal wetlands and littoral rainforests area	The proposal would not impact coastal wetlands that are not in the coastal wetlands and littoral rainforests area
(e) whether the development includes adequate safeguards and rehabilitation measures to protect aquatic ecology	Safeguards identified in Chapter 6 would be implemented to minimise the impact to aquatic ecology.
(f) if the development site adjoins a natural waterbody—whether additional measures are required to ensure a neutral or beneficial effect on the water quality of the waterbody	The proposal would require work in a natural waterbody and would result in localised sedimentation. Measures to minimise this impact include using a silt curtain, adjusting work schedules to allow sediment to settle before the silt curtain is moved or removed.
Flooding	
the likely impact of the development on periodic flooding that benefits wetlands and other riverine ecosystems, specifically: a) if there is a flood, result in a release of pollutants that may have an adverse impact on the water quality of a natural waterbody, or b) have an adverse impact on the natural recession of floodwaters into wetlands and other riverine ecosystems	The proposal would not be carried out when the river is in flood and pollutants would not be released to the river. The proposal would not result in changes to periodic flooding or impact the natural recession of floodwaters into wetlands and other riverine ecosystems.
Recreation and public access	

General development controls	Demonstration of consistency
(a) the likely impact of the development on recreational land uses in the regulated catchment	The proposal would not impact recreational uses in the regulated catchment.
(b) whether the development will maintain or improve public access to and around foreshores without adverse impact on natural waterbodies, watercourses, wetlands or riparian vegetation	The proposal would improve ferry access. Access to the foreshore would be unchanged by the proposal. Impacts to the waterway, such as sedimentation, would be minimised by implementing mitigation measures.
Total catchment management	
Consult with the council of each adjacent or downstream local government area on which the development is likely to have an adverse environmental impact	The proposal would not have an adverse environmental impact and consultation with councils is not required.

Table 4-2: Specific development controls

General development controls	Demonstration of consistency
Land within 100m of natural waterbody	
(a) the land uses proposed for land abutting the natural waterbody are water-dependent uses	Not applicable.
(b) conflicts between land uses are minimised	The proposal does not change the current land use.
Riverine scenic areas	
(a) whether the development is likely to damage river banks	The proposal would not damage the banks of the Hawkesbury River.
(b) whether the development will be adequately set back from natural waterbodies in the Hawkesbury-Nepean Catchment	Not applicable.
(c) the visibility of the development from the surrounding natural waterbodies and visual catchment	Not applicable.
(d) whether the development will be consistent with the scenic character of the Riverine Scenic Area, as described in the document entitled Hawkesbury-Nepean River Scenic Quality Study, published by the Department of Urban Affairs and Planning in 1996	The proposal involves installing ferry infrastructure at existing ferry locations. The proposal would not impact the scenic character of the areas around the ferries.
(e) whether the development will increase public recreational and visual access to natural waterbodies	The proposal would not affect public recreational access or visual access to the Hawkesbury River.
(f) landscaping, including the following— (i) the form and siting of buildings, (ii) the colours and materials proposed to be used in the buildings, (iii) whether the development includes or retains native vegetation	Not applicable.
(g) the appropriateness of imposing a condition requiring the protection of the scenic character of the Riverine Scenic Area	The proposal would not impact the scenic character of the Riverine Scenic Area.
Hawkesbury-Nepean conservation area sub-catchments	

General development controls	Demonstration of consistency
(a) whether the development will minimise human interference with the condition of the sub-catchment	The proposal would result in local sedimentation. Mitigation measures would be implemented to minimise these impacts.
(b) whether the development will maintain and enhance the structure and floristics of native vegetation in the sub-catchment	The proposal would remove 51 m ² of reedbed at Wisemans Ferry and trimming of one tree at Sackville Ferry. This would have minimal impact on the structure and floristics of native vegetation in the sub-catchment.
(c) whether the development will maintain or enhance the scenic quality of the locality	The proposal would maintain the scenic quality of the locality.
(d) whether development has previously been carried out on the development site	The proposal is located at existing ferry crossings and would not result in any new development.

Other SEPPs

State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 of Resilience and Hazards SEPP aims to manage development in the coastal zone and protect the environmental assets of the coast. The proposal is located in an area mapped as coastal environment area and coastal use area. While the Transport and Infrastructure SEPP permits the proposal without consent, consistency with the development controls for coastal environment areas and coastal use areas is demonstrated in Table 4-3 and Table 4-4 respectively.

Table 4-3: Specific development controls

Section 2.10	Demonstration of consistency
Coastal Environment area	
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment	The proposal would result in local sedimentation. Mitigation measures would be implemented to minimise these impacts.
(b) coastal environmental values and natural coastal processes	The proposal would disturb a relatively small area of the riverbed. This is not expected to impact coastal environmental values or coastal processes.
(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	The proposal would result in sedimentation and a temporary, localised water quality impact. This would be managed using a silt curtain. There would be no ongoing impact to water quality.
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	The proposal would remove 51 m ² of reedbed at Wisemans Ferry. This impact was assessed as no significant. Impact to aquatic vegetation would be minimal. The impact to native fauna habitat is anticipated to be minor.
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	The proposal would not impact existing public access to the river foreshore.
(f) Aboriginal cultural heritage, practices and places,	Aboriginal heritage would not be impacted.
(g) the use of the surf zone	Not applicable

Table 4-4: Specific development controls

Section 2.11	Demonstration of consistency
Coastal use area	
(a)(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	The proposal would not impact existing public access to the river foreshore.
(a)(ii) overshadowing, wind funneling and the loss of views from public places to foreshores,	Not applicable
(a)(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,	The proposal would not impact the scenic quality of the area.
(a)(iv) Aboriginal cultural heritage, practices and places	Aboriginal heritage would not be impacted.
(a)(v) cultural and built environment heritage, and	The proposal would not impact cultural and have a positive impact on built heritage by maintaining the heritage listed ferry operational.
(b)(i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or	Safeguards would be implemented to avoid the potential impacts.
(b)(ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or	
(b)(iii) if that impact cannot be minimised—the development will be managed to mitigate that impact	
(c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.	This REF has considered the surrounding coastal and built environment. The proposal is not expected to have a substantial impact on the environment.

4.1.2 Local Environmental Plans

Hornsby Local Environmental Plan 2013

The proposed work at the southern approach to Wisemans Ferry is located in Hornsby Shire LGA (Figure 4-1). As development without consent, the proposal is not subject to local environmental planning policy or development control. However, the Local Environmental Plan (LEP) is useful in identifying the proposal's consistency with its land use zoning and planning policy as described below.

Objectives	Proposal consistency
Land zoning: W1 Natural Waterways	
Proposed activities in zone (Wisemans Ferry): - Remove existing piles - Install new piles - Construct mooring block - Construct pontoon	
To protect the ecological and scenic values of natural waterways.	The proposal would not impact the ecological or scenic values of the natural waterways.
To prevent development that would have an adverse effect on the natural values of waterways in this zone.	The proposed work is relatively minor and would not have an adverse effect on the natural values of the waterway.
To provide for sustainable fishing industries and recreational fishing.	The proposal would not impact fishing industries or recreational fishing.
To provide for a limited range of development that facilitates access to the waterways.	The proposal is consistent with existing development.
Land zoning: C2 Environmental Conservation	
Proposed activities in zone (Wisemans Ferry): Construct pontoon anchor block and walkway	
To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.	Construction of the walkway mooring block would require removal of 51 m ² of reedland at Wisemans Ferry. This clearing is minor and constitute only a small amount of the reedland present.
To prevent development that could destroy, damage or otherwise have an adverse effect on those values.	The proposal is small scale and is not expected to destroy, damage or otherwise have an adverse effect on those values.

The Hills Local Environmental Plan 2019

The proposed work at the eastern approach to Webbs Creek Ferry and part of the southern approach to Wisemans Ferry are located in The Hills Shire LGA (Figure 4-1 and Figure 4-2). As development without consent, the proposal is not subject to local environmental planning policy or development control. However, the Local Environmental Plan (LEP) is useful in identifying the proposal's consistency with its land use zoning and planning policy as described below.

Objectives	Proposal consistency
Land zoning: W2 Recreational Waterways	
Proposed activities in zone (Webbs Creek Ferry): - Remove existing piles - Install new piles	
To protect the ecological, scenic and recreation values of recreational waterways.	The proposal would not impact the ecological or scenic values of the natural waterways.
To allow for water-based recreation and related uses.	The proposal would not impact fishing industries or recreational fishing.
To provide for sustainable fishing industries and recreational fishing.	The proposal would not impact recreational or commercial fishing.

Land zoning: SP3 Tourist	
Proposed activities in zone (Wisemans Ferry):	
Construct mooring block	
To provide for a variety of tourist-oriented development and related uses.	The proposal would maintain cable ferries that are an important facility for tourists.
To provide for activities that support and relate to the natural assets of the area, in particular the river front	The proposal would maintain ferries that provide access to the river front.
To provide for a range of support services to meet the needs of the surrounding residents that are complementary to the scale of adjoining land uses.	The proposal would maintain ferries that provide key transport link for the local community.
To allow a range of recreation and tourism related activities to be carried out where such activities are within the servicing capacity of the infrastructure of the area.	The proposal would maintain ferries that facilitate recreation and tourism.
Land zoning: C1 National Parks and Nature Reserves	
Proposed activities in zone (Webbs Creek Ferry):	
Construct mooring block	
To enable the management and appropriate use of land that is reserved under the National Parks and Wildlife Act 1974 or that is acquired under Part 11 of that Act.	While the proposal is located within the zone, no infrastructure would be located on National Parks land. Therefore, the proposal would not impact management of or use of National Parks land.
To enable uses authorised under the National Parks and Wildlife Act 1974.	The proposal is not located on National Parks land and is not subjects to the National Parks and Wildlife Act 1974.
To identify land that is to be reserved under the National Parks and Wildlife Act 1974 and to protect the environmental significance of that land.	The proposal would not affect the identification of land that is to be reserved under the National Parks and Wildlife Act 1974.

Hawkesbury Local Environmental Plan 2012

The proposed work at the southern approach to Sackville Ferry is located in Hawkesbury Shire LGA (Figure 4-3). As development without consent, the proposal is not subject to local environmental planning policy or development control. However, the Local Environmental Plan (LEP) is useful in identifying the proposal's consistency with its land use zoning and planning policy as described below.

Objectives	Proposal consistency
Land zoning: W2 Recreational Waterways	
Proposed activities in zone (Sackville Ferry):	
- Remove existing piles - Install new piles	
To protect the ecological, scenic and recreation values of recreational waterways.	The proposal would not impact the ecological or scenic values of the natural waterways.
To allow for water-based recreation and related uses.	The proposal would not impact fishing industries or recreational fishing.
To provide for sustainable fishing industries and recreational fishing.	The proposal would not impact recreational or commercial fishing.
Land zoning: RU2 Rural Landscapes	

Proposed activities in zone (Sackville Ferry):	
- Construct anchor block - Install HDPE sleeve on existing piles	
To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.	The proposal would not affect primary industry production.
To maintain the rural landscape character of the land.	The proposal would not impact the rural character of the land.
To provide for a range of compatible land uses, including extensive agriculture.	Sackville Ferry is an important crossing on the Hawkesbury River. This would benefit transport associated with agriculture.
To minimise the fragmentation and alienation of resource lands.	The proposal would not fragment or alienate resource land.
To minimise conflict between land uses in the zone and land uses in adjoining zones.	The proposal would not change land use and would not result in conflict between land use zones.
To ensure that development occurs in a way that does not have a significant adverse effect on water catchments, including surface and groundwater quality and flows, land surface conditions and important ecosystems such as waterways.	The proposal would not affect surface or groundwater flows.
To ensure that development retains or enhances existing landscape values including a distinctive agricultural component.	The proposal would not impact landscape values.
To preserve the river valley systems, scenic corridors, wooded ridges, escarpments, environmentally sensitive areas and other features of scenic quality.	The ferry is heritage listed and an important feature on the river. The proposal would maintain the operation of the ferry.
To ensure that development does not detract from the existing rural character or create unreasonable demands for the provision or extension of public amenities and services.	The proposal would not detract from the existing rural character or place demands on public services.



Figure 4-1: Zoning at Wisemans Ferry

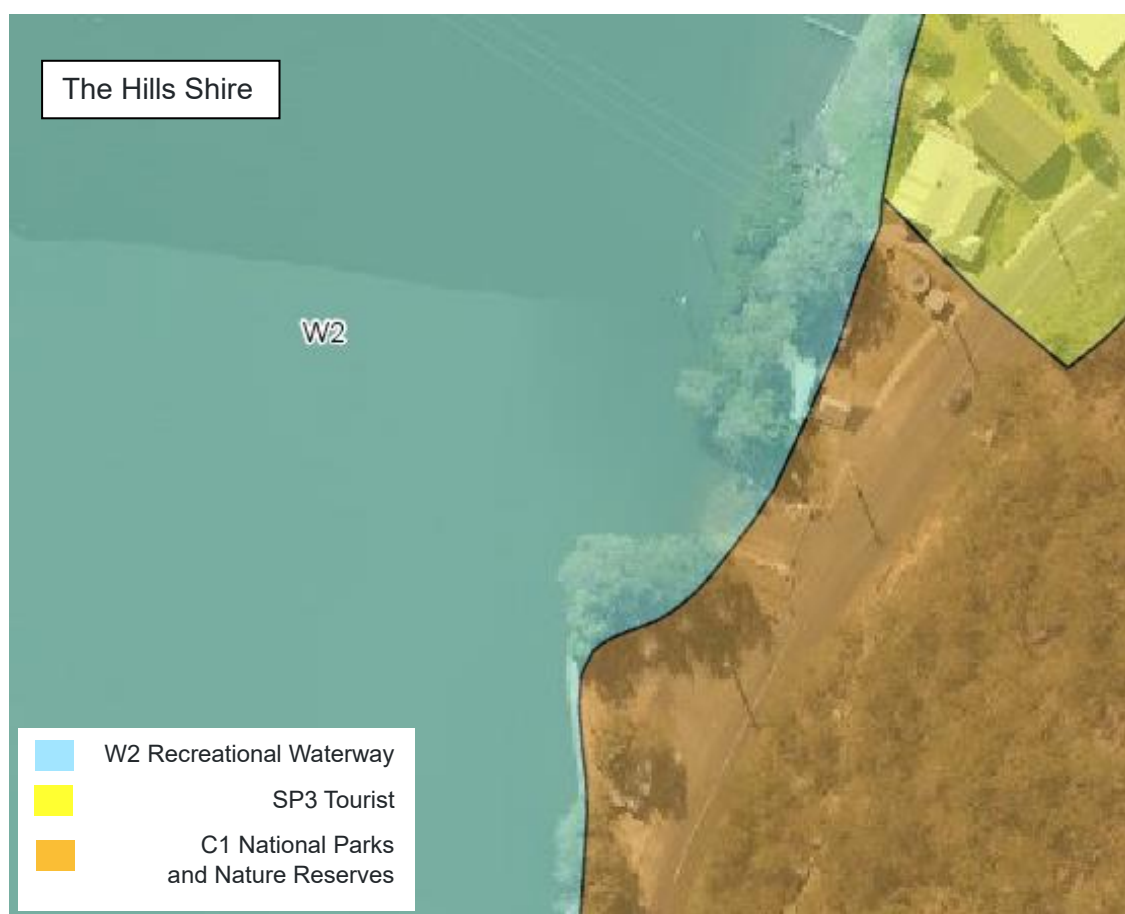


Figure 4-2: Zoning at Webb's Creek Ferry



Figure 4-3: Zoning at Sackville Ferry

4.2 Other relevant NSW legislation

4.2.1 Roads Act 1993

The Roads Act 1993 (The Roads Act) provides guidance on the use and access of public roads, including procedures regarding the opening and closure of public roads. The Act also classifies roads and identifies the functions of road authorities.

In accordance with Section 71 of The Roads Act a roads authority may carry out work on a public road for which it is the authority and on any other land under its control. The proposal is on land controlled by Transport and temporary ferry closures would be required during the work.

4.2.2 Crown Lands Management Act 2016

The Crown Land Management Act 2016 (Crown Land Management Act) provides a streamlined framework For the management of Crown land in NSW. The objectives of the Crown Land Management Act include:

- Providing for the ownership, use and management of the Crown land
- Requirements that environmental, social, cultural heritage and economic considerations be taken into account in decision-making about Crown land
- Facilitating the use of Crown land by the Aboriginal people of NSW
- Providing for the management of Crown land whilst having regard to the principles of 'Crown land management'.

Under Clause 2.18 (1), the Minister for Primary Industries can grant a lease, licence, permit, easement or right of way over dedicated or reserved crown land for facilities or infrastructure. The Hawkesbury River is a Crown Waterway and a licence from Crown Lands is required.

4.2.2.1 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, including conserving fish stocks and Key Fish Habitats (KFH) and promoting ecologically sustainable development.

Part 7 of the FM Act provides for the protection of aquatic habitats. Work that requires removing material from water land would constitute dredging work. The proposal would not require excavation below the high water mark and notification to the Minister for Fisheries for dredging work under section 199 of the FM Act is not required.

Transport for NSW notified DPI Fisheries on 9 November 2023. DPI Fisheries provided a response on 19 March 2024. Consultation with DPI Fisheries is provided in Appendix B.

4.2.2.2 Coastal Management Act 2016

The Coastal Management Act aims to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development. The Act defines the coastal zones as land in the coastal management areas:

- the coastal wetlands and littoral rainforests area,
- the coastal vulnerability area,
- the coastal environment area,
- the coastal use area.

The Act sets the management principles for each zone.

The proposal is located in land coastal environment area and coastal use area. The Coastal Management Act has the following management objectives for coastal environment and coastal use areas.

Coastal environment areas management objectives

- To protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity

- To reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change
- To maintain and improve water quality and estuary health
- To support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons
- To maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place
- To maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.

Assessment of potential impacts to biodiversity, surface and groundwater and socio economic from the REF proposal are assessed in Chapter 6.

Coastal use areas management objectives

To protect and enhance the scenic, social and cultural values of the coast by ensuring that—

- (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and
- (ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and
- (iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and
- (iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and
- (v) the use of the surf zone is considered, to accommodate both urbanised and natural stretches of coastline

Assessment of potential impacts to biodiversity, surface and groundwater and socio economic from the REF proposal are assessed in Chapter 6.

4.2.3 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

Section 7.3 of the BC Act and Part 7A of the FM Act require that the significance of the impact on threatened species, and endangered ecological communities is assessed using a five-part test. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

Results of biodiversity assessments undertaken for the proposal UPDATE WHEN ECOLOGY REPORT RECEIVED

Further detail on the biodiversity assessment conducted for this proposal is provided in Section 6.1

4.2.4 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates land, air, noise and water pollution in NSW. It includes provisions for clean-up notices, prevention notices, prohibition notices, audits and issuing environment protection licences. It also aims to provide opportunity for increased public involvement and access to information regarding environmental protection. An environment protection licence (EPL) is required for scheduled activities or scheduled development work outlined in Schedule 1 of the POEO Act. The proposed works do not require an EPL.

Section 148 of the POEO Act requires that any pollution incidents where material harm to the environment is caused or threatened must be reported. Failure to do so is an offence.

4.2.5 Heritage Act 1977

The *Heritage Act 1977* is concerned with all aspects of conservation ranging from the most basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement.

Activities on items listed on the State Heritage Register identified in section 57(1) of the Act require an approval under section 60. Exemptions for minor work on items listed on the State Heritage Register may be granted under 57(2) and 57(3). An excavation permit is required under Section 139 to disturb or excavate any land containing or likely to contain a relic.

Section 170 of the Heritage Act requires that culturally significant items or places managed or owned by Government agencies are listed on the departmental Heritage and Conservation Register (Section 170 Register).

The proposal is not located in the curtilage of State listed heritage items and approvals under the Act are not required. Disturbance of relics is not anticipated and an excavation permit is not required.

4.2.6 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for legal protection and management of National Parks estate and Aboriginal sites and objects in NSW. Section 86 lists offences relating to harming or desecrating Aboriginal objects. An Aboriginal heritage impact permit (AHIP) is required under Section 90 of the NPW Act to harm an Aboriginal heritage object.

A Stage 1 assessment under the Transport for NSW Procedure for Aboriginal cultural heritage consultation and investigation (March 2024) concluded that the proposal is unlikely to have an impact on Aboriginal cultural heritage.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, a referral is required to the Australian Government for proposed actions that 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.

A referral is not required for proposed road activities that may affect nationally-listed threatened species, endangered ecological communities and migratory species.

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

Findings - matters of national environmental significance

The assessment of the proposal's impact, on matters of national environmental significance and the environment of Commonwealth land, found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

Findings - nationally-listed biodiversity matters (where the strategic assessment applies)

The assessment of the proposal's impact on nationally-listed threatened species, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affecting native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the [Native Title Tribunal Native Title Vision](#) website was undertaken, with no Native Title holders/claimants identified.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of road infrastructure facilities and is being carried out by or on behalf of a public authority. Under section 2.109 of SEPP (Transport and Infrastructure) 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.

Transport for NSW is the determining authority for the proposal. This REF fulfils Transport'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.

5. Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

Transport would carry out community engagement in accordance with the Roads and Maritime Community Engagement e-Toolkit. The key points of engagement would be:

- Informing all potentially impacted stakeholders of the proposal in advance of the start date of the work. Emergency services and the local bus operator (Busways) are key stakeholders
- Informing all ferry users of the disruptions to ferry operations and of the detours that would be put in place. Ferry users would be informed one week before the work starts by:
 - Notification flyers would be distributed to ferry passengers by ferry operators
 - Variable message signs (VMS) would be installed at the ferries

The community engagement would be managed by Transport’s community and engagement team.

5.2 SEPP (Transport and Infrastructure) consultation

Consultation with local councils is not required. Appendix B contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered.

5.3 Government agency and stakeholder involvement

Transport notified DPI Fisheries for dredging work in accordance with section 199 of the Fisheries Management Act on 9 November 2023. The draft REF was provided to DPI Fisheries on 6 March 2024. DPI responded to the notification on 19 March 2024. The proposal is located in a Crown waterway and Transport notified Crown Land of the proposal as the landowner. Issues raised by the stakeholders are detailed in Table 5-1.

Table 5-1: Issues raised through stakeholder consultation

Agency	Issue raised	Response / where addressed in REF
DPI Fisheries	DPI Fisheries has no objections to the proposal provided they occur as described in this REF. DPI Fisheries recommended mitigation measures to be implemented during construction:	
	Erosion and sediment mitigation devices are to be erected in a manner consistent with current Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.	Section 6.3.3
	Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate erosion and sediment control devices.	Section 6.3.3
	On completion of the works all disturbed soil is to be levelled, smoothed and sown with a mixture of sterile/native grass seeds to	Section 6.1.4

Agency	Issue raised	Response / where addressed in REF
	encourage rapid revegetation and planted out with native endemic riparian vegetation.	
	Only clean rock (no fines) is to be used during these works.	Section 6.3.3
	Machinery is not to enter or work from the waterway unless in accordance with the proposed works.	The work would be carried out as proposed. Any change to work method would require further assessment.
	Prior to use at the site and/or entry into the waterway, machinery is to be appropriately cleaned degreased and serviced. Spill kits are to be available on site at all times during the works.	Section 6.2.3
	Works are to be undertaken during low flows in the waterway.	A Flood Plan would be implemented to ensure that work would be carried out during favourable conditions and would be stopped in advance of high flows (Section 6.2.3).
	Procedures to ensure adherence to ANZECC water quality guidelines are to be detailed in the CEMP.	Section 6.2.3
	In the instance that mangroves will be impacted, a permit must be obtained prior to any marine vegetation being harmed.	Transport will obtain a permit of mangroves are to be impacted.
	The worksite has potential for acid sulfate soils. Excavated and disturbed soil is to be managed in accordance with the Managing Acid Sulfate Soil (EPA, 1995), Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee 1998) and consistent with best management practice outlined in Restoring The Balance: Guidelines for Managing Floodgates and Drainage Systems on Coastal Floodplains available at: www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/167875/restoring-balance-guidelines.pdf .	Work would be carried out in accordance with the Roads and Maritime Guidelines for the Management of Acid Sulfate Materials (Section 6.3.3). The guideline is consistent with the Managing Acid Sulfate Soil (EPA, 1995), Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee 1998). There are no floodgates at any of the ferries and the proposal would not impact drainage systems.
	Dewatering at the worksite is not to be undertaken, unless a Dewatering Management Plan has been prepared and made available for assessment and if necessary modified to the satisfaction of the Senior Fisheries Manager - Coastal Systems prior to the commencement of works at the worksite as part of the Construction Environmental Management Plan.	The proposal does not require dewatering.
	DPI Fisheries (1800 043 536) and the Environment Protection Authority (EPA) (131 555) are to be notified immediately if any fish kills occur in the vicinity of the works. In this situation, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed.	Section 6.1.4
Crown Land	N/A	No response received.

5.4 Ongoing or future consultation

Transport would obtain a licence from Crown Lands for construction work in a Crown Waterway. The licence must be in place before any construction work in the waterway takes place.

Transport would notify the community of the proposal and continue to provide updates throughout the work as required. Notification of detours or any changes to ferry operation would be provided at least five business days before the start of work. Notification of detours would be displayed in signs, including variable message signs (VMS) at appropriate locations.

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, are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (DPE 2022) and as required under section 171 of the Environmental Planning and Assessment Regulation 2021 and the Roads and Related Facilities EIS Guideline (DUAP 1996). The factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A.
- Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Biodiversity

Biosis prepared a Biodiversity Assessment Report (BAR) (Biosis, 2024) for the proposed work. The BAR is summarised in this chapter and the full report provided in Appendix C.

6.1.1 Methodology

The following key terms are used in the BAR and are also used in this chapter:

- Subject land: equivalent to the construction footprint, or limit of works. This is the physical area equivalent to the proposal, including disturbance associated with the operational footprint as shown in Figure 6-1. This is the boundary used to calculate direct impacts
- Study area: this includes the subject land, plus the surrounding areas which may be indirectly impacted. The area surveyed for the purposes of the biodiversity assessment is shown in Figure 6-1
- Locality: the area covered by a 10-km buffer of the study area.

The following activities were undertaken to complete the BAR:

- Background searches of relevant databases to understand the existing environment and obtain records of threatened species, populations and ecological communities known or predicted to occur in the locality of the study area
- Native vegetation in the study area was mapped using field investigations and classified in accordance with the Plant Community Type (PCT) classification system which is described in the BioNet Vegetation Classification Database. The extent of native vegetation within the study area was determined using the results of site investigations and Section 4 of the Biodiversity Assessment Method (BAM) (DPIE 2020)
- A habitat assessment was performed for each species identified in the background searches. An assessment of 'likelihood of occurrence' following the collation of database records and species and community profiles
- Field inspections of the study area to identify and assess biodiversity values in accordance with the BAM including vegetation (PCT) surveys and threatened flora and fauna surveys
- An aquatic assessment carried out. Values were determined primarily on the basis of the type and quality of habitat(s) present.
- The potential impacts to flora, fauna, migratory and aquatic species were assessed, including assessments of significance where required. NSW Test of Significance (ToS) and/or Commonwealth Species Impact Criteria [SIC] were carried out for species that were deemed to have a moderate or higher likelihood of occurrence and could be potentially impacted by the proposed works
- Construction and operational management measures as well as the need for offsets were identified.

Field investigations were carried out in June 2023.

6.1.2 Existing environment

The study area is surrounded by Hawkesbury River, a mixture of cleared rural land, rural dwellings and intact, high-quality vegetation. The study area is located with the Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) bioregion and Yengo IBRA subregion.

The study areas consist of the existing ferry infrastructure at Sackville, Wisemans Ferry and Webbs Creek ferries, waterway comprising the Hawkesbury River, as well as some surrounding native and exotic vegetation, including estuary vegetation, and part of Sackville Road, River Road and Old Northern Road. The surrounding areas contain areas of both intact and cleared vegetation for rural homes and farms. These cleared areas often contain a mix of pastureland, orchards, and crops, as well as residential areas. No hollow-bearing trees occur within the study area, however one very large tree (50-100 centimeters at breast height) occurs within the Sackville subject land.

Plant community types and vegetation zones

PCTs within the study area were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM. Four vegetation communities were identified in the study area (Table 6-1). Vegetation communities in the study area are mapped in Figure 6-1, Figure 6-2 and Figure 6-3.

Table 6-1: Plant community types and vegetation zones including patch size and vegetation integrity (VI) score

Veg zone	Plant community type	Threatened ecological community	Ferry	Study area (ha)	Subject land (m ²)	Patch size class (ha)	VI score
Zone 1_High	PCT 3962 <i>Coastal Floodplain Phragmites Reedland</i>	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	0.17	51.2	>100	-
Zone 2_High	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	0.14	-	>100	-
Zone 3_Low	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Webbs Creek Ferry	0.06	-	>100	-
Zone 4_Low	PCT 4025 <i>Cumberland Red Gum Riverflat Forest</i>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Sackville Ferry	0.04	Tree trimming	>100	-
Zone 5_High	PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	Not a TEC	Wisemans Ferry	0.02	-	>100	-



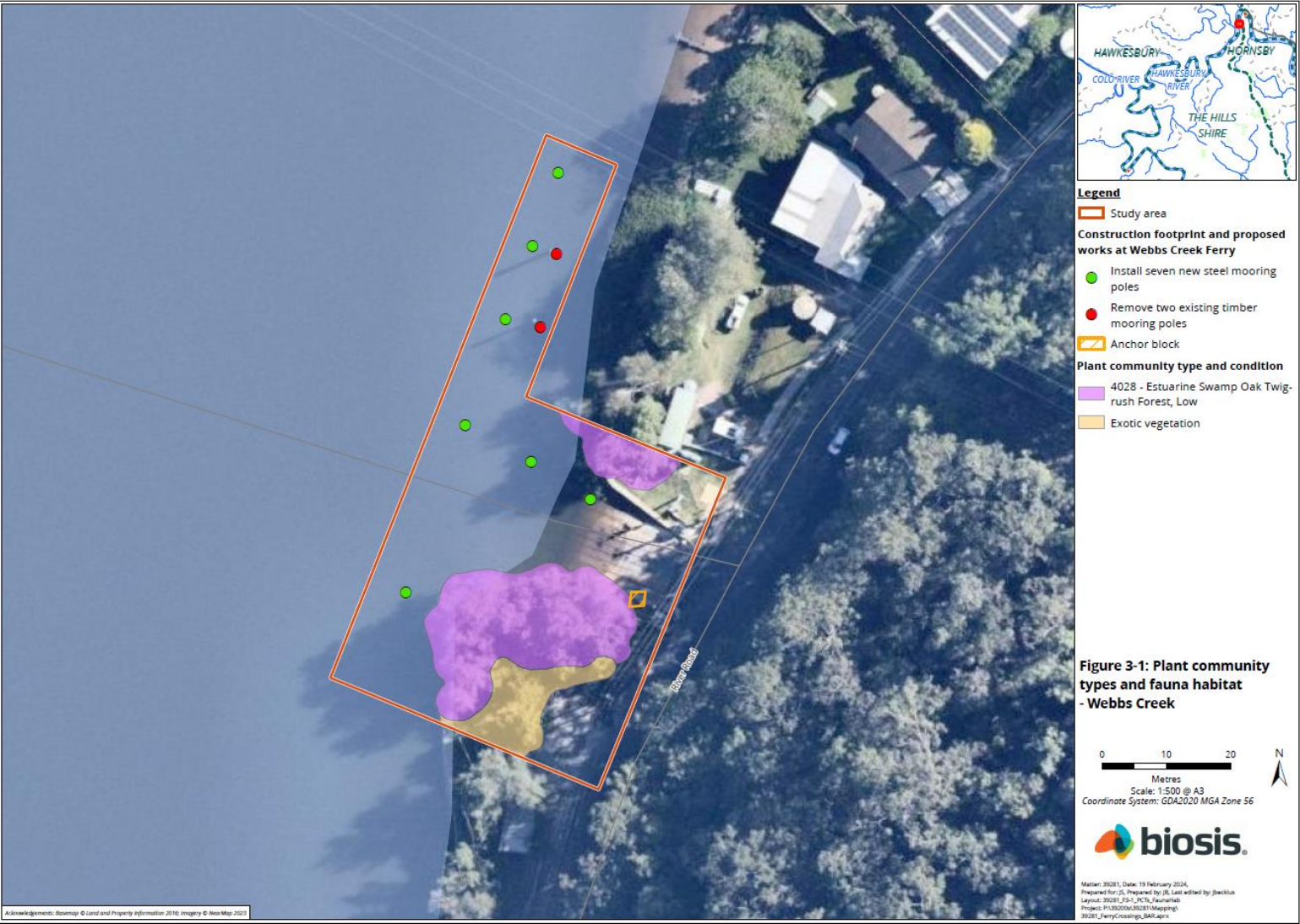


Figure 6-2 Study area, subject land and vegetation communities at Webbs Creek Ferry (Biosis, 2024)

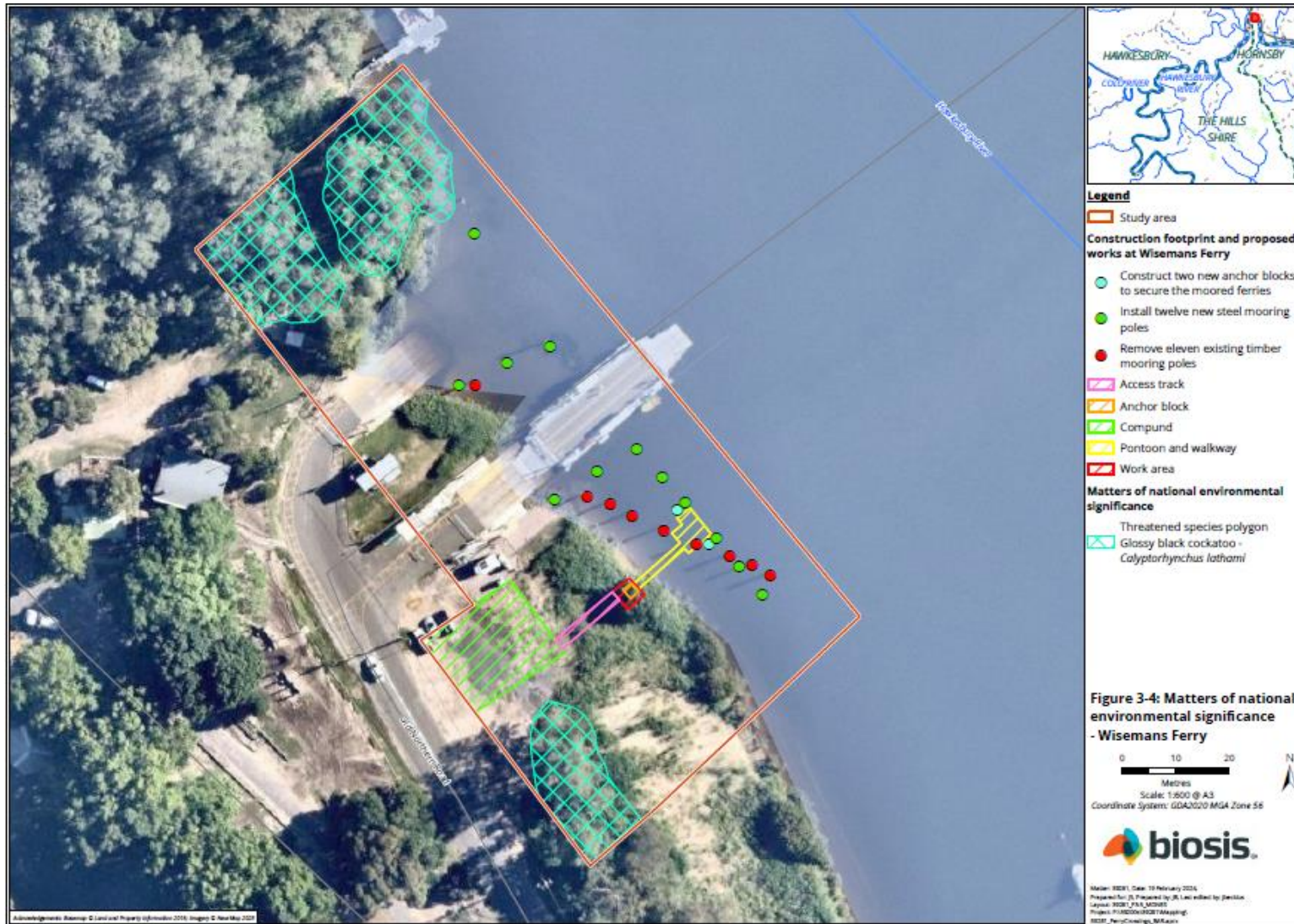


Figure 6-4: Glossy black cockatoo habitat at Wisemans Ferry

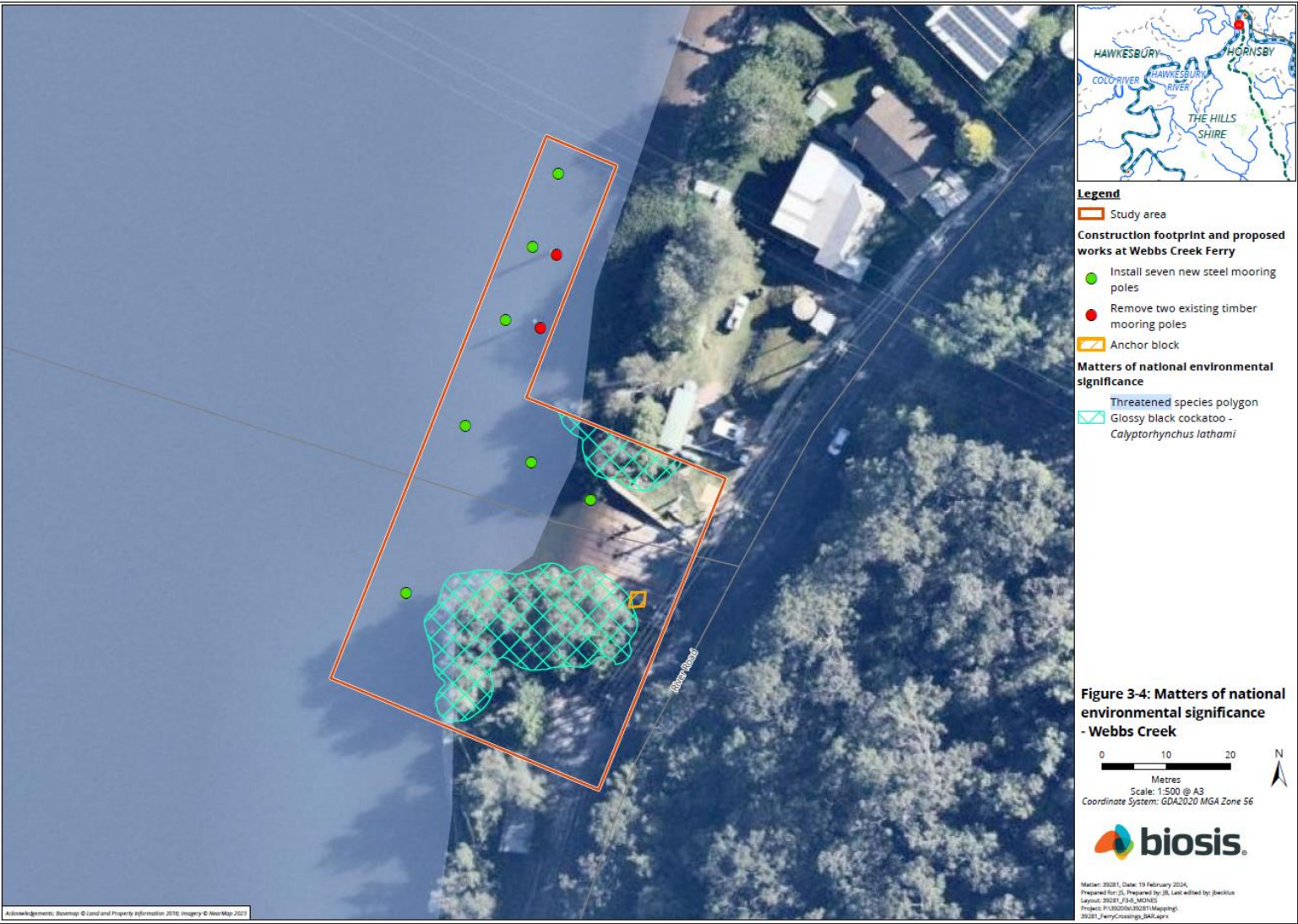


Figure 6-5: Glossy black cockatoo habitat at Webb's Creek Ferry



Figure 6-6: Glossy black cockatoo habitat at Sackville Ferry

All PCTs within the study area with an associated TEC are considered to represent their BC Act listed TECs. This is due to the landscape position, soil type and characteristic diagnostic species being present in all cases. The PCTs do not meet the criteria for listing under the EPBC Act.

The PCTs and associated TECs within the study area are:

- PCT 3962 - Coastal Floodplain Phragmites Reedland associated with *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act)
- PCT 4025 - Cumberland Red Gum Riverflat Forest associated with *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).
- PCT 4028 - Estuarine Swamp Oak Twig-rush Forest associated with *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).

PCT 4025 is considered to have a high likelihood of being a groundwater dependent ecosystem (GDE) in the location where it occurs. This PCT is likely to be on opportunistic facultative GDE that depends on the subsurface presence of groundwater in some locations but not in others, particularly where an alternative source of water (i.e. rainfall) cannot be accessed to maintain ecological function.

While PCT 3962 and 4028 are not mapped within the Atlas of GDE's, it is likely these communities have a high likelihood of being a GDE, given they are wetland communities.

Threatened species

The habitat assessment identified one threatened species considered to have a 'moderate' or higher likelihood of occurring in the study area at each ferry (Table 6-2). The location of the the Glossy black cockatoo habitat at each ferry is shown in Figure 6-4, Figure 6-5 and Figure 6-6.

Table 6-2: Threatened species habitat assessment results

Species name	Common name	BC Act	EPBC Act	Identification method
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	Vulnerable	Vulnerable	Assumed presence

Aquatic environment

The condition of the waterway was consistent largely consistent throughout the study area as all ferry locations are associated with the Hawkesbury River. The results of the aquatic surveys are summarised in Table 6-3.

Table 6-3: Summary of aquatic surveys

Ferry	Summary of aquatic environment
Wisemans Ferry	Ninth order waterway (Strahler) and as such constitutes Key Fish Habitat. High quality riparian corridor (approx. 40 m) including mangrove vegetation, with relatively low number exotic species observed. Bed and banks and predominantly comprised of sand and silt. Low levels of bank undercutting. Marginal habitat for native fish species. This site would be considered high condition due to the low level of pollution and moderate to high quality habitat available for aquatic species.
Webbs Creek Ferry	Ninth order waterway (Strahler) and as such constitutes Key Fish Habitat. Low to Moderate quality riparian corridor (approx. 20 m), with relatively low number exotic species observed. Bed and banks and predominantly comprised of sand, silt and rock. Low levels of bank undercutting due to installation of gabion wall. Marginal habitat for native fish species. This site would be considered moderate due to the low levels of pollution and low to moderate quality habitat available for aquatic species.
Sackville Ferry	Ninth order waterway (Strahler) and as such constitutes Key Fish Habitat. Moderate quality riparian corridor (approx. 25 m), with relatively moderate to high number of exotic species observed. Bed and banks and predominantly comprised of sand, silt and rock. Low levels of bank undercutting due sandstone retaining wall.

Ferry	Summary of aquatic environment
	Marginal habitat for native fish and other aquatic species. This site would be considered moderate condition due to the low levels of pollution and low to moderate quality habitat available for aquatic species.

Key Fish Habitat is present along all areas of the study area adjacent to the Hawkesbury River. The Macquarie Perch is listed under the FM Act and is known to occur in areas of the Hawkesbury River. However, the portion of the Hawkesbury River within the study area is not within the known distribution mapping of the species.

Within the study area, PCT 4091 contains a high abundance of mangrove species. Mangroves are protected under Part 7 of the FM Act. During field investigations undertaken in June 2023, no mangrove individuals were detected within the subject land.

Areas of outstanding biodiversity value

Areas of outstanding biodiversity value are declared by the Minister under the NSW BC Act, with a register of these declared areas kept by NSW Department of Climate Change, Energy the Environment and Water (DCCEEW). There are no currently declared areas of outstanding biodiversity value located within the study areas or broader assessment area.

Wildlife corridor connectivity

Wildlife connectivity corridors are currently not restricted throughout the locality, as there are large tracts of intact native vegetation adjacent to all ferry locations.

Weeds

Low condition areas of native vegetation (PCT) within the study area generally contained a moderate diversity and abundance of exotic weed species. Two priority weeds and 10 high threat weeds (BAM) were found in the study area (Table 6-4).

Table 6-4: Weeds found in the study area

Species name	Common name	Priority weed	High threat weed (BAM)
<i>Bidens pilosa</i>	Cobbler's Pegs	-	X
<i>Cenchrus clandestinum</i>	Buffalo grass	-	X
<i>Chloris gayana</i>	Rhodes Grass	-	X
<i>Erythrina crista-galli</i>	Cockspur Coral Tree	-	X
<i>Lantana camara</i>	Lantana	X	X
<i>Paspalum urvillei</i>	Vasey Grass	-	X
<i>Ricinus communis</i>	Castor Oil Plant	-	X
<i>Rubus fruticosus</i> spp. aggregate	Blackberry	X	X
<i>Rumex sagittatus</i> syn. <i>Acetosa sagittata</i>	Turkey Rhubarb	-	X
<i>Tradescantia fluminensis</i>	Wander Trad	-	X

6.1.3 Potential impacts

Construction

Threatened ecological communities and species – Wisemans Ferry

The impacts associated with the proposed works at Wisemans Ferry are minor, being limited to the removal of a small area of reedland vegetation (51.2 m²) associated with PCT 3962. Removal of vegetation is required to construct the access track and anchor block for the floating pontoon (Figure 6-1). An assessment of these impacts is provided in Table 6-5. PCT 3962 is

a threatened ecological community. A ToS concluded that clearing 51.2 m² of PCT 3962 would not be a significant impact (Table 6-6).

No threatened flora was recorded within the study area at Wisemans Ferry during field investigations or considered likely to occur due to the proximity to infrastructure and level of disturbance. There would be no impact to Glossy Black-Cockatoo habitat found at Wisemans Ferry, there would be no impact to the species.

Table 6-5: Summary of direct impact on native vegetation

Veg zone	Plant community type	Broad condition class	Threatened ecological community	Ferry	Subject land (m ²)
Zone 1_High	PCT 3962 <i>Coastal Floodplain Phragmites Reedland</i>	High	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	51.2
Zone 2_High	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	High	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	-
Zone 3_Low	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Low	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	-
Zone 5_High	PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	High	Not a TEC	Wisemans Ferry	-

Table 6-6: Summary of ToS and SIC assessments

Threatened community	Assessment type	Likely significant impact?
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	ToS	No

Threatened ecological communities – Webbs Creek Ferry

There would be no vegetation clearing or impact to threatened ecological communities at Webbs Creek Ferry. The impact area of the proposed work at Webbs Creek Ferry and the location of the threatened ecological community is shown in Figure 6-2.

No threatened flora was recorded within the study area at Webbs Creek Ferry during field investigations or considered likely to occur due to the proximity to infrastructure and level of disturbance. There would be no impact to Glossy Black-Cockatoo habitat found at Webbs Creeks Ferry, there would be no impact to the species.

Threatened ecological communities – Sackville Ferry

Installation of a mooring pile at Sackville would require trimming of one Swamp Oak (*Casuarina glauca*) (Figure 6-7). Trimming would be limited to minor trimming of one to two branches. There would be no impact to the tree canopy. An assessment of these impacts is provided in Table 6-5 and the area to be impacted is shown in Figure 6-3. The tree forms part of PCT 4025, a threatened ecological community. A ToS concluded that trimming a tree associated with PCT 4025 would not be a significant impact (Table 6-9).

Table 6-7: Summary of direct impact on native vegetation

Veg zone	Plant community type	Broad condition class	Threatened ecological community	Ferry	Subject land (m ²)
Zone 4_Low	PCT 4025 <i>Cumberland Red</i>	Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North	Sackville Ferry	Tree trimming

Veg zone	Plant community type	Broad condition class	Threatened ecological community	Ferry	Subject land (m ²)
	<i>Gum Riverflat Forest</i>		Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)		



Figure 6-7: Tree branches to be trimmed at Sackville Ferry

No threatened flora was recorded within the study area at Sackville Ferry during field investigations or considered likely to occur due to the proximity to infrastructure and level of disturbance. The proposed works would result in impacts to native vegetation condition which may form habitat for threatened fauna (Table 6-8).

ToS and SIC assessments were undertaken for impacts to GlossyBlack-Cockatoo habitat. Significant impacts as a result of the proposal are not expected (Table 6-9).

Table 6-8: Summary of direct impacts on threatened fauna habitat

Species name	BC Act	EPBC Act	Credit type	Potential occurrence	Associated habitat in subject land	Impact
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	Vulnerable	Vulnerable	Ecosystem	Moderate	PCT 4025	Minor tree trimming in PCT 4025. Clearing

Table 6-9: Summary of ToS and SIC assessments

Threatened community or specie	Assessment type	Likely significant impact?
River-flat Eucalypt Forest on coastal floodplains of New South Wales North Coast, Sydney Basin and South East Corner Bioregions	ToS	No
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	ToS	No
	SIC	No

Aquatic environment

It is unlikely that threatened aquatic species, populations or communities listed under the FM Act in the study area would be impacted by the proposal. Additionally, impacts within aquatic areas will be limited to the removal of existing piles, the installation of new piles and floating infrastructure. These additions are minor in nature, and are therefore, unlikely to reduce the movement and dispersal of aquatic flora and fauna species.

While no mangroves were found in the subject area, the field investigations were conducted over 6 months ago and there is a possibility that mangrove pneumatophores could have arisen. Therefore, it is recommended that pre-clearance surveys should be undertaken prior to construction to rule out their presence.

Fauna injury and mortality

The potential for wildlife injury or death could occur during the construction phase of the proposal, including:

- During construction when vegetation and habitat are being cleared
- Collision/strike by machinery and plant
- Collision with construction traffic.

Groundwater dependent ecosystems

Impacts to GDEs are limited to the trimming of a single tree. Groundwater interferences are not expected and as such substantial impacts to GDEs are unlikely to occur.

Indirect impacts

PCT 3962 at Wisemans Ferry is currently exposed to existing edge effects and the removal of 51.2 m² of the reedbed is unlikely to exacerbate any current edge effects. As the works will be temporary, if weeds are managed during the regeneration period, vegetation should return to its current state.

Wildlife connectivity corridors are currently limited due to proximity to existing infrastructure. The proposed works will be minor in nature, with vegetation impact limited to tree trimming and clearing for the installation of a pontoon walkway. The proposal is anticipated to have no more than minor impact on wildlife connectivity or increase habitat fragmentation.

Invasion and spread of weeds

The proposal has the potential to spread weeds during vegetation removal and through the movement of vehicles and machinery into or out of the proposal area. Vehicles and machinery would be clean on arrival to site and rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

During construction, the proposal has the potential to cause both the spread of pathogens and diseases currently occurring in the study area and surrounds, and to introduce new biodiversity risks. This is particularly the case for fungus and diseases spread through the introduction and movement of soil. Standard pest hygiene management measures would be implemented during construction to minimise this risk.

Cumulative

There are no other current projects within close proximity to any of the ferry locations. Therefore, there would be no cumulative biodiversity impacts.

Operation

Operational biodiversity impacts are not expected.

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 EPBC Act.

6.1.4 Safeguards and management measures

Table 6-10: Biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects</i> (RMS, 2011) and implemented as part of the CEMP. It will include, but not be limited to: - 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> (RMS 2008) - pre-clearing survey requirements - procedures for unexpected threatened species finds and fauna handling - procedures addressing relevant matters specified in the <i>DPI Policy and guidelines for fish habitat conservation and management</i> (2013) - protocols to manage weeds and pathogens	Contractor	Detailed design / pre-construction	Section 4.8 of QA G36 Environment Protection
Clearing native vegetation	Pre-clearing surveys will be undertaken in accordance with <i>Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Pre-construction	N/A
Clearing native vegetation	Native vegetation will be re-established in accordance with <i>Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
Clearing native vegetation/fauna habitat	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened ecological communities or threatened fauna, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction	N/A
Removal of threatened fauna habitat	Threatened fauna habitat removal and mangrove removal will be minimised by adjusting the location of the pontoon walkway.	Contractor/ Transport	Pre-construction	N/A
Removal of threatened fauna habitat	Fauna will be managed in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
Removal of threatened fauna habitat	Habitat removal will be undertaken in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A

Impact	Environmental safeguards	Responsibility	Timing	Reference
Removal of threatened fauna habitat	Habitat will be replaced or re-instated in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> and <i>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
Aquatic impacts	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI (Fisheries NSW) 2013).	Contractor	Construction	N/A
Fish kill	DPI Fisheries (1800 043 536) and the Environment Protection Authority (EPA) (131 555) are to be notified immediately if any fish kills occur in the vicinity of the works. In this situation, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed.	Contractor	Construction	N/A
Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
Invasion and spread of weeds	Weed species will be managed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
Invasion and spread of weeds	Pathogens will be managed in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
Impact to riparian vegetation	Vegetation removal to facilitate the transfer of mooring piles between the river bank and the barge is not permitted.	Contractor	Construction	N/A
Restoration	On completion of the works all disturbed soil is to be levelled, smoothed and sown with a mixture of sterile/native grass seeds to encourage rapid revegetation and planted out with native endemic riparian vegetation.	Contractor	Construction	N/A

6.1.5 Biodiversity offsets

This section considers whether any impacts require the provision of biodiversity offsets, conservation measures or tree and hollow replacement in accordance with the Transport:

- No Net Loss Guidelines and supporting resources (Transport)
- Tree and Hollow Replacement Guidelines and supporting resources (Transport).

The relevant thresholds set out by the No Net Loss Guidelines are demonstrated in Table 6-11 and an assessment against these thresholds is provided in Table 6-12. Offsets are not required.

Table 6-11: Relevant offset thresholds (Transport No Net Loss Guideline)

Impact	Threshold
Works involving clearing of an EEC	Where clearing of a EEC $\geq$ 2 ha in 'moderate to good' condition
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing $\geq$ 1 ha in 'moderate to good' condition

Table 6-12: Assessment of vegetation impacts against thresholds

Veg zone	Plant community type	Condition	Threatened ecological community	Ferry	Subject land (m ²)	Threshold triggered?
Zone 1_High	PCT 3962 <i>Coastal Floodplain Phragmites Reedland</i>	High	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	51.2	No
Zone 2_High	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	High	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	0	No
Zone 3_Low	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Low	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Wisemans Ferry	0	No
Zone 4_Low	PCT 4025 <i>Cumberland Red Gum Riverflat Forest</i>	Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	Sackville Ferry	Tree trimming	No
Zone 5_High	PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	High	Not a TEC	Wisemans Ferry	0	No

6.2 Surface water and flooding

6.2.1 Existing environment

The Hawkesbury River is a major waterway that originates at the confluence of the Nepean River and the Grose River in Western Sydney. The river is about 120 kilometres long and the section of the river from Wisemans Ferry and Broken Bay forms the boundary of Greater Metropolitan Sydney.

In the past four years, the Hawkesbury River has experienced significant rainfall and a series of heavy floods in the area which has deposited large quantities of sand, debris and other materials onto the riverbanks. The river can rise by more than four metres at the ferry crossing locations, inundating substantial areas around all the ferry crossings.

NSW State Emergency Service (SES) provides maps to show flood risk in the Hawkesbury-Nepean Valley. The maps show that even small floods impact the areas around the ferry crossings (FIGS) (Figure 6-8 and Figure 6-9).

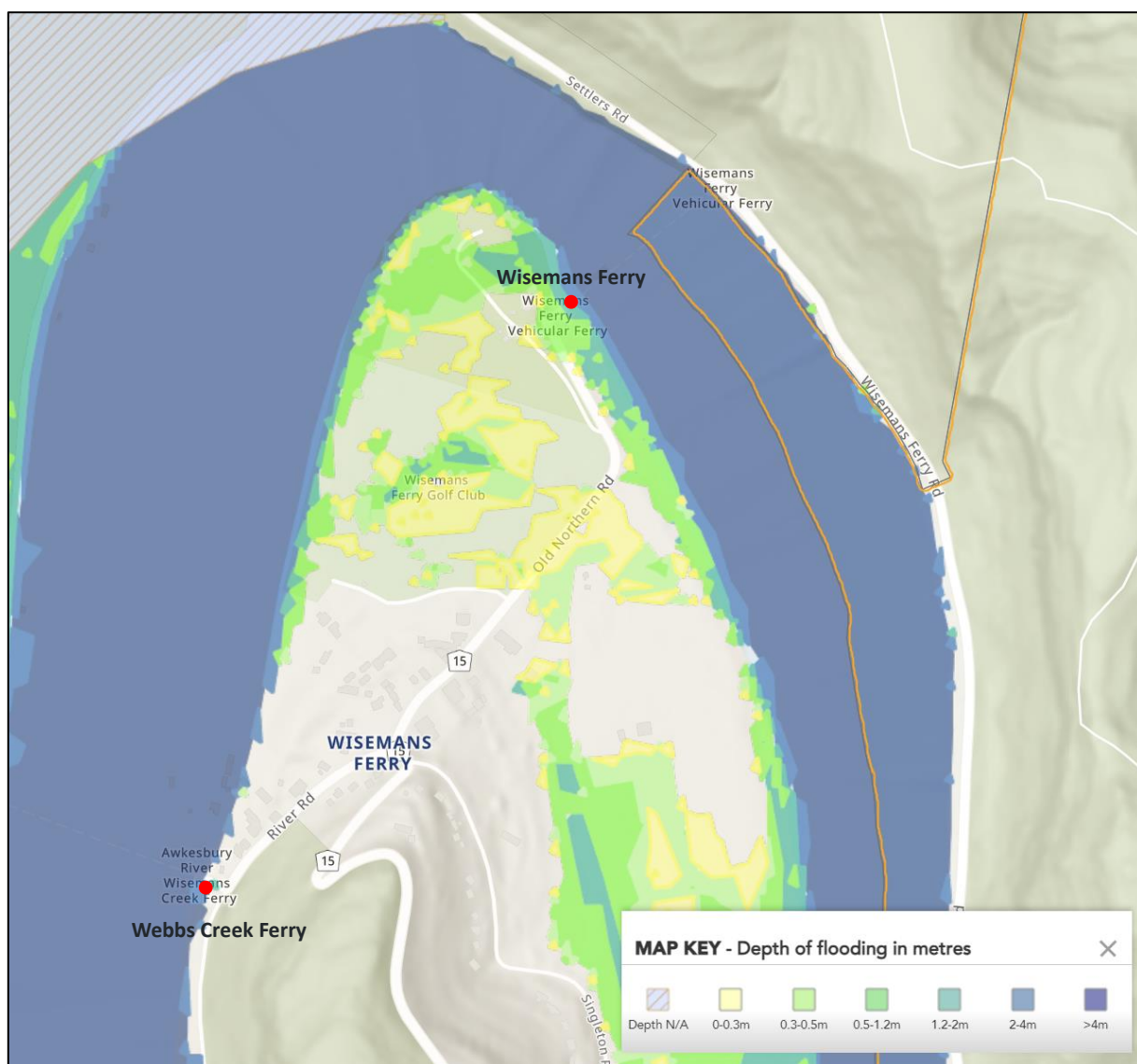


Figure 6-8: Impact of small floods at Wisemans Ferry and Webb's Creek Ferry (source: SES)

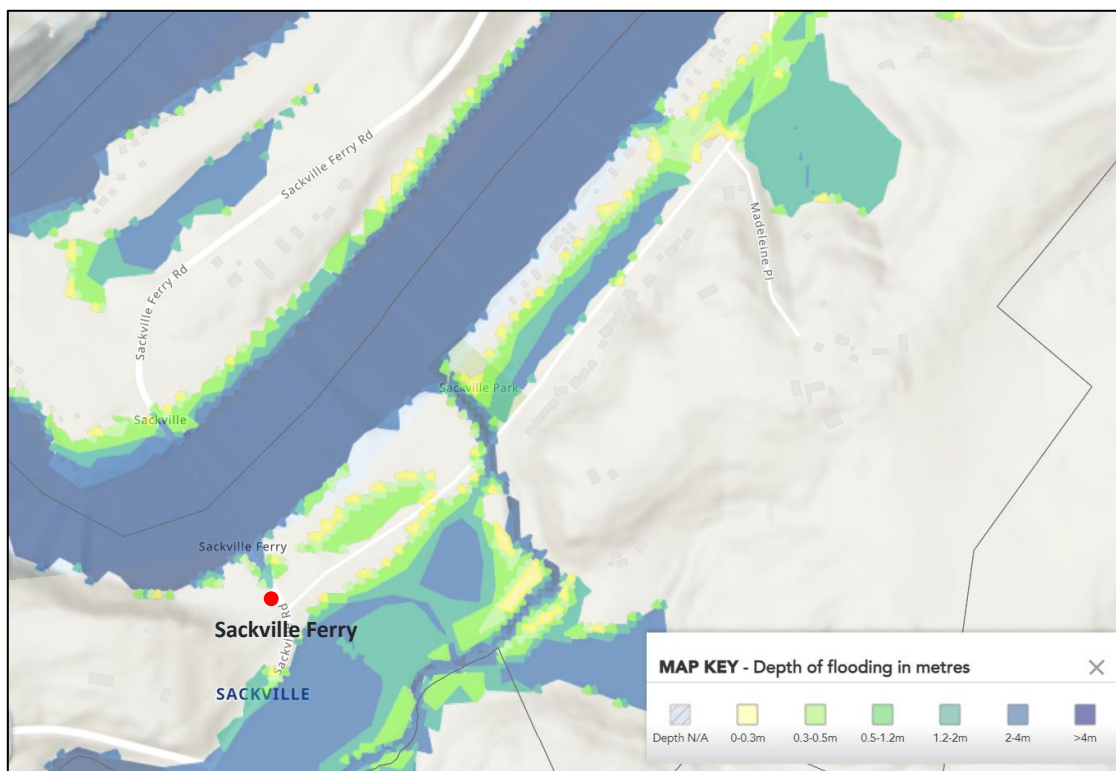


Figure 6-9: Impact of small floods at Sackville Ferry (source: SES)

Hornsby Council carries out real-time water quality monitoring at Wisemans Ferry using a remotely deployed water quality station. The station was deployed in May 2023. The following parameters monitored at 15-30 minute intervals:

- Salinity
- Chlorophyll-a
- Water temperature
- Turbidity.

Turbidity is the most relevant parameter to the proposed work. Figure 6-10 shows turbidity in the river is variable, with turbidity results ranging from less than 2 Nephelometric Turbidity unit (NTU) to more than 40 NTU for the period from August to October 2023. Turbidity is influenced by runoff from the catchment, storms and activities in the catchment.

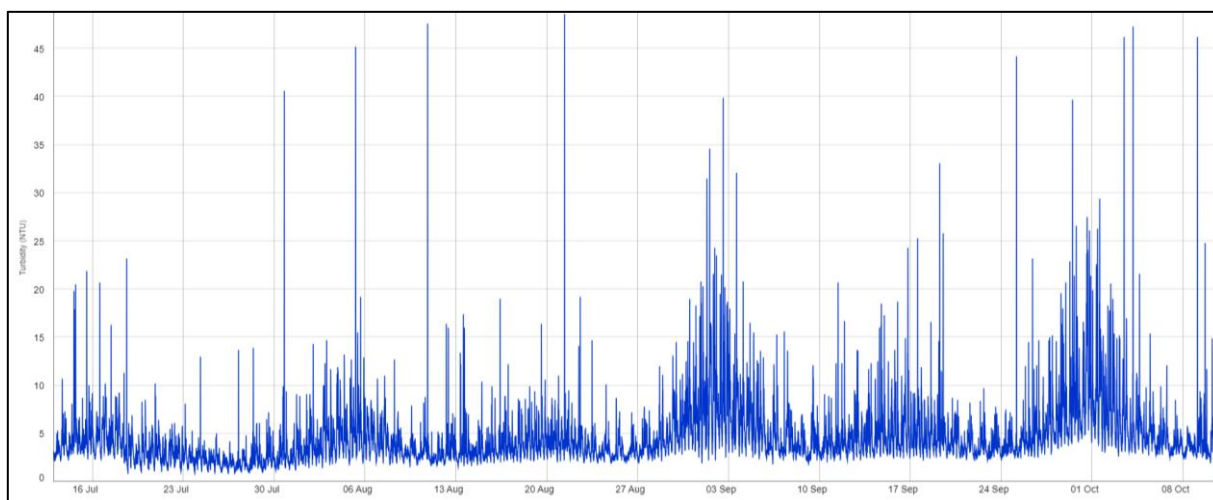


Figure 6-10: Turbidity monitoring results at Wisemans Ferry, August-October 2023 (source: Manly Hydraulics Laboratory)

There are oyster leases in the Hawkesbury River. However, the leases are located about 40 kilometres downstream of the proposal.

The topography at Wisemans Ferry is flat with the ferry ramps and surrounding ground at similar levels. At both Webbs Creek Ferry and Sackville Ferry the ground slopes to the river and the land on either sides of the ramps at both ferries is elevated. There are no stormwater inlets or outlets around any of the ferry ramps.

6.2.2 Potential impacts

Construction

The proposed work would be mostly carried out by barge-mounted plant. However, there would be storage areas at each crossing and minor excavation for construction of anchor blocks at each ferry crossing. There is potential for these works to be inundated during small floods. This could result in sediment moving offsite, loss of the silt curtain and potentially plant or materials. The contractor would develop a flood plan to ensure that excavated areas are stabilised and equipment and materials are moved from the area in advance of heavy rain. The plan would detail how the contractor will monitor for floods and what actions they will take in advance of a flood. Large floods would have substantial impacts on the areas around the ferries. These floods are rare and in the event of their occurrence, advance warnings would be in place to allow for the implementation of safeguards.

The existing mooring piles would be pulled from the river bed, the mooring piles would be driven into the river bed and the barge spuds would disturb the river bed. This would result in disturbance of sediment and an increase in turbidity of the water. An increase in turbidity would reduce the light available to aquatic organisms. This can impact aquatic plants ability to photosynthesise, clog fish gills and change predator/prey interactions. Higher than normal turbidity can also result in increased water temperature and reduced dissolved oxygen. The silt curtain would contain the silt to the work area, including the barge, and would be remain in place until sediment has settled and the turbidity is equal to or lower than the turbidity of the river outside the work area. With the implementation of the safeguards any increase in turbidity is likely to be short-term and localised and is not expected to impact aquatic organisms.

Operation

The proposed mooring piles would not increase the effects of floods on the areas around the ferry crossings. The mooring piles would have a positive impact on ferry operations by providing secure moorings for the ferries during large floods.

6.2.3 Safeguards and management measures

Table 6-13: Surface water and flooding safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Flooding	Prepare a Flood Plan that includes procedures to - Monitor weather forecast - Removing all plant, equipment and materials from flood zone.	Contractor	Detailed design / Pre-construction	N/A
Flooding	Program work to ensure that work can be carried out during favourable weather and tides. Work must be completed in advance of unfavourable tides or heavy rain or postponed until after the event.	Contractor	Construction	N/A
Flooding	Where high flows in the river are predicted all work will stop in advance, the silt curtains will be removed, disturbed areas stabilised and equipment and materials removed from site.	Contractor	Construction	N/A
Surface water	Procedures to ensure adherence to ANZECC water quality guidelines are to be detailed in the CEMP.	Contractor	Detailed design / Pre-construction	N/A
Surface water	Install a silt curtain with boom before the start of work. The curtain will be installed around all works that may result in silt/material becoming suspended during the works. The silt curtain must extend a minimum of 100 millimetres above the waterline and reach the river bed.	Contractor	Construction	N/A

Impact	Environmental safeguards	Responsibility	Timing	Reference
Surface water	Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient erosion and sediment controls.	Contractor	Construction	N/A
Surface water	The silt curtain must not be moved until turbidity within the silt curtain is equal to or less than turbidity in the river.	Contractor	Construction	N/A
Surface water	Any sediment that sticks to the timber piles is to be transferred directly to impervious skip bins for offsite disposal.	Contractor	Construction	N/A
Surface water	An emergency marine spill kit is to be kept on site at all times and maintained throughout the work. The spill kit must be appropriately sized for the volume of substances at the work site.	Contractor	Construction	N/A
Surface water	All workers will be advised of the location of the spill kit and trained in its use.	Contractor	Construction	N/A
Surface water	Prior to use at the site and/or entry into the waterway, machinery is to be appropriately cleaned degreased and serviced.	Contractor	Construction	N/A
Surface water	All machinery and equipment would be maintained in good working order and regularly visually inspected for leaks.	Contractor	Construction	N/A
Surface water	Chemicals or fuels will not be stored on the barge.	Contractor	Construction	N/A
Surface water	Water quality control measures are to be used to minimise materials (eg sediment etc) entering the river.	Contractor	Construction	N/A
Surface water	Refueling of plant and equipment is to occur offsite.	Contractor	Construction	N/A
Accidental spill	A site-specific emergency spill plan will be developed and include spill-management measures in accordance with the Transport <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 Transport EPA officers).	Contractor	Detailed design / Pre-construction	Section 4.3 of QA G36 <i>Environment Protection</i>

Other safeguards and management measures to address surface water impacts are identified in section 6.3.3.

6.3 Soils

6.3.1 Existing environment

The following acid sulfate soils mapping was checked on 6 November 2023:

- Hills Shire Acid Sulphate Soil mapping
- Hornsby Shire Acid Sulphate Soil mapping
- Hawkesbury Shire Acid Sulphate Soil mapping.

The mapping shows that:

- The Hawkesbury River is Class 1
- The bank as Wisemans Ferry is Class 1 and Class 2

- The bank at Webbs Creek Ferry is Class 5
- The bank at Sackville Ferry is Class 4.

A search of the Environmental Protection Authority’s Contaminated Land Record for Wisemans Ferry (covers Wisemans Ferry and Webbs Creek Ferry) and Sackville on 6 November 2023 found that there are no registered contaminated sites in the vicinity of the proposed works.

6.3.2 Potential impacts

Construction

Construction of the anchor blocks at each ferry would require ground disturbance. Three anchor blocks would be constructed at Wisemans Ferry (including scour protection at one anchor block) and one at each Webbs Creek Ferry and Sackville Ferry. The total area of disturbance would be about 20 square metres. All excavations would be within 5-10 metres from the river and there is a risk of sediment laden runoff entering the river if the excavations are not stabilised during heavy rain or floods.

Concrete would be poured to construct the anchor blocks. This would occur near the Hawkesbury River, within:

- 7m at Wisemans Ferry
- 12m at Webbs Creek Ferry
- 10m at Sackville Ferry.

Concrete or concrete washout entering the water has the potential to impact water quality by reducing the pH of the water. However, given the distance from the river and the small volume of concrete to be poured, the risk to the waterway is low.

Oxidation of acid sulphate soils would result in release of sulphuric acid to the environment. This has potential to impact surrounding vegetation and lower the pH of the river in the immediate area. The risk is higher at Wisemans Ferry as the excavations would be located on land mapped as Class 1 and 2 acid sulfate soils. The excavations at Webbs Creek and Sackville Ferries are on land mapped as Class 5 and 4 respectively and pose a lower risk. In any case, all excavated material would be treated as acid sulfate soil and transferred to impervious containers for offsite disposal.

The mooring piles would be installed in Class 1 acid sulfate soils. The drilling rig would not penetrate the river bed and is not expected to bring and sediment to the surface. Therefore, the installation process is not expected to result in acidification of acid sulfate soils. However, the sediment is likely to be brought to the surface on the timber piles as they are removed. This sediment would be managed on the barge to ensure that acidification does not occur.

Operation

Operational impacts are not anticipated.

6.3.3 Safeguards and management measures

Table 6-14: Soils safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil	Site-specific Erosion and Sediment Control Plans will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). • The Plans 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.	Contractor	Detailed design / pre-construction	Section 2.2 of QA G38 Soil and Water Management
Contaminated land	If contaminated areas are encountered during construction, appropriate control	Contractor	Detailed design / Pre-construction	Section 4.2 of QA G36

Impact	Environmental safeguards	Responsibility	Timing	Reference
	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 Transport for NSW Senior Manager Environment and Sustainability.			<i>Environment Protection</i>
Acid sulfate soil	All excavation work will be managed in accordance with the Roads and Maritime <i>Guidelines for the Management of Acid Sulfate Materials</i> .	Contractor	Construction	N/A
Soil	Erosion and sediment mitigation devices are to be erected in a manner consistent with current Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.	Contractor	Construction	N/A
Soil	Erosion and sediment control measures are not to be removed until the work is complete.	Contractor	Construction	N/A
Soil	Visual observations of the effectiveness of the erosion and sediment controls are required to be made regularly during the work.	Contractor	Construction	N/A
Soil	Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate erosion and sediment control devices.	Contractor	Construction	N/A
Soil	Only clean rock (no fines) is to be used during these works.	Contractor	Construction	N/A

Other safeguards and management measures to address soil impacts are identified in section 0.

6.4 Traffic and transport

6.4.1 Existing environment

The cable ferries at Wisemans, Webbs Creek and Sackville are key crossings of the Hawkesbury River and are crucial to transport in the area. Wisemans Ferry and Webbs Creek Ferry provides vehicular access to towns on the north side of the river. Wisemans ferry is regularly used by cyclists and bushwalkers accessing Dharug National Park and in particular the heritage listed Old Great North Road between Devine's Hill and Mount Manning. Sackville Ferry provides an east-west vehicular crossing of the river.

Traffic volumes for the ferry crossings are provided in Table 6-15. Webbs Creek Ferry and Sackville Ferry would be closed from 10am to 3pm, Monday to Friday during the proposed work. Additional detail on the number of vehicles using the ferry daily is provided in Table 6-16 and Table 6-17. A typical week (16 October 2023 to 20 October 2023) was selected.

Table 6-15: Traffic volumes at each ferry crossing

Ferry	Period	No. of vehicles using the ferry	No. of vehicles using the crossing
Wisemans Ferry	August 2023	Main ferry – 18,232	22,734
		Relief ferry – 4,502	
	September 2023	Main ferry – 17,298	23,263
		Relief ferry – 5,965	
Webbs Creek Ferry	August 2023	-	15,437
	September 2023	-	17,941
Sackville Ferry	August 2023	-	17,941
	September 2023	-	19,168

Table 6-16: Vehicles using Webbs Creek Ferry from 16/10/2023 to 20/10/2023

Number of vehicles using Webbs Creek Ferry crossing						
	Mon	Tue	Wed	Thu	Fri	Total
Total vehicles crossing	484	443	565	517	868	2,877
Vehicles crossings during proposed closure period (10am to 3pm)	160	74	154	156	307	851
Percentage of vehicles affected by closure	33	17	27	30	35	30

Table 6-17: Vehicles using Sackville Ferry from 16/10/2023 to 20/10/2023

Number of vehicles using Sackville Ferry crossing						
	Mon	Tue	Wed	Thu	Fri	Total
Total vehicles crossing	662	693	622	732	698	3,407
Vehicles crossings during proposed closure period (10am to 3pm)	155	131	138	146	265	835
Percentage of vehicles affected by closure	23	19	22	20	38	25

6.4.2 Potential impacts

Construction

Wisemans Ferry

Wisemans Ferry has a main and relief ferry, with more than 20,000 vehicles using the ferries in a month. One of the ferries would remain operational during the proposed works and a traffic detour would not be required. During busy periods both ferries are sometimes operated at the same time. This would not be possible during the proposed works. However, the operation is usually only for short periods and the closure of one ferry for one month is not expected to result in a substantial impact on traffic flow in the area.

Webbs Creek Ferry

Webbs Creek Ferry would be closed on weekdays between 10am and 3pm for the duration of works (one month). The work at the ferry crossing would not be undertaken concurrently with work on other ferries. A detour would be required during the proposed work.

There are two options for a detour during work on the ferry:

- Northern detour via St Albans – via St Albans Road and Settlers Road (Figure 6-11)
- Southern detour via the Lower Portland Ferry – via Bicentenary Road and River Road (Figure 6-12).

Table 6-18 provides the predicted detour times and the increase in travel times due to the detours.

Motorists using Webbs Creek Ferry would experience increased travel times of up to more than one hour. A trip on the Webbs Creek Ferry normally takes no more than a few minutes. Table 6-16 and Table 6-17 provide a snapshot of ferry use. However, this data can be used to generally quantify the potential impact on ferry users. On average about 30% of daily trips would be affected by the closure of Webbs Creek Ferry.

The northern detour uses St Albans Bridge, St Albans. There are upcoming works planned for the bridge. The contractor would consult with the bridge works contractor to ensure that the proposed works at Webbs Creek Ferry do not occur at a time when any traffic restrictions are in place at St Albans Bridge.

Sackville Ferry

Sackville Ferries would be closed on weekdays between 10am and 3pm for the duration of works (one month). The work would not be undertaken concurrently with the work on Webbs Creek Ferry or Wisemans Ferry. A detour would be required during the work at the ferry.

There are two options for a detour during work on the ferry:

- Northern detour via the Lower Portland Ferry – via West Portland Road and Sackville Road (Figure 6-13)
- Southern detour via Windsor – via Sackville Ferry Road/Wisemans Ferry Road/Cattai Road and Wilberforce Road/Sackville Road (Figure 6-14).

Table 6-18 provides the predicted detour times and the increase in travel times due to the detours. Motorists using the ferries would experience increased travel times of about 45 minutes. A trip on Sackville Ferry normally takes no more than a few minutes. Using the traffic data in Table 6-16 and Table 6-17 indicates that on average about 25% of daily trips affected at Sackville Ferry.

Maintaining the ferries operational during peak periods means that the majority of trips on the ferries would not be impacted. Providing the community with advance notice of the closures would allow ferry users to plan their trips in accordance with the ferry operating times. However, there will be some impact on the community during the ferry closures.

Table 6-18: Traffic volumes at each ferry crossing

Ferry	Detour	Detour distance	Predicted detour duration	Increase in travel time
Webbs Creek Ferry	Northern detour	54.1 km	1 hr 28 min	1 hr 11 min
	Southern detour	38 km	1 hr 16 min	59 min
Sackville Ferry	Northern detour	25.9 km	44 min	43 min
	Southern detour	48.5 km	44 min	43 min

The ferry crossings are not on a heavy vehicle route and no bus routes use the ferry crossings. However, local school buses run by Busways may use the ferry crossings. Ferry data indicates that buses uses Webbs Creek Ferry about five times per day on average and Sackville Ferry about once per day. It is not clear if these are scheduled trips. The ferry closure times are not expected to impact school bus services. Consultation with Busways would be carried out prior to the start of construction.

The ferry crossings are relatively isolated and are not heavily used by pedestrians and cyclists. Ferry data indicates that Sackville Ferry is rarely used by pedestrians and Webbs Creek is used about four times per day on average. It is not expected that the detour would substantially impact pedestrians or cyclists.

All work would be at the ferries or around the approaches to the ferry ramps. There would be no impact to private property access at any time during the work.

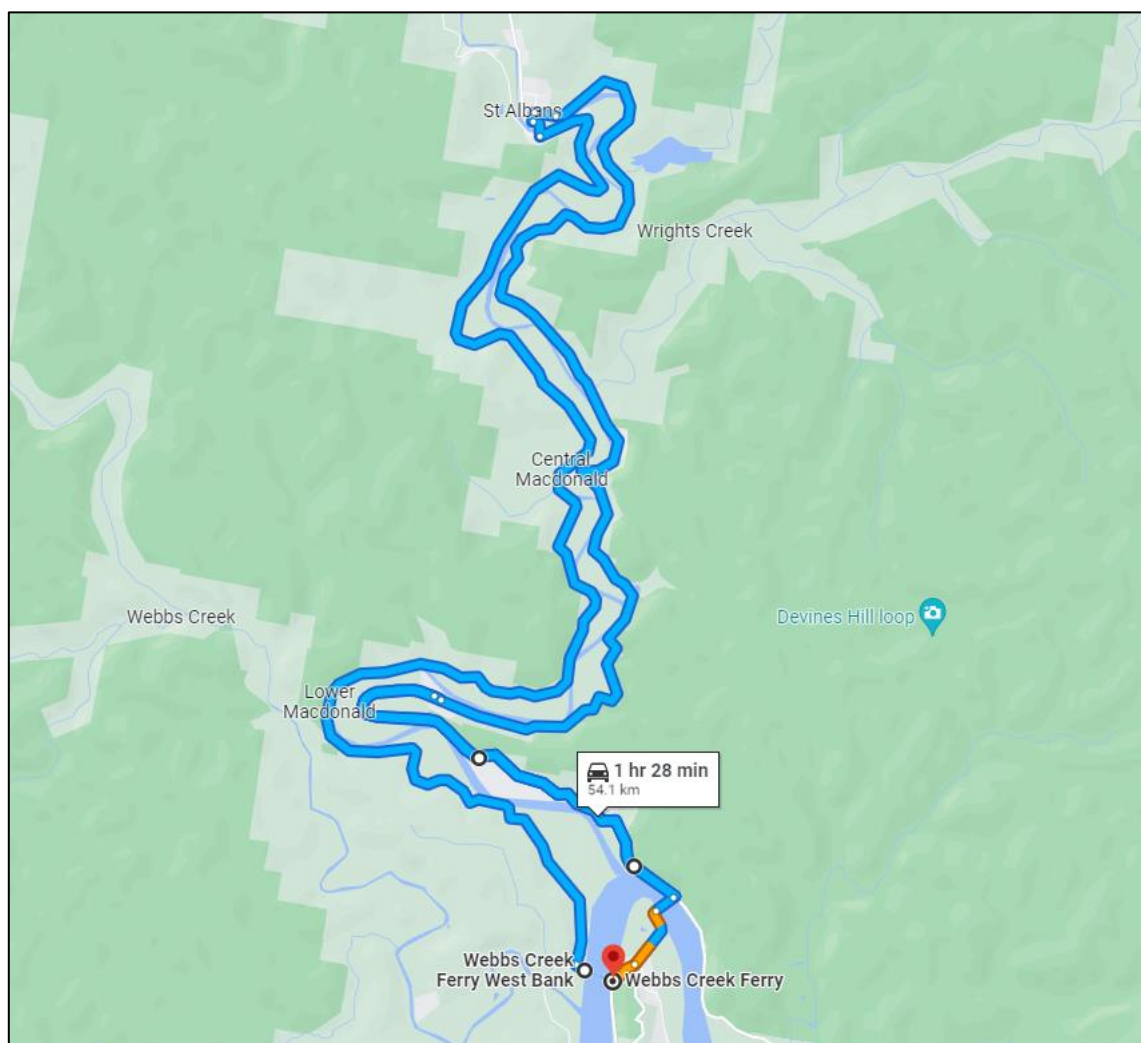


Figure 6-11: Webbs Creek Ferry – northern detour

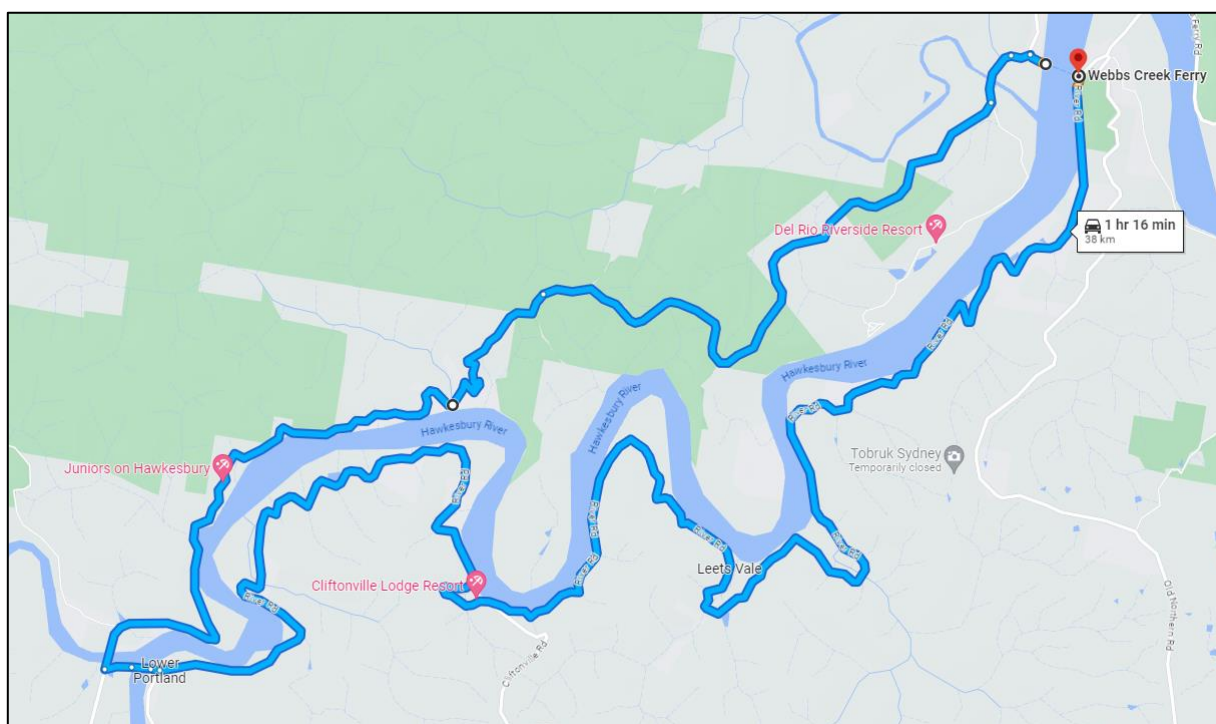


Figure 6-12: Webb's Creek Ferry – southern detour

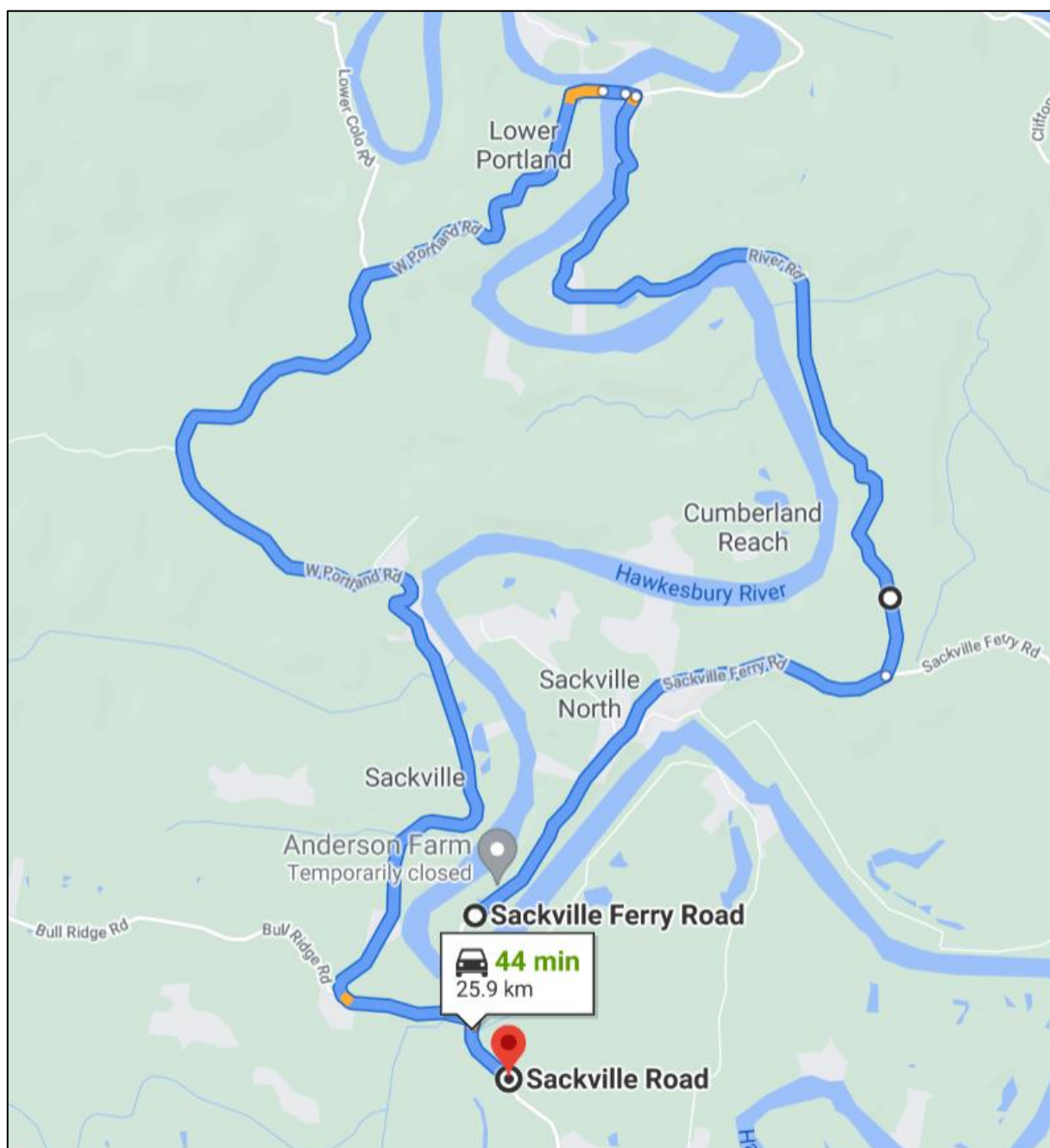


Figure 6-13: Sackville Ferry – northern detour

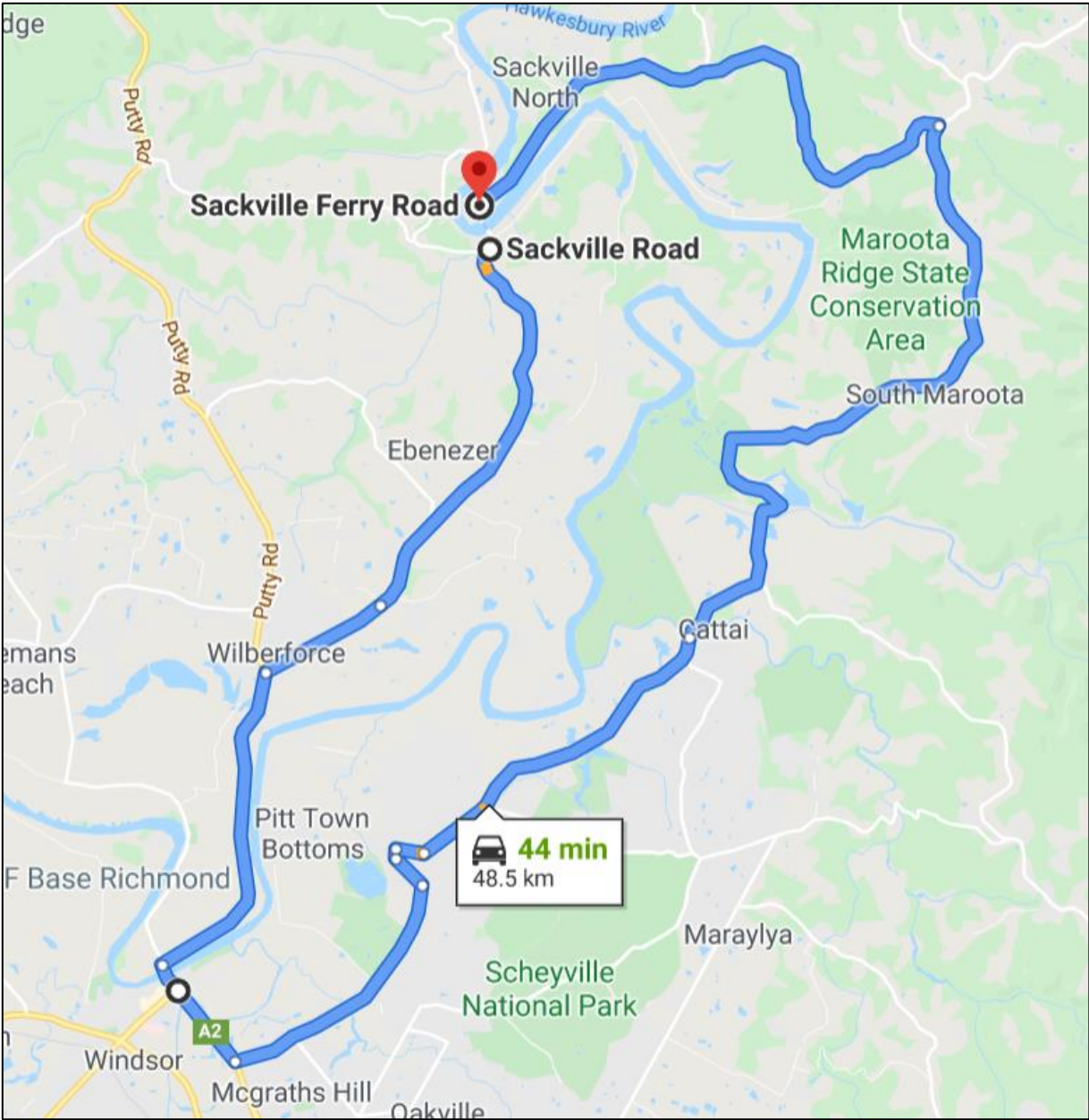


Figure 6-14: Sackville Ferry - southern detour

Operation

The proposal would ensure the continued operation of the ferries by providing secure moorings and improving ferry maintenance facilities and would have a positive operational impact.

6.4.3 Safeguards and management measures

Table 6-19: Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport <i>Traffic Control at Work Sites Manual</i> (RTA 2010) and <i>QA Specification G10 Control of Traffic</i> (Transport 2008). The TMP will include: confirmation of haulage routes	Contractor	Detailed design / Pre-construction	Section 2.5 of <i>QA G10 Control of Traffic</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	- details of detours - 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 - 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 that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic - monitoring, review and amendment mechanisms.			
Traffic and transport	Consult with internal Transport for NSW stakeholders to ensure that no other work will be carried out on the detour during the closure of the ferry.	Contractor	Pre-construction	N/A
Traffic and transport	Ensure that Lower Portland Ferry will be open during the closure of Sackville Ferry.	Contractor	Pre-construction	N/A
Traffic and transport	Consult with the contractor for the St Albans Bridge works to ensure that the works at Webbs Creek Ferry do not occur at the same time as any traffic restrictions are in place at St Albans Bridge.	Contractor	Pre-construction	N/A
Traffic and transport	Consult with The Hills Shire Council, Hornsby Shire Council and Hawkesbury Shire Council about any potential impact to council services during the detour.	Contractor	Pre-construction	N/A
Traffic and transport	Consult with Busways about potential impact to school bus services.	Contractor	Pre-construction	N/A
Traffic and transport	Notify emergency services of the ferry closures.	Contractor	Pre-construction	N/A
Traffic and transport	Notify road users of changed ferry operations using variable message signs (VMS). The signs must be in place at least seven days prior to the start of work.	Contractor	Pre-construction and construction	N/A

6.5 Noise and vibration

6.5.1 Methodology

The proposed upgrade would take about one month at each ferry crossing to complete. The *Interim Construction Noise Guideline* (EPA 2009) (ICNG) was used to assess the potential construction noise impact of the proposal. The proposal would last more than three weeks and a quantitative construction noise assessment is required. Operational noise impacts are not expected.

To determine the Rating Background Level (RBL) a construction noise estimator (RMS 2017) was used to predict noise levels during construction. Construction noise management levels for residential receivers are determined using the ICNG (refer to Table 6-20).

Table 6-20: Noise management levels

Time of day	Management level $L_{Aeq}(15min)$	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured L_{Aeq} (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: - times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) - if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5dB(A)	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.
Passive recreation	60dB(A)	-

Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified in Table 6-20. The noise affected level represents the point above which there may be some community reaction to noise. Where predicted and/or measured construction noise levels exceed noise management levels, all feasible and reasonable work practices will be applied to meet the management levels.

The potential noise level at properties around the proposal was estimated using the Transport for NSW Construction Noise Estimator. The work scenarios used to assess the noise impact are provided in (Table 6-21). The mooring pile removal and installation at Wisemans Ferry would include plant operating at the compound site. The sound power levels of plant to be used are provided in Table 6-22.

Table 6-21: Work scenarios

Work scenario	Plant operating
Mooring pile removal (Wisemans Ferry)	Excavator, dump truck, truck, delivery truck, light vehicles (3), hand tools
Mooring pile removal (Webbs Creek Ferry and Sackville Ferry)	Excavator, light vehicles (3), hand tools
Mooring pile installation (Wisemans Ferry)	Piling rig, dump truck, truck, delivery truck, light vehicles (3), hand tools
Mooring pile installation (Webbs Creek Ferry and Sackville Ferry)	Piling rig, hand tools, light vehicles (3)
Anchor block construction	Excavator, dump truck, truck, concrete truck, delivery truck, light vehicles (3), hand tools

Table 6-22: Sound power levels

Plant	Sound power level (SWL) L_{Aeq} (dB)	L_{Aeq} (dB) at 7m
Piling rig	116	91
Excavator	110	85
Dump truck	108	83
Truck	90	65
Concrete truck	109	84
Delivery truck	108	83
Light vehicles	103	78
Hand tools	105	80

6.5.2 Existing environment

Sensitive receivers in the vicinity of the proposal, adopted background noise levels and NMLs are provided in Table 6-23.

Table 6-23: Noise management levels

Ferry	Sensitive receivers	Distance from work (m)	RBL (dB) (daytime)	NML (dB)
Wisemans Ferry	Café	25	40	60 (passive recreation)
	Golf course	150		60
Webbs Creek Ferry	Nearest resident on River Road – 3014 River Road	100	40	50 (NML of 50 for all receivers for the purpose of the assessment)
	Able Hawkesbury River Houseboats and Hawkesbury Cruiser Hire	65		

Ferry	Sensitive receivers	Distance from work (m)	RBL (dB) (daytime)	NML (dB)
	St Marys Anglican Church	230		
	Wisemans Ferry Police Station	270		
Sackville Ferry	968 Sackville Road	265	40	50
	897 Sackville Road	115		
	888 Sackville Road	125		

6.5.3 Potential impacts

Construction

The predicted noise levels at the nearest sensitive receivers at each ferry is provided in Table 6-24. Figure 6-15, Figure 6-16 and Figure 6-17 show where noise is predicted to above the NML and where receivers are predicted to be highly noise affected at each ferry. Additional noise mitigation measures are provided in Table 6-25.

Wisemans Ferry

The estimator tool (individual plant) predicted noise at the nearest receiver, the café at the ferry, would experience noise levels ranging from 10dB(A) to 17dB(A) above the NML. Café staff and customers are predicted to be highly noise affected (>75dB) during the anchor block construction and likely to experience elevated levels of noise throughout the works. No residential receivers would be impacted by the proposed work and passive recreational receivers beyond 145 metres of the work would not be impacted. Golf course users are not expected to be impacted by the proposed work.

Webbs Creek Ferry

The estimator tool (individual plant) predicted noise at the nearest residence to the proposal, 3014 River Road, would experience noise levels ranging from 22 dB(A) to 26dB(A) above the NML. The resident is expected to be impacted during all work scenarios and residents along River Road are also expected to experience noise levels above the NML during the proposed work. Commercial receivers are less sensitive than residential receivers and are likely to experience elevated noise during the work.

Sackville Ferry

The estimator tool (individual plant) predicted noise at the nearest residence to the proposal, 897 Sackville Road, would experience noise levels ranging from 16 dB(A) to 22dB(A) above the NML. Residents at 888 Sackville Road would also experience elevated noise during all work scenarios. Residents at 968 Sackville Road are not expected to be impacted due to the distance to the ferry crossing.

No residential receivers are predicted to be highly noise affected (>75dB(A)) at any of the ferry crossings.

Table 6-24: Potential noise impacts at nearest receivers

Ferry	Receiver	Distance to receiver (m)	Scenario	NML (dB(A))	Predicted noise level at nearest receiver (dB(A))	Exceedence (dB(A))
Wisemans Ferry	Café at ferry	50	Mooring pile removal	60	70	10
		50	Mooring pile installation	60	73	13
		25	Anchor block construction	60	77	17
Webbs Creek Ferry	3014 River Road	100	Mooring pile removal	40	63	23
		100	Mooring pile installation	40	66	26

Ferry	Receiver	Distance to receiver (m)	Scenario	NML (dB(A))	Predicted noise level at nearest receiver (dB(A))	Exceedence (dB(A))
		135	Anchor block construction	40	62	22
Sackville Ferry	897 Sackville Road	155	Mooring pile removal	40	56	16
		155	Mooring pile installation	40	58	18
		140	Anchor block construction	40	61	22

Table 6-25: Additional noise mitigation measures

Receiver type and distance	Distance from proposal (m)	NML (dB(A))	Maximum predicted noise levels (dB(A))	Recommended additional mitigation measures ^{Note 1}
Passive recreation	25	60	77	N, V, PC, RO
Residential receivers	150	60	59	-
	100 - 160	50	66	N, V

Note 1:

N – Notification

V – Verification

PC – Phone calls

RO – Respite offer

The proposal would not require use of vibrating equipment. The piles would be driven and hammered into the riverbed. Due to the distance of receivers from the proposed work at all of the ferries, vibration impacts are not anticipated.

Operation

The floating pontoon would facilitate maintenance activities. However, this is not expected to result in additional noise to the noise generated under normal operation of the ferry crossing.

No operational vibration impacts are expected.

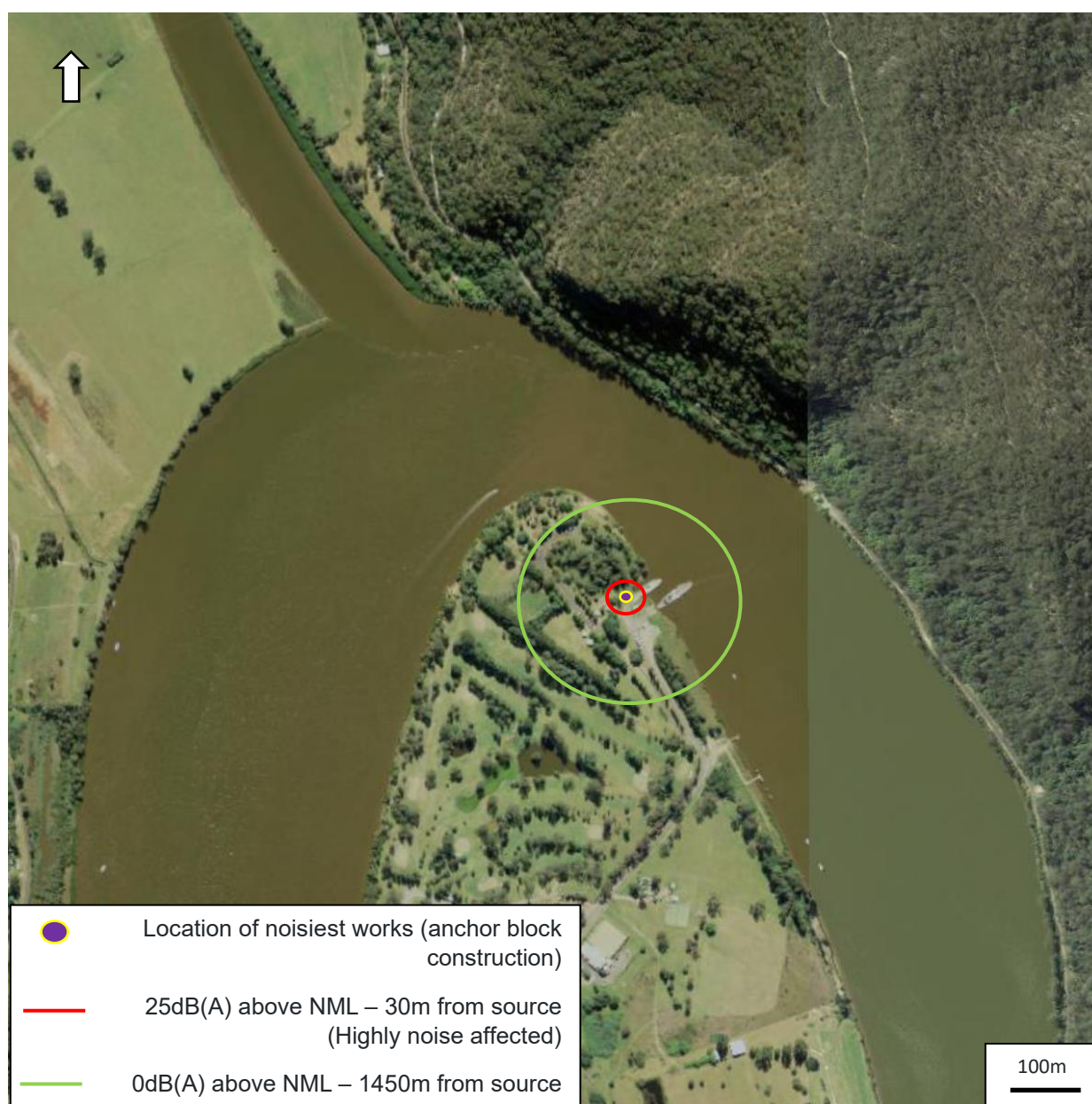


Figure 6-15: Potential noise impacts at Wisemans Ferry

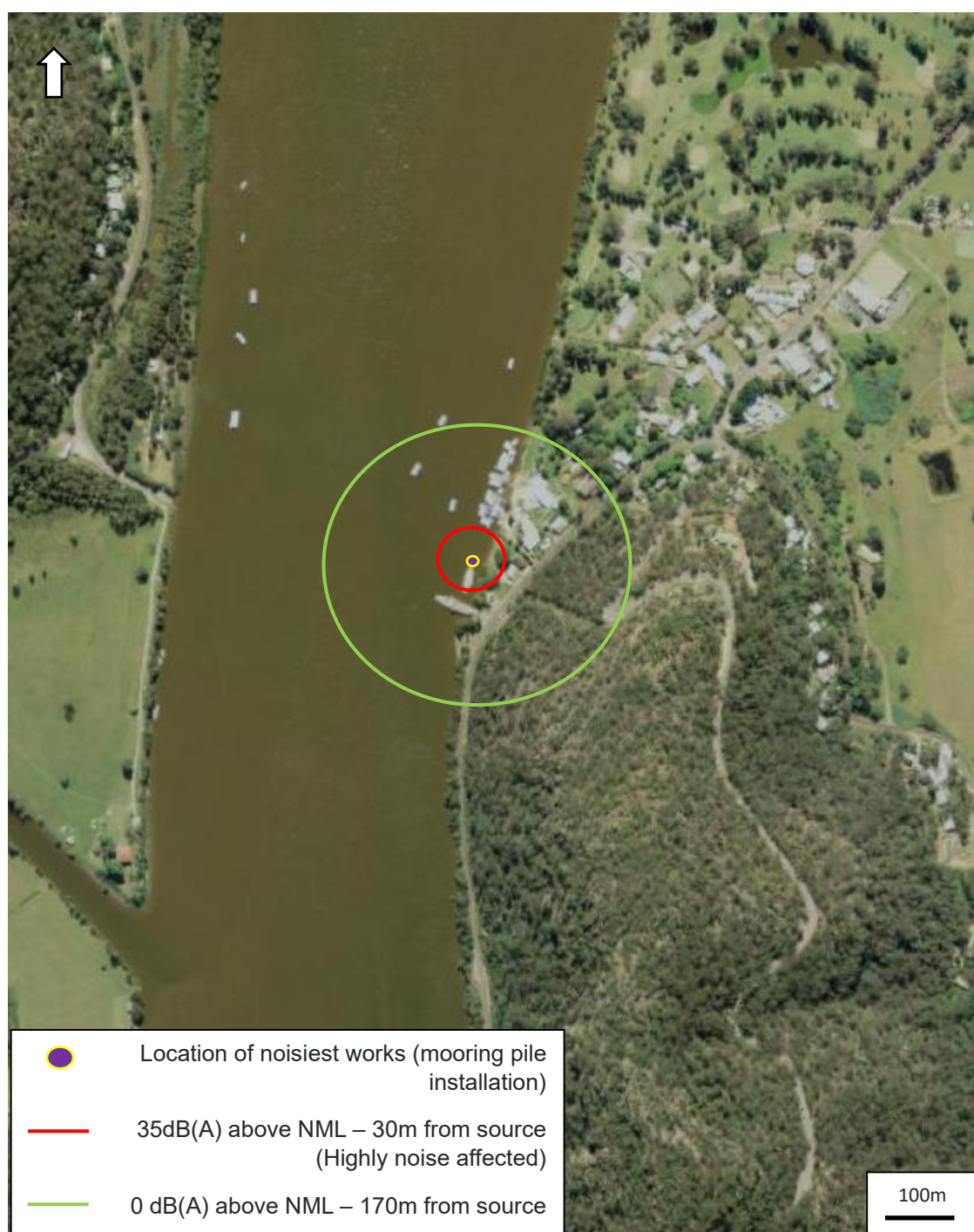


Figure 6-16: Potential noise impacts at Webb's Creek Ferry

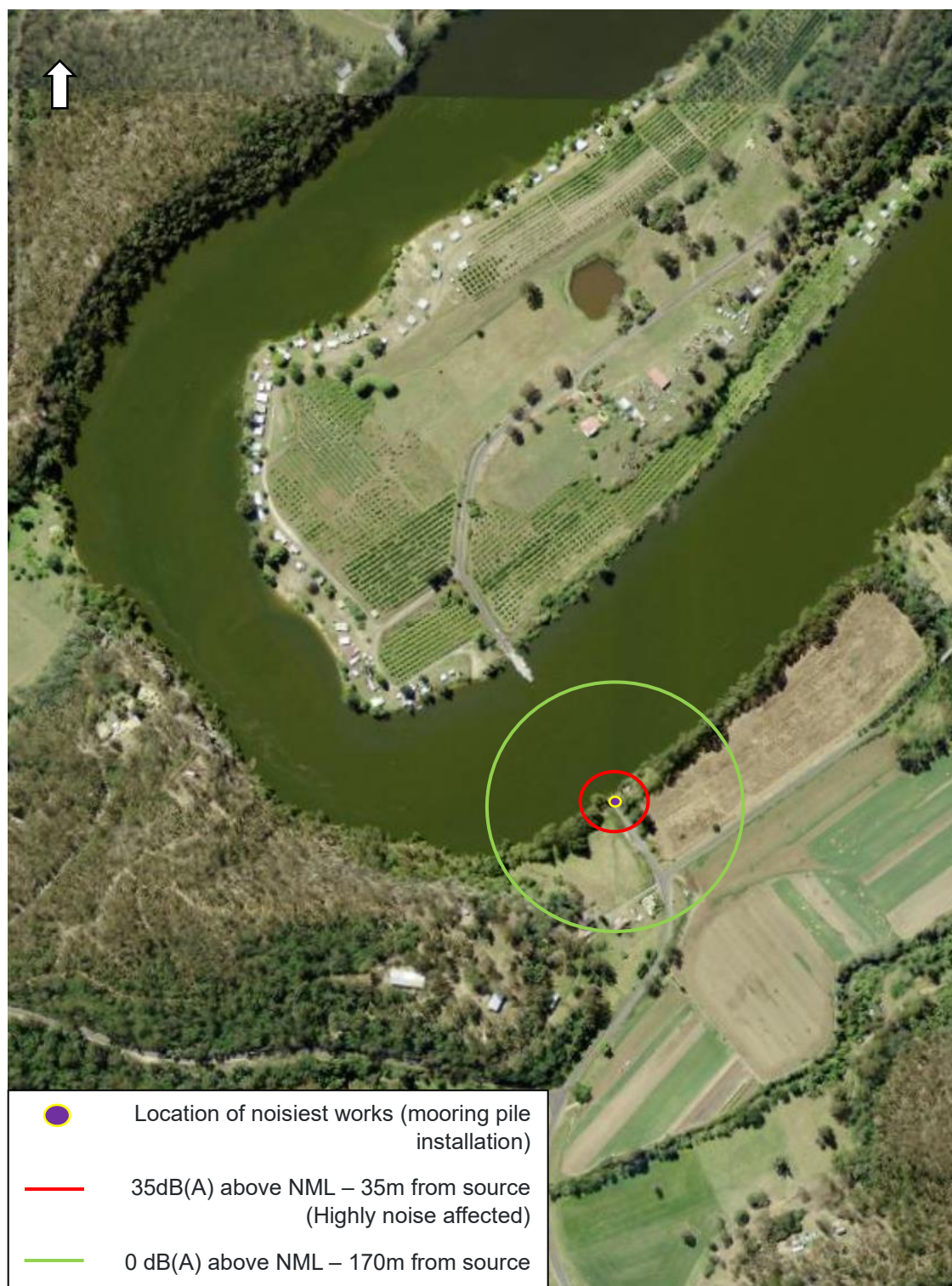


Figure 6-17: Potential noise impacts at Sackville Ferry

6.5.4 Safeguards and management measures

Table 6-26: Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	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 <i>the Interim Construction Noise Guideline (ICNG) (DECC 2009)</i> and identify: - all potential significant noise and vibration generating activities associated with the activity - feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (Transport 2014a). - 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.	Contractor	Pre-construction	N/A
Noise and vibration	All sensitive receivers (e.g., schools and local residents) likely to be affected will be notified at least five business days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: - the project - the construction period and construction hours - contact information for project management staff - complaint and incident reporting - how to obtain further information.	Contractor	Pre-construction	N/A
Noise and vibration	Works to be carried out during standard hours Monday to Friday. Any work that is performed outside normal work hours or on weekends or public holidays must have measures in place to minimise noise impacts.	Contractor	Construction	N/A
Noise and vibration	All construction personnel would be notified of the location of sensitive receivers, and the need to minimise noise from the work, during the site induction.	Contractor	Construction	N/A
Noise and vibration	No dropping of materials from height or throwing of metal items.	Contractor	Construction	N/A
Noise and vibration	No swearing or unnecessary shouting or loud stereos/radios on site.	Contractor	Construction	N/A

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	Plant used intermittently to be throttled down or shut down.	Contractor	Construction	N/A
Noise and vibration	Plant and equipment would be in good working order to prevent excess noise generation.	Contractor	Construction	N/A
Noise and vibration	Noise impacts are to be minimised in accordance with Roads and Maritime <i>Construction Noise and Vibration Guideline 2016</i> .	Contractor	Construction	N/A

6.6 Aboriginal cultural heritage

6.6.1 Methodology

Potential impact to Aboriginal heritage was assessed in accordance with *Procedure for Aboriginal cultural heritage consultation and investigation* (Transport 2011) (PACHCI).

6.6.2 Existing environment

The Aboriginal Heritage Information Management System (AHIMS) was searched on 7 November 2023 and the results for each ferry crossing are:

- Wisemans Ferry – no registered sites in the vicinity
- Webbs Creek – AHIMS site 45-2-0156 is registered as being located in the Hawkesbury River
- Sackville Ferry - no registered sites in the vicinity.

Site 45-2-0156 is an open site consisting of grinding grooves and art (pigment or engraved). The site was recorded in 1983 and the site card describes the location of the site as being at a rock platform near Longreach Ridge. However, incorrect GPS coordinates locates the site in the Hawkesbury River. Longreach lookout is located about 1.3 kilometres south of Webbs Creek Ferry (Figure 6-18).

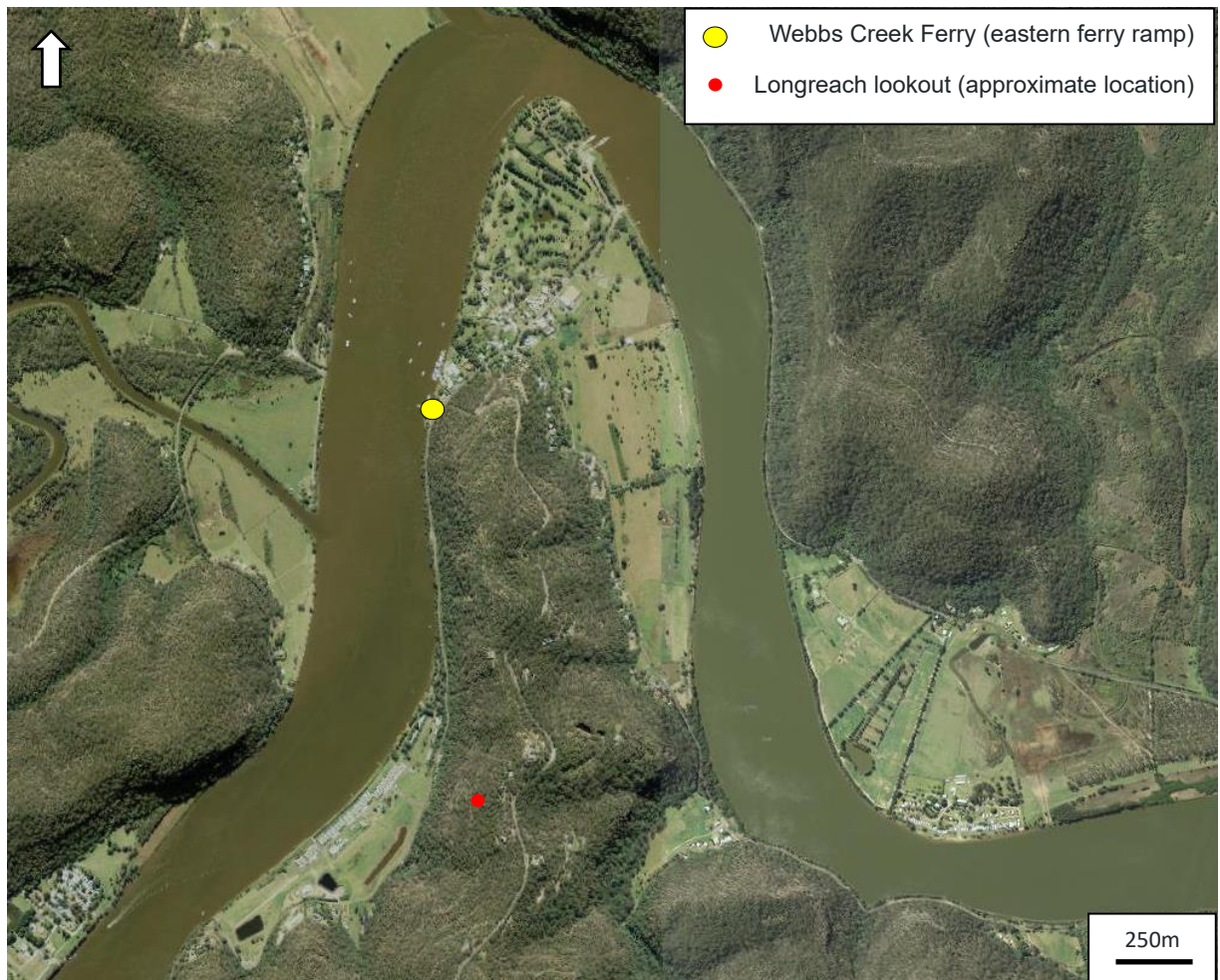


Figure 6-18: Approximate location of Longreach Lookout (source: Six Maps)

6.6.3 Potential impacts

Construction

A PACHCI Stage 1 was complete and concluded that the proposal would be unlikely to have an impact on Aboriginal cultural heritage (Appendix D). The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's Due diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Operation

There would be no expected impacts to Aboriginal heritage.

6.6.4 Safeguards and management measures

Table 6-27: Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	- The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport 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 will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	N/A

6.7 Non-Aboriginal heritage

6.7.1 Methodology

Heritage databases were searched for heritage items in the vicinity of the ferry crossings, including:

- Transport (including legacy Roads and Maritime) section 170 register.
- NSW Heritage database.
- Commonwealth Heritage List, established under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Australian Heritage Places Inventory.
- The Hills LEP heritage items
- Hornsby Shire LEP heritage items
- Hawkesbury Shire LEP heritage items.

6.7.2 Existing environment

There are several heritage items around the ferries. Table 6-28, Table 6-29 and Table 6-30 provide details of the heritage items at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry respectively.

Table 6-28: Non-Aboriginal items – Wisemans Ferry

Item	Listings	Description	Distance from the proposal
Cable Ferry Crossing, Wisemans Ferry	Roads and Maritime section 170 register Hornsby LEP The Hills LEP	The item has high significance because the ferry service has remained in-situ and in use since 1829, making it the oldest ferry service in NSW still in operation. The ferry was on the direct route of the Great North Road to Newcastle for much of the nineteenth and early twentieth century. This was a road of major importance during this period, and the Wisemans Ferry crossing was an important link in it, facilitating the economic development of the colony (and later the State), as well as being an important migration route.	The proposal is within the curtilage of this item (Figure 6-19).

		Significant elements of the ferry crossing include the eastern and western approach ramps and the cable anchors. The approaches have a high degree of original fabric present. However, the existing ramps were constructed in 1978. Ramps were covered over by ramp upgrade 2018 with original fabric left intact underneath.	
Old Northern Road, Dural to Wisemans Ferry – archaeological site	The Hills LEP	No information available.	The proposal is within the curtilage of this item (Figure 6-19).

Table 6-29: Non-Aboriginal items – Webb's Creek Ferry

Item	Listings	Description	Distance from the proposal
Cable Ferry, Webb's Creek Ferry	The Hills LEP	No information available.	The proposal is beside the curtilage of this item (Figure 6-20).
House	The Hills LEP	No information available.	About 110 metres north of the ferry (Figure 6-20).
Old Northern Road, Dural to Wisemans Ferry – archaeological site	The Hills LEP	No information available.	About 110 metres east of the ferry (Figure 6-20).
Convict Road Station	The Hills LEP	No information available.	About 110 metres east of the ferry (Figure 6-20).
Road, stone wall, bridge, escarpment and drain	Hornsby LEP	Historic road constructed by convicts down escarpment to Hawkesbury River formerly known as 'The Great North Road'. Stone embankments and cutting still in evidence. Line of road said to follow former Aboriginal track.	About 140 metres east of the ferry (Figure 6-20).
St Mary Magdalene Anglican Church	The Hills LEP	No information available.	About 230 metres north east of the ferry (Figure 6-20).
Police Station & Residence	The Hills LEP	No information available.	About 275 metres north east of the ferry (Figure 6-20).

Table 6-30: Non-Aboriginal items – Sackville Ferry

Item	Listings	Description	Distance from the proposal
Cable Ferry	The Hills LEP	The ferry began operating in the early 1870s and was privately owned. Around this time more settlers were establishing farms on the northern side of the Hawkesbury and stock and fruit and vegetable produce would have been transported on the ferry in the process of shipping it to the Sydney markets. The listing does not identify significant elements of the ferry.	The curtilage is not clearly defined (Figure 6-21).

Residence and barn	Hawkesbury LEP	This site includes a tall slab barn, characteristic of the Hawkesbury district. The house is a very good example of a substantial Inter-war bungalow featuring contrasting brick and render work, broad gables and leadlight windows.	About 15 metres south west of the ferry (Figure 6-21).
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Figure 6-19: Non-Aboriginal heritage items - Wisemans Ferry



Figure 6-20: Non-Aboriginal heritage items – Webbs Creek Ferry



Figure 6-21: Non-Aboriginal heritage items – Sackville Ferry

6.7.3 Potential impacts

Construction

The proposed work is within the curtilage of the Cable Ferry Crossing Wisemans Ferry and The Old Northern Road Dural to Wisemans Ferry.

The proposed works would not impact the significant elements of the item. The continued operation of the ferry is important to its heritage value and the proposal would contribute to its ongoing operation.

There is little information about The Old Northern Road Dural to Wisemans Ferry heritage item. However, the significance of this item is likely to be relate to the route that road takes rather than the physical road. Work within the curtilage would include construction of one anchor block. This area is disturbed and the new anchor block is not expected to impact the significance of the heritage item.

There is little information available about the significance of the Cable Ferry, Webbs Creek item. However, the continued operation of the ferry is likely to be important to its heritage value. There would be no work in the curtilage and minimal around the physical elements of the ferry. Construction of the anchor block at Webbs Creek would be outside the curtilage of the Cable Ferry and there would be no impact to heritage at this location.

Other heritage items are more than 100 metres from Webbs Creek Ferry and impact to these items is not anticipated.

The curtilage of the Cable Ferry, Sackville item is not well defined and the listing does not identify significant elements of the ferry. Again, it is likely that the continued operation of the ferry is important to its heritage significance. The works at the ferry are minor. Construction of the anchor block would not impact the physical elements of the ferry and there would be no impact to heritage at this location.

The proposed work is located close to the Residence and barn heritage item. The significant elements of the item are the of the item are more than 100 metres from the proposal and impact to these items is not anticipated.

Operation

A key heritage feature of the ferries is their continued operation. The proposal would have a positive effect on the operation of the three ferries by providing secure mooring and improved maintenance facilities.

6.7.4 Safeguards and management measures

Table 6-31: Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	- The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. - Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	N/A
Non-Aboriginal heritage	All construction personnel will be informed of the heritage significance of the ferry crossings during the site induction.	Contractor	Pre-construction and construction	N/A

6.8 Landscape character and visual impacts

6.8.1 Methodology

The landscape character impact visual impact of the proposal was assessed in accordance with Transport’s *Guideline for landscape character and visual impact assessment*.

Landscape character assessment helps determine the overall impact of the proposal on an area’s character and sense of place (what people think and feel about a place and how society values it, whether or not they are physically present at it). Visual impact assessment helps define the day to day visual effects of the proposal on people’s views (what people see at a place, when they are there).

The impact is assessed based on the combination of the sensitivity of the existing area or view to change and the magnitude (scale, contrast, quality, distance) of the proposal on that area or view.

Sensitivity refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed nature of change.

Magnitude refers to the physical scale of the project, how distant it is and the contrast it presents to the existing condition.

The combination of sensitivity and magnitude will provide the rating of the landscape character impact for the proposal. The matrix in Figure 6-22 is used to provide an impact rating.

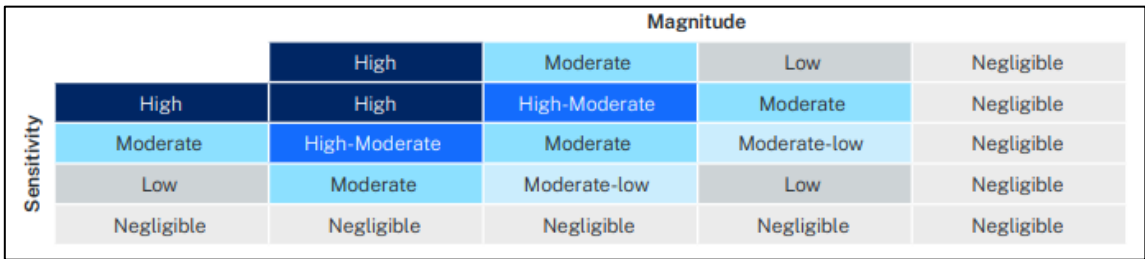


Figure 6-22: Landscape character and visual impact matrix

6.8.2 Existing environment

Landscape character

Wisemans Ferry is a scenic area. The area is identified on the SEPP (Biodiversity and Conservation) Riverine Scenic Map as having significance beyond the region. Visually significant features in the area are the Hawkesbury River, Dharug National on the northern side of the river and ridge line with The Northern Road on the southern side of Wisemans Ferry township. The area contains large areas of native vegetation. The area along the river at Wisemans Ferry is mainly parkland. The Dharug National Park contains 16 kilometres of the convict-built Old Great North Road that once connected Sydney and Newcastle. Visitors can walk the first 1.6 kilometres section of the old road. The park offers views across the Hawkesbury River and the ferry crossing. There is an existing floating pontoon immediately north of the ferry ramps and a public boat ramp about 200 metres south of the ferry crossing.

The area around Webbs Creek is also scenic with high, vegetation covered land on both the eastern and western banks of the river. Lookouts from The Northern Road on the ridgeline above the ferry provide views down to the ferry crossing. Able Hawkesbury River Houseboats has a large floating pontoon with houseboats moored about 100 metres north of the ferry crossing.

The banks of the Hawkesbury River around Sackville Ferry contain agricultural land. The river turns 90 degrees immediately south of the ferry crossing. There are large cliffs on the turn, contributing significantly to the scenic value of the area.

Viewpoints

The proposal would be visible from a range of locations. Representative viewpoints at each ferry are provided in Table 6-32.

Table 6-32: Representative viewpoints of the proposal

Ferry	Viewpoint		Description
Wisemans Ferry	WF1	View north from the southern ferry approach	Direct line of sight to the proposed mooring piles
	WF2	View south from the northern ferry approach	Distant view of the proposed mooring piles
	WF3	View south from the ferry	Direct line of sight to the proposed mooring piles as the ferry approaches the southern ferry ramp
	WF4	Views south from Dharug National Park	Distant view of the proposed mooring piles
Webbs Creek Ferry	WCF1	View west from the eastern ferry approach	Direct line of sight to some of the proposed mooring piles
	WCF2	View east from the western ferry approach	Distant view of the proposed mooring piles
	WCF3	View east from the ferry	Direct line of sight to the proposed mooring piles as the ferry approaches the eastern ferry ramp
	WCF4	Views west from lookout on The Northern Road	Distant view of the proposed mooring piles
Sackville Ferry	SF1	View north from the southern ferry approach	Direct line of sight to some of the proposed mooring piles
	SF2	View south from the northern ferry approach	Distant view of the proposed mooring piles
	SF3	View south from the ferry	Direct line of sight to the proposed mooring piles as the ferry approaches the southern ferry ramp
	SF4	Views north east from properties on the high ground south of the ferry	Distant view of the proposed mooring piles

6.8.3 Potential impacts

Construction

During construction, the barge with plant and equipment on board would be moored at each of the ferry locations. In addition there would be a compound site at Wisemans Ferry and a laydown area at Sackville Ferry. Construction would be temporary, taking about one month at each ferry location. The work is not expected to substantially change the character of the area or have an impact on views in the area due to the relatively small scale and the short duration of the proposed work. There would be temporary impacts to views of the ferry during construction.

Operation

During operation the mooring piles and floating pontoon would be in place. Changes as a result of the proposal are provided in Table 6-33. The potential impact on landscape character at each ferry location is assessed in Table 6-34. At each ferry the impact on landscape character was assessed to be negligible.

Table 6-33: Changes at each ferry

Ferry	Existing mooring piles	Proposed mooring piles/infrastructure
Wisemans Ferry	11 timber piles (6.5 m AHD)	12 steel piles, 8.5 metres AHD - Floating pontoon with four piles
Webbs Creek Ferry	Two timber piles (7 m AHD)	Seven steel piles, 8.5 metres AHD
Sackville Ferry	- One timber pile (4 m AHD) - Three steel piles (to be retained)	- HDPE sleeve on the piles to be retained - Four steel piles, 14.5 metres AHD

Table 6-34: Landscape character assessment

Ferry	Assessment of impact	Sensitivity	Magnitude	Impact
Wisemans Ferry	The proposed higher steel mooring piles are similar to the current pile arrangement and consistent with an operating ferry. The pontoon would be similar to the pontoon to the north of the ferry and is consistent with boat access on this section of the river. The proposal is not expected to impact the landscape character of the area.	High	Negligible	Negligible
Webbs Creek Ferry	The proposal would result in additional mooring piles at the ferry crossing. However, this is considered consistent with an operating ferry and is consistent with boat mooring facilities on this section of the river. The proposal is not expected to impact the landscape character of the area.	High	Negligible	Negligible
Sackville Ferry	The proposal would result in additional mooring piles at the ferry crossing. However, this is considered consistent with an operating ferry. The proposal is not expected to impact the landscape character of the area.	High	Negligible	Negligible

Viewpoints are assessed in Table 6-35. Impacts to viewpoints are acceptable with impacts ranging from negligible to moderate-low.

Table 6-35: Viewpoints assessment

Ferry	Viewpoint	Description of impact	Sensitivity	Magnitude	Impact
Wisemans Ferry	WF1	Ferry users approaching the ferry and pedestrians around the café would have views of the piles. The new piles would be about two metres taller than the existing piles. The pontoon would only be partially visible due to the flat ground around the ferry. The current view is of the existing ferry and mooring piles. The sensitivity is moderate and the magnitude low.	Moderate	Low	Moderate-low
	WF2	Ferry users would have distant views of the mooring piles. The pontoon would not be visible from the far side of the river. The sensitivity is moderate due to the sensitivity of the area. The magnitude is negligible as the proposal would not be clearly visible from the viewpoint.	Moderate	Negligible	Negligible
	WF3	The piles would come into view as the ferry approaches the southern ramp. However, most ferry users would be in their vehicles and the piles and pontoon may not be clearly visible. The sensitivity is moderate and the magnitude is low.	Moderate	Low	Moderate-low
	WF4	Lookouts from Dharug National Park would have distant views of the piles and pontoon. The proposal is unlikely to be clearly visible. The sensitivity is high. However, the magnitude is negligible.	High	Negligible	Negligible
Webbs Creek Ferry	WCF1	Ferry users approaching the ferry have views of some of the piles. The new piles would be about 1.5 metres taller than the two existing piles. This area tends to be used only by ferry users. The sensitivity is low and the magnitude low.	Low	Low	Low
	WCF2	Ferry users would have distant views of the mooring piles. The sensitivity is moderate due to views of the high ground behind the ferry crossing. The magnitude is negligible as the proposal would not be clearly visible from the viewpoint.	Moderate	Negligible	Negligible
	WCF3	The piles would come into view as the ferry approaches the southern ramp. However, most ferry users would be in their vehicles and the piles. The sensitivity is moderate and the magnitude is low.	Moderate	Low	Moderate-low
	WCF4	Lookouts from The Northern Road may have distant views of the piles. The proposal is unlikely to be clearly visible. The sensitivity is high. However, the magnitude is negligible.	High	Negligible	Negligible

Ferry	Viewpoint	Description of impact	Sensitivity	Magnitude	Impact
Sackville Ferry	SF1	Ferry users approaching the ferry have views of some of the existing piles. The new piles would be substantially taller than the single timber pile (four metres). However, there are three existing piles of similar height to the proposed piles. The sensitivity is low and the magnitude low.	Low	Low	Low
	SF2	Ferry users would have distant views of the mooring piles. The sensitivity is moderate due to views of the high ground south of the ferry crossing. The magnitude is negligible as the proposal would not be clearly visible from the viewpoint.	Moderate	Negligible	Negligible
	SF3	The piles would come into view as the ferry approaches the southern ramp. However, most ferry users would be in their vehicles and the piles. The sensitivity is moderate and the magnitude is low.	Moderate	Low	Moderate-low
	SF4	Properties on high ground south of the ferry, including the Cooks Shed venue, would have distant views of the piles. The proposal is unlikely to be clearly visible. The sensitivity is high. However, the magnitude is negligible.	High	Negligible	Negligible

6.8.4 Safeguards and management measures

Table 6-36: Landscape character and visual safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	The compound and laydown areas would be restored to pre-existing condition following completion of work.	Contractor	Post-construction	N/A

6.9 Socio-economic

6.9.1 Existing environment

The population around each of the ferries is small (Table 6-37). However, the ferries service the wider community as shown by the number of vehicles using the ferries on a daily basis (Table 6-18).

Table 6-37: Population data (source: ABS census 2021)

Suburb	People
Wisemans Ferry	233
Webbs Creek	55
Sackville (including Sackville North)	618

The ferries are key transport connections across the Hawkesbury River and are vital to communities on both sides of the river. The ferries are important economically providing key transport links for:

- Commuters during peak periods
- Commercial and business vehicles
- Tourists.

Construction is the main industry in the area (economy.id.com). This industry relies on the transport network for movement of workers, deliveries of plant and materials.

Businesses in the around the proposal include:

Wisemans Ferry

- Café beside the ferry approach
- Wisemans Ferry township is located around 550m south of the ferry crossing. A number of businesses would depend on the continued operation of the ferry including cafes, accommodation and other services.

Webbs Creek Ferry

- Able Hawkesbury River Houseboats and Hawkesbury Cruiser Hire around 100m north of the work.

Sackville Ferry

- Cooks Shed – restaurant and venue located about 300 metres southern west of the proposal
- Tractor 828 – restaurant, petrol station and grocery store located around 700m south of the proposal site
- Sackville Ski Gardens – camping and accommodation located 520m north east of the proposal
- Brewongle Environmental Education Centre – educational centre for school students located around 2.5km north east of the proposal.

6.9.2 Potential impacts

Construction

The impacts to local businesses at Wisemans Ferry is expected to be no more than minor during construction work. This is due to one ferry remaining operational at all times during the work and the distance from sensitive receivers. Community impacts are not expected as the transport link would be maintained throughout the proposed work.

The temporary closure of the Webbs Creek Ferry is not expected to impact businesses that depend on passing trade. Able Hawkesbury River Houseboats and Hawkesbury Cruiser Hire is a destination type business and advance notice of the closure would allow the business to notify customers. There would be some impact on the community. However, the ferry would only be closed between 10am and 3pm each day. This would allow the community to schedule planned trips to minimise the impact of the closure.

The temporary closure of Sackville Ferry may impact passing trade at the Tractor 828 restaurant and petrol station. Other businesses in the area are destination type business and are not expected to be substantially impacted by the temporary ferry closures. However, notification of the proposal is required to ensure businesses such as the Cooks shed venue are not impacted by the ferry closure. Again, there would be a community impact due to the closure. The closure would also be from 10am to 3pm each day, minimising the impact on the community.

The short-term ferry closures are not expected to have a long-term impact on the cohesiveness of the community or on the economy of the area.

Operation

As discussed in Section 6.4, the ferry crossings are key transport crossings of the Hawkesbury River. The proposal would provide secure mooring facilities at each ferry and improve access for maintenance at Wisemans Ferry. This would facilitate the long-term operation of the ferries, maintaining the key transport links. This would have a positive impact on the community and local businesses.

6.9.3 Safeguards and management measures

Table 6-38: Socio economic safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): - mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions - contact name and number for complaints. The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA 2008).	Contractor	Pre-construction/ construction	N/A
Socio-economic	Potentially impacted businesses would be notified at least 5 business days prior to the start of work.	Contractor	Pre-construction	N/A
Socio-economic	Signs would be erected at each of the ferry crossings to notify ferry users of the changed conditions during the work. The signs would be in place at least 5 business days prior to the start of work.	Contractor	Pre-construction	N/A

Other safeguards and management measures to address socio-economic impacts are identified in section 6.4.

6.10 Other impacts

6.10.1 Existing environment and potential impacts

Table 6-39: Other potential impacts

Environmental factor	Existing environment	Potential impacts
Waste and resource use	Currently there are timber piles at all three ferry crossing. These would be removed and disposed of as part of the proposed work.	The proposal would generate the following waste types: • Timber piles • Sediment • Concrete waste • Green waste • General waste. All waste would be classified prior to offsite disposal. The quantities of waste are not expected to be substantial and impacts associated with disposal of waste are not expected. Sediment attached to plant or timber piles would be classed as acid sulfate soil and must be contained in impervious containers and disposed of at a suitably licensed waste facility.
Air quality	Sections 6.5 and 6.9 provide details on the sensitive receivers around the three ferry crossings.	The potential for air quality impacts is low. The area of ground disturbance is about 20 square metres and the potential for dust generation is very low. There would be emissions from plant. However, given the distance from sensitive receivers any impact would be minor.
Property and land use	The proposal areas are three existing, operating vehicular ferries. There are existing mooring piles at all locations. The proposed pontoon at Wisemans Ferry is located beside the ferry and access would be from an area currently used for ferry operations. The proposal would be located on land managed by Transport.	The proposal is consistent with the current land use in the area and there would be no impact to property.
Hazards and risk management	The proposed work would involve work in the Hawkesbury River, a sensitive environment.	Impact to the waterway from sedimentation or fuel spills could result in material harm to the environment and could be a pollution incident under the POEO Act. A Hazard and Risk Management Plan would be prepared to mitigate this risk.

6.10.2 Safeguards and management measures

Table 6-40: Other impacts Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:	Contractor	Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Reference
	- measures to avoid and minimise waste associated with the project - classification of wastes and management options (re-use, recycle, stockpile, disposal) - statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions - procedures for storage, transport and disposal - monitoring, record keeping and reporting. The WMP will align with the <i>Environmental Procedure - Management of Wastes on Transport for NSW Land</i> (Transport 2014b) and relevant Transport Waste fact sheets.			
Waste	Resource management hierarchy principles are to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) - Disposal is carried out as a last resort (In accordance with the Waste Avoidance & Resource Recovery Act 2001).	Contractor	Construction	N/A
Waste	All waste will be classified in accordance with NSW EPA Waste Classification Guidelines 2014.	Contractor	Construction	N/A
Waste	All waste removed from the site would be immediately place within appropriate containers and disposed offsite an appropriately licensed waste facility.	Contractor	Construction	N/A
Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	N/A
Air quality	Dust generating works are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction	N/A
Air quality	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction	N/A
Air quality	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.	Contractor	Construction	N/A
Air quality	Vegetation or other materials will not be burnt onsite.	Contractor	Construction	N/A
Hazards and risk management	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: - details of hazards and risks associated with the activity - measures to be implemented during construction to minimise these risks - record keeping for materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials	Contractor	Pre-construction	N/A

Impact	Environmental safeguards	Responsibility	Timing	Reference
	- a monitoring program to assess performance in managing identified risks - contingency measures to be implemented in the event of unexpected hazards, risks arising and emergency situations. The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or OEH publications.			

6.11 Cumulative impacts

6.11.1 Study area

The cumulative impact assessment considered activities in the following suburbs:

- Wisemans Ferry
- Webbs Creek
- Sackville.

The development application tracker for The Hills Shire Council, Hornsby Shire Council and Hawkesbury Shire Council was searched for development that may have a cumulative impact with the proposal.

6.11.2 Other projects and developments

There are no current development applications for activities in the vicinity of the ferries that may have a cumulative impact with the proposed work. Transport is planning to carry out dredging work at Wisemans Ferry. This would not occur during the proposal.

Table 6-41: Past, present and future projects

Project	Construction impacts	Operational impacts
Dredging work at Wisemans Ferry southern ramp.	The proposed dredging work would result in sedimentation of the river.	No operational impacts.
Work at St Albans Bridge, St Albans	Potential traffic impact if ferry closures occur when there are traffic restrictions associated with the work at St Albans Bridge.	

6.11.3 Potential impacts

Table 6-42: Potential cumulative impacts

Environmental factor	Construction impacts	Operational impacts
Water quality	The proposal and proposed dredging work would not occur at the same time. Sedimentation in the river would be managed using a silt curtain for the proposal and for the dredging work. A cumulative impact is not anticipated.	No operational impact.

6.11.4 Safeguards and management measures

No safeguards required.

7. Environmental management

This chapter describes how the proposal will be managed to reduce potential environmental impacts during detailed design, construction and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are listed.

7.1 Environmental management plans (or system)

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment and Sustainability Officer, Sydney Region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The 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 G40 - Clearing and Grubbing*, *QA Specification G10 - Traffic Management*.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will 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 will minimise any potential adverse impacts arising from the proposed works 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	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Senior Manager Environment and Sustainability prior to commencement of the activity. As a minimum, the CEMP will address the following: - 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. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / Transport for NSW project manager	Pre-construction / detailed design	
B1	Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects</i> (RMS, 2011) and implemented as part of the CEMP. It will include, but not be limited to: - 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> (RMS 2008) - pre-clearing survey requirements - procedures for unexpected threatened species finds and fauna handling - procedures addressing relevant matters specified in the DPI <i>Policy and guidelines for fish habitat conservation and management</i> (2013) - protocols to manage weeds and pathogens	Contractor	Detailed design / pre-construction	Section 4.8 of QA G36 Environment Protection

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No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B2	Biodiversity	Pre-clearing surveys will be undertaken in accordance with <i>Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).			
B3	Biodiversity	Native vegetation will be re-established in accordance with <i>Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
B4	Biodiversity	The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened ecological communities or threatened fauna, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction	N/A
B5	Biodiversity	Threatened fauna habitat removal and mangrove removal will be minimised by adjusting the location of the pontoon walkway.	Contractor/ Transport	Pre-construction	N/A
B6	Biodiversity	Fauna will be managed in accordance with Guide 9: Fauna handling of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
B7	Biodiversity	Habitat removal will be undertaken in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
B8	Biodiversity	Habitat will be replaced or re-instated in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> and <i>Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
B9	Biodiversity	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI (Fisheries NSW) 2013).	Contractor	Construction	N/A
B10	Biodiversity	DPI Fisheries (1800 043 536) and the Environment Protection Authority (EPA) (131 555) are to be notified immediately if any fish kills occur in the vicinity of the works. In this situation, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed.	Contractor	Construction	N/A
B11	Biodiversity	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
B12	Biodiversity	Weed species will be managed in accordance with <i>Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A
B13	Biodiversity	Pathogens will be managed in accordance with <i>Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Contractor	Construction	N/A

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No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B14	Biodiversity	Vegetation removal to facilitate the transfer of mooring piles between the river bank and the barge is not permitted.	Contractor	Construction	N/A
B15	Biodiversity	On completion of the works all disturbed soil is to be levelled, smoothed and sown with a mixture of sterile/native grass seeds to encourage rapid revegetation and planted out with native endemic riparian vegetation.	Contractor	Construction	N/A
F1	Flooding	Prepare a Flood Plan that includes procedures to • Monitor weather forecast • Removing all plant, equipment and materials from flood zone.	Contractor	Construction	N/A
F2	Flooding	Program work to ensure that work can be carried out during favourable weather and tides. Work must be completed in advance of unfavourable tides or heavy rain or postponed until after the event.	Contractor	Construction	N/A
F3	Flooding	Where high flows in the river are predicted all work will stop in advance, the silt curtains will be removed, disturbed areas stabilised and equipment and materials removed from site.	Contractor	Construction	N/A
SW1	Surface water	Procedures to ensure adherence to ANZECC water quality guidelines are to be detailed in the CEMP.	Contractor	Detailed design / Pre-construction	N/A
SW2	Surface water	Install a silt curtain with boom before the start of work. The curtain will be installed around all works that may result in silt/material becoming suspended during the works. The silt curtain must extend a minimum of 100 millimetres above the waterline and reach the river bed.	Contractor	Construction	N/A
SW3	Surface water	Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient erosion and sediment controls.	Contractor	Construction	N/A
SW4	Surface water	The silt curtain must not be moved until turbidity within the silt curtain is equal to or less than turbidity in the river.	Contractor	Construction	N/A
SW5	Surface water	Any sediment that sticks to the timber piles is to be transferred directly to impervious skip bins for offsite disposal.	Contractor	Construction	N/A
SW6	Surface water	An emergency marine spill kit is to be kept on site at all times and maintained throughout the work. The spill kit must be appropriately sized for the volume of substances at the work site.	Contractor	Construction	N/A
SW7	Surface water	All workers will be advised of the location of the spill kit and trained in its use.	Contractor	Construction	N/A
SW8	Surface water	All machinery and equipment would be maintained in good working order and regularly visually inspected for leaks.	Contractor	Construction	N/A
SW9	Surface water	Chemicals or fuels will not be stored on the barge.	Contractor	Construction	N/A
SW10	Surface water	Water quality control measures are to be used to minimise materials (eg sediment etc) entering the river.	Contractor	Construction	N/A

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No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW11	Surface water	Refueling of plant and equipment is to occur offsite.	Contractor	Construction	N/A
SW12	Accidental spill	A site-specific emergency spill plan will be developed and include spill-management measures in accordance with the Transport <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 Transport EPA officers).	Contractor	Detailed design / Pre-construction	Section 4.3 of QA G36 <i>Environment Protection</i>
S1	Soil	Site-specific Erosion and Sediment Control Plans will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The Plans 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.	Contractor	Detailed design / pre-construction	Section 2.2 of QA G38 <i>Soil and Water Management</i>
S2	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 Transport for NSW Senior Manager Environment and Sustainability.	Contractor	Detailed design / Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>
S3	Acid sulfate soil	All excavation work will be managed in accordance with the Roads and Maritime <i>Guidelines for the Management of Acid Sulfate Materials</i> .	Contractor	Construction	N/A
S4	Soil	Erosion and sediment mitigation devices are to be erected in a manner consistent with current Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal.	Contractor	Construction	N/A
S5	Soil	Erosion and sediment control measures are not to be removed until the work is complete.	Contractor	Construction	N/A
S6	Soil	Visual observations of the effectiveness of the erosion and sediment controls are required to be made regularly during the work.	Contractor	Construction	N/A
S7	Soil	Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate erosion and sediment control devices.	Contractor	Construction	N/A
S8	Soil	Only clean rock (no fines) is to be used during these works.	Contractor	Construction	N/A
T1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and QA <i>Specification G10 Control of Traffic</i> (Transport for NSW, 2008). The TMP will include: confirmation of haulage routes	Contractor	Detailed design / Pre-construction	Section 2.5 of QA G10 <i>Control of Traffic</i>

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No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• details of detours • 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 • 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 that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms.			
T2	Traffic and transport	Consult with internal Transport for NSW stakeholders to ensure that no other work will be carried out on the detour during the closure of the ferry.	Contractor	Pre-construction	N/A
T3	Traffic and transport	Ensure that Lower Portland Ferry will be open during the closure of Sackville Ferry.	Contractor	Pre-construction	N/A
T4	Traffic and transport	Consult with the contractor for the St Albans Bridge works to ensure that the works at Webbs Creek Ferry do not occur at the same time as any traffic restrictions are in place at St Albans Bridge.	Contractor	Pre-construction	N/A
T5	Traffic and transport	Consult with The Hills Shire Council, Hornsby Shire Council and Hawkesbury Shire Council about any potential impact to council services during the detour.	Contractor	Pre-construction	N/A
T6	Traffic and transport	Consult with Busways about potential impact to school bus services.	Contractor	Pre-construction	N/A
T7	Traffic and transport	Notify emergency services of the ferry closures.	Contractor	Pre-construction	N/A
T8	Traffic and transport	Notify road users of changed ferry operations using variable message signs (VMS). The signs must be in place at least seven days prior to the start of work.			
N1	Noise and vibration	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 <i>the Interim Construction Noise Guideline (ICNG)</i> (DECC, 2009) and identify: • all potential significant noise and vibration generating activities associated with the activity • feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (Transport 2014a). • a monitoring program to assess performance against relevant noise and vibration criteria	Contractor	Pre-construction	N/A

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No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		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.			
N2	Noise and vibration	All sensitive receivers (e.g., schools and local residents) likely to be affected will be notified at least five business days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: - the project - the construction period and construction hours - contact information for project management staff - complaint and incident reporting how to obtain further information.	Contractor	Pre-construction	N/A
N3	Noise and vibration	Works to be carried out during standard hours Monday to Friday. Any work that is performed outside normal work hours or on weekends or public holidays must have measures in place to minimise noise impacts.	Contractor	Construction	N/A
N4	Noise and vibration	All construction personnel would be notified of the location of sensitive receivers, and the need to minimise noise from the work, during the site induction.	Contractor	Construction	N/A
N5	Noise and vibration	No dropping of materials from height or throwing of metal items.	Contractor	Construction	N/A
N6	Noise and vibration	No swearing or unnecessary shouting or loud stereos/radios on site.	Contractor	Construction	N/A
N7	Noise and vibration	Plant used intermittently to be throttled down or shut down.	Contractor	Construction	N/A
N8	Noise and vibration	Plant and equipment would be in good working order to prevent excess noise generation.	Contractor	Construction	N/A
N9	Noise and vibration	Noise impacts are to be minimised in accordance with Roads and Maritime <i>Construction Noise and Vibration Guideline 2016</i> .	Contractor	Construction	N/A
AH1	Aboriginal heritage	- The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport 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 will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Construction	N/A
H1	Non-Aboriginal heritage	The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Transport for NSW, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered.	Contractor	Construction	N/A

Transport for NSW

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Work will only re-commence once the requirements of that Procedure have been satisfied.			
H2	Non-Aboriginal heritage	All construction personnel will be informed of the heritage significance of the ferry crossings during the site induction.	Contractor	Pre-construction and construction	N/A
LV1	Landscape character and visual impact	The compound and laydown areas would be restored to pre-existing condition following completion of work.	Contractor	Post-construction	N/A
SE1	Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): - mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions - contact name and number for complaints. The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).	Contractor	Pre-construction/ construction	N/A
SE2	Socio-economic	Potentially impacted businesses would be notified at least 5 business days prior to the start of work.	Contractor	Pre-construction	N/A
SE3	Socio-economic	Signs would be erected at each of the ferry crossings to notify ferry users of the changed conditions during the work. The signs would be in place at least 5 business days prior to the start of work.	Contractor	Pre-construction	N/A
W1	Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: - measures to avoid and minimise waste associated with the project - classification of wastes and management options (re-use, recycle, stockpile, disposal) - statutory approvals required for managing on- and off-site waste, or application of any relevant resource recovery exemptions - procedures for storage, transport and disposal - monitoring, record keeping and reporting. The WMP will align with the <i>Environmental Procedure - Management of Wastes on Transport for NSW Land</i> (Transport 2014b) and relevant Transport Waste fact sheets.	Contractor	Pre-construction	Section 4.2 of QA G36 <i>Environment Protection</i>
W2	Waste	Resource management hierarchy principles are to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) - Disposal is carried out as a last resort (In accordance with the Waste Avoidance & Resource Recovery Act 2001).	Contractor	Construction	N/A
W3	Waste	All waste will be classified in accordance with NSW EPA Waste Classification Guidelines 2014.	Contractor	Construction	N/A

Transport for NSW

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
W4	Waste	All waste removed from the site would be immediately place within appropriate containers and disposed offsite an appropriately licensed waste facility.	Contractor	Construction	N/A
W5	Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	N/A
AQ1	Air quality	Dust generating works are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction	N/A
AQ2	Air quality	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction	N/A
AQ3	Air quality	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.	Contractor	Construction	N/A
AQ4	Air quality	Vegetation or other materials will not be burnt onsite.	Contractor	Construction	N/A
HR1	Hazards and risk management	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: • details of hazards and risks associated with the activity • measures to be implemented during construction to minimise these risks • record keeping for 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 identified risks • contingency measures to be implemented in the event of unexpected hazards, risks arising and emergency situations. The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or OEH publications.	Contractor	Pre-construction	Section 3 of QA G36 Environment Protection

7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Fisheries Management Act 1994</i> (s199)	Notification to the Minister for Lands and Water prior to any dredging or reclamation works.	A minimum of 28 days prior to the start of work.
<i>Crown Land Management Act 2016</i> (Division 3.4, 5.5 and 5.6)	Lease or licence to occupy areas of Crown land.	Prior to start of the activity.

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

8.1.1 Social factors

The proposal would require temporary closure of Webbs Creek Ferry and Sackville Ferry. This would potentially impact the community. Substantial detours at both ferries would be required. However, the proposal would ensure the long-term operation of the ferry by providing secure mooring facilities for the ferries and improving maintenance facilities.

8.1.2 Biophysical factors

The proposal would require removal of native vegetation. However, clearing would not be significant.

8.1.3 Economic factors

There is some potential to impact businesses around the ferries through noise and ferry closures at Webbs Creek and Sackville Ferries. However, overall the impact is expected to be minor as the ferries would be closed between 10am and 3pm only and all potentially affected businesses would be notified in advance of the work.

8.1.4 Public interest

The ferries are key transport crossings of the Hawkesbury River. Their continued operation is important for the local and wider community. Ensuring that the ferries can be safely secured during floods is in the public interest.

8.2 Objects of the EP&A Act

Table 8-1: Objects of the Environmental Planning and Assessment Act 1979

Instrument	Requirement
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.	The proposal would benefit the economic and social welfare of the community by ensuring the ferries can be securely moored, minimising interruptions to service.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The ferry closure times at Webbs Creek and Sackville Ferries were chosen to avoid peak periods and minimise economic and social impacts. Potential environmental impacts, such as sedimentation of the river, and safeguards identified during the planning stage.
1.3(c) To promote the orderly and economic use and development of land.	The proposal is located at three existing ferries. Improving existing facilities is orderly and economic use of land.
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.	Clearing of native vegetation would be minimised and safeguards to minimise environmental impacts.

Instrument	Requirement
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The three ferries are heritage items. The continuing operation of the ferries is part of their heritage value.
1.3(g) To promote good design and amenity of the built environment.	The mooring pile design is sympathetic to the existing environment and would not result in visual impacts.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	The mooring piles and pontoon would improve access to the ferries for maintenance.
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 is relatively minor and involves upgrading infrastructure at existing facilities. In addition, maintenance of the ferries is key to maintaining transport links in the area. In this case, community participation in planning and assessment was not required.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during route options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures:

- Issues that may cause serious or irreversible environmental damage as a result of the proposed project and where there is scientific uncertainty as to the nature of the damage have been identified.
- The best-available technical information, environmental standards and measures have been used to minimise environmental risks.
- Specialist studies were incorporated to gain a detailed understanding of the existing environment.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The proposal would minimise the risk of damage to the ferries during large flood events and improve access for ferry maintenance. This would contribute to the continued, long-term operation of the ferries. This benefits future generations and minimises future maintenance costs associated to ferry damage during floods. The intergenerational equity principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures:

- Water quality, and hydrological measures were included into the design to ensure that the impacts on the distribution of flora, fauna and ecological communities within sensitive ecological areas are minimised both for the short and long term.
- Benefits that the project provides to current and future generations of local communities and the surrounding region, that would maintain or enhance the health, diversity and productivity of the environment, were identified.

Conservation of biological diversity and ecological integrity

The proposal was designed to minimise impacts to native vegetation, in particular mangroves. The proposal would not result in substantial harm to biological diversity or ecological integrity.

- Site selection criteria were established for construction-phase facilities to minimise native vegetation clearance.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things.

Minimising disruptions to ferry services and protecting the environment were considered during the planning phase of the proposal. The cost of maintaining the ferries operational during peak periods during the work and the cost of environmental measures were included in the overall cost of the proposal. Considerations during the planning phase included:

- Environmental issues were considered as key matters in the planning of the proposal.
- The value of the project to the community in terms of minimising disruptions to ferry services was considered.
- Mitigation measures for the avoidance, reuse, recycling and management of waste during construction and operation are to be implemented.

8.3 Conclusion

The proposed installation of mooring piles and Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry and floating pontoon at Wisemans Ferry 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 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 project objectives but would still result in some impacts on traffic, water quality, noise and biodiversity. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also provide secure mooring facilities for the ferries during large flood events and improve access for maintenance. 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 nor 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.

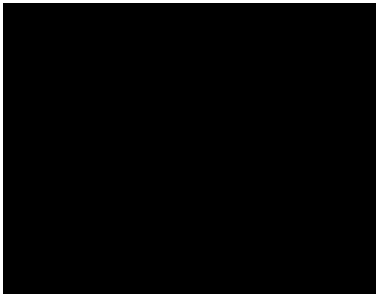
Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

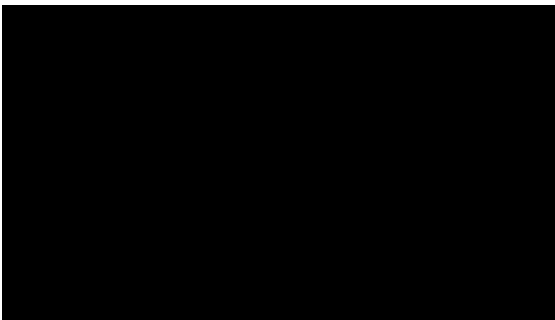
This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Name:
Position:
Company name:
Date:



I certify that I have reviewed and endorsed the contents of this REF and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading. I accept it on behalf of Transport for NSW.

Name:
Position:
Transport
region/program:
Date:



10. EP&A Regulation publication requirement

Table 10-1: EP&A Regulation publication requirement

Requirement	Yes/No
Does this REF need to be published under section 171(4) of the EP&A Regulation?	No

11. References

Biosis 2024, Biodiversity Assessment Report Flood Piles (Stage 2) at Wisemans, Sackville and Webbs Creek Ferries

EPA 2009, Interim Construction Noise Guideline, Sydney.

DPE 2022, Guidelines for Division 5.1 assessments, Sydney.

DPI 2013, Policy and guidelines for fish habitat conservation and management.

DUAP 1996, Roads and Related Facilities EIS Guideline.

INSW 2022, NSW State Infrastructure Strategy.

RMS 2017. Construction noise estimateor tool - https://www.transport.nsw.gov.au/system/files/media/documents/2023/EMF-NV-TT-0067_Construction-and-Maintenance-Noise-Estimator.xlsx.

RMS 2008, Landscape Guideline, Sydney.

RTA 2010, Traffic Control at Work Sites Manual.

RTA 2008, Community Involvement and Communications Resource Manual.

RTA 1999. Code of Practice for Water Management.

Transport 2015, Standard Management Procedure - Unexpected Heritage Items, Sydney.

Transport 2014a, Beyond the Pavement: urban design policy, process and principles, Sydney.

Transport 2014b, Environmental Procedure - Management of Wastes on Transport for NSW Land, Sydney.

Transport 2012, NSW Long Term Transport Master Plan, Sydney.

Transport 2011, Procedure for Aboriginal cultural heritage consultation and investigation, Sydney.

Transport 2008, QA Specification G10 Control of Traffic, Sydney.

Terms and acronyms used in this REF

Table 11-1: Terms and acronyms used in this REF

Term / Acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
CEMP	Construction environmental management plan
EIA	Environmental impact assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i> . Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i> . Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
Facultative GDE	GDEs that depend on both surface water and groundwater
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
GDE	Groundwater dependent ecosystem
Heritage Act	<i>Heritage Act 1977 (NSW)</i>
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers
MNES	Matters of national environmental significance under the <i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
NPW Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
OEH	Office of Environment and Heritage within the Department of Planning and Environment.
PEA Act	<i>Protection of the Environment Administration Act 1991</i> .
QA Specifications	Specifications developed by Transport for use with road work and bridge work contracts let by Transport.
RMS	NSW Roads and Maritime Services, now Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP (Biodiversity and Conservation)	State Environmental Planning Policy (Biodiversity and Conservation) 2021
SEPP (Planning Systems)	State Environmental Planning Policy (Planning Systems) 2021
SEPP (Precincts – Central River City)	State Environmental Planning Policy (Precincts – Central River City) 2021
SEPP (Precincts – Eastern Harbour City)	State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021
SEPP (Precincts – Regional)	State Environmental Planning Policy (Precincts – Regional) 2021
SEPP (Resilience and Hazards)	State Environmental Planning Policy (Resilience and Hazards) 2021

Term / Acronym	Description
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
Transport	Transport for NSW

Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in section 171 of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a Any environmental impact on a community? The proposal would require closure of Webbs Creek Ferry and Sackville Ferry between 10am and 3pm Monday to Friday during the proposed work. This would result in a substantial detour for ferry users of both ferries. Safeguards identified in section 7.2 would be implemented to minimise impact. Noise also has potential to impact receivers. This would be managed by implementing the safeguards identified in section 7.2.	Short-term, negative impact
b Any transformation of a locality? The proposal would be consistent with the current ferry operations and would not transform the localities.	Nil
c Any environmental impact on the ecosystems of the locality? The proposed work at Wisemans Ferry would impact a small area of native vegetation. This would not be a substantial impact and is not expected to impact the ecosystems of the locality.	Minor, negative impact
d Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would install additional mooring piles at the ferries and a floating pontoon at Wisemans Ferry. The proposed works are consistent with the existing ferries and would not reduce the aesthetic, recreational, scientific or other environmental quality or value of the localities.	Nil
e Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The ferries are heritage listed. The continuing operation of the ferries is part of their heritage value.	Nil
f Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)? The proposal would not impact protected fauna.	Nil
g Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would not endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air.	Nil
h Any long-term effects on the environment? The proposal would not result in long-term environmental impacts.	Nil
i Any degradation of the quality of the environment? The proposal would result in sedimentation of the Hawkesbury River. This would be contained using a silt curtain and by implementing the safeguards identified in section 7.2.	Minor, short-term impact
j Any risk to the safety of the environment? The proposal would not risk safety of the environment. While the work would involve work in the Hawkesbury River, it would not negatively affect flood patterns in the areas.	Nil
k Any reduction in the range of beneficial uses of the environment?	Positive, long-term impact

Factor	Impact
The proposal would improve mooring facilities at the ferry crossings. This would improve the use of the infrastructure at the ferry crossings.	
l Any pollution of the environment? The proposal would result in temporary sedimentation of the work area. This would be contained using a silt curtain. There would also be temporary noise impacts. These impact would be managed by implementing the safeguards identified in section 7.2.	Minor, short-term impact
m Any environmental problems associated with the disposal of waste? The volumes of waste would be relatively small and would not be an issue for disposal.	Nil
n Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not result in an increased demand for resources. Materials such as steel and concrete would not be required in large volumes.	Nil
o Any cumulative environmental effect with other existing or likely future activities? Cumulative impacts are not expected due to the relatively small scale of the proposal.	Nil
p Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal would install mooring piles in the Hawkesbury River. The piles are not expected to impact coastal processes or habitats.	Nil
q Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1, The Hills Shire Council Local Strategic Planning Statement looks at opportunities to connect to other areas of Greater Sydney. Maintaining the ferries across the Hawkesbury River is consistent with this objective. The Hornsby Shire Council Local Strategic Planning Statement supports the Convict Trail Project that aims to protect the historical route from Sydney to Newcastle. This route passes through Wisemans Ferry. The planning statement also recognizes the ferry's importance to the visitor economy. Maintaining the ferry is consistent with the objectives of the planning statement. Hawkesbury Shire Council Local Strategic Planning Statement identifies the need for connection to other areas of Greater Sydney. Maintaining the ferries across the Hawkesbury is consistent with this objective.	Positive, long-term impact
r Other relevant environmental factors.	In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 6 of this assessment.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Department of Climate Change, Energy, the Environment and Water .

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor		Impact
a	Any impact on a World Heritage property? The proposal would not impact on a World Heritage property.	Nil
b	Any impact on a National Heritage place? The proposal would not impact on a National Heritage place.	Nil
c	Any impact on a wetland of international importance? The proposal would not impact on a wetland of international importance.	Nil
d	Any impact on a listed threatened species or communities? The proposal would not impact a threatened species or community.	Nil
e	Any impacts on listed migratory species? The proposal would not impact on any nationally threatened species, ecological communities or migratory species.	Nil
f	Any impact on a Commonwealth marine area? The proposal would not impact on a Commonwealth marine area.	Nil
g	Does the proposal involve a nuclear action (including uranium mining)? The proposal would involve a nuclear action.	Nil
h	Additionally, any impact (direct or indirect) on the environment of Commonwealth land? There would be no impact (direct or indirect) on the environment of Commonwealth land.	Nil

Appendix B - Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.110
Bus Depots	Does the project propose a bus depot?	No		Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		Section 2.110

Development within the Coastal Zone

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		Section 2.14

Note: See interactive map at [Planning Portal NSW spatial viewer - find a property](#). Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Stormwater	Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No		Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will <i>strain</i> the capacity of the existing road system in a local government area?	No		Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will	No		Section 2.10

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	this connection have a <i>substantial</i> impact on the capacity of any part of the system?			
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a <i>substantial</i> volume of water?	No		Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	No		Section 2.10
Road & footpath excavation	Will the works involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No		Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No		Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a <i>minor</i> extent?	The work is located on flood liable land. The proposal		Section 2.12

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
		would not change flood patterns.		
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	No		Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	No	Environment and Heritage Group, DPE	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment and Heritage Group, DPE	Section 2.15
Navigable waters	Do the works include a fixed or floating structure in or over navigable waters?	Yes	Transport for NSW - Maritime	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service (RFS) [Refer to the NSW RFS publication: <i>Planning for Bush Fire Protection (2006)</i>]	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map)	No	Secretary of the Commonwealth Department of Defence	Section 2.15

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.			
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	No	Mine Subsidence Board	Section 2.15



9 November 2023

DPI Fisheries

[REDACTED]

Dear Sir or Madam

Notification of mooring pole installation at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry

Transport for NSW proposes to remove existing timber mooring piles and install new steel piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry. The work will be in the Hills Shire, Hornsby Shire and Hawkesbury City Local Government Areas.

The new piles are required to provide adequate mooring during large floods and for a new floating pontoon at Wisemans Ferry. The pole removal and installation would require some disturbance of the riverbed. Under the *Fisheries Management Act 1994* Clause 199, Transport for NSW is required to notify the Minister of proposed dredging work. A brief outline of the proposal is attached to this letter. A Review of Environmental Factors (REF) for the proposal is currently being prepared.

If you have any comments regarding this proposal, please provide these as soon as possible.

If you require further information, please contact the Transport for NSW Project Manager [REDACTED]

[REDACTED]

[REDACTED]

Yours sincerely,

[REDACTED]

On behalf of Transport for NSW

Proposal identification

Key features of the proposal include:

- Install environmental controls at the existing mooring poles at the southern approach to Wisemans Ferry
- Set up pole storage area
- Launch a barge, with drilling rig and excavator, from Brooklyn. Travel to Wisemans Ferry
- Install silt curtain around the work area
- Install 2x2x2m concrete anchor blocks on the bank beside the ferry ramps:
 - Two at Wisemans Ferry
 - One at Webbs Creek Ferry
 - One at Sackville Ferry.
- Pole removal procedure at each ferry crossing (11 at Wisemans Ferry, two at Webbs Creek Ferry and one at Sackville Ferry):
 - Set up the barge at the existing mooring poles. Spuds from the barge are lowered to maintain the barge position during the work
 - Use clamp attachment on the excavator to remove existing poles. The removed poles are stored on the barge.
- New poles installation procedure at each ferry crossing (16 at Wisemans Ferry, seven at Webbs Creek Ferry, four at Sackville Ferry):
 - Drive new steel piles using the drilling rig to a depth of up to 15m below the river bed
 - Install HDPE sleeves and weld to seal the sleeves.
- Install floating pontoon at Wisemans Ferry:
 - Construct 2x2x2 anchor block
 - Install floating pontoon at four piles
 - Install walkway from anchor block to the pontoon
- Remove environmental controls
- All waste would be disposed of at an appropriately licensed waste facility.

Plant and equipment that would be used includes:

- Barge
- Excavator with clamp, auger and hammer attachments
- Drilling rig
- Welding equipment
- Concrete pump
- Waste containers

- Delivery truck.

The work is proposed to start in early 2024. Work would take place in standard hours and is expected to take one month to complete at each ferry.

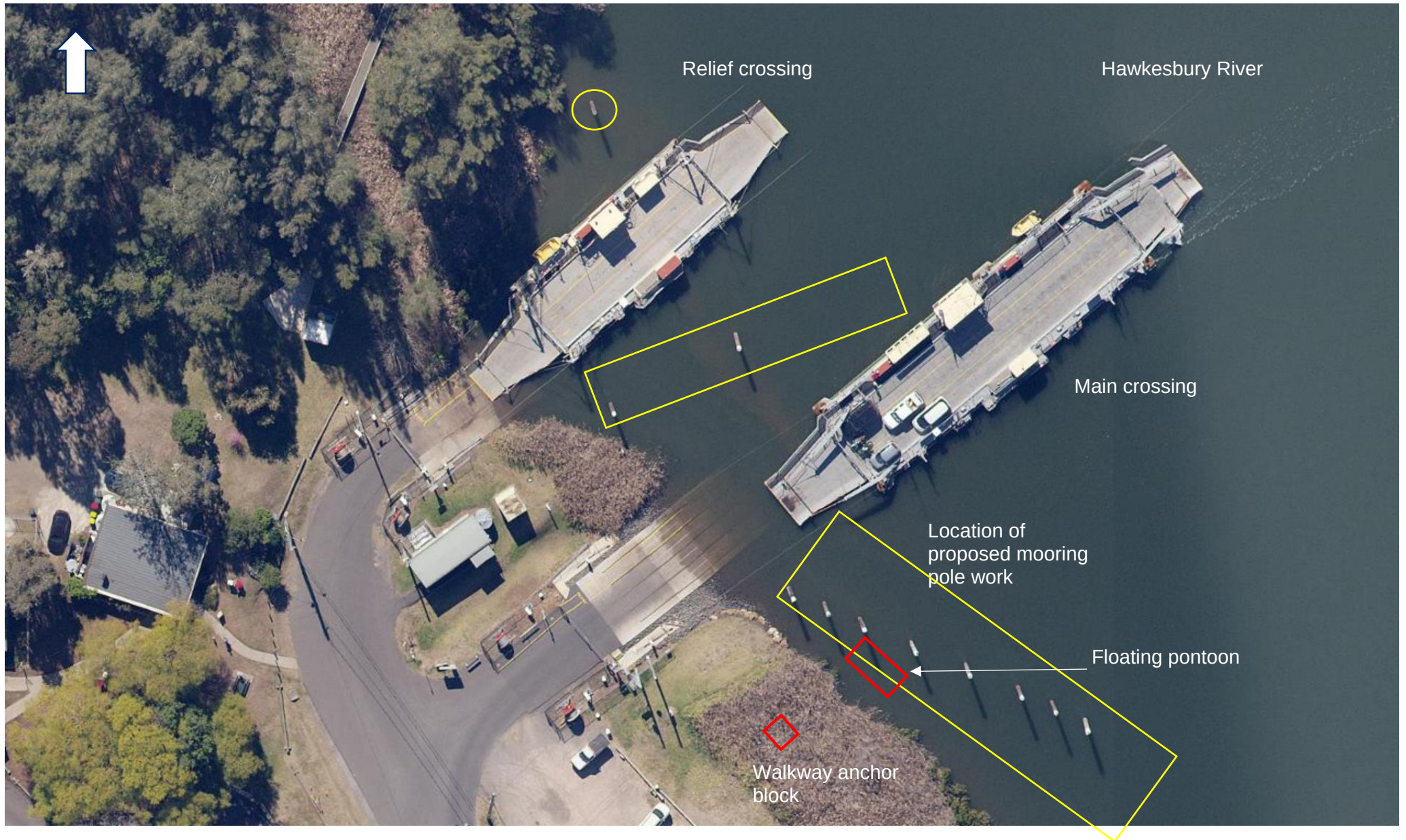


Figure 1 Proposal location – Wisemans Ferry



Figure 2 Proposal location – Webbbs Creek Ferry



Figure 3 Proposal location – Sackville Ferry

Potential impacts

Soil and water

Potential impacts

The mooring piles would be driven into the river bed and the barge spuds would disturb the river bed. This would result in disturbance of sediment and an increase in turbidity of the water. The silt curtain would contain the silt to the work area and would be retained until sediment has settled the turbidity is equal to or lower than the turbidity of the river outside the work area.

The mooring piles would be installed in Class 1 acid sulfate soils. The drilling rig would not penetrate the river bed and is not expected to bring and sediment to the surface. Therefore, the installation process is not expected to result in acidification of acid sulfate soils. However, the sediment is likely to be brought to the surface on the timber piles as they are removed. This sediment would be managed on the barge to ensure that acidification does not occur.

Safeguards

1. Install a silt curtain with boom before the start of work. The curtain will be installed around all works that may result in sediment run off. The silt curtain must extend a minimum of 100 millimetres above the waterline and reach the river bed.
2. Turbidity would be monitored and the silt curtain would not be moved or removed from around a work area until sediment has settled and the turbidity is at an acceptable level
3. Weather forecasts would be checked daily and no work will take place when there is a risk of flooding
4. Material removed from the auger will be managed in accordance with the Roads and Maritime *Guidelines for the Management of Acid Sulfate Materials*
5. Excavated material will be stored in impervious containers prior to disposal.
6. An emergency marine spill kit is to be kept on site at all times and maintained throughout the work. The spill kit must be appropriately sized for the volume of substances at the work site
7. All machinery and equipment would be maintained in good working order and regularly visually inspected for leaks
8. Chemicals or fuels will not be stored onsite
9. Tides are to be considered when planning the work
10. Where high flows in the river are predicted all work will stop in advance and the barge safely moored
11. Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills
12. All workers will be advised of the location of the spill kit and trained in its use.
13. If an incident (eg spill) occurs, the Roads and Maritime Services Environmental Incident Classification and Reporting Procedure is to be followed and the Transport for NSW Contract Manager notified as soon as practicable.

Biodiversity

Potential impacts

Mangroves are located around the ferry ramps. A biodiversity assessment is currently being undertaken and it is not anticipated that mangroves would be impacted by the proposal.

[REDACTED]
[REDACTED]
[REDACTED]

Re: s.199 FM Act notification – Proposed mooring pile installation - Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry

Dear [REDACTED]

Thank you for your referral dated 09 November 2023 regarding the above stated matter. This notification complies with s.199(1)(a) of the *Fisheries Management Act* (FM Act) concerning the proposed activities.

DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, DPI Fisheries ensures that developments comply with the requirements of the FM Act (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Fish Habitat Conservation and Management (2013)*. DPI Fisheries is also responsible for ensuring the sustainable management of commercial, recreational and Aboriginal cultural fishing, aquaculture, marine parks and aquatic reserves in NSW.

DPI Fisheries has reviewed these works in light of those provisions and has no objections to the proposed works provided that they occur as described in the REF (Version 5.4, Date July 2022, Author: Environment and Sustainability Planning and Assessment specialists) and Biodiversity Assessment (Date: February 2024), and other communications for these works.

DPI Fisheries recommends that the following general environmental mitigation measures be implemented during construction:

1. Erosion and sediment mitigation devices are to be erected in a manner consistent with current Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal;
2. Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate erosion and sediment control devices;
3. On completion of the works all disturbed soil is to be levelled, smoothed and sown with a mixture of sterile/native grass seeds to encourage rapid revegetation and planted out with native endemic riparian vegetation;

4. Only clean rock (no fines) is to be used during these works;
5. Machinery is not to enter or work from the waterway unless in accordance with the proposed works;
6. Prior to use at the site and/or entry into the waterway, machinery is to be appropriately cleaned degreased and serviced. Spill kits are to be available on site at all times during the works;
7. Works are to be undertaken during low flows in the waterway;
8. Procedures to ensure adherence to ANZECC water quality guidelines are to be detailed in the CEMP;
9. In the instance that mangroves will be impacted, a permit must be obtained prior to any marine vegetation being harmed;
10. The worksite has potential for acid sulfate soils. Excavated and disturbed soil is to be managed in accordance with the Managing Acid Sulfate Soil (EPA, 1995), Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee 1998) and consistent with best management practice outlined in Restoring The Balance: Guidelines for Managing Floodgates and Drainage Systems on Coastal Floodplains available at: www.dpi.nsw.gov.au/data/assets/pdf_file/0007/167875/restoring-balance-guidelines.pdf;
11. Dewatering at the worksite is not to be undertaken, unless a Dewatering Management Plan has been prepared and made available for assessment and if necessary modified to the satisfaction of the Senior Fisheries Manager - Coastal Systems prior to the commencement of works at the worksite as part of the Construction Environmental Management Plan; and
12. DPI Fisheries (1800 043 536) and the Environment Protection Authority (EPA) (131 555) are to be notified immediately if any fish kills occur in the vicinity of the works. In this situation, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed.

For any further information , please contact me at [REDACTED]

Sincerely

[REDACTED]
[REDACTED]
Fisheries Manager, Coastal Systems
DPI Fisheries



9 November 2023

Crown Land
[REDACTED]

Dear Sir or Madam

Notification of works in Crown waterway at Wisemans Ferry

Transport for NSW is proposing to remove existing timber mooring piles and install new steel piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry. This would involve work in the Hawkesbury River, a Crown waterway. A review of environmental factors (REF) is currently being prepared to assess the likely impacts of the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979*.

We are notifying you as the land manager and providing an opportunity to provide feedback on the proposal. A brief outline of the proposal is attached to this letter.

If you have any comments regarding this proposal, please provide these as soon as possible as this work must be carried out before further flood damage occurs.

If you require further information, please contact the Transport for NSW Project Manager [REDACTED]
[REDACTED]

Yours sincerely,
[REDACTED]

[REDACTED]
On behalf of Transport for NSW

Proposal identification

Key features of the proposal include:

- Install environmental controls at the existing mooring poles at the southern approach to Wisemans Ferry
- Set up pole storage area
- Launch a barge, with drilling rig and excavator, from Brooklyn. Travel to Wisemans Ferry
- Install silt curtain around the work area
- Install 2x2x2m concrete anchor blocks on the bank beside the ferry ramps:
 - Two at Wisemans Ferry
 - One at Webbs Creek Ferry
 - One at Sackville Ferry.
- Pole removal procedure at each ferry crossing (11 at Wisemans Ferry, two at Webbs Creek Ferry and one at Sackville Ferry):
 - Set up the barge at the existing mooring poles. Spuds from the barge are lowered to maintain the barge position during the work
 - Use clamp attachment on the excavator to remove existing poles. The removed poles are stored on the barge.
- New poles installation procedure at each ferry crossing (16 at Wisemans Ferry, seven at Webbs Creek Ferry, four at Sackville Ferry):
 - Drive new steel piles using the drilling rig to a depth of up to 15m below the river bed
 - Install HDPE sleeves and weld to seal the sleeves.
- Install floating pontoon at Wisemans Ferry:
 - Construct 2x2x2 anchor block
 - Install floating pontoon at four piles
 - Install walkway from anchor block to the pontoon
- Remove environmental controls
- All waste would be disposed of at an appropriately licensed waste facility.

Plant and equipment that would be used includes:

- Barge
- Excavator with clamp, auger and hammer attachments
- Drilling rig
- Welding equipment
- Concrete pump
- Waste containers
- Delivery truck.

- The work is proposed to start in early 2024. Work would take place in standard hours and is expected to take one month to complete at each ferry.

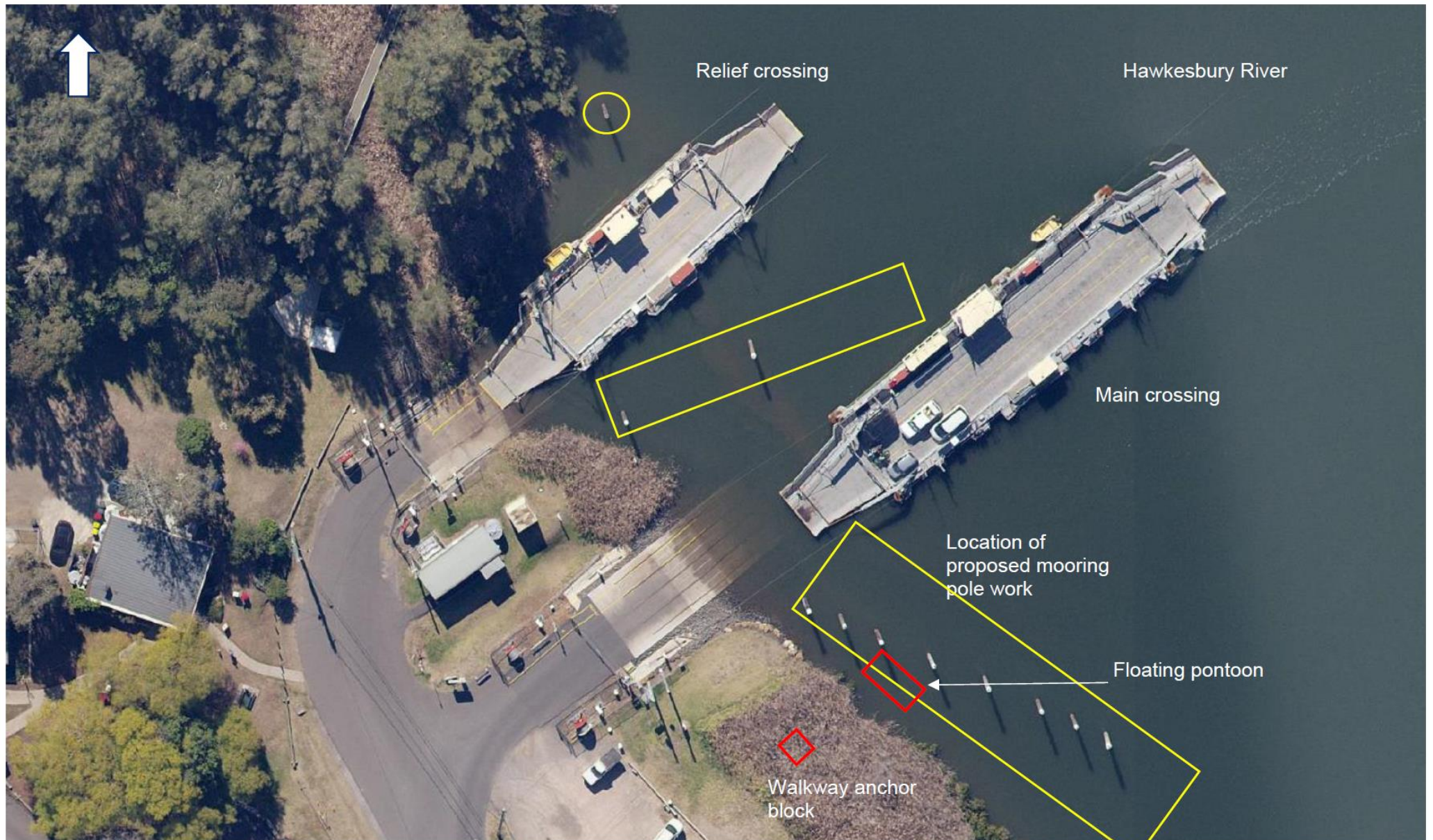


Figure 1 Proposal location – Wisemans Ferry



Figure 2 Proposal location – Webbs Creek Ferry

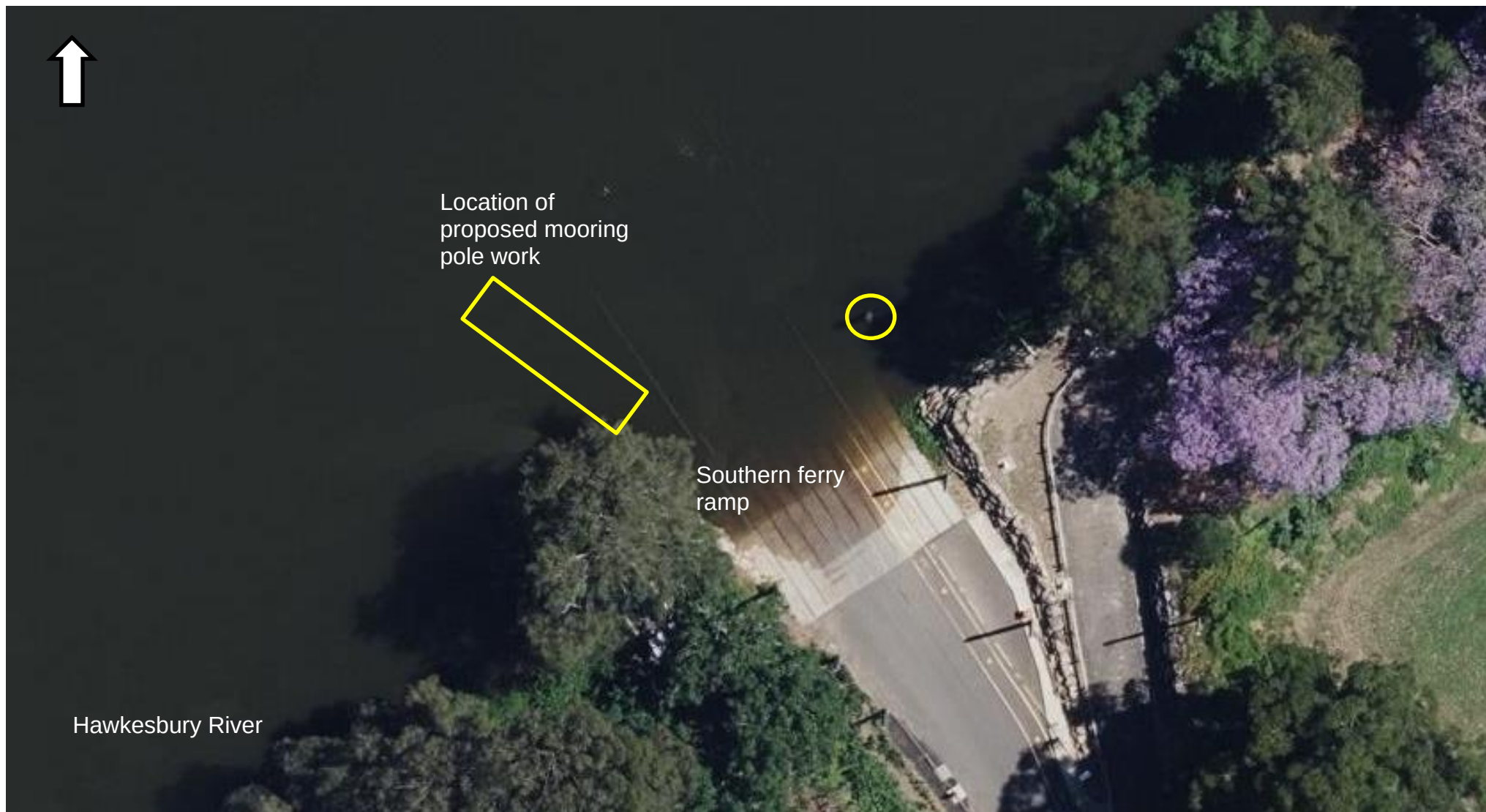


Figure 3 Proposal location – Sackville Ferry

Appendix C – Biodiversity Assessment Report

Biodiversity

Assessment Report

Flood Piles (Stage 2) at Wiseman,
Sackville and Webbs Creek ferry
crossings

March 2024



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Executive summary

Transport for NSW (TfNSW) proposes to install mooring piles at Wisemans Ferry, Webbs Creek Ferry and Sackville Ferry. The piles are needed to safely moor the ferries, particularly when the Hawkesbury River is in flood. Transport also proposes installing a pontoon and gangway at Wisemans Ferry, improving access to ferries for maintenance.

The proposal comprises of three cable ferry crossing sites; Wisemans Ferry, Webbs Creek Ferry, and Sackville Ferry, located on the Hawkesbury River in New South Wales (NSW). Wisemans Ferry has two crossings, a main crossing with capacity for 24 vehicles and a relief ferry with capacity for 18 vehicles. The ferry connects Old Northern Road and Wisemans Ferry Road. Webbs Creek Ferry has capacity for 24 vehicles and connects River Road to St Albans Road. Sackville Ferry crosses the Hawkesbury River, north of Sackville on Sackville Road. The ferry connects the roads linking Windsor and Wisemans Ferry and can carry 15 cars every trip across the river. All three ferries operate 24 hours a day, seven days a week.

Key features of the proposal would include:

- Wisemans Ferry (southern approach):
 - Remove 11 existing timber mooring piles.
 - Install 12 new steel mooring piles.
 - Construct two new anchor blocks to secure the moored ferries.
 - Clear about 51 m2 of reedbed (PCT 3962) which consists of a threatened ecological community.
 - Install a floating pontoon and gangway. Four piles would secure the gangway and pontoon and would be located east of the ferry ramps to provide access to moored ferries. The gangway would be secured on the bank with an anchor block.
- Webbs Creek Ferry (eastern approach):
 - Remove two existing timber mooring piles.
 - Install seven new steel mooring piles.
 - Construct a new anchor block to secure the moored ferry.
- Sackville Ferry (southern approach):
 - Remove one existing timber mooring pile.
 - Install sleeve over three existing piles to raise the height of the piles.
 - Minor tree trimming of one individual tree (Swamp-oak *Casuarina glauca*)
 - Install four new steel mooring piles.
 - Construct a new anchor block to secure the moored ferry.

For the purposes of this assessment the subject land is defined as the construction footprint, or limit of works, including disturbance associated with the operational footprint as shown on Figure 1 2. The study area includes the subject land, plus the surrounding areas which may be indirectly impacted. The area surveyed for the purposes of the biodiversity assessment is shown on Figure 1 2.

In June 2023, Biosis undertook vegetation and habitat mapping / identification for threatened entities that may be impacted by the proposal. Native vegetation within the study area consisted of four PCTs including three Threatened Ecological Communities (TECs). Due to the small area of native vegetation present (<1 hectares), no vegetation integrity plots (BAM plots) were completed. Impacts required for the proposal are limited to the removal of around 51.2 meters squared of PCT 3962 *Coastal Floodplain Phragmites Reedland* and the trimming of a single tree (Swamp-oak *Casuarina glauca*) forming a component of PCT 4025 *Cumberland Red Gum Riverflat Forest*.

Impacts for the proposal are of a minor scale (i.e., <1 hectares of impact to threatened ecological community). Therefore, in accordance with Transport's No Net Loss Policy (Transport for NSW 2022a), the proposal does not trigger the consideration of offsets and as no trees are being removed, the Tree and Hollow Replacement Guidelines (Transport for NSW 2022b) also do not apply. Considering that no offsetting is required and that the area to be impacted is relatively small, no targeted surveys for threatened flora or fauna species was undertaken. However, a thorough habitat assessment was performed for each species identified in the background searches (BioNet and Protected Matter Search Tool), and the results generated from the Biodiversity Assessment Method – Calculator (BAM-C) database and further assessment via a NSW Test of Significance (ToS) and Commonwealth Species Impact Criteria (SIC) was carried out for species that were deemed to have a moderate or higher

likelihood of occurrence, and could be potentially impacted by the proposed works (Appendix B). These assessments indicate that a significant impact is not likely to result from the project.

With the effective implementation of safeguards and mitigation measures identified in this Biodiversity Assessment Report (BAR), risk of impacts to biodiversity values can be mitigated to an acceptable level.

1. Introduction

1.1 Proposal background

Biosis was commissioned by Transport for NSW (TfNSW) to undertake a biodiversity assessment for the proposed installation of mooring piles at Sackville Ferry, Webbs Creek Ferry, and Wisemans Ferry with an additional pontoon and gangway to be installed at Wisemans Ferry New South Wales (NSW).

Transport for NSW are responsible for servicing and maintaining vehicular ferries in the Greater Sydney region. Currently, there are four ferries in operation at Sackville, Webbs Creek and Wiseman Ferry on the Hawkesbury River.

In recent years from 2020 to 2022, the ferries on the Hawkesbury River have experienced significant rainfall and a series of heavy floods in the area. In the past 20 years, the July 2022 flood event was the highest and caused significant damage to the ferries and ferry assets on the Hawkesbury River. The ferries at Sackville and Wisemans Ferry were badly damaged due to the excessive height and severity of the July flood.

Three rivetted hull ferries at Sackville, Webbs Creek and Wiseman crossings have since been replaced with new ferries during the period of 2007 – 2015. These new ferries have been built with improved safety, bigger capacity, and welded hull construction. They are wider, longer, and heavier than the old ferries which were previously in operation. Therefore, the existing flood piles at Sackville and Wiseman ferry crossings did not have adequate capacities for new ferries in the recent floods. At present there are no flood piles at Webbs Creek crossing. During recent flood periods, the Webbs Creek ferry was berthed at Wiseman side approach of the crossing.

The TfNSW Ferry Maintenance team require access to a ferry when moored at Wiseman's main crossing flood piles. This is to prepare the vessel for sea tow, maintenance works or to rebuild them on return after major maintenance works. At present the team use a work boat for access and it is not considered a safe and satisfactory option. The team discussed and agreed a pivoted gangway from the land to a pontoon setup next to the array of flood piles is a safe access to the ferry at varying tidal heights of the river. Transport for NSW has identified the design and installation of new flood piles at these three locations is a priority for the safety of assets.

The proposal is located within the Hawkesbury City, Hills Shire and Hornsby Shire Local Government Areas (LGA). The Sackville Ferry is located within the suburb of Sackville, along western bank of the Hawkesbury River. The Webbs Creek and Wisemans Ferry's are located approximately 17 kilometres north-east of the Sackville Ferry, in the suburb of Wisemans Ferry. The surrounding land use consists of small-scale rural homes and farms, as well as conserved land (Dharug and Marramarra National Parks) containing intact high condition native vegetation subject to passive recreation.

1.2 The proposal

As previously mentioned, the severe weather and flooding events from 2020 to 2022 had a devastating impact on the ferries at Sackville, Wisemans Ferry, resulting in bad damage to the ferries and associated infrastructure. In response, TfNSW proposes to decommission and reinstall piles and pontoons for all three ferry sites.

Key features of the proposal would include:

Wisemans Ferry (southern approach):

- Remove 11 existing timber mooring piles.
- Install 12 new steel mooring piles.
- Construct two new anchor blocks to secure the moored ferries.
- Clear about 51 m² of reedbed (PCT 3962) which consists of a threatened ecological community.
- Install a floating pontoon and gangway. Four piles would secure the gangway and pontoon and would be located east of the ferry ramps to provide access to moored ferries. The gangway would be secured on the bank with an anchor block.

Webbs Creek Ferry (eastern approach):

- Remove two existing timber mooring piles.
- Install seven new steel mooring piles.

- Construct a new anchor block to secure the moored ferry.

Sackville Ferry (southern approach)

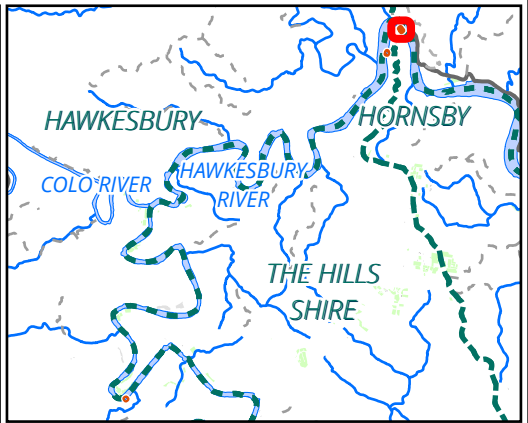
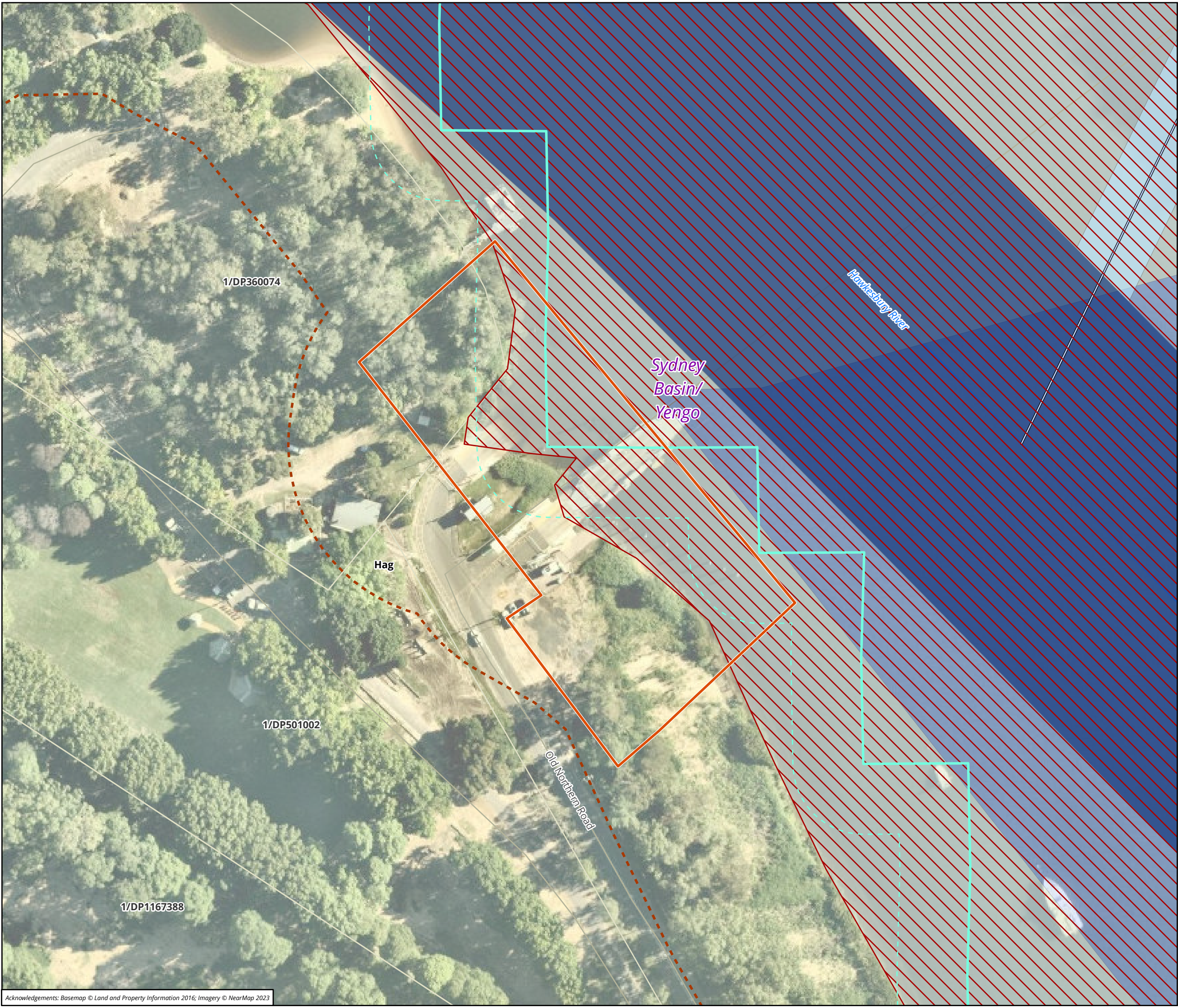
- Remove one existing timber mooring pile.
- Install sleeve over three existing piles to raise the height of the piles.
- Minor tree trimming of one individual tree (Swamp-oak *Casuarina glauca*)
- Install four new steel mooring piles.
- Construct a new anchor block to secure the moored ferry.

The existing mooring piles at each ferry do not have adequate capacity to safely moor the ferries during floods. Transport proposes to remove existing timber piles at all ferries and install new steel mooring piles. Transport's Ferry Maintenance team need safe access to ferries moored at Wisemans Ferry. A 'hinged walkway' from the land to a pontoon setup next to the new mooring piles is proposed.

1.2.1 Assessment areas

The following key terms are used throughout this BAR:

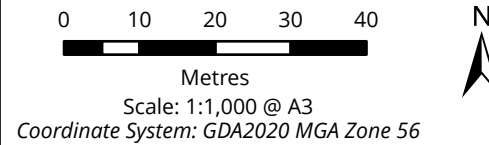
- The proposal: as described in Section 1.2 above.
- Subject land: equivalent to the construction footprint, or limit of works. This is the physical area equivalent to the proposal, including disturbance associated with the operational footprint as shown on Figure 1-2. This is the boundary used to calculate direct impacts.
- Study area: this includes the subject land, plus the surrounding areas which may be indirectly impacted. The area surveyed for the purposes of the biodiversity assessment is shown on Figure 1-2.
- Locality: the area covered by a 10-km buffer of the study area.



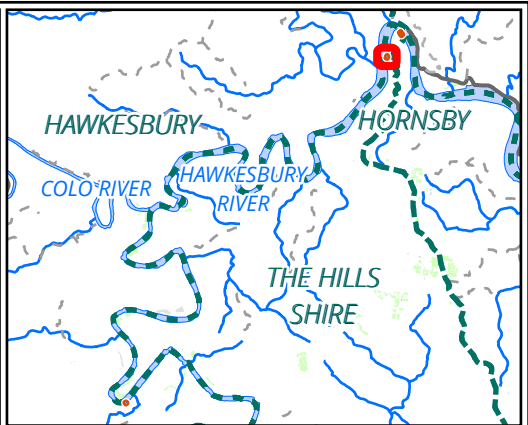
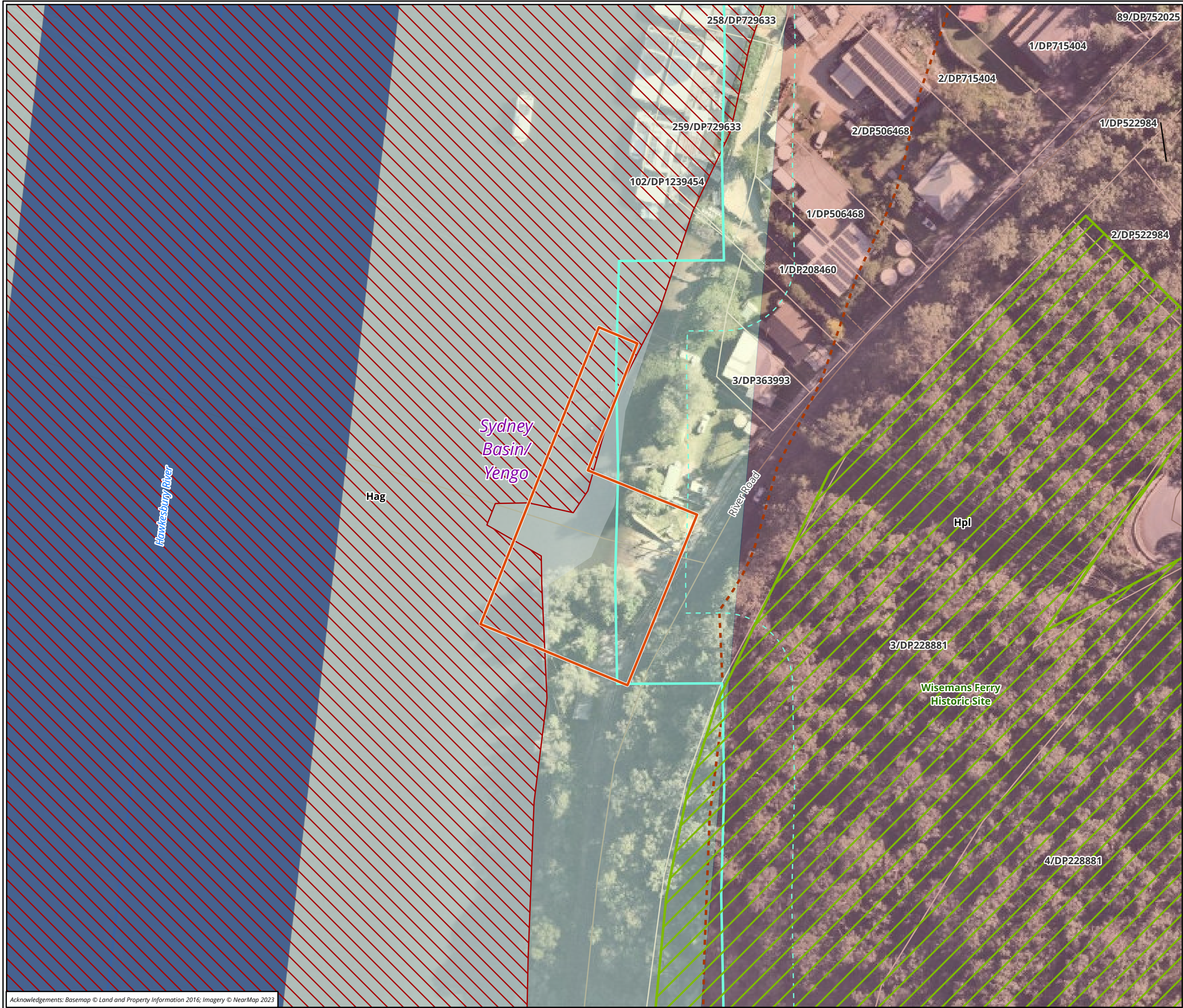
Legend

- Study area
- Lot
- IBRA Region/Sub-region
- HydroLine stream order**
 - 1
- Strahler stream order buffers**
 - 1
 - 9
- Wetlands /estuaries**
 - Local wetlands
 - Riparian buffers - Local wetlands
 - Estuaries
 - Riparian buffers- Estuaries
- Mitchell landscapes**
 - Hag,Hawkesbury Gorge

**Figure 1-1: Proposal context
- Wisemans Ferry**

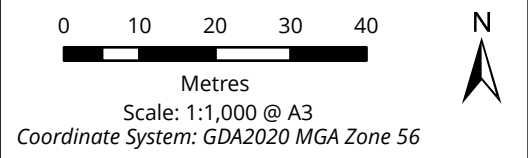


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- Legend**
- Study area
 - Lot
 - IBRA Region/Sub-region
 - National Park/Reserve
- Strahler stream order buffers**
- 9
- Wetlands /estuaries**
- Local wetlands
 - Riparian buffers - Local wetlands
 - Estuaries
 - Riparian buffers- Estuaries
- Mitchell landscapes**
- Hag,Hawkesbury Gorge
 - Hpl,Hornsby Plateau

Figure 1-1: Proposal context - Webb's Creek



1/DP634989

Hawkesbury River

Sydney
Basin/
Yengo

7001/DP1055097

Hag

Sackville Road

12/DP603161

4/DP616167

3/DP616167

1/DP650010



Legend

- Study area
- Lot
- IBRA Region/Sub-region
- Strahler stream order buffers**
 - 9
- Wetlands /estuaries**
 - Local wetlands
 - Riparian buffers - Local wetlands
 - Estuaries
 - Riparian buffers- Estuaries
- Mitchell landscapes**
 - Hag,Hawkesbury Gorge

**Figure 1-1: Proposal context
- Sackville Ferry**

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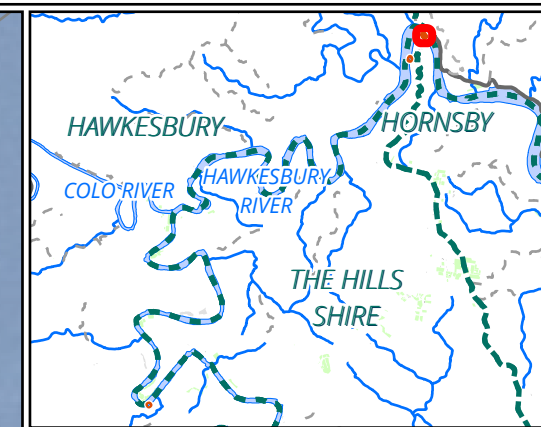
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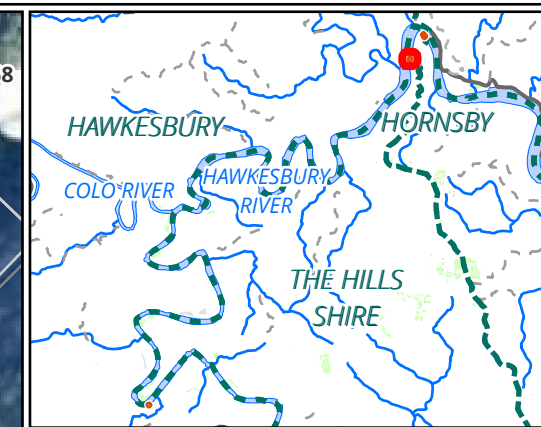
- Legend**
- Study area
 - Lot
- Construction footprint and proposed works at Wiseman Ferry**
- Construct two new anchor blocks to secure the moored ferries
 - Install twelve new steel mooring poles
 - Remove eleven existing timber mooring poles
 - Access track
 - Anchor block
 - Compund
 - Pontoon and walkway
 - Work area
 - Vegetation trimming

Figure 1-2: The proposal - Wisemans Ferry

0 10 20
Metres
Scale: 1:600 @ A3
Coordinate System: GDA2020 MGA Zone 56



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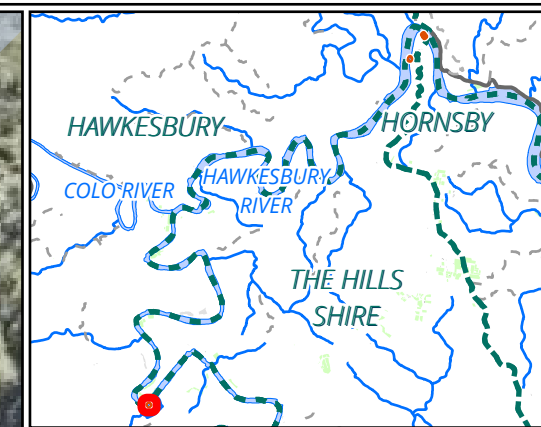
- Legend**
- Study area
 - Lot
- Construction footprint and proposed works at Webb's Creek Ferry**
- Install seven new steel mooring poles
 - Remove two existing timber mooring poles
 - Anchor block
 - Vegetation trimming

**Figure 1-2: The proposal
- Webb's Creek**

0 10 20
Metres
Scale: 1:500 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F1-2_TheProp
Project: P:\39200s\39281\Mapping\
39281_FerryCrossings_BAR.aprx



- Legend**
- Study area
 - Lot
- Construction footprint and proposed works at Sackville Ferry**
- Remove one existing timber mooring pole
 - Install four new steel mooring poles
 - Install sleeve over three existing poles to raise the height of the poles
 - Anchor block
 - Vegetation trimming

Figure 1-2: The proposal - Sackville Ferry

0 10 20
Metres
Scale: 1:500 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F1-2_TheProp
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx

1.3 Legislative context

A Review of Environmental Factors (REF) is prepared to satisfy Transport for NSW (Transport) duties under s.5.5 of the *Environment Planning and Assessment Act 1979* (EP&A Act) to “*examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity*” and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the proposal and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

The *Biodiversity Conservation Act 2016* (BC Act) requires that the significance of the impact on threatened species, populations and threatened ecological communities is assessed using the test listed in Section 7.3 of the BC Act. Similarly, Part 7A of the *Fisheries Management Act* (FM Act) requires that significance assessments are undertaken in accordance with Division 12 of the FM Act. Where a significant impact is likely to occur, a Species Impact Statement (SIS) must be prepared in accordance with the Environment Agency Head’s requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020a).

In September 2015, a ‘strategic assessment’ approval was granted by the Federal Minister in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The approval applies to transports road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, transport road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species, including application of the “avoid, minimise, mitigate and offset” hierarchy.
- Do not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) for these matters, even if the activity is likely to have a significant impact.
- Must use the BAM to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species.

Assessments of impact significance are required for all relevant biodiversity values in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth of Australia 2013a).

2. Methods

2.1 Personnel

This BAR has been certified by Rebecca Goodwin (Accredited Assessor No. BAAS17067) and was carried out by appropriate qualified and experienced environmental professionals, ecologists and accredited people as demonstrated in Table 2-1.

Table 2-1: Personnel

Name	BAM Assessor Accreditation no. (if relevant)	Role	Qualifications
Rebecca Goodwin	BAAS17067	Principal Ecologist and NSW Ecology (Botany) Team Leader Accredited Assessor	B. Landscape Management and Conservation (Hons) BAM Accredited Assessor: BAAS17067
Jake Schwebel	-	Botanist	BSc (Zoology/Conservation Biology) Over 2 years' experience undertaking ecological survey in the Sydney Basin Bioregion, combined with a strong background in bush regeneration and vegetation management. Experience in applying the BAM.
Todd Horton	-	Botanist	BSc (Environmental Science) Over 1 year experience in ecological consulting.
Kit King	-	Botanist	BSc (Honours – Ecology) Over 1 year experience in ecological consulting.
Jenny Beckius	-	Graduate GIS Analyst	BEnvScMgmt (Sustainability) DipBus Over 2 years' experience in the use and application of GIS.
Dylan Mason	-	Graduate Ecologist	Bsc (Honours) Over 6 years' of volunteering experience with local landcare.

2.2 Background research

Background research conducted for this assessment included relevant databases, spatial data, literature and previous site reports. These included:

- Commonwealth DCCEEW Protected Matters Search Tool (PMST) for matters protected by the EPBC Act (Cth DCCEEW 2023).
- BioNet - the website for the Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC) (DPE 2023a).
- BioNet Vegetation Classification database (NSW DCCEEW 2024).
- Native vegetation regulatory map (DPE 2023b).
- BAM Important Areas maps (DPE 2022a).
- PlantNET (The Royal Botanic Gardens and Domain Trust) (RBGDT 2022).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.
- BAM calculator (BAM-C).
- SEED Layer Intersection Tool.
- NSW DPI Fisheries Spatial Data Portal (DPI 2023a).
- Vegetation Mapping:
- NSW State Vegetation Type Map (DPE 2023c)
- Commonwealth Atlas of Groundwater Dependent Ecosystems (GDE): GDE Atlas Map: Water Information: Bureau of Meteorology (bom.gov.au) (BOM 2023).
- National Flying-fox monitoring viewer (environment.gov.au)
- Core Koala Habitat identified by the Biodiversity and Conservation State Environmental Planning Policy (SEPP) 2022.

2.3 Vegetation assessment

2.3.1 Vegetation mapping

The extent of native vegetation within the study area was determined using the results of site investigations and Section 4 of the BAM (DPIE 2020). Areas of native vegetation within the current assessment were identified based on the definition of native vegetation provided under Part 5A 60B of the NSW Local Land Services Act 2013 (LLS Act). Native vegetation therefore includes any of the following types of plants native to NSW as defined under the LLS Act:

- (a) *trees (including any sapling or shrub or any scrub)*
- (b) *understorey plants*
- (c) *groundcover (being any type of herbaceous vegetation)*
- (d) *plants occurring in a wetland*

A plant is native to New South Wales if it was established in New South Wales before European settlement.

Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water).

In this BAR, native vegetation has been mapped and classified in accordance with the Plant Community Type (PCT) classification system which is described in the BioNet Vegetation Classification Database. Biosis undertook vegetation mapping in June 2023. Vegetation mapping involved recording of dominant species, particularly canopy species, and then assigning PCTs to like sections of vegetation (Appendix A). Mapping the extent of native vegetation involved detailed field mapping and collection of GPS point locations using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an

accuracy of generally $\pm$ five metres. Four PCTs are mapped within the study area for this BAR, with further details provided below.

East coast revised PCTs

Revised PCTs for Eastern NSW were publicly released in June 2022 by the Department of Climate Change, Energy, and the Environment (NSW DCCEEW). On April 14, 2023, the BAM-C was updated to include these revised PCTs. The update included transitional arrangements for BAM-C cases that were in-progress prior to the update. The transitional arrangement allows BAM-C assessments to maintain access to the previous version of the BAM-C data and avoid changes to assessments. As the BAM-C for this assessment was created after the update, the new revised PCTs have been utilised.

2.3.2 Vegetation survey and classification

Vegetation zones

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM. Due to the moderate level of disturbance within and immediately surrounding each of the ferry locations, native vegetation was generally present in a low-moderate condition, with the exception of some small areas of high condition vegetation.

High condition vegetation includes areas that display a diversity of vegetation layers and habitat features (such as tree hollows, fallen timber, groundcover, leaf litter). Tree density is close to natural, and a range of ages is present including established mature trees.

Plot-based vegetation survey

Due to the very small size of the impact area, no BAM plots were able to be undertaken for the current assessment. Benchmark data held within BioNet was entered into the BAM-C for each PCT present within the site to generate lists of candidate species likely to occur within the subject land.

2.3.3 Patch size

Patch size classes were not calculated for this assessment. This is due to the small area size for each vegetation zone present within the subject land. For the purposes of capturing all threatened species that may occur within the study areas, a patch size of 100 was entered into the BAM-C for all PCT's.

2.3.4 Native vegetation cover

Native vegetation cover, in accordance with Section 3.2 of the BAM was not calculated for this assessment. This is due to the small nature of the impacts associated with the proposed works, and that the study areas occur on land surrounded by intact native vegetation where native vegetation cover is evidently high. The calculation of native vegetation cover for the purposes of the BAM-C acts as a filter for candidate species for which impacts need to be considered at a development site. To ensure all candidate species were captured by the BAM-C for the purposes of offset calculations, the highest category (> 70% native vegetation cover) was entered into the BAM-C.

2.4 Threatened species assessment

2.4.1 Habitat suitability assessment

Databases searches (BioNet and PMST) of the locality were the primary means of generating the list of threatened entities that should be considered for assessment. However, consideration was also given to any BAM species credit species and ecosystem credit species that were not returned from database searches but generated through the BAM-C.

In addition to the knowledge and experience of involved personnel, information utilised in the habitat assessment includes ecological information contained within BioNet, the TBDC and Species Profile and Threats Database (SPRAT) as appropriate. Where background information or detailed survey is lacking, the precautionary principle has been applied and a 'Moderate' likelihood of occurrence rating given to ensure that all threatened entities at risk of being impacted by the proposal have been adequately assessed.

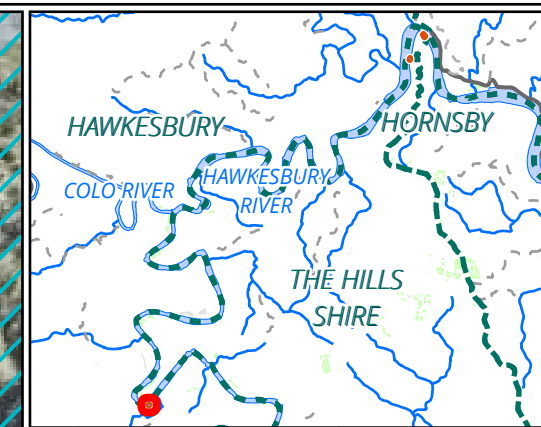
2.4.2 Targeted flora and fauna surveys

No targeted flora or fauna survey was completed for this BAR. However, a thorough habitat assessment was performed for each species identified in the background searches (Bionet and PMST), and the results generated from the BAM-C database (Species Credit Species and Ecosystem Credit Species). Further assessment (via an NSW Test of Significance [ToS] and/or Commonwealth Species Impact Criteria [SIC]) was carried out for species that were deemed to have a moderate or higher likelihood of occurrence and could be potentially impacted by the proposed works.

2.5 Aquatic surveys

The study area was investigated to determine its value for aquatic flora and fauna. Values were determined primarily on the basis of the type and quality of habitat(s) present. All species of aquatic fauna and flora observed during the assessment were noted and active searching for fauna was undertaken. Particular attention was given to searching for threatened biota and their habitats. Aquatic assessment was undertaken along the Hawkesbury River where impacts associated with the proposed works have the potential to impact on areas mapped by DPI (DPI 2023b) as containing Key Fish Habitat Figure 2-1.

Section 3.2 of the *Policy and guidelines for fish habitat conservation and management 2013* (Fairfull 2013) provides a defined methodology for identifying and classifying Key Fish Habitat. This methodology is a higher resolution approach than the mapping produced by DPI (DPI 2023b). As such Fairfull (2013) is considered the most meaningful approach to achieve the goals of the FM Act and supporting guidelines. Fairfull (2013) uses defined characteristics to establish TYPE and CLASS grades for sites, which considers both the relative sensitivity and functionality of the waterways. Therefore, guidelines presented by Fairfull (2013) were used in this assessment to identify and classify Key Fish Habitat.



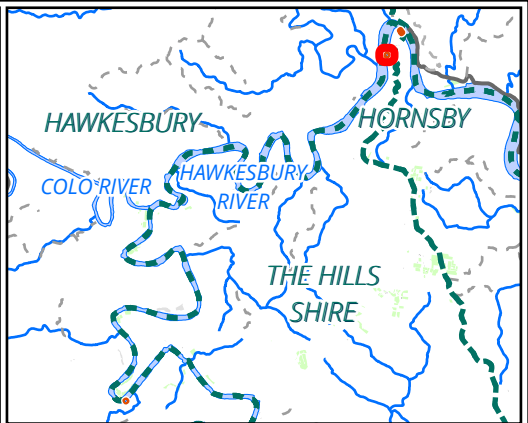
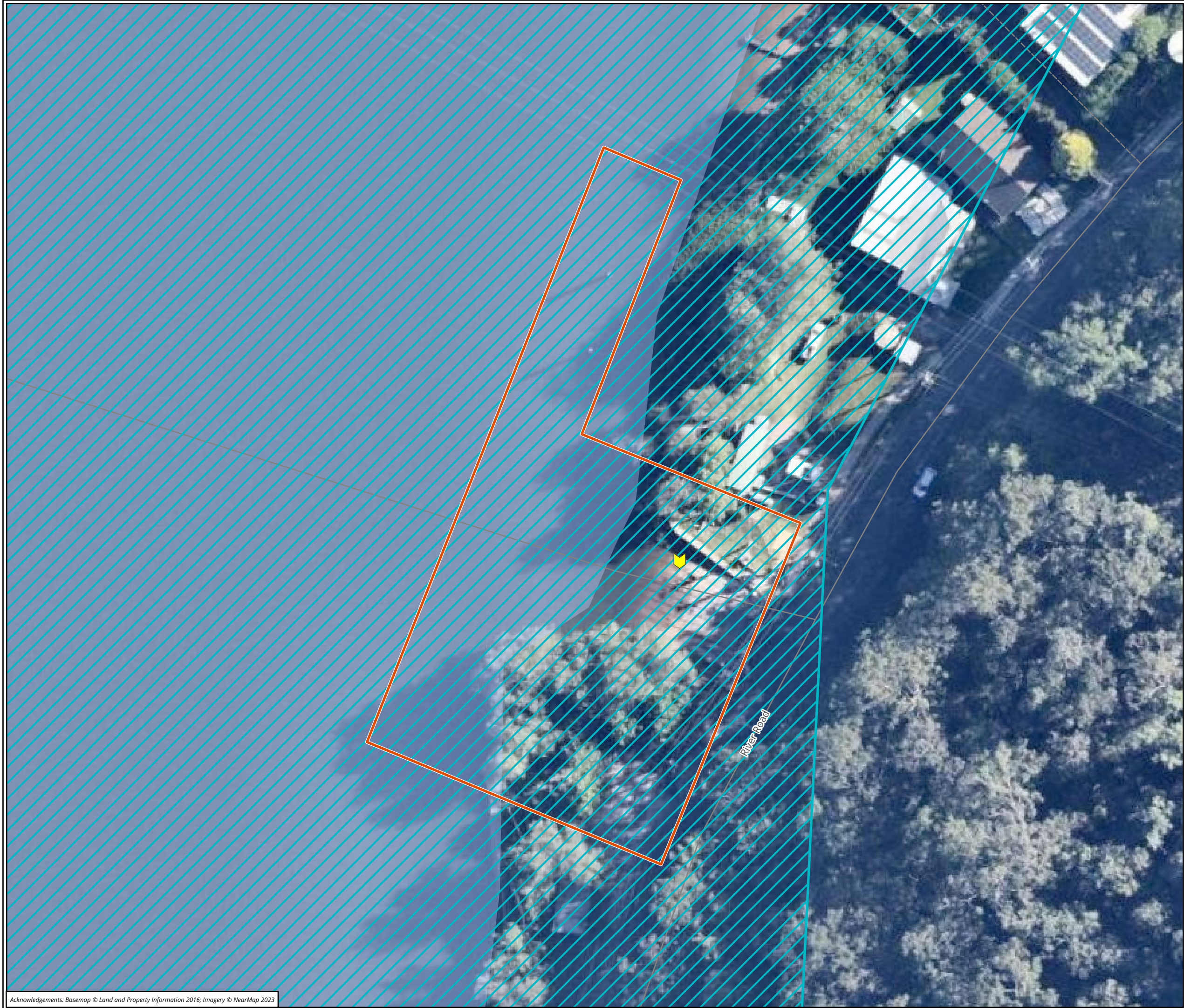
- Legend**
- Study area
 - Key fish habitat (Hawkesbury Nepean basin)
 - Aquatic survey location

**Figure 2-1: Aquatic survey locations
- Sackville Ferry**

0 10 20
Metres
Scale: 1:500 @ A3
Coordinate System: GDA2020 MGA Zone 56

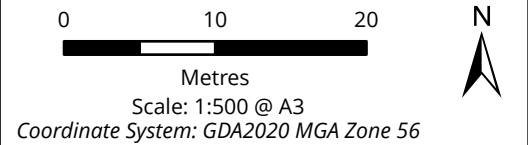


Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F2-1_AquaSurvey
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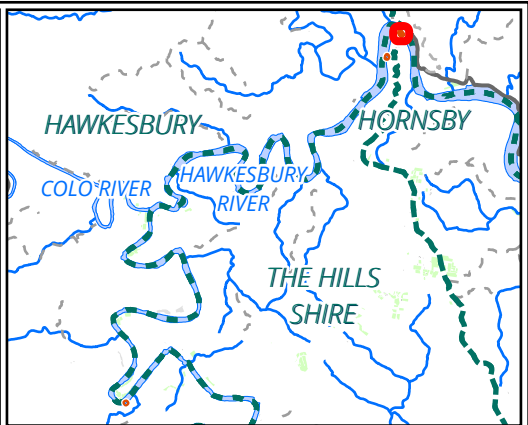


- Legend**
- Study area
 - Key fish habitat (Hawkesbury Nepean basin)
 - Aquatic survey location

Figure 2-1: Aquatic survey locations - Webb's Creek



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Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F2-1_AquaSurvey
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx



- Legend**
- Study area
 - Key fish habitat (Hawkesbury Nepean basin)
 - Aquatic survey location

Figure 2-1: Aquatic survey locations - Wisemans Ferry

0 10 20
Metres
Scale: 1:600 @ A3
Coordinate System: GDA2020 MGA Zone 56



2.6 Limitations

It is a recognised limitation that not all species present within an area are detectable at any one time or year over year. The random meander survey undertaken was carried out during winter, providing a list of flora species readily detectable for this point in time. Repeated survey at the same locations over several seasons or years during ranging weather conditions may detect different species present. Therefore, the presence of native species recorded during the field investigation is assuredly less than what is truly present. Nonetheless, given that a habitat assessment was completed for all species within 10 km identified in the background searches (Bionet and PMST), and the results generated from the BAM-C database, this limitation is of small concern.

No BAM plots were undertaken due to the small size of the impact area. This meant that accurate floristic data including cover and abundance was not collected, resulting in the generalisation of vegetation integrity scores for each PCT present. However, as benchmark data was entered in the BAM-C, representing the highest quality for each community, threatened species likely to occur within the study areas have been adequately considered.

As previously mentioned, native vegetation mapping was completed via field mapping and collection of GPS point locations using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. This also presents a limitation as spatial locations are considered to have an accuracy of generally $\pm$ five metres.

3. Existing environment

The study areas are located within the suburbs of Sackville and Wisemans Ferry and is approximately 80 kilometres north-west of Sydney. The study area is surrounded by Hawkesbury River, a mixture of cleared rural land, rural dwellings and intact, high-quality vegetation. The study area is located with the Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) bioregion and Yengo IBRA subregion.

Regional soil landscape mapping indicates that the study area occurs on the Hawkesbury Gorge soil landscape (Mitchell 2002). The Hawkesbury Gorge soil landscape is characterised by steep stepped slopes with frequent cliffs to 15 metres high on horizontal Triassic quartz sandstone, and a general elevation of 0 to 200 metres, and local relief 150 metres. There are extensive rock outcrop and limited soil, sands and loamy sands on benches and within joint crevices.

The study areas consist of the existing ferry infrastructure at Sackville, Wisemans Ferry and Webbs Creek ferries, waterway comprising the Hawkesbury River, as well as some surrounding native and exotic vegetation, including estuary vegetation, and part of Sackville Road, River Road and Old Northern Road. The surrounding areas contain areas of both intact, and cleared vegetation for rural homes and farms. These cleared areas often contain a mix of pastureland, orchards, and crops, as well as residential areas. No hollow-bearing trees occur within the study area, however one very large tree (50-100 centimeters diameter at breast height) occurs within the Sackville subject land that will be trimmed, but not removed as part of the proposal. Four native vegetation communities are present across the study area and are detailed below.

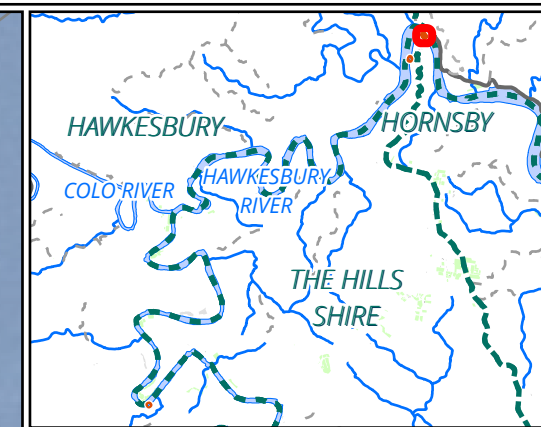
3.1 Plant community types and vegetation zones

PCTs within the study area were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM shown in Figure 3-1.

A total of four vegetation communities were identified across the study area including. The attributes of these vegetation zones within the study area and subject land are summarised below.

Table 3-1: Plant community types and vegetation zones including patch size and vegetation integrity (VI) score

Veg. zone	Plant community type (PCT)	Threatened ecological community	Study area (ha)	Subject land (m2)	Patch size class	VI score
Zone 1_High	PCT 3962 <i>Coastal Floodplain Phragmites Reedland</i>	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	0.17	51.2	>100 ha	-
Zone 2_High	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	0.14	-	>100 ha	-
Zone 3_Low	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	0.06	-	>100 ha	-
Zone 4_Low	PCT 4025 <i>Cumberland Red Gum Riverflat Forest</i>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	0.04	Tree trimming of individual Swamp-oak <i>Casuarina glauca</i>	>100 ha	-
Zone 5_High	PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	Not a TEC	0.02	-	>100 ha	-



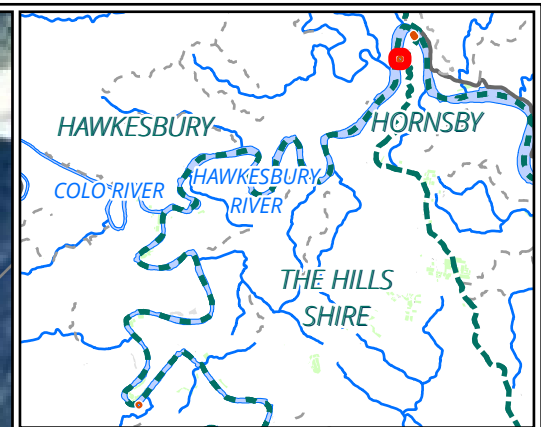
- Legend**
- Study area
 - Construction footprint and proposed works at Wisemans Ferry**
 - Construct two new anchor blocks to secure the moored ferries
 - Install twelve new steel mooring poles
 - Remove eleven existing timber mooring poles
 - Access track
 - Anchor block
 - Compund
 - Pontoon and walkway
 - Work area
 - Plant community type and condition**
 - 3962 - Coastal Floodplain Phragmites Reedland, High
 - 4028 - Estuarine Swamp Oak Twig-rush Forest, High
 - 4091 - Grey Mangrove-River Mangrove Forest, High

Figure 3-1: Plant community types and fauna habitat - Wisemans Ferry

0 10 20
Metres
Scale: 1:600 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-1_PCTs_FaunaHab
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx



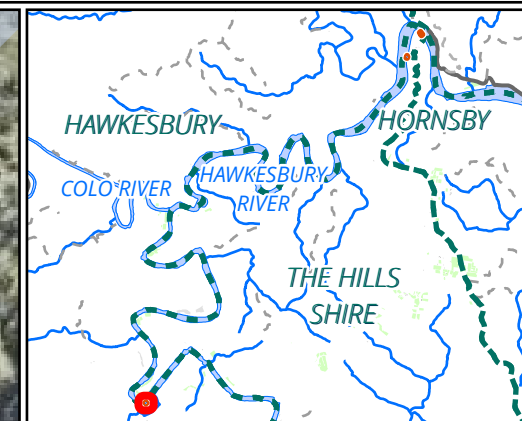
- Legend**
- Study area
 - Construction footprint and proposed works at Webb's Creek Ferry**
 - Install seven new steel mooring poles
 - Remove two existing timber mooring poles
 - Anchor block
 - Plant community type and condition**
 - 4028 - Estuarine Swamp Oak Twig-rush Forest, Low
 - Exotic vegetation

Figure 3-1: Plant community types and fauna habitat - Webb's Creek

0 10 20
Metres
Scale: 1:500 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-1_PCTs_FaunaHab
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx



Legend

Study area

Construction footprint and proposed works at Sackville Ferry

- Remove one existing timber mooring pole
- Install four new steel mooring poles
- Install sleeve over three existing poles to raise the height of the poles

Anchor block

Vegetation trimming

Plant community type and condition

- 4025 - Cumberland Red Gum Riverflat Forest, Low
- Exotic vegetation

Figure 3-1: Plant community types and fauna habitat - Sackville Ferry

0 10 20
Metres
Scale: 1:500 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-1_PCTs_FaunaHab
Project: P:\39200s\39281\Mapping\
39281_FerryCrossings_BAR.aprx

3.1.1 PCT 3962 Coastal Floodplain Phragmites Reedland

Description

This community is typically described as a very tall *Phragmites australis* freshwater reedland occurring on alluvial backswamps on coastal floodplains, usually at elevations of below 5 metres above sea level (asl). The community existed as high condition phragmites reedland on the banks of the Hawkesbury River. The community was present on alluvium soils below an elevation of 5m asl.

The community was dominated by a ground layer consisting of Common Reed *Phragmites australis*, Marsh Club Rush *Bolboschoenus fluviatilis*, and Couch *Cynodon dactylon* with sporadic appearances of Slender Knotweed *Persicaria decipiens*, Snake Vine *Stephania japonica*, and Common Silk Pod *Parsonsia straminea*.

PCT ID	3962
PCT name	Coastal Floodplain Phragmites Reedland
Vegetation class	Freshwater Wetlands
Vegetation formation	Coastal Freshwater Lagoons
Estimate of per cent cleared	73 %
Area in study area	0.17 ha
Area in subject land	0.005 ha (51.2 m ²)
Conservation status	<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> (Endangered, BC Act) This PCT is not consistent with the TEC Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community (Endangered, EPBC Act) as it lacks an open woodland structure with at least 10 percent total crown cover.
Vegetation zones (condition)	Zone 1_High
Location within study area	Wisemans Ferry

Justification for PCT selection:

- IBRA region – Occurs in the Hornsby LGA within the Sydney Basin region (Yengo subregion).
- Landscape position – Occurs along a riverbank of the Hawkesbury River in a mosaic with adjacent floodplain communities, at an elevation below 20 m.
- Soil – Occurs on the Hawkesbury Gorge Mitchells landscape.
- Dominant species – Devoid of a woody canopy and midstorey with an understorey dominated by *Phragmites australis* and *Cynodon dactylon*.

Floristic and structural summary of PCT 3962 within the study area

Growth form	Typical species	
	Common Name	Species Name
Trees	-	-
Shrubs	-	-
Grass and grass-like	Common Reed Couch Grass Marsh Club Rush	<i>Phragmites australis</i> <i>Cynodon dactylon</i> <i>Bolboschoenus fluviatilis</i>

Forb	Slender Knotweed	<i>Persicaria decipiens</i>
Fern	-	-
Other	Common Silk pod Snake Vine	<i>Parsonsia straminea</i> <i>Stephania japonica</i>
Exotic	Panic Veldtgrass Cockspur Coral Tree Vasey Grass Castor Oil Plant Curled Dock Paddy's Lucerne Black-berry Nightshade Stinking Roger Wandering Trad	<i>Ehrharta erecta</i> <i>Erythrina crista-galli</i> <i>Paspalum urvillei</i> <i>Ricinus communis</i> <i>Rumex crispus</i> <i>Sida rhombifolia</i> <i>Solanum nigrum</i> <i>Tagetes minuta</i> <i>Tradescantia fluminensis</i>
High Threat Exotic	Fireweed	<i>Senecio madagascariensis</i>

Condition states



Photo 3-1: PCT 3962 – High condition within the study area at Wisemans Ferry

3.1.2 PCT 4025 Cumberland Red Gum Riverflat Forest

Description

This community is typically described as a tall to extremely tall sclerophyll open forest with a mid-stratum of soft-leaved shrubs, small trees and dense, grassy ground layer situated on the alluvial flats alongside streams that drain the Cumberland Plain or more rarely the broad alluvial flats of the Hawkesbury and Nepean River systems to the west of Sydney. The community present within the study area existed in a low condition state along the banks of the Hawkesbury River. All vegetation within and adjacent to the study area has been subject to a high level of historical clearing which has subsequently resulted in a low diversity of native species present within this community.

The canopy was dominated by Forest Red Gum *Eucalyptus tereticornis*, Swamp Oak *Casuarina glauca* with a sparse mid storey of Cheese Tree *Glochidion ferdinandi*, and White cedar *Melia azedarach* and an understorey largely devoid of native vegetation being limited to minor occurrences of Bracken Fern *Pteridium esculentum*, Common Couch and *Dichondra repens*. Dominate weed species present included Jacaranda *Jacaranda mimosifolia*, Paddy's Lucerne *Sida rhombifolia*, Blackberry Nighshade *Solanum nigrum*, Curled Dock *Rumex crispus* Wandering Trad *Tradescantia fluminensis* and Panic Veldtgrass *Ehrharta erecta*.

PCT ID	4025
PCT name	Cumberland Red Gum Riverflat Forest
Vegetation class	Freshwater Wetlands
Vegetation formation	Coastal Freshwater Lagoons
Estimate of per cent cleared	89 %
Area in study area	0.04 ha
Area in subject land	Limited to tree trimming of one Swamp-oak <i>Casuarina glauca</i>
Conservation status	<i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> (Endangered, BC Act) This PCT is not consistent with the TEC River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (Critically Endangered, EPBC Act) as the perennial understory vegetation cover is < 30% and ground cover richness is < 4 native species per plot.
Vegetation zones (condition)	Zone_2 Low
Location within the study area	Sackville Ferry

Justification for PCT selection:

- IBRA region – Occurs in the Hornsby LGA within the Sydney Basin region (Yengo subregion).
- Landscape position – Occurs along a riverbank of the Hawkesbury River below 10 m elevation.
- Soil – Occurs on the Hawkesbury Gorge Mitchells landscape.
- Dominant species – This community was highly devoid of native vegetation however it contained a canopy of *Eucalyptus tereticornis* and *Casuarina glauca*, with a ground layer of *Dichondra repens*, *Cynodon dactylon* and *Pteridium esculentum*.

Floristic and structural summary of PCT 4025 within the study area

Growth form	Typical species	
	Common Name	Species Name
Trees	Cheese Tree Forest Red Gum Swamp Oak White cedar	<i>Glochidion ferdinandi</i> <i>Eucalyptus tereticornis</i> <i>Casuarina glauca</i> <i>Melia azedarach</i>
Shrubs	-	-
Grass and grass-like	Couch Grass	<i>Cynodon dactylon</i>
Forb	Kidney Weed	<i>Dichondra repens</i>
Fern	Bracken	<i>Pteridium esculentum</i>

Other	-	-
Exotic	Cobblers Pegs Prairie Grass Kikuyu Rhodes Grass Panic Veldtgrass Jacaranda Lamb's Tongue Paddy's Lucerne Pidgeon Grass Wild Tobacco Black-berry Nightshade Purpletop	<i>Bidens pilosa</i> <i>Bromus catharticus</i> <i>Cenchrus clandestinum</i> <i>Chloris gayana</i> <i>Ehrharta erecta</i> <i>Jacaranda mimosifolia</i> <i>Plantago lanceolata</i> <i>Setaria parviflora</i> <i>Sida rhombifolia</i> <i>Solanum mauritianum</i> <i>Solanum nigrum</i> <i>Verbena bonariensis</i>
High Threat Exotic	Lantana Blackberry	<i>Lantana camara</i> <i>Rubus fruticosus</i> sp. <i>aggregate</i>



Photo 3-2: PCT 4025 - Low condition within the study area at Sackville Ferry

3.1.3 PCT 4028 Estuarine Swamp Oak Twig-rush Forest

Description

The community is described as a tall to very tall open forest or woodland featuring *Casuarina glauca* and usually *Machaerina juncea* and *Juncus kraussii* subsp. *australiensis* occurring on the edges of tidal estuarine flats and tidal creek flats along the NSW Coast usually at elevations below 10 metres asl.

The community was dominated by a canopy of Swamp Oak *Casuarina glauca*, Cheese Tree *Glochidion ferdinandi* var. *ferdinandi*, Red Ash *Alphitonia excelsa*. The midstorey consisted of various shrubs including Flax-leaved Paperbark *Melaleuca linariifolia*, Prickly-leaved Paperbark *Melaleuca styphelioides* and Sweet Pittosporum *Pittosporum undulatum*. The ground layer consisted of Common Reed, Bordered Panic *Entolasia marginata*, Weeping Grass *Microlaena stipoides*, Sickie Fern

Pellaea falcata. All layers were additionally dominated by a combination of various vines including Snake Vine, Common Silk Pod and Sweet Morinda *Gynochthodes jasminoides*.

The community was present in two conditions within the study area. High condition was categorised levels of stratum present and a low level of weed inclusion. Low condition was categorised as having a fragmented canopy, missing a midstorey layer and having an understorey dominated by exotic weed species.

PCT ID	4028
PCT name	Estuarine Swamp Oak Twig-rush Forest
Vegetation class	Forested Wetlands
Vegetation formation	Coastal Floodplain Wetlands
Estimate of per cent cleared	64 %
Area in study area	High condition – 0.14 ha Low condition – 0.06 ha
Area in subject land	0 ha
Conservation status	<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> (Endangered, BC Act) This PCT is not consistent with the TEC Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community (Endangered, EPBC Act) as the patch sizes are either < 0.5 ha or not contiguous with a larger patch of native vegetation > 5ha.
Vegetation zones (condition)	Zone_3 High Zone_4 Low
Location within study area	Wisemans Ferry Webbs Creek

Justification for PCT selection:

- IBRA region - Occurs in the Hornsby LGA within the Sydney Basin region (Yengo subregion).
- Landscape position – Occurs on tidal flats of the Hawkesbury River at an elevation of below 10m asl.
- Soil - Occurs on the Hawkesbury Gorge Mitchells landscape.
- Dominant species – Dominated by a canopy of *Casuarina glauca*, *Glochidion ferdinandi* var. *ferdinandi*, and Red Ash *Alphitonia excelsa*, a midstorey of *Backhousia myrtifolia*, *Melaleuca styphelioides* and *Pittosporum undulatum* with a ground layer of *Phragmites australis*, *Cynodon dactylon* and the vines *Parsonsia straminea* and *Stephania japonica* var. *discolor*.

Floristic and structural summary of PCT 4028 within the study area

Growth form	Typical species	
	Common Name	Species Name
Trees	Swamp Oak Cheese Tree Red Ash	<i>Casuarina glauca</i> <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> <i>Alphitonia excelsa</i>
Shrubs	Willow Bottlebrush Flax-leaved Paperbark Prickly-leaved Tea Tree Grey Myrtle Sweet Pittosporum	<i>Callistemon salignus</i> <i>Melaleuca linariifolia</i> <i>Melaleuca styphelioides</i> <i>Backhousia myrtifolia</i> <i>Pittosporum undulatum</i>

	Sandpaper Fig Native Peach	<i>Ficus coronata</i> <i>Trema tomentosa</i> var. <i>aspera</i>
Grass and grass-like	Bordered panic Basket Grass Common Reed Weeping Grass	<i>Entolasia marginata</i> <i>Oplismenus aemulus</i> <i>Phragmites australis</i> <i>Microlaena stipoides</i>
Forb	Blue Flax-lily Geranium homeanum Persicaria decipiens	<i>Dianella caerulea</i> - <i>Slender Knotweed</i>
Fern	Sickle Fern	<i>Pellaea falcata</i>
Other	Common Silkpod Snake vine Sweet Morinda	<i>Parsonsia straminea</i> <i>Stephania japonica</i> var. <i>discolor</i> <i>Gynochthodes jasminoides</i>
Exotic	Cobblers Pegs Prairie Grass Kikuyu Rhodes Grass Panic Veldtgrass Lamb's Tongue Turkey Rhubarb Black-berry Nightshade Sticky Nightshade	<i>Bidens pilosa</i> <i>Bromus catharticus</i> <i>Cenchrus clandestinum</i> <i>Chloris gayana</i> <i>Ehrharta erecta</i> <i>Plantago lanceolata</i> <i>Rumex sagittatus</i> <i>Solanum nigrum</i> <i>Solanum sisymbriifolium</i>
High Threat Exotic		



Photo 3-3: PCT 4028 – High condition within the study area at Wisemans Ferry



Photo 3-4: PCT 3028 – Low condition within the study area at Webbs Creek

3.1.4 PCT 4091 Grey Mangrove-River Mangrove Forest

Description

This community typically exists as a low to mid-high mangrove open forest or woodland occurring on tidal flats of the NSW Coast. The tree canopy is sparse to mid-dense with tree species diversity being low dominated primarily by Grey Mangrove *Avicennia marina* subsp. *australasica* however other mangrove species may be present.

The community was present along the tidal flats of the Hawkesbury River and dominated entirely by Grey Mangrove with fringing ground layer vegetation including Common Reed and Couch.

PCT ID	4091
PCT name	Grey Mangrove-River Mangrove Forest
Vegetation class	Saline Wetlands
Vegetation formation	Mangrove Swamps
Estimate of per cent cleared	53 %
Area in study area	0.02 ha
Area in subject land	0 ha
Conservation status	Not a TEC
Vegetation zones (condition)	Zone_5 High
Location within study area	Wisemans Ferry

Justification for PCT selection:

- IBRA region - Occurs in the Hornsby LGA within the Sydney Basin region (Yengo subregion).
- Landscape position - Occurs on tidal flats of the Hawkesbury River.

- Soil - Occurs on the Hawkesbury Gorge Mitchells landscape.
- Dominant species – Dominated by Grey Mangrove *Avicennia marina* subsp. *Australasica*, *Phragmites australis* and *Cynodon dactylon*.

Floristic and structural summary of PCT 4091 within the study area

Growth form	Typical species	
	Common Name	Species Name
Trees	Grey Mangrove	<i>Avicennia marina</i> subsp. <i>australasica</i>
Shrubs	-	-
Grass and grass-like	Common Reed Cynodon dactylon	Phragmites australis Couch
Forb	-	-
Fern	-	-
Other	-	-
Exotic	-	-
High Threat Exotic	-	-

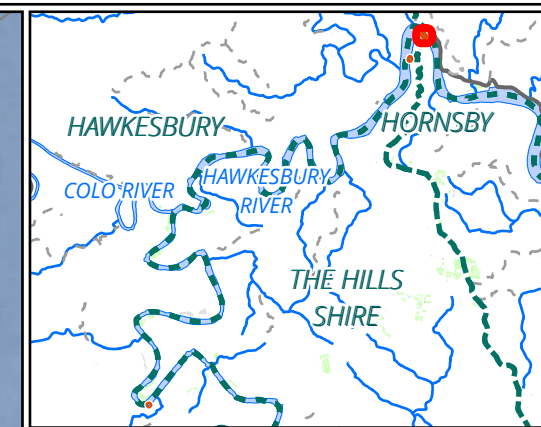


Photo 3-5: PCT 4091 – High condition within the study area as Wisemans Ferry

3.2 Threatened ecological communities.

All PCTs within the study area with an associated TEC are considered to represent their BC Act listed TECs. This is due to the landscape position, soil type and characteristic diagnostic species being present in all cases. Generally, BC Act TEC listings seek to protect even the most disturbed condition remnants within the TECs and therefore, no vegetation zones have been excluded. The PCTs and associated TECs within the study area are listed below and shown in Figure 3-2:

- PCT 3962 - Coastal Floodplain Phragmites Reedland associated with *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act)
- PCT 4025 - Cumberland Red Gum Riverflat Forest associated with *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).
- PCT 4028 - Estuarine Swamp Oak Twig-rush Forest associated with *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Endangered, BC Act).



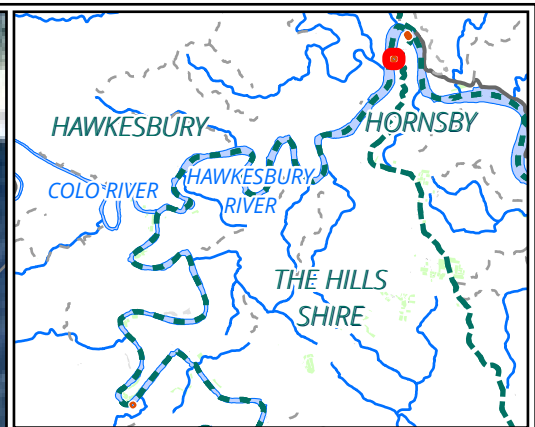
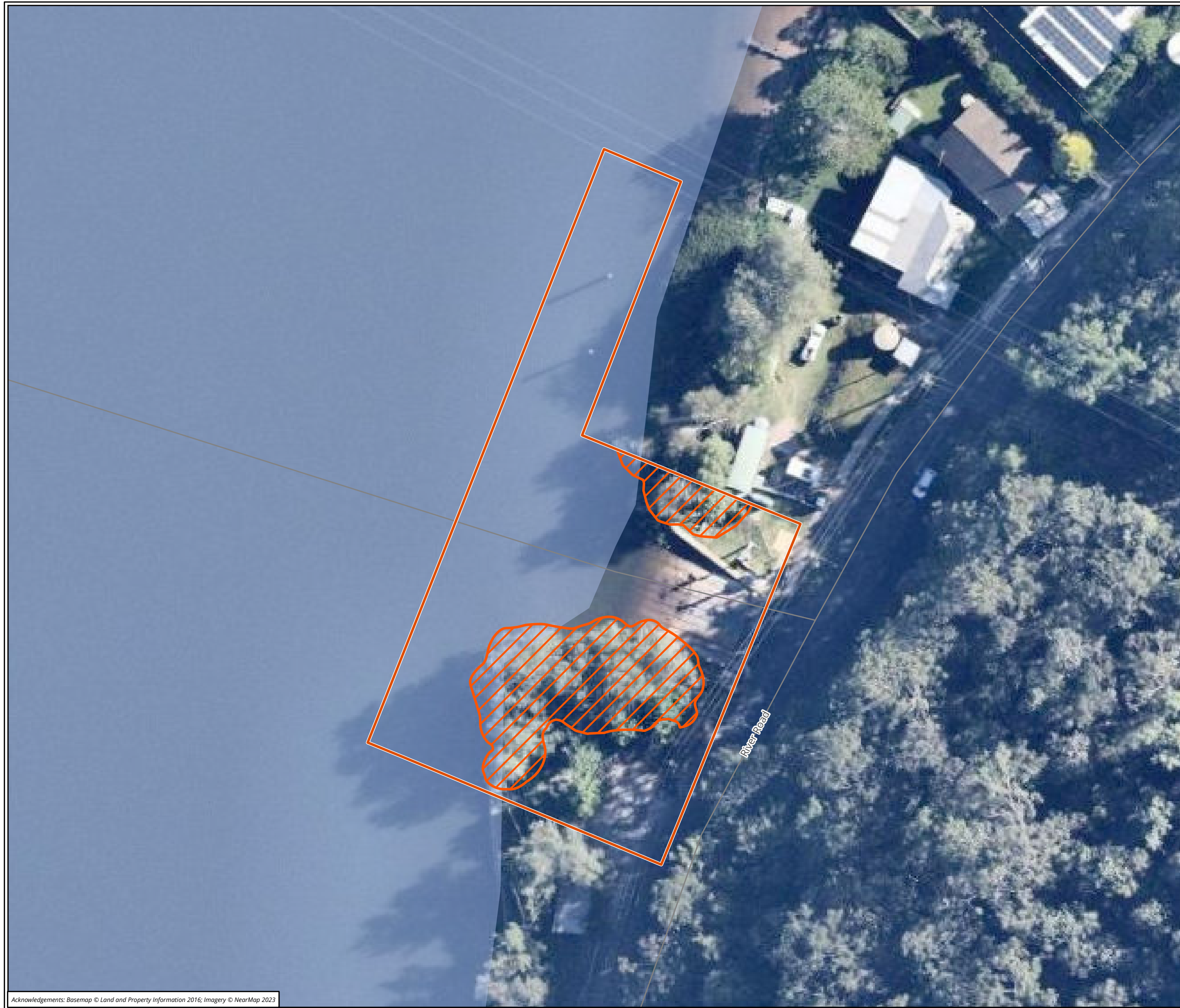
- Legend**
- Study area
- Threatened ecological communities**
- Coastal Floodplain Phragmites Reedland - Associated with the TEC Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered BC Act)
 - Estuarine Swamp Oak Twig-rush Forest - Associated with the TEC Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)

Figure 3-2: Threatened ecological communities - Wisemans Ferry

0 10 20
Metres
Scale: 1:600 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-2_TECs
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx



Legend

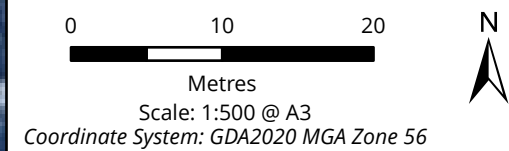
 Study area

Threatened ecological communities

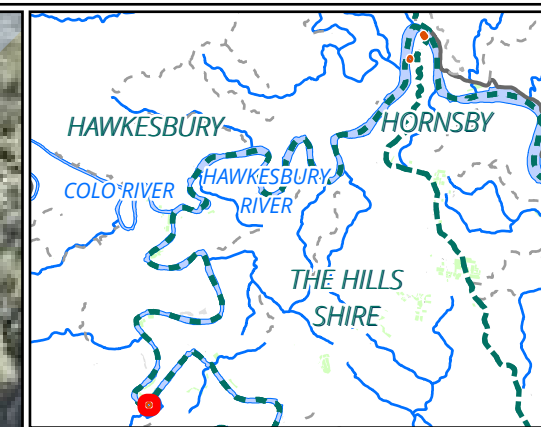
Estuarine Swamp Oak Twig-rush Forest - Associated with the TEC Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered EPBC Act and BC Act)



Figure 3-2: Threatened ecological communities - Webb's Creek



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-2_TECs
Project: P:\39200s\39281\Mapping\
39281_FerryCrossings_BAR.aprx



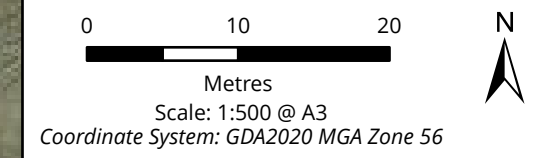
Legend

Study area

Threatened ecological communities

- Cumberland Red Gum Riverflat Forest- Associated with the TEC River-Flat Eucalypt Forest on
- Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Critically Endangered EPBC Act and Endangered BC Act)

Figure 3-2: Threatened ecological communities - Sackville Ferry



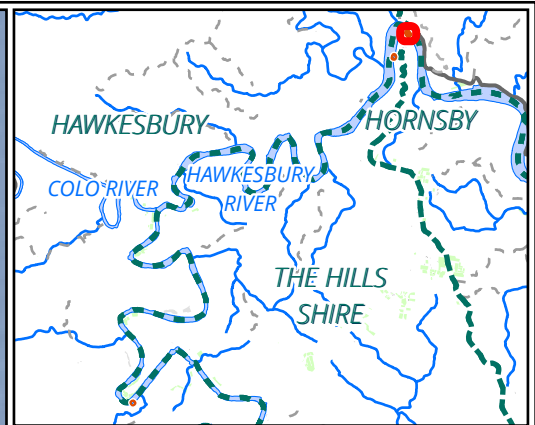
3.3 Groundwater dependent ecosystems

Groundwater Dependent Ecosystems (GDEs) are defined by the NSW Department of Primary Industries (DPI) Water as *ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services*. To assist with the identification and mapping of these ecosystems, DPI Water has published the guidance document *Methods for the identification of high probability groundwater dependent vegetation ecosystems* (Kuginis et al. 2016).

The likely degree of groundwater dependence of the PCTs within the study area has been assessed using the Atlas of GDEs (BOM 2023). The Atlas of GDEs (Figure 3-3) identifies areas of native vegetation within the study area that are modelled to contain moderate potential GDEs.

While PCT 4025 is considered to have a high likelihood of being a GDE in the location where it occurs, this PCT is not obligate and entirely dependent on groundwater. PCT 4025 is not restricted to locations of groundwater discharge or located within aquifers. This PCT is likely to be an opportunistic facultative GDE that depends on the subsurface presence of groundwater in some locations but not in others, particularly where an alternative source of water (i.e. rainfall) cannot be accessed to maintain ecological function (Kuginis et al. 2016).

While PCT 3962 and 4028 within the Wisemans Ferry and Webbs Creek are not mapped within the Atlas of GDE's, it is likely these communities have a high likelihood of being a GDE, given they are wetland communities.



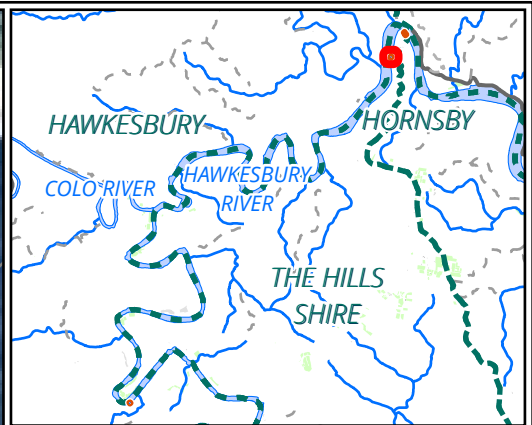
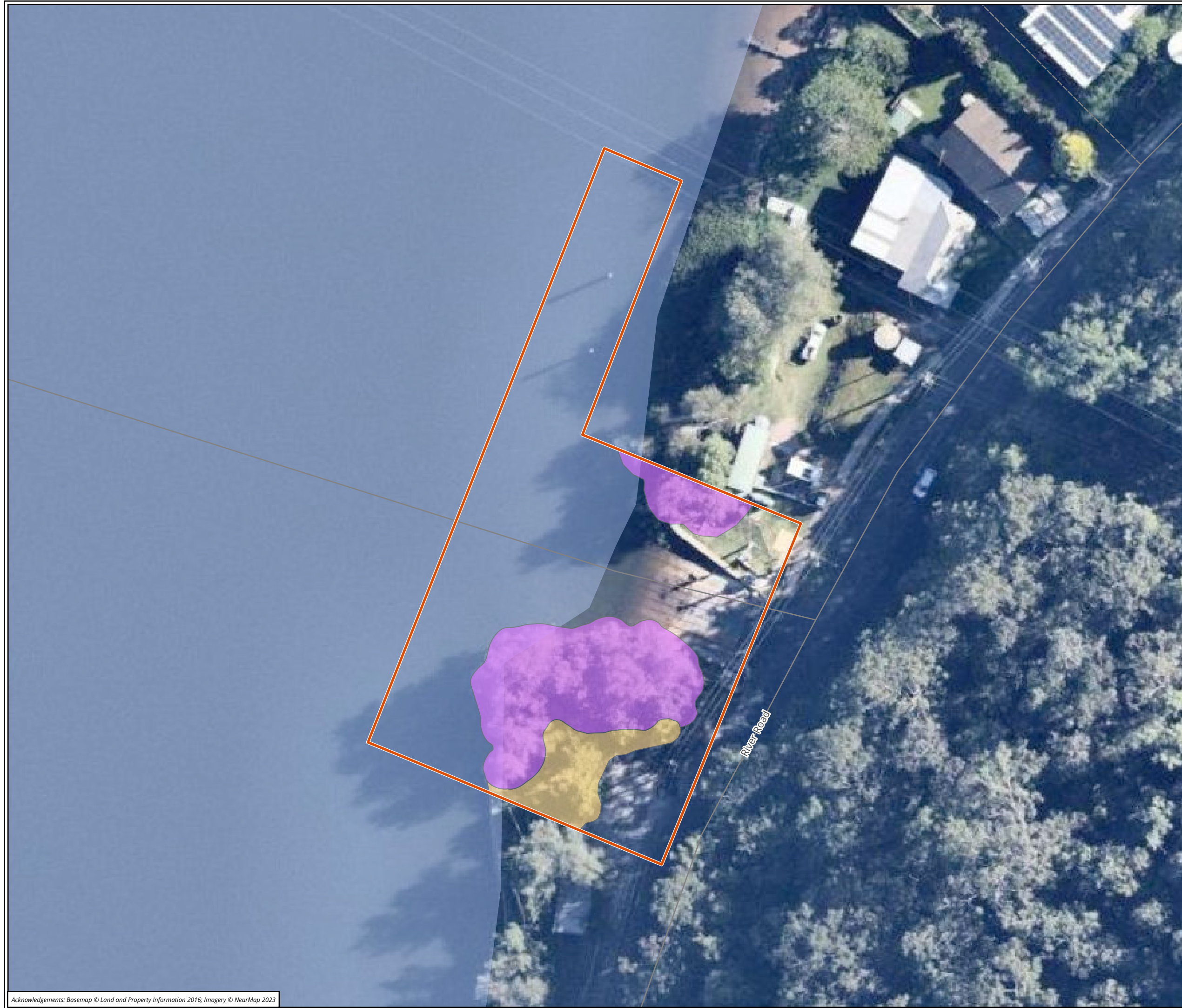
- Legend**
- Study area
 - Plant community type and condition
 - 3962 - Coastal Floodplain Phragmites Reedland, High
 - 4028 - Estuarine Swamp Oak Twig-rush Forest, High
 - 4091 - Grey Mangrove-River Mangrove Forest, High

Figure 3-3: Groundwater dependent ecosystem - Wisemans Ferry

0 10 20
Metres
Scale: 1:600 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-4_GDEs
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx



Legend

 Study area

Plant community type and condition

 4028 - Estuarine Swamp Oak Twig-rush Forest, Low

 Exotic vegetation

Figure 3-3: Groundwater dependent ecosystem - Webb's Creek

0 10 20

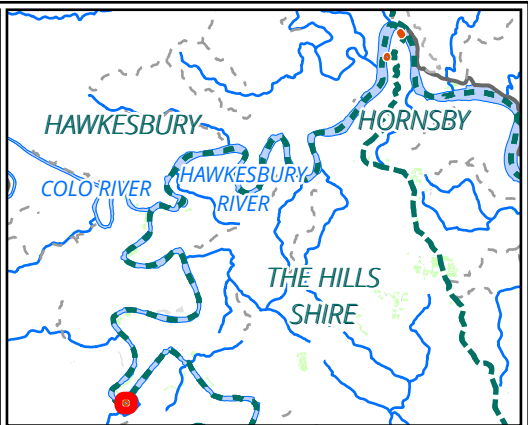
Metres

Scale: 1:500 @ A3

Coordinate System: GDA2020 MGA Zone 56

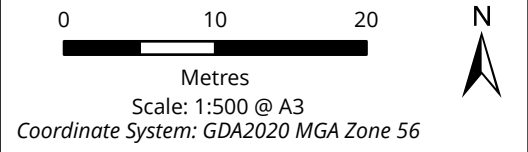


Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-4_GDEs
Project: P:\39200s\39281\Mapping\
39281_FerryCrossings_BAR.aprx



- Legend**
- Study area
 - Terrestrial GDE**
 - High potential GDE - from national assessment
 - Aquatic GDE**
 - High potential GDE - from national assessment
 - Plant community type and condition**
 - 4025 - Cumberland Red Gum Riverflat Forest, Low
 - Exotic vegetation

Figure 3-3: Groundwater dependent ecosystem - Sackville Ferry



3.4 Threatened species

As previously mentioned, no detailed targeted threatened species surveys were undertaken for this BAR. To overcome the limitation of not conducting any targeted surveys, a habitat assessment was carried out for all species that were identified through background searches and results obtained from the BAM-C database. Any species that were likely to have a moderate or greater likelihood of occurrence within the study area, and could be potentially impacted, were assumed present and evaluated through the completion of a ToS and/or SIC, which is provided in Appendix d and Appendix E.

A summary of the threatened species considered to have a ‘Moderate’ or higher likelihood of occurring within the study area is provided in Table 3-2.

Table 3-2: Threatened species surveys results

Species name	Common name	EPBC Act	BC Act	Identification method
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	VU	VU	Assumed present
Note: 1. As identified in Section 2.4 of this BAR.				

3.5 Aquatic results

The condition of each waterway was consistent largely consistent throughout the study area as all locations were associated with the Hawkesbury River. The Hawkesbury River is considered a Strahler Order 9 and therefore, each of the locations surveyed meet the requirements of Key Fish Habitat In accordance with the guidelines outlined in Fairfull (2013), and are mapped as Key Fish Habitat by DPI (DPI 2023b).

The aquatic condition of each site is highly varied between ferry locations, with the presence of moderate to high quality vegetation buffers determined to be the leading factor in the condition of each waterway. Sites in poor to moderate condition were typically subject to a considerable degree of modification of instream structures, degradation of riparian vegetation and high stormwater pollutant inputs from surrounding land uses. Sites in moderate to high condition typically exhibited a relatively higher degree of naturalness, including more intact riparian vegetation, the presence of a higher degree of aquatic habitat diversity or pool dimensions providing greater aquatic habitat and condition.

No threatened aquatic species or communities listed under the FM Act are considered likely to occur within the study area. If, mitigation measures in section 6 are followed, minimal impacts are expected to occur within the waterways. As such, no further assessment of these waterways has been undertaken.

3.5.1 Aquatic surveys

Three aquatic surveys were undertaken with one taken at each Ferry location within the study area. The results of each assessment are outlined in Table 3.5 below.

Table 3.5 Aquatic Assessments

Wisemans Ferry	
Condition assessment: Ninth order waterway (Strahler) and as such constitutes Key Fish Habitat. Surrounding land usage comprises of conservation land, a golf course and transport infrastructure. Low levels of pollution including runoff or rubbish, Signs of recent flooding, including debris in trees. High quality riparian corridor (approx. 40 m) including mangrove vegetation, with relatively low number exotic species observed. Bed and banks and predominantly comprised of sand and silt. Low levels of bank undercutting. Marginal habitat for native fish species. No obvious signs of sewage overflow. Water quality clear This site would be considered high condition due to the low level of pollution and moderate to high quality habitat available for aquatic species. No aquatic vegetation (such as sea grass) was recorded. Location: Hawkesbury River	
Impacts: Installation of boardwalk, pilings anchor blocks and floating infrastructure.	
Webbs Creek	
Condition assessment: Ninth order waterway (Strahler) and as such constitutes Key Fish Habitat. Surrounding land usage comprises of conservation land, rural residential housing and transport infrastructure. Low levels of pollution including runoff or rubbish. Signs of recent flooding, including debris in trees. Low to Moderate quality riparian corridor (approx. 20 m), with relatively low number exotic species observed. Bed and banks and predominantly comprised of sand, silt and rock. Low levels of bank undercutting due to installation of gabion wall. Marginal habitat for native fish species. No obvious signs of sewage overflow. Water quality clear This site would be considered moderate due to the low levels of pollution and low to moderate quality habitat available for aquatic species. No aquatic vegetation (such as sea grass) was recorded. Location: Hawkesbury River	
Impacts: Installation of Pilings.	

Photo 3.5.1 Wisemans Ferry

Photo 3.5.2 Webbs Creek

Sackville

Condition assessment:

Ninth order waterway (Strahler) and as such constitutes Key Fish Habitat.
Surrounding land usage comprises of rural residential housing and transport infrastructure.
Low levels of pollution including runoff or rubbish
Signs of recent flooding, including debris in trees.
Moderate quality riparian corridor (approx. 25 m), with relatively moderate to high number of exotic species observed.
Bed and banks and predominantly comprised of sand, silt and rock.
Low levels of bank undercutting due sandstone retaining wall.
Marginal habitat for native fish and other aquatic species.
No obvious signs of sewage overflow.
Water quality clear
This site would be considered moderate condition due to the low levels of pollution and low to moderate quality habitat available for aquatic species.
No aquatic vegetation (such as sea grass) was recorded.
Location: Hawkesbury River



Photo 3.5.3 Sackville Ferry

Impacts: Minor tree trimming and installation of pilings.

3.6 Areas of outstanding biodiversity value

Areas of outstanding biodiversity value are declared by the Minister under the NSW BC Act, with a register of these declared areas kept by NSW DCCEEW. There are no currently declared areas of outstanding biodiversity value located within the study areas or broader assessment area.

3.7 Wildlife connectivity corridors

Wildlife connectivity corridors are currently not restricted throughout the locality, as there are large tracts of intact native vegetation adjacent to all study areas. The trimming of one tree for the proposed works is unlikely to fragment movement corridors for threatened fauna, as extensive remnant vegetation adjacent to the subject land will remain intact and not be fragmented. The clearing of wetland vegetation will be temporary in nature and therefore connectivity will be returned after construction works are completed.

3.8 SEPPs

State Environmental Planning Policies (SEPPs) are environmental planning instruments under the EP&A Act that outline policy objectives relevant to State or regional environmental planning issues. As of early 2022, NSW DCCEEW have consolidated the existing 45 SEPPs into 11 new SEPPs, with the following being relevant to this BAR.

SEPP (Transport and Infrastructure) 2021

The SEPP (Transport and Infrastructure) 2021 consolidates and repeals the provisions of four SEPPs, with the following relevant to this project:

- Chapter 2 – Infrastructure (prior SEPP (Infrastructure) 2007), contains planning rules and controls from the Infrastructure SEPP for infrastructure in NSW, such as for hospitals, roads, railways, public transport, emergency services, water supply and electricity delivery.

Chapter 2, Infrastructure is relevant to this assessment as development for the purposes of associated public transport facilities for a public ferry wharf are considered as ‘development permitted without consent’.

SEPP (Biodiversity and Conservation) 2021

Chapter four of the SEPP (Koala Habitat Protection) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The study areas are located within the Hawkesbury City and Hornsby Shire LGA, all of which are listed under Schedule 2 of the SEPP, and are therefore subject to the requirements laid out by the policy. However, as the project is proceeding under the Transport and Infrastructure SEPP, that planning instrument takes precedence and no further consideration is required.

3.9 Matters of national environmental significance

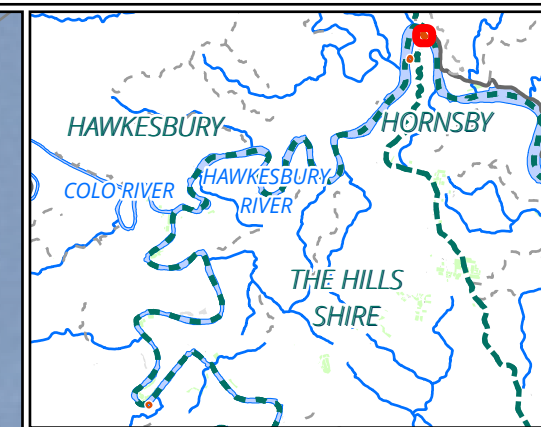
An assessment of the impacts of the proposed development on Matters of National Environmental Significance (MNES), against heads of consideration outlined in Commonwealth of Australia (Commonwealth of Australia 2013a) was prepared to determine whether referral of the proposed development to the Commonwealth Minister for the Environment is required.

The following EPBC Act listed threatened species are considered to have a ‘Moderate’ or higher likelihood of occurring within the study area, and may be potentially impacted:

- Glossy Black Cockatoo *Calyptorhynchus lathami* (Vulnerable, EPBC Act)

The distribution of habitat for these species within the study area is shown on [Figure 3-4](#).

No TECs listed under the EPBC Act were identified within the subject land. Therefore, further assessment under the EPBC Act is not required.



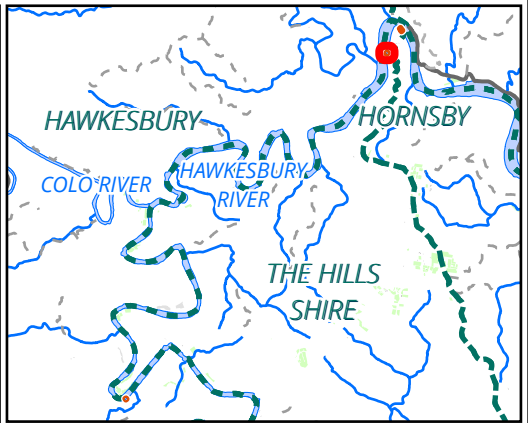
- Legend**
- Study area
 - Construction footprint and proposed works at Wisemans Ferry**
 - Construct two new anchor blocks to secure the moored ferries
 - Install twelve new steel mooring poles
 - Remove eleven existing timber mooring poles
 - Access track
 - Anchor block
 - Compund
 - Pontoon and walkway
 - Work area
 - Matters of national environmental significance**
 - Threatened species polygon
 - Glossy black cockatoo - *Calyptorhynchus lathami*

Figure 3-4: Matters of national environmental significance - Wisemans Ferry

0 10 20
Metres
Scale: 1:600 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-5_MONES
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx



Legend

Study area

Construction footprint and proposed works at Webb's Creek Ferry

Install seven new steel mooring poles

Remove two existing timber mooring poles

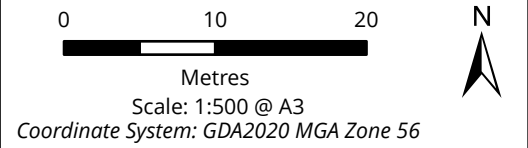
Anchor block

Matters of national environmental significance

Threatened species polygon

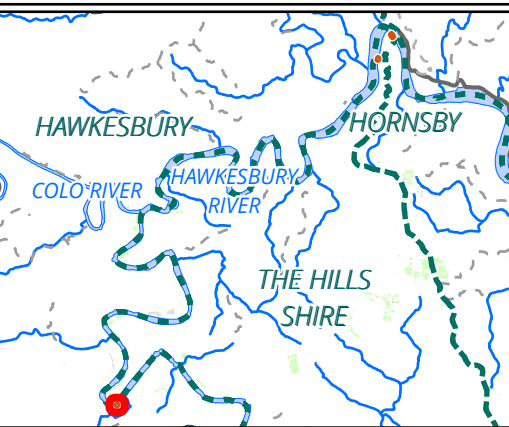
Glossy black cockatoo - *Calyptorhynchus lathami*

Figure 3-4: Matters of national environmental significance - Webb's Creek



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-5_MONES
Project: P:\39200s\39281\Mapping\39281_FerryCrossings_BAR.aprx

Hawkesbury River



Legend

- Study area
- Construction footprint and proposed works at Sackville Ferry**
 - Remove one existing timber mooring pole
 - Install four new steel mooring poles
 - Install sleeve over three existing poles to raise the height of the poles
- Anchor block
- Vegetation trimming
- Matters of national environmental significance**
 - Threatened species polygon
 - Glossy black cockatoo - *Calyptorhynchus lathami*

Figure 3-4: Matters of national environmental significance - Sackville Ferry

0 10 20
Metres
Scale: 1:500 @ A3
Coordinate System: GDA2020 MGA Zone 56



Matter: 39281, Date: 19 February 2024,
Prepared for: JS, Prepared by: JB, Last edited by: jbeckius
Layout: 39281_F3-5_MONES
Project: P:\39200s\39281\Mapping\
39281_FerryCrossings_BAR.aprx

4. Avoidance and minimisation

A key part of Transport's management of biodiversity for this proposal is the application of the 'avoid, minimise, mitigate and offset' hierarchy as follows:

1. Avoid and minimise impacts.
2. Mitigate impacts.
3. Offset impacts in accordance with Transport guidelines.

Proposal design, including the location of temporary ancillary construction and maintenance facilities, should avoid and minimise clearing of native vegetation and habitat by:

- Reducing the clearing footprint of the proposal.
- Locating ancillary facilities in areas where there are no biodiversity values.
- Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the lowest condition.
- Locating ancillary facilities in areas that avoid habitat for threatened species and vegetation in high threat status categories (e.g., endangered or critically endangered).

This section of the BAR demonstrates the efforts taken to avoid and minimise impacts on biodiversity values.

As is common regarding infrastructure projects, opportunities to avoid and minimise impacts to the biodiversity values are often limited. The level of impact to native vegetation that will result from the proposed works is not substantial and the footprint of the proposal is considered the minimum required to provide a more functional and safer roadway.

Whilst the impacts are limited, the proposed works have still mitigated impacts to biodiversity by utilising cleared and/or disturbed areas for the strategic location of compound areas and spoil sites and the strategic placement of the board walk to avoid mangrove vegetation.

5. Impact assessment

5.1 Construction direct impacts

The impacts associated with the proposed works are of a minor scale, being limited to the removal of a small area of reedland vegetation (51.2 m²) and the trimming of a single tree (Swamp-oak *Casuarina glauca*) An assessment of these impacts is provided below.

5.1.1 Removal of native vegetation

The proposed works would result in the direct loss of native vegetation, which is summarised in Table 5-1. Impacts were calculated using GIS and by applying the construction footprint.

Table 5-1: Summary of direct impacts on native vegetation

Veg. zone	Plant community type (PCT)	Broad condition class	TEC	Area to be impacted (ha or m ²) ¹	Impact Location
Zone 1_High	PCT 3962 <i>Coastal Floodplain Phragmites Reedland</i>	High	<i>Freshwater wetlands on coastal floodplains of the Sydney Basin, North Coast and South East Corner</i> (Endangered, BC Act)	51.2 m ²	Wisemans Ferry
Zone 2_High	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	High	<i>Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions</i> (Endangered, BC Act)	-	Wisemans Ferry
Zone 3_Low	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Low	<i>Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions</i> (Endangered, BC Act)	-	Webbs Creek Ferry
Zone 4_Low	PCT 4025 <i>Cumberland Red Gum Riverflat Forest</i>	Low	<i>River-flat Eucalypt Forest on coastal floodplains of New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> (Endangered, BC Act)	Trimming of one individual Swamp-oak <i>Casuarina glauca</i>	Sackville Ferry
Zone 5_High	PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	High	Not a TEC	-	Wisemans Ferry
NOTE 1: Area to be cleared based on ground-truthed vegetation mapping within the subject land.					

5.1.2 Removal of threatened fauna habitat

The proposed works would result in impacts to native vegetation condition which may form habitat for threatened fauna. However, it should be mentioned that impacts associated with the proposed works are considerably small, being limited to the trimming of tree branches and the removal of 51.2 m² of native reedland vegetation to facilitate the construction of a boardwalk and anchor blocks.

A summary of impacts to potential habitat for those species assessed as having a moderate or higher likelihood of occurrence within the study area are presented below.

Table 5-2: Summary of direct impacts on threatened fauna and habitat

Species name	EPBC Act	BC Act	Credit type ¹	Potential occurrence	Associated habitat in subject land	Impact (ha)
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	VU	VU	Ecosystem	Moderate	PCT 4025	Minor tree trimming within PCT 4025
<i>Note: 1. For dual-credit species, identify the credit type being assessed (ie. where there is no breeding habitat present the credit type would be 'ecosystem').</i>						

5.1.3 Removal of threatened flora

No threatened flora was recorded within the study area during field investigations or considered likely to occur due to the proximity to infrastructure and level of disturbance. Based on the small size of the study area and historic disturbances, the survey effort is considered comprehensive to assess the presence of potential threatened flora species within the study area.

5.1.4 Aquatic impacts

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened entities, and critical habitats listed under the FM Act must be assessed through a ToS process under Section 1.7 of the EP&A Act. If assessment under Section 1.7 of the EP&A Act determines a project is likely to result in a significant effect to threatened species, populations or communities, then a SIS should be prepared.

Key Fish Habitat is present along all areas of the study area adjacent to the Hawkesbury River. The Macquarie Perch is both listed under the FM Act and is known to occur in areas of the Hawkesbury River. However, the portion of the Hawkesbury River within the study area is not within the known distribution mapping of the species. Further to this, mitigation measures would be implemented to minimise indirect impacts such as sedimentation. Therefore, it is unlikely that threatened aquatic species, populations or communities listed under the FM Act in the study area are likely to be impacted by the proposal. Additionally impacts within aquatic areas will be limited to the removal of existing pilings, the installation of new pilings and floating infrastructure. These additions are minor in nature, and are therefore, unlikely to reduce the movement and dispersal of aquatic flora and fauna species.

Within the study area, PCT 4091 contains a high abundance of mangrove species, of which are protected under Part 7 of the FM Act. During field investigations undertaken in June 2023, no mangrove individuals were detected within the construction footprint. However, with the consideration that field investigations were conducted over 6 months ago, there is a possibility that mangrove pneumatophores could have arisen. Therefore, it is recommended that pre-clearance surveys should be undertaken prior to construction to rule out their presence. This is discussed further below.

In the instance that mangroves will be impacted, Part 7 Division 4 of the FM Act (Protection of mangroves and certain other marine vegetation) states that a permit must be obtained prior to any marine vegetation being harmed.

5.1.5 Injury and mortality

The potential for wildlife injury or death could occur during the construction phase of the proposal. The clearing of vegetation may result in injury or death to resident fauna. Species at risk are primarily restricted to ground dwelling species such as snakes, lizards, birds, and small mammals. There is also the risk of displaced fauna succumbing to predation, or stress induced by competing with existing resident populations for resources, particularly shelter / refuge habitat.

In summary, injury and mortality of fauna could occur during construction activities, including:

- During construction when vegetation and habitat are being cleared.
- Collision/strike by machinery and plant.
- Collision with construction traffic.

5.1.6 Groundwater dependent ecosystems

As discussed in Section 3.2, the Atlas of GDEs (BOM 2023) identified one potential GDE within the study area. However, any impacts to the stated GDE are limited to the trimming of a single tree (Swamp-oak *Casuarina glauca*). These impacts are not anticipated to result in any appreciable change in groundwater flow or depth.

For this project specifically, groundwater interferences are not expected and as such substantial impacts to GDEs are unlikely to occur.

5.2 Indirect and operational impacts

5.2.1 Edge effects on adjacent native vegetation and habitat

With consideration that the proposed works are of minor scale (limited to tree trimming and the temporary removal of 0.05 ha (51.2 m²) of PCT 3962 Coastal Floodplain Phragmites Reedland already exposed to existing edge effects, the proposal is unlikely to exacerbate any current edge effects. As the works will be temporary within the boardwalk area, if weeds are managed during the regeneration period, vegetation should return to its current state. Nonetheless, project specific mitigation measures regarding edge effects are displayed in Chapter 6.

5.2.2 Wildlife connectivity and habitat fragmentation

Potential impacts to wildlife connectivity can occur where roads affect the movement of plants and animals between habitats. Wildlife connectivity issues include blocking or degrading fish passage, preventing migration of a species and decreasing the opportunity for dispersal. Wildlife connectivity corridors are currently limited due to proximity to existing infrastructure. The proposed works will be minor in nature and include tree trimming and the installation of a raised boardwalk. After the installation of the boardwalk at Wisemans Ferry is complete, the existing Reedland vegetation will be allowed to regrow in all areas except for a small section where anchor blocks are to be installed. As the anchor blocks are small in size, impacts will be small, and vegetation will largely remain intact, therefore, works are not expected to reduce wildlife connectivity or increase habitat fragmentation. Works to take place within aquatic areas are limited to vertical pilings and floating infrastructure which will not disturb the flow of water. Therefore, while the project may result in a slight temporary decrease in available habitat in the immediate areas to be impacted, it is unlikely to be substantial.

5.2.3 Injury and mortality

As operations associated with the completed works are not expected to change greatly from existing operations, impacts will be primarily limited to the construction phase and therefore, no new indirect operational impacts are expected to occur.

5.2.4 Invasion and spread of weeds

The proposal has the potential to spread weeds during vegetation removal and through the movement of vehicles and machinery into or out of the proposal area. Weeds are easily transported as seeds and propagules on machinery brought to the proposal area. Equally, they can be carried away to other areas from the site or spread within it. If weeds are not controlled prior to work commencing, then there is the potential for spread throughout the site during and following construction. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

Low condition areas of native vegetation (PCT) within the study area generally contained a moderate diversity and abundance of exotic weed species. A summary of the exotic species recorded across the study area is provided below.

Table 5-3 Summary of exotic flora within the study area

Species name	Common Name	Priority Weed	High Threat Weed (BAM)
<i>Bidens pilosa</i>	Cobbler's Pegs	-	X
<i>Bromus catharticus</i>	Prairie Grass	-	-
<i>Cenchrus clandestinum</i>	Buffalo grass	-	X
<i>Chloris gayana</i>	Rhodes Grass	-	X
<i>Erythrina crista-galli</i>	Cockspur Coral Tree	-	X
<i>Jacaranda mimosifolia</i>	Jacaranda	-	-
<i>Lantana camara</i>	Lantana	X	X
<i>Paspalum urvillei</i>	Vasey Grass	-	X
<i>Plantago lanceolata</i>	Lamb's Tongues	-	-
<i>Ricinus communis</i>	Castor Oil Plant	-	X
<i>Rubus fruticosus</i> spp. <i>aggregate</i>	Blackberry	X	X
<i>Rumex crispus</i>	Curled Dock	-	-
<i>Rumex sagittatus</i> syn. <i>Acetosa sagittata</i>	Turkey Rhubarb	-	X
<i>Setaria parviflora</i>	Pidgeon Grass	-	-
<i>Sida rhombifolia</i>	Paddy's Lucerne	-	-
<i>Solanum mauritianum</i>	Tabacco Weed	-	-
<i>Solanum nigrum</i>	Black-berry Nightshade	-	-
<i>Solanum sisymbriifolium</i>	Sticky Nightshade	-	-
<i>Tagetes minuta</i>	Stinking Roger	-	-
<i>Tradescantia fluminensis</i>	Wander Trad	-	X
<i>Verbena bonariensis</i>	Purpletop	-	-

Two priority weeds for the Greater Sydney LLS region have been recorded in the study area, and are listed above.

The Biosecurity Act provides for the identification, classification and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled or eradicated in the region.

The General Biosecurity Duty as outlined in the Biosecurity Act states:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

To prevent biosecurity impacts from occurring as a result of the presence of the above listed priority weeds within the study area, all practical steps should be taken to control and eradicate the weeds from the study area as per the relevant biosecurity duties outlined above, or prior to or during any future vegetation removal.

5.2.5 Invasion and spread of pests, pathogens and disease

During construction, the proposal has the potential to cause both the spread of pathogens and diseases currently occurring in the study area and surrounds, and to introduce new biodiversity risks. This is particularly the case for fungus and diseases spread through the introduction and movement of soil. Standard pest hygiene management measures (listed below in Chapter 6) during construction would minimise this risk.

5.2.6 Changes to hydrology

There would be some alteration to the existing surface hydrological conditions, however, this alteration is anticipated to be minor (surface level changes) and temporary such that the processes that are currently in place would largely remain.

Any small change to hydrology is unlikely to cause a substantial impact to the native vegetation and habitat present in the study area or surrounds post construction.

5.2.7 Noise, light, dust and vibration

Noise, light and vibration may disturb fauna, including any nearby threatened species. However, disturbances to wildlife from noise emissions and light spill during construction are considered to be negligible as associated disturbances will be localised.

While increased noise levels can reduce the distance over which acoustic signals such as song can be detected, the proposed works will only result in a temporary increase in noise during the construction phase, with operation impacts to return to existing levels post-construction. Therefore, potential impacts to wildlife are of minor concern.

5.3 Cumulative impacts

Cumulative impacts are impacts that, when considered together, have different and/or greater impacts than a single impact on its own. Cumulative impacts can result from the successive, incremental and/or combined effects of a project when considered with other project/s. The extent to which another project would interact with the construction or operation of the proposal depends on its scale, location and/or timing of construction and/or operation. Generally, cumulative impacts would be expected to occur in situations where multiple long-duration construction activities are undertaken close to, and over a similar timescale to, construction activities for the proposal.

Cumulative impacts would also be expected to occur in situations where projects are operating at a similar scale and location to the proposal. However, in the instance of the current project, no other projects within close proximity are currently taking place. Therefore, the impacts to the 0.005 ha (51.2 m²) of native vegetation for the proposed works is the sole contributor to cumulative impacts for the area.

5.4 Assessments of significance

BC Act ToS and EPBC Act SIC assessments were undertaken for all relevant threatened entities recorded or considered to have a moderate or higher likelihood of occurrence and may be impacted by the proposed works. Results from these assessments are displayed below in Table 5-6 and Table 5-7. With respect to the BC Act, the following is to be considered for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

- a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction
- b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
 - i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
 - ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
- c) In relation to the habitat of a threatened species or ecological community
- d) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

- e) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
- f) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
- g) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
- h) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

No *Fisheries Management Act 1994* (FM Act) 7-part tests were undertaken as no threatened entities protected under the FM Act are considered likely to occur and therefore there is no risk of impact.

Table 5-4: Summary of BC Act significance assessments findings

Significance assessment question (per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
<i>River-flat Eucalypt Forest on coastal floodplains of New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	X	N	N	N	N	No
<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	X	N	N	N	N	No
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	N	X	N	N	N	No
Y = Yes (negative impact), N = No (no or positive impact), X = Yes/No answer not applicable? = unknown impact.						

Table 5-5: Summary of EPBC Act significance assessments findings

Threatened species, or communities	Likely significant impact?
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	No

6. Mitigation

Mitigation measures recommended for the proposal are detailed in Table 6-1.

Table 6-1: Mitigation measures

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B01	Removal of native vegetation	Pre-clearing surveys will be undertaken in accordance with <i>Guide 1: Pre-clearing process</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Prior to construction	Effective	51.2 m ² of native vegetation	Transport/Contractor
B02		Vegetation removal will be undertaken in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	51.2 m ² of native vegetation	Transport/Contractor
B03		Native vegetation will be re-established in accordance with <i>Guide 3: Re-establishment of native vegetation</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	Post construction	Effective	51.2 m ² of native vegetation	Transport/Contractor
B04		The unexpected species find procedure is to be followed under <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	51.2 m ² of native vegetation	Transport/Contractor
B05	Removal of threatened fauna habitat	Fauna will be managed in accordance with <i>Guide 9: Fauna handling</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	Tree trimming	Transport/Contractor
B06		Habitat removal will be undertaken in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	Tree trimming	Transport/Contractor
B07		Habitat will be replaced or re-instated in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> and <i>Guide 8: Nest boxes</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Proven	Tree trimming	Transport/Contractor
B08		The unexpected species find procedure is to be followed under <i>Guide 1: Pre-clearing process</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) if threatened fauna, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	Tree trimming	Transport/Contractor

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B9	Aquatic impacts	Aquatic habitat will be protected in accordance with <i>Guide 10: Aquatic habitats and riparian zones</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011) and Section 3.3.2 <i>Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013</i> (DPI (Fisheries NSW) 2013).	During construction	Effective	Minimal, if any	Transport/Contractor
B10	Changes to hydrology and groundwater dependent ecosystems	Appropriate erosion and sediment control measures should be installed at all sites to avoid sedimentation of receiving water bodies or other indirect impacts to surrounding biodiversity values.	Prior to construction	Effective	Tree trimming and 51.2 m ² of native vegetation	Transport/Contractor
B11	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with <i>Guide 2: Exclusion zones</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	Minimal, if any	Transport/Contractor
B12	Injury and mortality of fauna	Fauna will be managed in accordance with <i>Guide 9: Fauna handling</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	Unknown	Transport/Contractor
B13	Invasion and spread of weeds	Weed species will be managed in accordance with <i>Guide 6: Weed management</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	Unknown	Transport/Contractor
B14	Invasion and spread of pests	Pest species will be managed within the proposal site.	During construction	Effective	Unknown	Transport/Contractor
B15	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with <i>Guide 2: Exclusion zones</i> of the <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011).	During construction	Effective	Unknown	Transport/Contractor

7. Offsets and other measures

This section considers whether any impacts require the provision of biodiversity offsets, conservation measures or tree and hollow replacement in accordance with the Transport:

- No Net Loss Guidelines and supporting resources (Transport).
- Tree and Hollow Replacement Guidelines and supporting resources (Transport).

7.1 Thresholds

The thresholds set out by the No Net Loss Guidelines are demonstrated in Table 7-1 and an assessment against these thresholds is provided in Table 7-2.

Table 7-1: Offset thresholds (Transport No Net Loss Guidelines)

Impact	Threshold
Works involving clearing of a <u>CEEC</u>	Where there is any clearing of an <u>CEEC</u> in 'moderate to good' condition
Works involving clearing of an <u>EEC</u>	Where clearing of a <u>EEC</u> ≥ 2 ha in 'moderate to good' condition
Works involving clearing of <u>VEC</u>	Where clearing of <u>VEC</u> ≥ 5 ha in 'moderate to good' condition
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥ 1 ha in 'moderate to good' condition
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥ 10 or where clearing of habitat is ≥ 1 ha
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the Tree and Hollow Replacement Guideline.	Any clearing of hollows and/or trees ≥ 5 cm DBH

Table 7-2: Assessment of vegetation impacts against thresholds

Veg. zone	Plant community type (PCT)	Condition	TEC	Impact area (ha or m ²) ¹	Threshold triggered?
Zone 1_High	PCT 3962 Coastal Floodplain Phragmites Reedland	High	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)	0.005 ha (51.2 m ²)	No
Zone 2_High	PCT 4028 Estuarine Swamp Oak Twig-rush Forest	High	Swamp Oak Floodplain Forest of the New South Wales	0 ha	No

			<i>North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)</i>		
Zone 3_Low	PCT 4028 <i>Estuarine Swamp Oak Twig-rush Forest</i>	Low	<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)</i>	0 ha	No
Zone 4_Low	PCT 4025 <i>Cumberland Red Gum Riverflat Forest</i>	Low	<i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered, BC Act)</i>	Tree trimming	No
Zone 5_High	PCT 4091 <i>Grey Mangrove-River Mangrove Forest</i>	High	Not a TEC	0 ha	No

7.2 Preliminary offset and tree/hollow replacement calculations

As no biodiversity offsetting thresholds have been reached under the Not Net Loss, and Tree and Hollow Guidelines, offsets or conservation measures are not required (Transport for NSW 2022b).

8. Conclusion

This BAR report provides an assessment of the potential impact of the proposed works on ecological values in accordance with the EP&A Act, FM Act, BC Act and the EPBC Act. The study area was found to contain the following biodiversity values.

- 0.02 ha of non-threatened native vegetation;
 - PCT 4091: Grey Mangrove-River Mangrove Forest
- 0.4 ha of threatened native vegetation;
 - PCT 3962: Coastal Floodplain Phragmites Reedland, consistent with the Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC (Endangered, BC Act).
 - PCT 4025: Cumberland Red Gum Riverflat Forest, consistent with the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC (Endangered, BC Act).
 - PCT 4028: Estuarine Swamp Oak Twig-rush Forest consistent with the Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC (Endangered, BC Act).
- Potential habitat for the following threatened fauna species:
 - Glossy Black-Cockatoo *Calyptorhynchus lathami* (Vulnerable, EPBC Act and BC Act)

Appropriate significant impact assessments (ToS and/or SICS) were undertaken for the above TECs and threatened fauna species. These assessments concluded that the proposal is unlikely to have a significant impact on any state or nationally listed entity.

Through the application of specific and measurable mitigation measures, it is anticipated that the level of impact to threatened fauna and flora would continue to be reduced from the levels assessed in this BAR. Therefore, Transport is not required to prepare a SIS or BDAR. Safeguards specific to the removal of threatened and general fauna species habitat have been included in section 6 of this report, which primarily covers mitigation measures listed in the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (refer to Table 6-1 for full details regarding proposal safeguards). The successful execution of the precautionary measures and mitigation strategies specified in this BAR can effectively alleviate the risks of adverse effects on biodiversity to a level that is deemed satisfactory.

In accordance with Transport's No Net Loss Policy and Tree and Hollow replacement guidelines (Transport for NSW 2022a), the proposal will not trigger the consideration of offsets.

9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity Assessment Method Calculator	Biodiversity Assessment Method Calculator (BAM-C) – the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department (DPIE 2020a).
Biodiversity credit report	The report produced by the BAM-C that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (DPIE 2020a).
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020a).
Biodiversity Offsets and Agreement Management System	The online system used to administer the Biodiversity Offsets Scheme. The BOAMS is used by accredited assessors (to carry out specific BAM-related tasks involving access to the BAM-C to perform assessments, submit data, generate credits and calculate a credit price), by landholders (to apply for a Biodiversity Stewardship Agreement and manage ongoing reporting obligations for their agreement) and by proponents of developments (to view their credit obligation or the payment required to the Biodiversity Conservation Fund).
Biodiversity risk weighting	A factor of the formulas used by the BAM to calculate credits. The biodiversity risk weighting (BRW) is a score given to each vegetation zone and species based on the ‘sensitivity to loss’ versus the ‘sensitivity to gain’. The value is set for threatened species and listed in the TBDC. The BRW for vegetation is calculated for each vegetation zone by the BAM-C using a factor of the ‘sensitivity to loss’ of the PCT or TEC (located in the BioNet vegetation classification) and the ‘sensitivity to gain’ of the ecosystem credit species (in the TBDC) that are predicted to occur.
Biodiversity Stewardship site	Refers to land which is the subject to a Biodiversity Stewardship Agreement under the BC Act.
BioNet Atlas	The DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish (DPIE 2020a).
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. Refer About BioNet Vegetation Classification NSW Environment and Heritage (DPE 2020a).
Construction footprint	The area to be directly impacted by the proposal during construction activities. See also definition for subject land.

Term	Definition
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020a).
Ecosystem credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for ecosystem credits. This is analogous with the definition of 'predicted species'.
Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site (DPIE 2020a).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (DPIE 2020a).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020a).
Landscape assessment area	The area which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land or 500 m along each side of the centre line of a linear-shaped proposal
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year (OEH 2018).
Matter of national environmental significance	A matter of national environmental significance (MNES) is any of the nine defined components protected by a provision of Part 3 of the EPBC Act (Commonwealth).
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary: a) trees (including any sapling or shrub or any scrub). b) understorey plants.

Term	Definition
	c) groundcover (being any type of herbaceous vegetation). d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020a).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Patch size	An area of native vegetation that: - occurs on the development site or biodiversity stewardship site. - includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (DPIE 2020a).
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Spatial datasets	Spatial databases required to prepare a BAR: - BioNet NSW (Mitchell) Landscapes – Version 3.1 - NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7 - NSW soil profiles - hydrogeological landscapes - acid sulfate soils risk - digital cadastral database - Vegetation Information Systems maps - Geological sites of NSW.
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (DPIE 2020a). This is analogous with the definition of ‘candidate species’.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (DPIE 2020a).
Species polygon	An area of land identified in Chapter 5 (of the BAM) that contains habitat or is occupied by a threatened species (DPIE 2020a).
Study area	The area directly affected by the proposal (subject land or construction footprint) and any additional areas likely to be affected by the proposal, either directly or indirectly.
Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject land (i.e., the area of land in the 1500 m buffer zone around the subject land or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land

Term	Definition
	includes the biodiversity certification assessment area (DPIE 2020a). See also definition for construction footprint.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (DPIE 2020a). Part of the BioNet database, published by the EHG and accessible from the BioNet website at www.bionet.nsw.gov.au .
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (DPIE 2020a).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (DPIE 2020a).

10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
BRW	Biodiversity risk weighting
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DIWA	Directory of Important Wetlands in Australia
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EHG	NSW Environment and Heritage Group within the Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	<i>Environment Planning and Assessment Act 1979</i> (NSW)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
Fisheries NSW Policy and guidelines	Fisheries NSW Policy and guidelines for fish habitat conservation and management (Update 2013)
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of national environmental significance
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SAIL	Serious and Irreversible Impacts
SEARS	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (EECs and CEECs)
Transport	Transport for NSW

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Appendix A: Species recorded

Recorded flora

Family	Scientific name	Common name
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash
Acanthaceae	<i>Avicennia marina</i> subsp. <i>australasica</i>	Grey Mangrove
Myrtaceae	<i>Backhousia myrtifolia</i>	Grey Myrtle
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Poaceae	<i>Bromus catharticus</i>	Prairie Grass
Cyperaceae	<i>Bolboschoenus fluviatilis</i>	Marsh Club-rush
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak
Poaceae	<i>Cenchrus clandestinus</i> *	Kikuyu Grass
Poaceae	<i>Chloris gayana</i> *	Rhodes Grass
Poaceae	<i>Cynodon dactylon</i>	Couch Grass
Asphodelaceae	<i>Dianella caerulea</i>	Blue Flax-lily
Poaceae	<i>Entolasia marginata</i>	Bordered Panic
Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum
Myrtaceae	<i>Eucalyptus saligna</i>	Blue Gum
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Moraceae	<i>Ficus coronata</i>	Sandpaper Fig
Geraniaceae	<i>Geranium homeanum</i>	Rainforest Crane's-bill

Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree
Rubiaceae	<i>Gynochthodes jasminoides</i>	Sweet Morinda
Myrtaceae	<i>Melaleuca linariifolia</i>	Flax-leaf Paperbark
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Paperbark
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod
Poaceae	<i>Paspalum urvillei</i> *	Vasey Grass
Pteridaceae	<i>Pellaea falcata</i>	Sickle Fern
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed
Poaceae	<i>Phragmites australis</i>	Common Reed
Plantaginaceae	<i>Plantago lanceolata</i> *	Lamb's Tongue
Polygonaceae	<i>Rumex crispus</i> *	Curled Dock
Polygonaceae	<i>Rumex sagittatus</i> *	Turkey Rhubarb
Fabaceae	<i>Senna pendula</i> *	Easter Cassia
Poaceae	<i>Setaria parviflora</i> *	Pigeon Grass
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Solanaceae	<i>Solanum nigrum</i> *	Berry Nightshade
Solanaceae	<i>Solanum sisymbriifolium</i> *	Sticky Nightshade
Menispermaceae	<i>Stephania japonica</i>	Snake Vine
Myrtaceae	<i>Syncarpia glomulifera</i>	Turpentine
Asteraceae	<i>Tagetes minuta</i> *	Stinking Roger

Commelinaceae	<i>Tradescantia fluminensis*</i>	Wandering Trad
Cannabaceae	<i>Trema tomentosa</i> var. <i>aspera</i>	Native Peach
Verbenaceae	<i>Verbena bonariensis*</i>	Purpletop

Note: *Cover determined in accordance with the BAM.

Recorded fauna

Scientific name	Common name
Birds	
<i>Corvus coronoides</i>	Australian Raven
<i>Grallina cyanoleuca</i>	Magpie-lark
<i>Malurus cyaneus</i>	Superb Fairy-wren
<i>Manorina melanocephala*</i>	Noisy Miner
<i>Philemon corniculatus</i>	Noisy Friarbird
<i>Rhipidura albiscapa</i>	Grey Fantail
<i>Strepera graculina</i>	Pied Currawong
Reptiles	
<i>Lampropholis guichenoti</i>	Garden Skink

Note: Location data can be added in another column or as separate rows if the assessment area is large or to differentiate records between habitat areas.

Appendix B: Habitat suitability assessment

Use the below criteria to determine the likelihood that a threatened species could occur in the study area. The criteria are designed for use in a BAR only and is not applicable for use in a BDAR (i.e., where the BAM-C is being used). Only recorded sightings from BioNet are valid for these criteria.

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey or has been recorded within the past five years (known from a reputable source).
High	A species is considered highly likely to occur in the study area if: <i>There are previous credible records on BioNet within the study area from the last 10 years and suitable habitat is present.</i> OR <i>The species is highly mobile, is dependent on identified suitable habitat within the study area (i.e., for breeding or important life cycle periods such as winter flowering resources) and has been recorded recently (within five years) on BioNet in the locality. This also includes species known or likely to visit the study area during regular seasonal movements or migration.</i>
Moderate	A species is considered moderately likely to occur in the study area if: <i>Any suitable habitat (e.g., foraging) is present in the study area, the species is highly mobile and has been recorded in the locality in the last 10 years on BioNet. The species may be unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area.</i> OR <i>The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has been recorded in the locality in the last 10 years on BioNet.</i> OR <i>For flora species that are associated with PCTs in the study area (see TBDC) or have been recorded in the locality in the last 10 years on BioNet – the associated PCT/habitat present in the study area is not degraded and the species was not targeted by surveys in accordance with the BAM and relevant survey guidelines. In addition, for flora species known to occur in disturbed areas (e.g., orchids), records from any time within the locality may warrant inclusion in this category.</i>
Low	A species is considered to have a low likelihood of occurring in the study area if: <i>For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet.</i> OR <i>The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet.</i> OR <i>For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.</i>
Unlikely	Suitable habitat for the species is absent from the study area.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence /impact
	BC Act	EPBC Act					
Plants							
<i>Acacia bynoeana</i> Bynoe's Wattle	VU	EN	N/A	N/A	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.	100 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Acacia pubescens</i> Downy Wattle	VU	VU	N/A	N/A	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland, usually within roadside and bushland remnants. Grows on shale, sandstone, alluvium and gravelly soils, often including ironstone.	67 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Allocasuarina glareicola</i>	EN	E1	N/A	N/A	Small, depauperate shrub restricted to a few populations in the Richmond district with an outlier population at Voyager Point in Liverpool. Grows in Castlereagh Woodlands, Cumberland Dry Sclerophyll Forest, Sydney Hinterland Dry Sclerophyll Forest, Sydney Sand Flats Dry Sclerophyll Forests. Grows in lateritic soil.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

<i>Ancistrachne maidenii</i>	-	VU	N/A	N/A	Scrambling perennial grass restricted to northern Sydney around the St Albans-Mt White-Maroota-Berowra regions and Shannon Creek near Grafton. Grows in transitional geology between Hawkesbury and Watagan soil landscapes in a variety of communities including South Coast Dry Sclerophyll Forests, Coastal Floodplain Wetlands, North Coast Wet Sclerophyll Forests, and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone derived soils.	42 - BioNet	Low – Not a BAM credit species. This species has been recorded in moderate numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Asterolasia elegans</i>	EN	EN	N/A	N/A	Tall, thin shrub found growing north of Sydney in the Baulkham Hills, Hawkesbury and Hornsby districts. Could also occur in the Goulburn area. Grows in wet sclerophyll forest on moist hillsides in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and North Coast Wet Sclerophyll Forests. Grows on Hawkesbury sandstone.	141 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Cryptostylis hunteriana</i> Leafless Tongue-orchid	VU	VU	N/A	N/A	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in sandy soils.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Cynanchum elegans</i> White-flowered Wax Plant	EN	E1	N/A	N/A	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Darwinia biflora</i>	VU	VU	N/A	N/A	Erect shrub distributed in the Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. Grows on edges of weathered shale capped ridges in the vicinity of an intergrade with Hawkesbury sandstone in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in shale-sandstone transitional soils.	8 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Darwinia fascicularis</i> subsp. <i>oligantha</i>	-	E2	N/A	N/A	Erect shrub restricted to three sites in the Maroota area of Baulkham Hills and Hornsby Local Government Areas. Found near rock platforms and in rocky heath communities in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in shallow soils derived from sandstone.	13 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

<i>Dendrobium melaleucaphilum</i> Spider Orchid	-	EN	Species	N/A	Epiphytic Orchid with a distribution confined to the coastal districts extending from Queensland down to the lower Blue Mountains. Grows on Pricky Paperbark trees <i>Melaleuca styphelioides</i> and occasionally on rainforest trees or on rocks in Coastal Floodplain Wetlands, Coastal Swamp Forests and Coastal Valley Grassy Woodlands.	BAM-C Candidate Species Report	Low – A BAM credit species. This species is not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Deyeuxia appressa</i>	EN	EN	Species	N/A	Erect, perennial grass, endemic to NSW. Restricted to two records, one in 1930 at Herne Bay south of Bankstown and the other in 1941 from Killara near Hornsby. Grows on wet ground in Sydney Coastal Dry Sclerophyll Forests and Eastern Riverine Forests.	BAM-C Candidate Species Report	Low – A BAM credit species. This species is not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Dillwynia tenuifolia</i>	-	VU, E2	N/A	N/A	Low, spreading shrub restricted to the Cumberland Plain in Western Sydney. Grows in scrubby or heathy areas within a variety of communities including Castlereagh Ironbark Forest, Shale Gravel Transition Forest, Castlereagh Scribbly Gum Woodland and Sydney Hinterland Dry Sclerophyll Forests. Grows on tertiary alluvium, laterised clays and in shale-sandstone transitions.	119 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Eucalyptus sp. Cattai</i>	CE	CE	N/A	N/A	Small tree or mallee distributed between Colo Heights and Castle Hill in north-western Sydney. Grows as an emergent tree on flats and ridgetops in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows on sandstone substrates in laterised clays and occasionally on sandy soils.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Genoplesium baueri</i> Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid	EN	E1	N/A	N/A	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Grammitis stenophylla</i> Narrow-leaf Finger Fern	-	EN	N/A	N/A	Small fern growing on the south, central and north coasts of NSW with records from Mount Kaputar National Park at Narrabri forming its western limit. Grows near streams in moist places on rocks or in trees in a variety of communities including Sydney Montane Dry Sclerophyll Forest, Dry Rainforest, Littoral Rainforest, Northern Warm Temperate Forests and North Coast Wet Sclerophyll Forests.	2 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Grevillea juniperina</i> subsp. <i>juniperina</i> Juniper-leaved Grevillea	-	VU	N/A	N/A	Spreading to erect medium sized shrub endemic to Western Sydney with a distribution spanning from Blacktown, Erskine Park, Londonderry and Windsor and outlying populations at Kemps Creek and Pitt Town. Grows at elevations <50 m in Cumberland Plain Woodland, Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland, Shale/Gravel Transition Forest, Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands. Grows in sandy to clay loam soils and red pseudolateritic gravels derived from Wianamatta Shale and Tertiary Alluvium.	3 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species (e.g. <50m elevation) in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Grevillea parviflora</i> subsp. <i>supplicans</i>	-	EN	N/A	N/A	Low shrub restricted to a few locations in the Arcadia and Maroota-Marramarra Creek area including Marramarra National Park in Hornsby and Baulkham Hills Local Government Area. Grows in periodically disturbed areas in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Grows on sandstone substrates in skeletal sandy soils, also shows a preference for yellow clays with impeded drainage.	287 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Haloragis exalata</i> subsp. <i>exalata</i> Wingless Raspwort, Square Raspwort	VU	VU	N/A	Found adjacent to waterbodies. Often occurs along edges of coastal lakes after flooding has removed other vegetation, creek banks within flood zone, and areas close to these features, particularly where human disturbance has recently occurred.	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides the appropriate habitat for this species

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<i>Hibbertia puberula</i>	-	EN	N/A	N/A	Shrublet with a distribution extending from Wollemi National Park south to Morton National Park and the south coast near Nowra. Grows in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Heath Swamps, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on sandy soils, occasionally on clay soils.	1 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Hibbertia superans</i>	-	EN	N/A	N/A	Low spreading shrub recorded from 16 sites with a distribution spanning from Baulkham Hills to South Maroota. Grows on sandstone ridgetops near shale/sandstone transitions in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Northern Hinterlands Wet Sclerophyll Forests, Coastal Valley Grassy Woodlands, and Sydney Coastal Heaths. Grows on sandstone substrates.	6 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Kunzea rupestris</i>	VU	VU	N/A	Occurs on or within 50m of Hawkesbury sandstone rock platforms.	Clonal shrub restricted to 20 populations growing throughout the Maroota - Sackville - Glenorie area with one outlier at Ku-ring-gai Chase National Park. Grows in shallow depressions on rock platforms and outcrops in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows on sandstone substrates.	103 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.

<i>Lasiopetalum joyceae</i>	VU	VU	N/A	N/A	Erect, medium sized shrub restricted to 34 sites within the Hornsby Plateau from Berrilee to Duffys Forest. Grows on lateritic or shale influenced ridgetops in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows on sandstone substrates.	6 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	-	EN	N/A	Found on slopes and outcrops nearby rocky areas, particularly in soils derived from weathered laterite or sandstone.	Erect, densely branched shrub restricted to north-west Sydney between St Albans in the north to Annangrove in the south. Grows along ridges and spurs on flat to gently sloping terrain in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on lateritic soils.	40 - BioNet	Low – Not a BAM credit species. This species has been recorded in moderate numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Macadamia integrifolia</i> Macadamia Nut	VU	-	N/A	N/A	Medium sized tree found growing from Mount Bauple, near Gympie to Currumbin Valley in the Gold Coast hinterland in south-east Queensland. Occurs in the Northern Rivers region of NSW in remnant rainforest, mixed notophyll forest and rainforest margins.	1 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species as it is outside its natural distribution with no desired habitat features present on site. Impacts are limited minor trimming and aquatic vegetation.

<i>Melaleuca biconvexa</i> Biconvex Paperbark	VU	VU	Species	N/A	Large shrub or small tree confined to NSW with scattered, widely dispersed populations around the Jervis Bay area in the south and the Gosford-Wyong area to the north. Grows in damp places, often near streams or low lying areas on low slopes or sheltered aspects in a variety of communities including Hunter-Macleay Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Floodplain Wetlands, Coastal Freshwater Lagoon and North Coast Wet Sclerophyll Forests. Grows in alluvial soils.	BAM-C Candidate Species Report	Low – A BAM credit species. This species is not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Melaleuca deanei</i> Deane's Paperbark	VU	VU	N/A	N/A	Medium sized shrub found growing in two distinct populations in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas along with a few outliers at Springwood and in the Wollemi National Park, Yalwal and the Central Coast regions. Grows in ridgetop woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths. Grows on sandstone substrates in alluvial soils.	28 – BioNet	Low – Not a BAM credit species. This species has been recorded in moderate numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Micromyrtus blakelyi</i>	VU	VU	N/A	Found on skeletal soil on or within 50m of Hawkesbury sandstone rock platforms and outcrops.	Low spreading shrub restricted to the Hawkesbury River with a distribution which extends from the north of Maroota down to Cowan in the south. Grows in cracks and depressions of sandstone rock platforms in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows on sandstone substrates in shallow, sandy soils.	371 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Olearia cordata</i>	VU	VU	N/A	N/A	Slender shrub endemic to NSW with a scattered distribution confined to the south-western Hunter Plateau, eastern Colo Plateau and the far north-west of the Hornsby Plateau. Grows along sandstone ridges in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.	23 - BioNet	Low – Not a BAM credit species. This species has been recorded in moderate numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Persicaria elatior</i> Knotweed, Tall Knotweed	VU	VU	Species	Found within close proximity to semi-permanent/ephemeral wet areas including swamps and wetlands.	Erect herb found growing in south-eastern NSW at Mount Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.	PMST, BAM-C Candidate Species Report	Low – A BAM credit species. This species has not been recorded within 10 km of the study area. Vegetation within the study area provides the appropriate habitat for this species. (Associated with PCT 4028)
<i>Persoonia hirsuta</i> Hairy Geebung	EN	EN	Species	N/A	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the west. Grows at elevations between 350 - 600 metres in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment Wet Sclerophyll Forests. Grows in sandy soils on sandstone substrates.	34 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in moderate numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.

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<i>Pimelea curviflora</i> var. <i>curviflora</i>	VU	VU	N/A	N/A	Small to medium sized shrub restricted to the coastal areas of Sydney between northern Sydney and Maroota with an outlying population at Croom Reserve near Albion Park in the Illawarra region. Grows on ridgetops and upper slopes amongst grasses and sedges in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Can be inconspicuous amongst grasses and sedges although easier to find in October to May when flowering. Grows on sandstone substrates in shale/lateritic soils and shale/sandstone transition soils.	48 - BioNet	Low – Not a BAM credit species. This species has been recorded in moderate numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited minor trimming and aquatic vegetation.
<i>Pimelea spicata</i> Spiked Rice-flower	EN	EN	N/A	N/A	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occurring in the Illawarra from Lansdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open Woodland Coastal Grasslands in the Illawarra region. Grows on well-structured clay soils.	4 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Pomaderris brunnea</i> Brown Pomaderris	VU	EN	Species	N/A	Medium sized shrub with a distribution limited to the area around the Colo, Nepean and Hawkesbury Rivers including the Bargo area and near Camden. Grows on floodplains and creek lines in a variety of communities including Sydney Hinterland Dry Sclerophyll Forests, Central Gorge Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grasslands and North Coast Wet Sclerophyll Forests. Grows in clay and alluvial soils.	3 – BioNet, BAM-C Candidate Species Report	Low – A BAM credit species. This species is recorded in low numbers within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Pterostylis gibbosa illawarra</i> Greenhood, Rufa Greenhood, Pouched Greenhood	EN	E1	N/A	N/A	Deciduous terrestrial orchid with a disjunct distribution from the Milbrodale in the Hunter Region, Albion Park and Yallah in the Illawarra Region and Nowra in the Shoalhaven Region. Found growing amongst grasses on flat or gently sloping land with poor drainage in woodland dominated by Forest Red Gum <i>Eucalyptus tereticornis</i> , Woollybutt <i>E. longifolia</i> , and White Feather Honey-myrtle <i>Melaleuca decora</i> . In Nowra, the orchid can be found growing in association with Spotted Gum <i>Corymbia maculata</i> , Forest Red Gum and Grey Ironbark <i>E. paniculata</i> . In the Hunter Region, the orchid is associated with Narrow-leaved Ironbark <i>E. crebra</i> , Forest Red Gum and Black Cypress Pine <i>Callitris endlicheri</i> . Grows in red brown loam soils.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Pterostylis saxicola</i> Sydney Plains Greenhood	EN	EN	N/A	N/A	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests. Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.	5 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Pultenaea parviflora</i>	VU	EN	N/A	N/A	Small erect, branching shrub endemic to the Cumberland Plain from Windsor to Penrith east to Dean Park with outlying populations at Kemps Creek and Wilberforce. Found growing in Cumberland Dry Sclerophyll Forests including Castlereagh Ironbark Forest, Shale Gravel Transition Forest and Castlereagh Scribbly Gum Woodland, Sydney Coastal Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Southern Lowland Wet Sclerophyll Forests. Grows in soils derived from Wianamatta shale, laterite or alluvium.	88 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

<i>Rhizanthella slateri</i> Eastern Australian Underground Orchid	EN	VU	N/A	N/A	Terrestrial orchid with a distribution spanning from south-east NSW to south-east Queensland. Recorded in ten populations in NSW including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wisemans Ferry Area, Agnes Banks and near Nowra. A cryptic species which grows beneath the soil surface with flowers being the only part of the plant to occur aboveground in Sydney Sand Flats Dry Sclerophyll Forests, Eastern Riverine Forests, Northern Warm Temperate Rainforests, North Coast Wet Sclerophyll Forests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows in deep loam soils.	1 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Rhodamnia rubescens</i> Scrub Turpentine	CE	CE	N/A	N/A	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	8 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Rhodomyrtus psidioides</i> Native Guava	CE	CE	Species	N/A	Shrub or small tree which typically grows to 12 metres high. Populations are typically restricted to coastal regions of low elevation between Sydney and Maryborough, Queensland. Often found in littoral, warm temperate and subtropical rainforests and wet sclerophyll forests near creeks and drainage lines. This species is known to be particularly susceptible to myrtle rust.	PMST, BAM-C Candidate Species Report	Low – A BAM credit species. This species is not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Senna acclinis</i> Rainforest Cassia	-	EN	N/A	N/A	Tall shrub with populations occurring in the coastal districts and adjacent tablelands from the Illawarra to Queensland. Found growing on rainforest margins, often fulfilling the role of a gap phase shrub in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Dry Rainforests, Subtropical Rainforests, Western Vine Thickets, North Coast Wet Sclerophyll Forests and Northern Escarpment Wet Sclerophyll Forests.	2 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	VU	EN	Species	N/A	Small to medium sized rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.	3 – BioNet, BAM-C Candidate Species Report	Low – A BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Tetratheca glandulosa</i>	-	VU	N/A	N/A	Small, spreading shrub with 150 populations confined to the Baulkham Hills, Gosford, Hawkesbury, Ku-ring-gai, Pittwater, Ryde and Wyong Local Government Areas. Found growing in a variety of communities including Sydney Sandstone Ridgetop Woodland, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands, Sydney Montane Heaths and North Coast Wet Sclerophyll Forests. Grows in the shallow, yellow clay/sandy loams that are typical of shale/sandstone transition soils where shale caps occur over sandstone substrates such as the Lucas Heights, GyMEA, Lambert and Faulconbridge soil landscapes.	420 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

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<i>Tetradlea juncea</i> Black-eyed Susan	VU	VU	N/A	N/A	Small shrub confined to the northern area of the Sydney Basin bioregion and the southern area of the North Coast bioregion in the Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock Local Government Areas. Found growing at well drained sites which experience annual rainfall levels between 1000 and 1200 mm at elevations below 200 metres in swampy heath and moist forests. Usually found growing in soils from the Awaba soil landscape comprising of low nutrient sandy, skeletal soils, sandy loam soils and clay soils on sandstone or conglomerate substrates.	1 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Thesium australe</i> Austral Toadflax, Toadflax	VU	VU	N/A	N/A	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass <i>Themeda triandra</i> in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.	PMST	Low – Not a BAM credit species and not recorded within 10 km of the study area. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
<i>Velleia perfoliata</i>	VU	VU	N/A	N/A	Small herb confined to the Hawkesbury district and the Upper Hunter Valley. Found growing in shallow depressions on rocky shelves, rocky hill sides, under cliffs or on rocky / sandy tracks and trails, often amongst mosses and lichen mats in a variety of communities including Central Gorge Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests. Grows in shallow, sandy or sandy loam soils over Hawkesbury sandstone substrates.	1 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.

<i>Zieria involucrata</i>	VU	EN	N/A	N/A	Small, erect shrub with a disjunct distribution north and west of Sydney in the Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains Local Government Areas primarily in the Macdonald, Colo, and Hawkesbury River Catchments. Found growing on mid to lower slopes and valleys or adjacent to gullies in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Southern Lowland Wet Sclerophyll Forests and North Coast Wet Sclerophyll Forests. Grows on Hawkesbury or Narrabeen sandstone or Quaternary alluvium substrates.	671 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. Features within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. Impacts are limited to minor trimming and aquatic vegetation.
Birds							
<i>Anthochaera phrygia</i> Regent Honeyeater	CE	CE	Species/Ecosystem	N/A	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nests in tall mature eucalypts and sheoaks.	30 - BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality. The study area is not mapped as important habitat for this species on the BAM important habitat maps.
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	-	VU	Ecosystem	N/A	Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	51 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality.

<i>Botaurus poiciloptilus</i> Australasian Bittern	EN	EN	Ecosystem	Found in brackish or freshwater wetlands.	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> spp. and <i>Eleocharis</i> spp.. Typically, this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	5 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been observed in low numbers within 10 km of the study area. Marginal quality foraging habitat will be removed for the works.
<i>Burhinus grallarius</i> Bush Stone-curlew	-	EN	Species	Occurs in habitats with plenty of dead timber and logs.	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common. In the south-east, it is either rare or extinct throughout its former range. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.	7 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in low numbers within 10 km of the study area. No suitable flat woodlands within the study area.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	EN	VU	Species/Ecosystem	N/A	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	71 - BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. This species has been recorded in high numbers within 10 km of the study area. Suitable foraging habitat will not be removed for the works.
<i>Calyptrorhynchus lathamii</i> Glossy Black-Cockatoo	VU	VU	Species/Ecosystem	N/A	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	163 - BioNet, BAM-C Candidate and Predicted Species Reports	Moderate – BAM credit species. This species has been recorded in high numbers within 10 km of the study area. Marginal quality foraging habitat will be removed for the works.
<i>Chthonicola sagittata</i> Speckled Warbler	-	VU	Ecosystem	N/A	The Speckled Warbler occurs on the hills and tablelands of the Great Dividing Range. Found in eucalypt and cypress woodlands with a grassy understorey, often on ridges or gullies. The species nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground for arthropods and seeds.	25 - BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality.

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<i>Circus assimilis</i> Spotted Harrier	-	VU	Ecosystem	N/A	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.	8 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. Vegetation within the study area provides low quality habitat for this species in the context of available habitat within the broader locality.
<i>Climacteris picumnus victoriae</i> Brown Tree creeper (eastern subspecies)	VU	VU	Ecosystem	N/A	Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.	12 – BioNet, BAM-C Predicted Species Report	Low – Not BAM credit species. This species has been recorded in low numbers within 10 km of the study area. No suitable flat woodlands within the study area.
<i>Daphoenositta chrysoptera</i> Varied Sittella	-	VU	Ecosystem	N/A	The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts. The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	51 - BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. The study area may provide nominal foraging habitat however vegetation removal is limited to the trimming of one tree and aquatic vegetation.
<i>Diomedea gibsoni</i> Gibson's Albatross	VU	VU	N/A	N/A	A marine pelagic species which breeds on the Auckland islands, New Zealand. Uses wave updrafts for lift and so typically flies close to the sea surface. Nests on marshy grounds on breeding islands, usually in areas near exposed ridges or hillocks.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is unlikely to be recorded within inland NSW.
<i>Ephippiorhynchus asiaticus</i> Black-necked Stork	-	EN	Ecosystem	Found in or close to shallow open freshwater or saline waterbodies.	Found in swamps, mangroves and mudflats. Can also occur in dry floodplains and irrigated lands and occasionally forages in open grassy woodland. Nests in live or dead trees usually near water.	1 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has only been recorded once within 10km of the study area. Mangroves within the study area may provide minimal foraging habitat.

<i>Epthianura albifrons</i> White-fronted Chat	-	VU	Ecosystem	N/A	Sydney Metropolitan CMA: The White-fronted Chat occupies foothills and lowlands below 1000 m above sea level. In NSW it occurs mostly in the southern half of the state, occurring in damp open habitats along the coast, and near waterways in the western part of the state. The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands. Along the coastline, they are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the species is often observed in open grassy plains, saltlakes and salt pans that are along the margins of rivers and waterways. In Victoria White-fronted Chats have been observed breeding from late July through to early March. Nests are built in low vegetation and in the Sydney region, nests have also been observed in low isolated mangroves. An Endangered Population occurs in the Sydney Metropolitan CMA area, at Newington Nature Reserve near Homebush and at Towra Point Nature Reserve.	BAM-C Predicted Species Report	Low – Not a BAM credit species. While mangroves within the study area may provide some foraging habitat, there have been no records of this species within 10 km of the study area.
<i>Erythrotriorchis radiatus</i> Red Goshawk	EN	CE	N/A	N/A	Occur in forest and woodland habitat near permanent water. In NSW prefer Melaleuca swamp forest and open eucalypt woodland. Require greater than 20 m tall trees for nesting.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area, and is only predicted as per the PMST. The study area is unlikely to provide any significant foraging resources, and does not provide adequate nesting habitat.
<i>Falco hypoleucos</i> Grey Falcon	VU	E1	N/A	N/A	Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area, and is only predicted as per the PMST. Highly mobile species with extensive home range, habitat within the study area unlikely to provide any significant foraging resources.

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<i>Falco subniger</i> Black Falcon	-	VU	Ecosystem	N/A	Mainly occur in woodlands and open country where can hunt. Often associated with swamps, rivers, and wetlands. Nest in tall trees along watercourses.	10 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. Highly mobile species with extensive home range, habitat within the study area unlikely to provide any significant foraging resources. This species has been recorded in low number within 10 km of the study area.
<i>Glossopsitta pusilla</i> Little Lorikeet	-	VU	Ecosystem	N/A	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo, and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	58 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded at high numbers within 10 km of the study area, however, the study area provides minimal foraging habitat, in an area of extensive intact vegetation.
<i>Grantiella picta</i> Painted Honeyeater	VU	VU	N/A	Found in habitats where mistletoes are present at a density of greater than five mistletoes per hectare.	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.	4 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. No suitable foraging habitat occurs within the study area.
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	-	VU	Species/Ecosystem	N/A	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands favouring deep freshwater swamps, lakes, and reservoirs shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans, and carrion. Roosts and makes nest in trees.	36 - BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. This species has been recorded at high numbers within 10 km of the study area. However, the study area is unlikely to provide any significant foraging habitat. The study area does not provide suitable breeding habitat.
<i>Hieraaetus morphnoides</i> Little Eagle	-	VU	Species/Ecosystem	N/A	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland, and forests.	18 – BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. Highly mobile species with extensive home range, habitat within the study area unlikely to provide any significant foraging resources.

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<i>Irediparra gallinacea</i> Comb-crested Jacana	-	VU	Ecosystem	Closely associated with freshwater wetlands with a good surface cover of floating aquatic vegetation.	Occurs in freshwater wetlands, lagoons, Billabongs, swamps, lakes, rivers, and reservoirs, generally with abundant floating aquatic vegetation.	9 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded at low numbers within 10 km of the study area. The study area is unlikely to provide suitable habitat due to the lack of floating aquatic vegetation.
<i>Ixobrychus flavicollis</i> Black Bittern	-	VU	Ecosystem	Closely associated with freshwater and estuarine areas with permanent water and dense vegetation.	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely been recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.	17 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. While the species has been recorded at high numbers within 10 km of the study area, the study area is unlikely to provide significant habitat for the species due to the lack of dense vegetation.
<i>Lathamus discolor</i> Swift Parrot	CE	EN	Species/Ecosystem	N/A	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and nomadic, moving about in response to changing food availability.	9 - BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. No suitable hollows will be impacted and only marginal foraging habitat is present, in an area of extensive remnant vegetation. The study area is not mapped as important habitat for this species on the BAM important habitat maps. This species has been recorded in low numbers within 10 km of the study area.
<i>Lophochroa leadbeateri</i> Major Mitchell's Cockatoo	-	VU	N/A	N/A	Found mainly in semi-arid and arid regions, in dry woodlands, particularly mallee - casuarina assemblages. They breed in the hollows of large trees, often near watercourse.	1 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. While some suitable foraging habitat will be impacted, the study area is outside of the species' range. No suitable hollows are to be impacted within the study area.

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<i>Lophoictinia isura</i> Square-tailed Kite	-	VU	Species/Ecosystem	N/A	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> , or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100 km ² . They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	30 - BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, the study area provides minimal foraging habitat, in an area of extensive intact vegetation and wetlands. Study area does not provide suitable nesting habitat.
<i>Melanodryas cucullata cucullata</i> South-eastern Hooded Robin, Hooded Robin (south-eastern)	EN	VU	N/A	N/A	This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area, and is only predicted as per the PMST. Limited foraging habitat will be impacted by the project.
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subspecies)	-	VU	N/A	N/A	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts. It is rarely recorded east of the Great Dividing Range.	10 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. This species is rarely observed east of the Great Dividing Range.
<i>Neophema chrysostoma</i> Blue-winged Parrot	VU	-	N/A	N/A	The Blue-winged Parrot is a small parrot found in Tasmania and southeast mainland Australia. Some populations are known to migrate to Tasmania from the mainland during summer months. The species feeds predominantly on the ground and occurs in savannah woodlands and grasslands.	PMST, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area. The species is rarely observed within south-eastern NSW.
<i>Neophema pulchella</i> Turquoise Parrot	-	VU	Ecosystem	N/A	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs. Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies. Nest in hollow-bearing trees, either dead or alive; also, in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies that are moist.	8 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. No suitable hollow will be impacted, and no suitable foraging habitat is present within the study area. Area surrounding the study area represent suitable intact vegetation for foraging habitat.

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<i>Ninox connivens</i> Barking Owl	-	VU	Species/Ecosystem	N/A	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	8 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area, No suitable hollows will be impacted. The study area provides limited foraging habitat for this highly mobile species.
<i>Ninox strenua</i> Powerful Owl	-	VU	Species/Ecosystem	N/A	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.	243 – BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. This species has been recorded in low numbers within 10 km of the study area, No suitable hollows will be impacted. The study area provides limited foraging and nesting habitat for this highly mobile species.
<i>Oxyura australis</i> Blue-billed Duck	-	VU	N/A	N/A	The Blue-billed Duck is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only seen in coastal areas during summer. Prefers large permanent wetlands, feeding on the bottom of swaps.	3 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area represents minimal foraging habitat is an extensive wetland area.
<i>Pachyptila turtur subantarctica</i> Fairy Prion (southern)	VU	-	N/A	N/A	Fairy Prions (including other subspecies) are often beachcast on the south-eastern coast of Australia and are commonly seen offshore over the continental shelf and over pelagic waters. Observations are less common off Western Australia and Queensland than in south-eastern Australia. Beachcast birds are found along the whole coast of NSW, and the species is common offshore along the entire Victorian coast, where thousands are sometimes seen. In Tasmania, the Fairy Prion is an abundant visitor to all offshore waters. In South Australia, this species is regularly seen and often beachcast.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is unlikely to be observed inland.

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<i>Pandion cristatus</i> Eastern Osprey	-	VU	Species/Ecosystem	N/A	Found in coastal waters, inlets, estuaries, and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands, and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	4 – BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area provides minimal foraging habitat, in an area of extensive intact vegetation and wetlands. Study area does not provide suitable nesting habitat.
<i>Petroica boodang</i> Scarlet Robin	-	VU	Ecosystem	N/A	The Scarlet Robin inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. During autumn and winter, it moves to more open and cleared areas. The Scarlet Robin forages amongst logs and woody debris for insects. The nest is an open cup of plant fibres and cobwebs, found in the fork of a tree.	15 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area provides minimal foraging habitat, in an area of extensive intact vegetation.
<i>Petroica phoenicea</i> Flame Robin	-	VU	Ecosystem	N/A	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet consists mainly of invertebrates.	6 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area provides minimal foraging habitat, in an area of extensive intact vegetation.
<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler (eastern subspecies)	-	VU	Ecosystem	N/A	The eastern sub-species occurs on the western slopes of the Great Dividing Range, the western plains, woodlands in the Hunter Valley and locations on the north coast of NSW. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine, open Box Woodlands on alluvial plains and woodlands on fertile soils in coastal regions. Feeds on invertebrates and builds dome-shaped nests.	BAM-C Predicted Species Report	Low – Not a BAM credit species. Rarely recorded east of the Great Diving Range. This species has not been recorded within 10 km of the study area.
<i>Pterodroma leucoptera leucoptera</i> Gould's Petrel	EN	VU	N/A	N/A	The Gould's Petrel is a marine species which only comes to shore to breed. It breeds exclusively on Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah Island. The first arrival of Gould's petrel on cabbage tree Island occurs from mid to late September. Fledglings depart the island from late March to early May.	1 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. This is a marine species, unlikely to be found inland.

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<i>Pycnoptilus floccosus</i> Pilotbird	VU	-	N/A	N/A	The pilotbird is found from the Wollemi National Park and Blue Mountains National Park in New South Wales through to the Dandenong Ranges, near Melbourne in Victoria. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris. [ALA 2022].	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area, and is only predicted as per the PMST. The study area provides minimal foraging habitat, in an area of extensive intact vegetation. Dense undergrowth is not present in the study area.
<i>Rostratula australis</i> Australian Painted Snipe	EN	EN	N/A	N/A	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps, and waterlogged grassland. They prefer freshwater wetlands but have been recorded in brackish waters. Forages on mudflats and in shallow water. Feeds on worms, molluscs, insects, and some plant-matter.	3 - BioNet	Low – This species has been recorded in low numbers within 10 km of the study area. No suitable shallow wetlands occur within the study area.
<i>Stagonopleura guttata</i> Diamond Firetail	VU	VU	Ecosystem	N/A	The Diamond Firetail is widely distributed, found in a range of habitat types including open eucalypt forest, mallee, and <i>Acacia</i> scrubs. Often occur in vegetation along watercourses. Feeds exclusively on the ground on ripe grass and herb seeds, green leaves, and insects.	PMST, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area. Habitat within the study area unlikely to provide any significant foraging resources.
<i>Sternula nereis nereis</i> Australian Fairy Tern	VU	-	N/A	N/A	The Fairy Tern nests on sheltered sandy beaches, spits, and banks above the high tide line and below vegetation. This species will also frequent embayments, estuarine habitats, wetlands, and mainland coastlines.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area. This species is only predicted as per the PMST. This species occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia.
<i>Stictonetta naevosa</i> Freckled Duck	-	VU	Ecosystem	N/A	The Freckled Duck breeds in permanent fresh swamps that are heavily vegetated. Found in fresh or salty permanent open lakes, especially during drought. Often seen in groups on fallen trees and sand spits.	27 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, it is unlikely that this species will use the study area for anything more than occasional foraging.

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<i>Thalassarche bulleri platei</i> Northern Buller's Albatross, Pacific Albatross	VU	-	N/A	N/A	A marine pelagic species occurring in subtropical and subantarctic waters, with a preference for waters of the East Australia Current. Known to breed on subtropical and subantarctic islands and rock stacks in the New Zealand region.	PMST	Low – Not a BAM credit species. This species has not been recoded within 10 km of the study area. This species is only predicted as per the PMST and is unlikely to be observed inland.
<i>Tyto longimembris</i> Eastern Grass Owl	-	VU	Ecosystem	N/A	Occurs mainly in open tussock grassland, usually in treeless areas. Can also occur in marshy areas with tall dense tussocks of grass. Occasionally occurs in densely vegetated agricultural lands such as sugarcane fields.	BAM-C Predicted Species Report	Low – Not a BAM credit species. Has not been recorded within 10 km of the study area. No tall grasslands within the study area. Study area is unlikely to provide any significant foraging habitat for this highly mobile species with a large home range.
<i>Tyto novaehollandiae</i> Masked Owl	-	VU	Species/Ecosystem	N/A	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	22 – BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. No suitable hollows within the study area will be impacted. Study area is unlikely to provide any significant foraging habitat for this highly mobile species with a large home range.
<i>Tyto tenebricosa</i> Sooty Owl	-	VU	N/A	N/A	The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. It is mostly found on escarpments with a mean altitude <500 m. This species nests and roosts in hollows of emergent trees, mainly eucalypts often located in gullies.	20 - BioNet	Low – Not a BAM credit species. No suitable hollows within the study area will be impacted. Study area is unlikely to provide any significant foraging habitat for this highly mobile species with a large home range.
Mammals							

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<i>Cercartetus nanus</i> Eastern Pygmy-possum	-	VU	Species	N/A	Patchily distributed from the coast to the Great Dividing Range, and as far as Pilliga, Dubbo, Parkes, and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable, and it also feeds on insects. Will often nest in tree hollows but can also construct its own nest. Because of its small size it can utilise a range of hollow sizes including very small hollows. Individuals will use several different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5-month period.	14 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. No suitable hollows will be impacted within the study area. Study area represents minimal foraging habitat in an area of extensive intact vegetation.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	VU	VU	Species	Occurs within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	37 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. No suitable hollows will be impacted within the study area. Study area represents minimal foraging habitat in an area of extensive intact vegetation.
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	EN	VU	Ecosystem	N/A	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.	18 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, as the study area does not contain any suitable den sites (hollows and fallen logs), it is unlikely to occur within the study area particularly given the extensive resources available in the broader locality.

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<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	-	VU	N/A	N/A	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.	18 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, no suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Micronomus norfolkensis</i> Eastern Coastal Free-tailed Bat	-	VU	Ecosystem	N/A	Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites.	41 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, no suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Miniopterus australis</i> Little Bent-winged Bat	-	VU	Species/Ecosystem	N/A	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels, and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps, and ants) beneath the canopy of densely vegetated habitats.	12 – BioNet, BAM-C Candidate and Predicted Species Reports	Low – BAM credit species. This species has been recorded in low numbers within 10 km of the study area. No suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.

<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat	-	VU	Species/Ecosystem	N/A	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.	43 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, no suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	-	VU	N/A	N/A	Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites.	31 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, no suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Myotis macropus</i> Southern Myotis	-	VU	Species	Closely associated with waterbodies with permanent pools or stretches 3m or wider.	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines, or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws and catch flying insects.	48 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in high numbers within 10 km of the study area. While suitable foraging habitat exists within the study area, no suitable roosting habitat occurs and so this species is unlikely to utilise the study area for anything more than occasional foraging.

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<i>Notamacropus parma</i> Parma Wallaby	VU	VU	N/A	N/A	Occurs in wet and dry sclerophyll forest with a thick, shrubby understorey associated with grassy patches. They may also occur in rainforest but prefer the wet sclerophyll forest (Strahan, 1995 134 /id). This species feed on grasses and herbs (Strahan, 1995 134 /id).	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area, and is only predicted as per the PMST species. Dense understorey is not present within the study area.
<i>Petauroides volans</i> Southern Greater Glider	EN	EN	Species	N/A	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.	5 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in low numbers within the study area. No suitable hollows will be impacted within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Petaurus australis</i> Yellow-bellied Glider	VU	VU	N/A	N/A	Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types.	236 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within the study area. No suitable hollows or foraging habitat will be impacted within the study area.
<i>Petaurus norfolcensis</i> Squirrel Glider	-	VU	Species	N/A	Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	15 - BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in low numbers within the study area. No suitable hollows will be impacted within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.

<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	VU	EN	N/A	Occurs within 1 kilometre of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.	Occurs along the Great Dividing Range south to the Shoalhaven, and occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.	9 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area does not contain suitable habitat due to the lack of ledges, caves and crevices.
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	-	VU	N/A	N/A	The Brush-tailed Phascogale had a scattered distribution centred around the Great Dividing Range. It prefers open forests with a sparse ground cover, but also inhabits mallee and rainforests. It feeds on insects and nectar, particularly in rough-barked trees. Nests and shelters in tree hollows, tree stumps and occasionally birds' nests, and can use more than 40 nests in a year.	3 - BioNet	Low – Not a BAM credit species. This species has been recorded within 10 km of the study area. Study area represents only marginal foraging habitat in an area of extensive intact vegetation.
<i>Phascolarctos cinereus</i> Koala	EN	VU	Species	Only occurs in areas where mature feed trees are present.	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with varying home ranges.	89 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in high numbers within 10 km of the study area. While some koala feed trees exist within the study area, these will not be impacted, and only represent marginal foraging habitat within an area of extensive intact vegetation.
<i>Phoniscus papuensis</i> Golden-tipped bat	-	VU	Ecosystem	N/A	The Golden-tipped Bat is a small bat species with dark brown fur and distinctive golden tips on its wings, legs, and tail. It is distributed along the east coast of Australia from Queensland to southern New South Wales, as well as in New Guinea. This bat species primarily inhabits rainforests and adjacent forest types, foraging for small web-building spiders and utilizing various roosting sites such as modified bird nests, tree hollows, and dense foliage.	BAM-C Predicted Species Report	Low – Not a BAM credit species. No suitable roosting habitat will be impacted. The study area represents minimal foraging habitat within an area of extensive intact vegetation.

<i>Pseudomys novaehollandiae</i> New Holland Mouse	VU	-	Ecosystem	N/A	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.	1 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. Only one record of this species occurs within 10 km of the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	VU	VU	Species/Ecosystem	N/A	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	56 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, there are no camps within close proximity to the study area, and the study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	-	VU	Ecosystem	N/A	Found throughout NSW in habitats including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands and desert. They roost in tree hollows in colonies and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. Forages for insects above the canopy in forests.	9 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. No suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.

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<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	-	VU	Ecosystem	N/A	Occurs along the Great Dividing Range and in coastal areas. Occurs in woodland and rainforest, preferring open habitats or openings in wetter forests. Often hunts along creeks or river corridors. Preys upon beetles and other large, flying insects, other bats and spiders. Roosts in hollow tree trunks and branches.	35 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, no suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Vespadelus troughtoni</i> Eastern Cave Bat	-	VU	N/A	Occurs within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds.	Found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. It roosts in small groups, often in well-lit overhangs and caves, mine tunnels, road culverts, and occasionally in buildings.	6 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. Limited suitable roosting habitat occurs within the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
Amphibians							
<i>Heleioporus australiacus</i> Giant Burrowing Frog	VU	VU	N/A	N/A	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.	12 - BioNet	Low – Not a BAM credit species. This species has been observed in low numbers within 10 km of the study area. Vegetation and waterways within the study area provide low quality habitat for this species in the context of available habitat within the broader locality.

<i>Litoria aurea</i> Green and Golden Bell Frog	VU	EN	Species	Found in semi-permanent or ephemeral wet areas.	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks, although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop, feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.	6 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area is not considered suitable habitat as the waterbody is not semi-permanent or ephemeral in nature.
<i>Mixophyes balbus</i> Stuttering Frog	VU	EN	Species	N/A	This species is usually associated with mountain streams, wet mountain forests and rainforests. It rarely moves very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains.	BAM-C Candidate Species Report	Low – BAM credit species. This species has not been recorded within 10 km of the study area. Vegetation and waterways within the study area provide low quality habitat for this species in the context of available habitat within the broader locality.
<i>Mixophyes iteratus</i> Giant Barred Frog	EN	EN	Species	N/A	Occurs along coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. Found in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m, often hiding in leaf litter near permanent fast-flowing streams. Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched. When not breeding the frogs disperse hundreds of metres away from streams.	BAM-C Candidate Species Report	Low – BAM credit species. This species has not been recorded within 10 km of the study area. The study area is considered not to be suitable habitat for the species due to the absence of extensive leaf litter, rainforest and moist eucalypt forest.

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<i>Pseudophryne australis</i> Red-crowned Toadlet	-	VU	N/A	N/A	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams.	68 - BioNet	Low – Not a BAM credit species This species has been recorded in high numbers within 10 km of the study area. However, habitat within the study area is not considered appropriate for the species, as onsite waterways are not ephemeral in nature. The study area is also not characterised by dry open forests or sandstone formations.
Reptiles							
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	VU	EN	N/A	N/A	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.	1 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. The study area does not provide suitable habitat for this species due to the lack of rock crevices and tree hollows.
<i>Varanus rosenbergi</i> Rosenberg's Goanna	-	VU	Ecosystem	N/A	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests. Termite mounds are a critical habitat component.	9 – BioNet, BAM-C Predicted Species Report	Low – Not a BAM credit species. No termite mounds are present within the study area.
Invertebrates							
<i>Meridolum corneovirens</i> Cumberland Plain Land Snail	-	EN	Species	N/A	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.	19 – BioNet, BAM-C Candidate Species Report	Low – BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, suitable habitat for the species, including leaf litter and fallen logs, will not be affected by the proposed works.

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<i>Pommerhelix duralensis</i> Dural Land Snail	EN	EN	N/A	N/A	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	108 - BioNet	Low – Not a BAM credit species. This species has been recorded in high numbers within 10 km of the study area. However, suitable habitat for the species, including leaf litter and fallen logs, will not be affected by the proposed works.
Fish							
<i>Macquaria australasica</i> Macquarie Perch	EN	-	N/A	N/A	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries	PMST	Low – Not a BAM credit species. Species has not been recorded within 10 km of the study area and is only predicted as per the PMST.
<i>Prototroctes maraena</i> Australian Grayling	VU	-	N/A	N/A	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range from Sydney southwards to the Otway Ranges in Victoria, and Tasmania. The Australian grayling does not occur in the inland Murray–Darling Basin system. Grayling is a diadromous species, migrating between freshwater streams and the ocean. This species has been found in clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops, and in muddy-bottomed, heavily silted habitats.	PMST	Low – Not a BAM credit species. Species has not been recorded within 10 km of the study area and is only predicted as per the PMST.
Migratory species							
<i>Actitis hypoleucos</i> Common Sandpiper	Mi	-	N/A	N/A	Inhabits a wide range of coastal and inland wetlands, often with muddy or rocky margins. Also known to occur at estuaries, billabongs, dams, pools and lakes, often associated with mangroves.	4 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

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<i>Apus pacificus</i> Fork-tailed Swift	Mi	-	N/A	N/A	Almost exclusively aerial (foraging). The Fork-tailed Swift breeds in Asia but migrates to Australia from September to April. Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 metres high.	3 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This species does not breed in Australia and would not use the study area for anything besides occasional foraging. The study area provides minimal foraging habitat amongst a larger landscape.
<i>Ardenna grisea</i> Sooty Shearwater	Mi	-	N/A	N/A	The Sooty Shearwater is a seabird species with a widespread distribution across the Southern Hemisphere. It inhabits pelagic waters, nesting on remote islands and coastal cliffs, and undertakes long-distance migrations.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This is a seabird species and unlikely to be recorded inland
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Mi	-	N/A	N/A	This species is a migratory visitor to Australia, and spends its breeding season in Siberia. In the non-breeding season, the Sharp-tailed Sandpiper is known to occur mostly in the south-east of Australia, but has been found on coastlines all throughout the country.	10 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Calidris ferruginea</i> Curlew Sandpiper	CE, Mi	EN	N/A	N/A	Inhabits sheltered intertidal mudflats. Also, non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	14 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

<i>Calidris melanotos</i> Pectoral Sandpiper	Mi	-	N/A	N/A	Scarce, but regular visitor, usually recorded in summer from November to March. Widespread but scattered records in Australia. Usually found in fresh to saline wetlands, floodplains, swamps, estuaries and lagoons, sometimes with emergent or fringing vegetation such as grass.	10 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Calidris ruficollis</i> Red-necked Stint	Mi	-	N/A	N/A	Inhabits mainly coastal environments; saltmarshes, tidal mudflats, saline and freshwater wetlands, sandy or shelly beaches and sewage ponds.	1 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. The study area represents minimal foraging habitat within a large wetland habitat.
<i>Calidris subminuta</i> Long-toed Stint	Mi	-	N/A	N/A	Inhabit coastal and inland shallow wetlands, sewage ponds and tidal mudflats.	2 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. The study area represents minimal foraging habitat within a large wetland habitat.
<i>Chlidonias leucopterus</i> White-winged Black Tern	Mi	-	N/A	N/A	Irregular summer visitor from northern Eurasia to coastal and subcoastal grassy swamps and fresh or saline wetlands of western, northern and eastern mainland Australia. Rarely recorded inland or at sea except during migration.	1 - BioNet	Low – Not a BAM credit species. This species has only been recorded once within 10 km of the study area. The study area represents minimal foraging habitat within a large wetland habitat. This species is rarely recorded inland.

<i>Cuculus optatus</i> Oriental Cuckoo	Mi	-	N/A	N/A	The Oriental Cuckoo inhabits forests where it forages in trees and bushes, and occasionally on the ground. The species is a brood parasite, with a large breeding area covering most of northern Eurasia. This Cuckoo spends the winter in warmer regions of the Asia-Pacific, having been recorded along the east coast of Australia.	2 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. The study area represents minimal foraging habitat within an area of extensive intact vegetation.
<i>Diomedea antipodensis</i> Antipodean Albatross	VU, Mi	VU	N/A	N/A	A marine pelagic species endemic to New Zealand, which is known to forage off the coast of New South Wales. This species is known to feed on cephalopods, fish and crustaceans.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10km of the study area and is only predicted as per the PMST. This is a marine species which is unlikely to be recorded inland.
<i>Diomedea epomophora</i> Southern Royal Albatross	VU, Mi	-	N/A	N/A	During the non-breeding season, it has a wide and possibly circumpolar distribution, ranging north to about 35°S. The Royal Albatross is moderately common throughout the year in offshore waters of southern Australia, mostly off southeastern NSW, Victoria and Tasmania. Off South Australia, they are mostly seen May to September.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10km of the study area and is only predicted as per the PMST. This is a marine species which is unlikely to be recorded inland.
<i>Diomedea exulans</i> Wandering Albatross	VU, Mi	E1	N/A	N/A	A marine, pelagic and aerial species. Versatile feeders in pelagic and shelf waters. Breed on subantarctic and Antarctic islands.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10km of the study area and is only predicted as per the PMST. This is a marine species which is unlikely to be recorded inland.
<i>Diomedea sanfordi</i> Northern Royal Albatross	EN, Mi	-	N/A	N/A	The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia. The Northern Royal Albatross feeds regularly in Tasmanian and South Australian waters, and less frequently in NSW waters.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10km of the study area and is only predicted as per the PMST. This is a marine species which is unlikely to be recorded inland.

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<i>Gallinago hardwickii</i> Latham's Snipe	Mi	-	N/A	N/A	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams.	111 - BioNet	Low – Not a BAM credit species. While this species has been recorded in high numbers within 10 km of the study area, this is a highly mobile species with extensive home range and habitat within the study area is unlikely to provide any significant foraging resources.
<i>Gelochelidon nilotica</i> Gull-billed Tern	Mi	-	N/A	N/A	The Gull-billed Tern breeds in small colonies on small islands of shallow inland lakes. These migratory species are rarely seen over the ocean. They often nest close to inland waters, especially temporary waters on mudflats, claypans, saltpans, salt marshes and open floodplains.	4 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Hirundapus caudacutus</i> White-throated Needletail	VU, Mi	-	N/A	N/A	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. This species roosts in trees in forests and woodlands and feeds on insects. The White-throated Needletail breeds in forests and sparse hills in Asia.	21 - BioNet	Low – Not a BAM credit species. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Hydroprogne caspia</i> Caspian Tern	Mi	-	N/A	N/A	Usually coastal, with a preference for sheltered estuaries, inlets, bays, harbours, lagoons with muddy or sandy shores. Keeps close inshore, not out beyond reef line. Also extends well inland on fresh or salt lakes, temporary floodwaters, large rivers, reservoirs, sewage ponds.	2 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

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<i>Limosa lapponica</i> Bar-tailed Godwit	Mi	-	N/A	N/A	Coastal species, usually inhabiting intertidal sandflats, spits and banks. Less frequently found in mudflats, estuaries, coastal lagoons and harbours.	1 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range along the eastern coast of Australia. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Limosa limosa</i> Black-tailed Godwit	Mi	VU	N/A	N/A	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. The species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	12 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Macronectes giganteus</i> Southern Giant-Petrel, Southern Giant Petrel	EN, Mi	E1	N/A	N/A	The Southern Giant-Petrel is a marine species found throughout the Antarctic to subtropical waters occasionally venturing to inshore waters.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland. Habitat within the study area is unlikely to provide any significant foraging resources.

<i>Macronectes halli</i> Northern Giant Petrel	VU, Mi	VU	N/A	N/A	Marine, pelagic species found mainly in subantarctic waters.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Motacilla flava</i> Yellow Wagtail	Mi	-	N/A	N/A	Regular spring-summer visitor in north of Australia, rare vagrant or occasional visitor farther south. Found in marshes, damp paddocks, airfields, cultivated fields, lawns and estuaries.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Numenius madagascariensis</i> Eastern Curlew, Far Eastern Curlew	CE, Mi	-	N/A	N/A	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

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<i>Numenius minutus</i> Little Curlew	Mi	-	N/A	N/A	Short, dry grasslands and sedgeland, including dry floodplains and black soil plains, which have scattered, shallow freshwater pools. Mostly feed in dry grassland or sedgeland, either natural or artificial. Foraging sites usually occur within 5km of daytime roosting sites.	2 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Pandion haliaetus</i> Osprey	Mi	VU	N/A	N/A	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is unlikely to be recorded inland. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Phaethon lepturus</i> White-tailed Tropicbird	Mi	-	N/A	N/A	A marine pelagic species which only returns to land based colonies to breed. A vagrant visitor to Australia.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland.
<i>Philomachus pugnax</i> Ruff	Mi	-	N/A	N/A	Rare migrant from northern Eurasia regularly visits fresh, brackish or saline wetlands with exposed mudflats at edges, usually terrestrial but sometimes found in sheltered coast habitats.	3 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

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<i>Thalassarche bulleri</i> Buller's Albatross, Pacific Albatross	VU, Mi	-	N/A	N/A	A marine pelagic species which breeds in New Zealand, and regularly visits Australian waters. When in Australia, Buller's Albatross can be seen over inshore, offshore and pelagic waters.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Thalassarche cauta</i> Shy Albatross	EN, Mi	VU	N/A	N/A	The Shy Albatross is a marine pelagic species inhabiting sub-Antarctic and subtropical waters, spending most of their time at sea. Occasionally it is observed in continental shelf waters in bays and harbours.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Thalassarche eremita</i> Chatham Albatross	EN, Mi	-	N/A	N/A	The Chatham Albatross is a medium sized albatross, with a wing-span less than 2.1 m. The bright yellow bill has a distinctive black spot near the tip of the lower mandible, allowing discrimination from the similar Shy Albatross. Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland.
<i>Thalassarche impavida</i> Campbell Albatross, Campbell Black-browed Albatross	VU, Mi	-	N/A	N/A	Inhabits Antarctic, subantarctic and subtropical waters. Although the Campbell Albatross does not breed in Australia, it can be found in Australian waters, typically in the winter months.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland.

<i>Thalassarche melanophris</i> Black-browed Albatross	VU, Mi	VU	N/A	N/A	Inhabits Antarctic, subantarctic and subtropical waters. Although generally pelagic the species also occurs on the continental shelf and can be seen from land.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland.
<i>Thalassarche salvini</i> Salvin's Albatross	VU, Mi	-	N/A	N/A	Salvin's Albatross is a non-breeding visitor to Australian waters. This species predominantly feeds on cephalopods and fish found along continental shelves.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland.
<i>Thalassarche steadi</i> White-capped Albatross	VU, Mi	-	N/A	N/A	The White-capped Albatross is probably common off the coast of south-east Australia throughout the year. It has been observed that juveniles are rare in New Zealand waters, being more common off south-east Australia and South Africa. Breeding colonies occur on islands south of New Zealand.	PMST	Low – Not a BAM credit species. This species has not been recorded within 10 km of the study area and is only predicted as per the PMST. This species is marine and unlikely to be recorded inland.
<i>Tringa glareola</i> Wood Sandpiper	Mi	-	N/A	N/A	Freshwater swamps, lakes, flooded pasture; less frequently on brackish waters, occasionally in mangroves.	4 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

<i>Tringa nebularia</i> Common Greenshank	Mi	-	N/A	N/A	Widely distributed throughout a range of inland wetlands and sheltered coastal habitats. Occurs in habitats with varying salinity.	3 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.
<i>Tringa stagnatilis</i> Marsh Sandpiper	Mi	-	N/A	N/A	Inhabits permanent or ephemeral wetlands, including swamps, billabongs, lagoons, saltmarshes and estuaries. Forages at the edge of wetlands in shallow water.	12 - BioNet	Low – Not a BAM credit species. This species has been recorded in low numbers within 10 km of the study area. This is a highly mobile species with extensive home range. Habitat within the study area is unlikely to provide any significant foraging resources.

Appendix C: Tests of Significance (BC Act)

The following section provides for Tests of Significance according to the five factors outlined in Section 7.3 of the BC Act for all species determined as having a medium likelihood of occurrence (or greater) and may potentially be impacted by the works.

River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

River-flat Eucalypt Forest is listed as an EEC under the BC Act. The community is found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 metres in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. Major examples once occurred on the floodplains of the Hunter, Hawkesbury, Moruya, Bega and Towamba Rivers, although many smaller floodplains and river flats also contain examples of the community. The remaining area is likely to represent much less than 30 % of its original range. Given its habitat, the community has an important role in maintaining river ecosystems and riverbank stability. Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains (DPE 2022b).

River-flat Eucalypt Forest within the study area

River-flat Eucalypt Forest aligns with PCT 4025 in low condition within the study area. The proposal is limited to the trimming of a single *Casuarina* spp. tree. For this assessment, the local occurrence of River-flat Eucalypt Forest comprises all PCT 4025 mapped within the study area and any contiguous areas of the community that extend outside the study area into the surrounding landscape. This predominantly occurs along the southern side of the Hawkesbury River adjacent the Sackville Ferry area.

Table C.1 Test of Significance for River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Test of Significance for River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
<i>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</i>
Not applicable.
<i>In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i> <i>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i> <i>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.</i>
As outlined above the local occurrence of River-flat Eucalypt Forest comprises all PCT 4025 mapped within the study area and the patch extending along the southern side of the Hawkesbury River. The local occurrence of River-flat Eucalypt Forest is present in low condition and is contiguous with larger area of vegetation which would not be impacted by the proposal extending outside the study area along the riparian corridors of the above waterways. The viability of these patches of the TEC along these waterways would not be substantially affected by the impacts associated with the proposal. The proposal requires the trimming of a single <i>Casuarina</i> spp. Within the area mapped as River-flat Eucalypt Forest. This community is present in low condition and occurs in a patchy and edge effected state in an already fragmented landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years.

Test of Significance for River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Therefore, tree trimming for the proposal is considered unlikely to substantially modify the composition of the local occurrence or place the community at risk of extinction.

In relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The habitat supporting the local occurrence of River-flat Eucalypt Forest comprises degraded patches located adjacent to waterways, where canopy trees have been retained and degraded patches of the community have been able to persist. These areas of habitat occur with a patchy distribution between land used for agriculture and residential infrastructure development.

The proposal would result in the trimming of a single *Casuarina* spp. within an area of River-flat Eucalypt Forest which is already subject to edge effects resulting from the fragmented and patchy landscape within which it occurs. However, the proposal is not considered likely to increase the level to which these negative pressures occur.

The area of habitat to be directly and indirectly impacted by the proposal is not considered important to the long-term survival of the community in the locality.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposed works will not impact on an area declared as of outstanding biodiversity value.

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal has the potential to result in the following key threatening processes (KTP) which are listed under the Schedule 4 of the BC Act and which are considered relevant to River-flat Eucalypt Forest:

- Clearing of native vegetation.

The proposed works will be limited to the trimming of a single tree where this community occurs resulting in minor impacts to the EEC. However, vegetation to be cleared is of low condition, subject to edge effects, and occurs in proximity to adjacent, higher quality patches of vegetation within the locality.

Conclusion.

The proposed works are unlikely to significantly impact River-flat Eucalypt Forest for the following reasons:

- The proposal would not adversely affect the extent or composition of the ecological community to the point where its current ecological function is compromised to cause it to become locally extinct.
- The proposal is unlikely to significantly alter floristic or structural diversity of the retained portions of the EEC.
- The localised nature of the proposed works would not significantly trigger or exacerbate any key threatening processes.

Therefore, no further assessment is required and a SIS or BDAR is not required.

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Freshwater wetlands on coastal floodplains is listed as an EEC under the BC Act. The community occurs on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains. Freshwater Wetlands on Coastal Floodplains generally occur below 20 m elevation in the NSW North Coast, Sydney Basin and South East Corner bioregions.

Freshwater Wetlands on coastal floodplains within the study area

Freshwater Wetlands on coastal floodplains align with PCT 3962 in high condition within the study area. The proposal would result in the removal of approximately 0.005 ha (51.2 m²) of this EEC.

For this assessment, the local occurrence of Freshwater Wetlands on coastal floodplains comprises all PCT 3962 mapped within the study area and any contiguous areas of the community that extend outside the study area into the surrounding landscape. This predominantly occurs scattered along the Hawkesbury River and its tributaries.

Table C.2 Test of Significance for Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
<i>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</i>
Not applicable.
<i>In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</i>
<i>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i>
<i>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.</i>
As outlined above the local occurrence of Freshwater Wetlands on coastal floodplains comprises all PCT 3962 mapped within the study area and primarily patches that extend up and downstream along Hawkesbury.
The local occurrence of Freshwater Wetlands on coastal floodplains is present in high condition and is contiguous with larger area of vegetation which would not be impacted by the proposal extending east of the study area along the riparian corridors of the waterway. The viability of these patches of the TEC along these waterways would not be substantially affected by the impacts associated with the proposal.
The proposal requires the removal of 0.005 ha (51.2 m ²) of Freshwater Wetlands on coastal floodplains. This community is present in high condition and occurs in an edge effected state along the western edge of the community in an already fragmented riparian landscape where introduced vegetation cover is significant and intensive land clearing has taken place over the past 150 years. The works are expected to be temporary along the boardwalk area with vegetation allowed to regrow post construction. Permanent vegetation clearing will be limited to the anchor block areas which are small in size with limited impacts. Therefore, clearing for the proposal is considered unlikely to substantially modify the composition of the local occurrence of the EEC.

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

In relation to the habitat of a threatened species or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*

The habitat supporting the local occurrence of Freshwater Wetlands on coastal floodplains comprises small patches located within and adjacent to waterways. These areas of habitat occur with a patchy distribution between land used for agriculture and recreational infrastructure development.

The proposal would result in the direct removal of 0.005 ha (51.2 m²) of habitat for Freshwater Wetlands on coastal floodplains in areas that are already subject to edge effects resulting from previous clearing for infrastructure adjacent which they occur. However, the proposal is limited to initial direct impacts for the installation of a boardwalk and anchor blocks. The anchor blocks are small in size and therefore impacts are not expected to be substantial. After construction of the boardwalk is complete, vegetation will be allowed to regrow and therefore, impacts are unlikely to increase the level of fragmentation within the community to a substantial level.

The area of habitat to be directly and indirectly impacted by the proposal is not considered important to the long-term survival of the community in the locality.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposed works will not impact on an area declared as of outstanding biodiversity value.

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal has the potential to result in the following key threatening processes which are listed under the Schedule 4 of the BC Act and which are considered relevant to River-flat Eucalypt Forest:

Clearing of native vegetation.

The proposed works will be limited to the removal of 0.005 ha (51.2 m²), where this community occurs resulting in minor impacts to the EEC. However, vegetation to be cleared within area of the boardwalk will temporary, therefore as long as mitigations laid out in section 6 of this report are followed impacts within this community will be limited.

Conclusion.

In consideration of the above five factors, the proposed activity is not likely to significantly impact Glossy Black-Cockatoo within the study area or wider locality, as:

- The proposed works will only result in impacts to 0.005 ha (51.2 m²) of vegetation. Given the availability of high-quality resources within the study area and surrounding connected areas along the riparian corridor, the removal of this native vegetation is unlikely to constitute a significant impact.
- The proposal will not interfere with the recovery of this community.
- The proposed works do not significantly contribute to a KTP for Freshwater Wetlands on coastal floodplains.

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner
Bioregions

As such further assessment of impact in the form of the application of the BOS or preparation of a SIS is therefore not required.

Glossy Black-Cockatoo *Calyptorhynchus lathami*

The Glossy Black-Cockatoo is listed as Vulnerable under the BC Act. This species is a medium-sized cockatoo with a diagnostic combination of black-brown head, neck, and underbody, red or orange-red panel in tail, and otherwise black plumage. Adult females also exhibit extensive patches of yellow feathering on head and neck.

The species is closely associated with *Allocasuarina* spp. and *Casuarina* spp. dominated woodlands, or open sclerophyll forest. They feed almost exclusively on the seed of *Allocasuarina* spp. but occasionally also take wood-boring insect larvae. The species is dependent on hollow-bearing trees for breeding habitat as they nest in the hollows formed in the trunk, stump, spout or limbs of eucalypt trees, living or dead (Higgins 1999, DPE 2022c).

No Glossy Black-Cockatoos were recorded during the field investigation, however there are known records of the species within 10 kilometres of the study area. As the native vegetation within the study area may be used by individuals in the locality, a test for determining whether the proposed works are likely to significantly affect the species in accordance with Section 7.3 of the BC Act has been undertaken below.

Table C.3 Test of Significance for Glossy Black-Cockatoo

Test of Significance for Glossy Black-Cockatoo

In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Breeding habitat for Glossy Black-Cockatoos requires suitable sized hollows in large, old eucalypt trees (living or dead). Glossy Black-Cockatoos are highly specialised, feeding almost exclusively on the seeds extracted from the cones of species of *Allocasuarina* and *Casuarina* spp. The cockatoos are highly selective with respect to both the trees and the cones on which they choose to forage, often showing fidelity to particular trees. Glossy Black-Cockatoos prefer trees carrying a large number of cones, in part because they appear to select feeding trees primarily on the basis of optimizing kernel intake. Feed-tree species for the Glossy Black-Cockatoo, namely *Casuarina* spp. is present across the study area and a single *Casuarina* tree will be trimmed as part of the proposed works.

Vegetation in the study area has potential for occasional utilisation by the Glossy Black-Cockatoo. However, no hollow bearing trees suitable for nesting for this species will be removed. Therefore, impacts derived from the works are limited to the removal of a small amount of potential foraging habitat only. Food resources in the study area are likely to be important for the life cycle of this species, however there is a low potential that the proposal would adversely affect the life-cycle of this species to be impacted given the widespread occurrence of suitable foraging habitat within the adjacent national parks and protected areas. The current potential for these species to occur based on the presence of foraging habitat is expected to remain after completion of the project such that foraging, movement and other life-cycle attributes would not be impacted.

The proposal is unlikely to reduce the population size or decrease the reproductive success of the Glossy Black-Cockatoo. The proposal is considered unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Test of Significance for Glossy Black-Cockatoo

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or***
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***

Not applicable.

In relation to the habitat of a threatened species or ecological community:

- (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and***
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and***
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.***

The proposal would require the trimming of one *Casuarina* spp. tree that may provide potential foraging habitat. This extent of habitat removal is considered small in the context of available foraging habitat in the locality.

Importantly, the proposal will not result in fragmentation of habitat for the Glossy Black-Cockatoo. No large sections of high-quality habitat for these species will be broken apart by the proposal. Glossy Black-Cockatoos are a highly mobile species that occupy a large home range and can persist in areas where small scale disturbances occur. The proposal will not affect the movement of these species between habitat patches.

The loss of foraging habitat would directly affect the opportunity for the Glossy Black-Cockatoo to feed in the area; however, the study area is not considered a critical area for these species. Extensive areas of higher quality habitat for this species occur elsewhere in the locality and the current potential for these species to occur based on the presence of potential foraging habitat is expected to remain after completion of the project.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposed works will not impact on an area declared as of outstanding biodiversity value.

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The trimming of one feed tree for the proposed works will potentially reduce the availability of dispersal and foraging resources within the immediate locality of the impact area. Of the listed key threatening processes under the BC Act, the only KTPs relevant to these species that will be increased by the proposal is the clearing of native vegetation. The clearing of native vegetation will be minimal as it is limited to trimming of a single tree. The proposed works may have the potential to degrade vegetation composition through increasing existing weed abundance within impacted areas. Therefore, recommendations have been provided to reduce soil transportation during the proposed works, to minimise the risk of introduction and proliferation of weed species.

Conclusion.

Test of Significance for Glossy Black-Cockatoo

In consideration of the above five factors, the proposed activity is not likely to significantly impact Glossy Black-Cockatoo within the study area or wider locality, as:

- The proposed works will only result in minor impacts to one tree species potential feed trees. Given the availability of high-quality resources within the study area and surrounding connected areas, the removal of this native vegetation is unlikely to constitute a significant impact.
- The proposal will not interfere with the recovery of this species.
- The proposed works do not significantly contribute to a KTP for Glossy Black-Cockatoo.

As such further assessment of impact in the form of the application of the BOS or preparation of a SIS is therefore not required.

Appendix D: Assessments of significance (EPBC Act)

Glossy Black-Cockatoo *Calyptorhynchus lathami*

Glossy Black-Cockatoo is listed as Vulnerable under EPBC Act and is the smallest species of black cockatoos, with a body length of around 48 cm and weight of 420 g. They have mostly dull black plumage, with red or yellowish-red panels in the tail for adult males and females, respectively. Juveniles have pale-yellow patches on their heads and undersides. They are uncommon but widespread in the southeastern part of Australia, from Queensland to Victoria. They feed almost exclusively on the seeds of sheoaks (*Allocasuarina* spp.), and it is likely that this preference explains the patchy distribution of the species.

The project will result in the trimming of a single Casuarina spp. which could be used as potential foraging habitat for the Glossy Black-Cockatoo. As the native vegetation within the study area may be used by individuals in the locality. An assessment against the Significant Impact Criteria detailed in the *Matters of National Environmental Significance: Significant impact guidelines version 1.1* (Commonwealth of Australia 2013b) has been undertaken below.

Table D.1 SIC assessment for Glossy Black-Cockatoo

SIC assessment for Glossy Black-Cockatoo
Lead to a long-term decrease in the size of an important population of a species.
The proposed works will result in the trimming of a single potential feed tree representing potential foraging resources for the Glossy Black-Cockatoo. While the proposal will result in a small removal of potential foraging habitat, the impacts will be temporary and after works are complete the foraging resource can return to provide the same potential foraging habitat. Vegetation to be impacted is also contiguous with areas of existing higher value native vegetation. Given the small scale of the impact in the context of available habitat in the region, it is unlikely that it will lead to a long-term decrease in the size of an important Glossy Black-Cockatoo population.
Reduce the area of occupancy of an important population
There is a considerable amount of available habitat within the landscape surrounding the study area. The study area is within proximity to higher value habitat such as Wollemi NP to the west, Marramarra NP to the east and Parr state conservation area to the north. As the Glossy-black Cockatoo is a highly mobile species they can take advantage of foraging habitat over a greater distance. The proposed works require the trimming of a single feed tree which may provide foraging habitat for the Glossy Black-Cockatoo, however this removal is not considered substantial when considering the vast amount of intact, high-quality vegetation within the surrounds of the study area. Further to this, due to the current operating of the ferry, Glossy-black Cockatoos are likely to be deterred from relying on the existing foraging habitat. Therefore, considering the above, whilst the trimming of a single feed tree for the species will slightly reduce the amount of foraging habitat within the direct vicinity, it will not reduce the area of occupancy for the species.
Fragment an existing important population into two or more populations.
In the scope of the greater context of the surrounding land, the Glossy Black-Cockatoo foraging habitat to be removed as a result of the proposed work represents a relatively small portion of foraging habitat. Additionally, the works are not expected to reduce connectivity throughout the landscape which would fracture multiple populations and vegetated corridors containing key Glossy Black-Cockatoo habitat in the surrounds of the study area.
Adversely affect habitat critical to the survival of a species.
No hollow bearing trees suitable for the Glossy Black-Cockatoo will be removed for the proposed works, and no individuals were observed during field investigations (although targeted survey was not undertaken). Therefore, impacts to dispersal habitat are expected to be negligible. Vegetation connectivity will be maintained throughout the landscape. Although some native vegetation will be trimmed, the project will not substantially impact upon any of the required Glossy Black-Cockatoo habitat, and thus will not adversely affect habitat critical for the species' survival.
Disrupt the breeding cycle of an important population.

SIC assessment for Glossy Black-Cockatoo

Impacts for the proposed works are limited to the of trimming of a single feed tree for the species and no breeding habitat (i.e., large hollows) will be removed. Considering this, the project is unlikely to result in the disruption to the breeding cycle of the Glossy Black-Cockatoo population as a whole. It is unlikely that disturbance from noise or lighting associated with the construction will substantially interfere with the species' ability to reproduce successfully. Glossy Black-Cockatoos will continue to breed in areas unaffected by vegetation loss and as a result the breeding cycle of the population will not be disrupted.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

The project is not likely to isolate populations as the trimmed tree is not likely to constitute a barrier to movement. While the project will result in the trimming of a Glossy Black-Cockatoo feed tree, which may potentially be used by the species, this level of loss is not likely to result in the decline of the species at a national scale.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

There are a large number of feral animals and plants that are known or likely to be well established in surrounds of the study area. Some of these are known to negatively impact native species including dogs, cats and foxes. However, it is unlikely that the project would result in the establishment of new species. The proposed action is unlikely to exacerbate the current level of invasive species threat operating within the project area. High standards of machinery wash-down will prevent the spread of pathogens such as *Phytophthora cinnamomi*.

Introduce disease that may cause the species to decline.

The proposed action is unlikely to introduce a disease that causes the Glossy Black-Cockatoo to decline.

Interfere with the recovery of the species.

There is no National Recovery Plan for the Glossy Black-Cockatoo, however a conservation advice for the species was published by DCCEEW in August 2022 (Cth DCCEEW 2022). The impacts associated with the proposed works are not consistent with the priority conservation and recovery actions within the advice. However, due to the small-scale removal of vegetation, and the wide availability of high-quality connected resources within the locality, it is unlikely the proposed works will interfere substantially with any of the priority management actions listed in the conservation advice.

The conservation advice for the species states that habitat critical to the survival to the species refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species
- To maintain genetic diversity and long-term evolutionary development

Therefore, any habitat utilised by Glossy Black-Cockatoo is considered habitat critical to survival of the species and impacts to habitat may interfere with the recovery of the species. The area of habitat to be removed by the proposed works is surrounded by areas of suitable foraging habitat and the trimmed foraging habitat will be allowed to regrow and restore the foraging habitat after works are complete. Given these factors, it is considered unlikely that the trimming of a single feed tree will interfere with the recovery of the species.

Conclusion.

Considering the above factors, it is unlikely that the proposed work will impose a significant impact on Glossy Black-Cockatoo or their habitats as:

- The proposed works will not introduce any diseases or invasive species of the Glossy Black-Cockatoo.
- The proposed works will not interfere with the recovery of the species
- The removal of native vegetation is considered to be a threat to the recovery and ongoing survival of the species however as the project will impact on only a very small area of potential habitat, surrounded by large swathes of habitat, it is not likely to significantly impact the species.

SIC assessment for Glossy Black-Cockatoo

Based on the factors above, it is concluded that the proposed works are unlikely to lead to a significant impact on the Glossy Black-Cockatoo.

Appendix D – PACHCI Stage 1

25 March 2024

[REDACTED]
Project Engineer

Dear [REDACTED]

Preliminary assessment results for Wisemans Ferry, Sackville Ferry and Webbs Creek Ferry – Mooring Piles based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment checklist (see attached), was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff [REDACTED], to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW *Unexpected Archaeological Finds Procedure*.

For further assistance in this matter do not hesitate to contact me.

Yours sincerely

A large black rectangular redaction box covering the signature area.

 Aboriginal Cultural Heritage Advisor – Sydney Region

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