

**REVIEW OF ENVIRONMENTAL FACTORS (REF)
CALLALA BEACH RD – CALLALA CREEK
CULVERT REPLACEMENT**

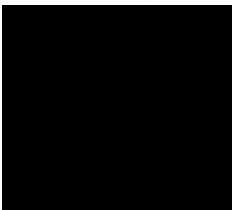
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Document control

Item	Details
Project	Review of Environmental Factors – Callala Beach Rd Callala Creek Culvert Replacement
Client	City Services, Shoalhaven City Council
Prepared By	City Services, Shoalhaven City Council

Document status

Version	Author / Reviewer*	Name	Signed	Date
V1.0	Author	Jeff Bryant		20/11/2023
	Reviewer	Geoff Young		20/11/2023

*Review and endorsement statement:

“I certify that I have reviewed and endorsed the contents of this REF document 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 clause 170 of the EP&A Regulation, and the information it contains is neither false nor misleading”.

Assessment and approvals overview

Item	Details
Assessment type	Division 5.1 (EP&A Act) - Review of Environmental Factors (REF)
Proponent	Shoalhaven City Council
Determining authority / authorities	Shoalhaven City Council
Required approvals (consents, licences and permits)	NSW DPI Fisheries Permit for dredging and reclamation under section 200 of the <i>Fisheries Management Act 1994</i>
Required publication	Yes: this REF must be published on the determining authority's (Council's) website or the NSW planning portal, in accordance with clause 171(4) EP&A Regulation 2021 and the guidelines published under cl.170, as requiring an approval or permit under section 200 of the <i>Fisheries Management Act 1994</i>).

1. PROPOSAL AND LOCATION

1.1 Proposed activity

The proposal involves the replacement of a culvert on Callala Beach Rd, crossing Callala Creek, in addition to widening Callala Beach Rd in this location.

The culvert to be replaced is at the end of its life and is at increased risk of failure. Replacement of the culvert would occur in the event that the asset failed or inspection determined that failure was imminent. Replacement would be like-for-like in capacity, with an extension in length to account for the shoulder widening of the road.

The proposed widening of Callala Beach Rd (increasing travel lanes from 3.0 m to 3.5 m with 1.5 m shoulders) would improve vehicle safety, provide safer cycling clearances, and provide for a shared-user path (SUP) crossing the creek – in line with future plans to widen Callala Beach Rd and construct a SUP between Callala Bay and Callala Beach.

Works would involve:

- Demolition of the existing culvert.
- Excavation and drilling for: piles (up to 50.85 m³); base and apron slab (approx. 65.8 m³); scour protection (approx. 46.62 m³); and western shoulder widening (replacement of soft soils up to 785.4 m³).
- Construction of temporary rock platforms (approx. 3.5 m x 9.5 m within the construction footprint) for pile construction.
- Construction of 24 piles (8 x 750 mm diameter and 16 x 600 mm diameter) drilled at least 1.5 m into high-strength sandstone (expected to be encountered at depth between 7.8 m and 9.0 m below existing ground level. Piles would be constructed using grout injected Continuous Flight Auger (CFA) methodology.
- Construction of base and apron slab: 300 mm reinforced concrete slab with 900 mm deep x 300 mm wide thickened east and west edges.
- Construction of multi-cell reinforced concrete box culvert (RCBC): three culvert cells at 2.1 m wide x 1.2 m high x total length of 13.25 m, noting that the proposed replacement culvert would have the same capacity as existing (i.e., the existing culvert is also three cells at 2.1 m wide x 1.2 m high).
- Construction of culvert wing walls: 2.9 m wings at 135° on each corner of inlet and outlet.
- Construction of scour protection: 11.1 m width x 2.0 m (upstream) or 2.2 m (downstream) length x 1.0 m minimum depth consisting of two layers of 500 mm rock.
- Construction of western road shoulder and batter: 150 mm layer of 50 mm ballast rock over two 300 mm layers of 100 – 200 mm ballast rock over two layers of very high strength basalt or other armour rock (min. 500 mm diameter), all wrapped in 400kN/m woven geotextile fabric; covered with engineering fill and 150 mm topsoil and turf seed.
- Construction of 104 m road pavement: 3.5 m travel lanes with 1.5 m shoulders and 1.0 m (min.) verge and batters (2H:1V max. to 4H:1V desirable); generally, a 180 mm wearing course over 140 mm base course over variable sub-base. With 600 mm x 300 mm subsoil drains discharging in downstream scour protection. Horizontal road geometry would generally match the existing road centreline.

The proposal is anticipated to require a total construction timeframe of approximately 18 weeks, off which, a 14-week construction timeframe is required for the culvert (indicative works program SCC reference D23/381062).

Replacement of the culverts would be staged to enable traffic-controlled, single-lane, continued access along Callala Beach Rd during construction (refer to Figure 6).

Refer to Figures 3 through 6, and Appendix A for design plans.

Shoalhaven City Council (SCC) is the proponent and the determining authority under Part 5 of the EP&A Act. The environmental assessment of the proposed activity and associated environmental impacts has been undertaken in the context of Clause 171 of the *Environmental Planning and Assessment Regulation 2021*. In doing so, this Review of Environmental Factors (REF) helps to fulfil the requirements of Section 5.5 of the Act that SCC examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

1.2 Location

The proposed activity would be undertaken over a 104 m length of Callala Beach Rd (Ch.1107m to Ch.1211m), Callala Beach, crossing Callala Creek.

Details of affected land are provided in Table 1.

Table 1. Property affected by the proposal

Lot / DP	Description	Land owner / manager	Other pertinent information
-	Callala Beach Rd	Shoalhaven City Council	

Figure 1. Site location

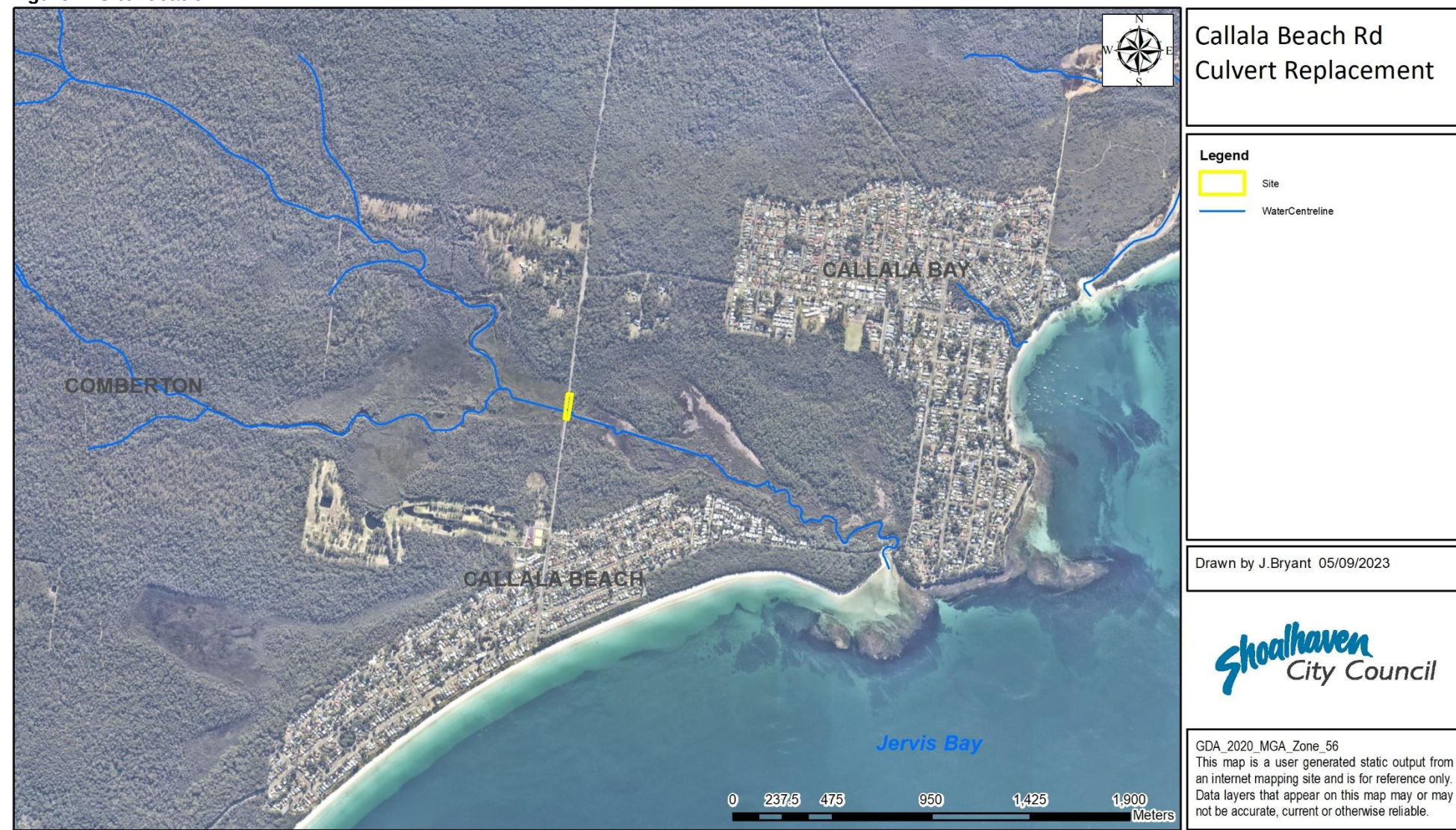
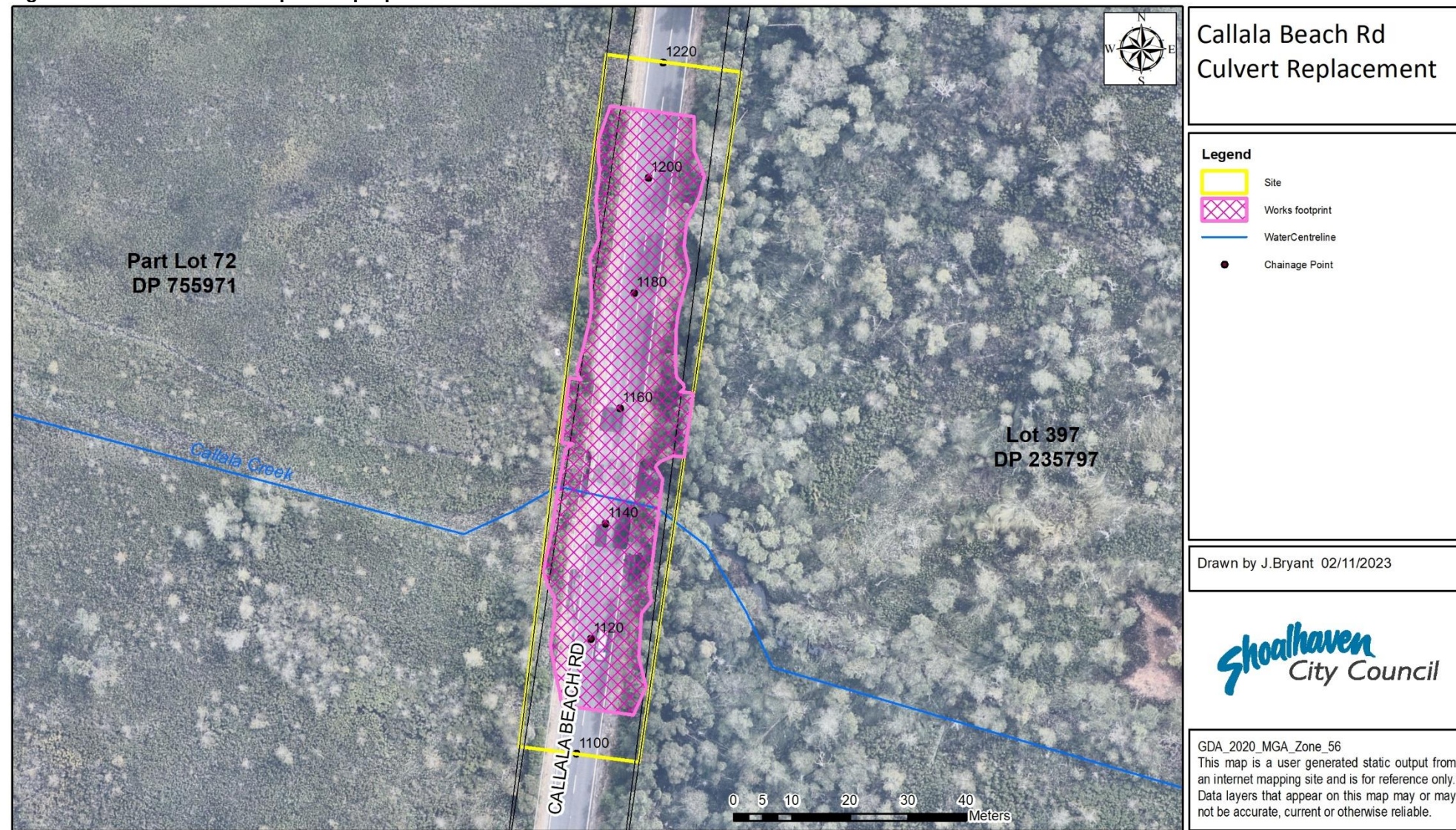


Figure 2. Site extent and footprint of proposed works



2.0m

SETOUT POINT 4

CAST-IN-SITU CULVERT HEADWALL AND WINGWALLS, TYPICAL

EXTENT OF COASTAL WETLAND AS SUPPLIED BY COUNCIL

SETOUT POINT 3

MONOWILLS FENCING AT HEADWALLS, TYPICAL

SAFETY BARRIER & END TERMINALS REFER TO SHEET C120 FOR DETAILS, TYPICAL

10

2.2m

SETOUT POINT 2

TAPER SCOUR PROTECTION TO DOWNSTREAM WATERCOURSE. CONFIRM EXTENT OF WORK ON SITE WITH THE PRINCIPAL.

2.0m

SETOUT POINT 1

SUBSOIL DRAIN TO DISCHARGE INTO DOWNSTREAM SCOUR PROTECTION TO AUS-SPEC 1171, TYPICAL

EXISTING RETAINING WALL

ALLALA

Figure 5. Culvert section (from MI Engineers 2023: Project DN210351, Drawing C200 Rev.E)

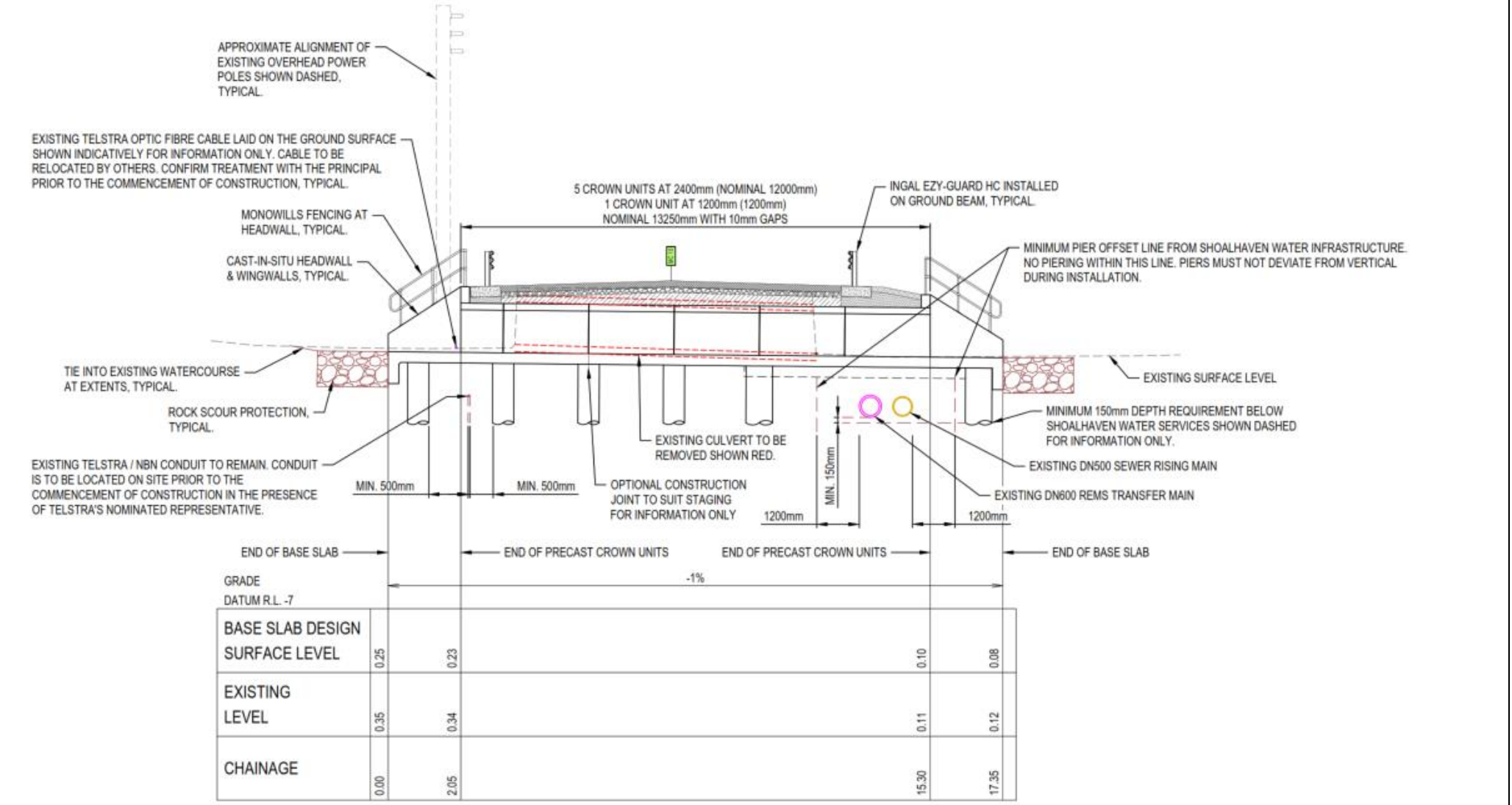
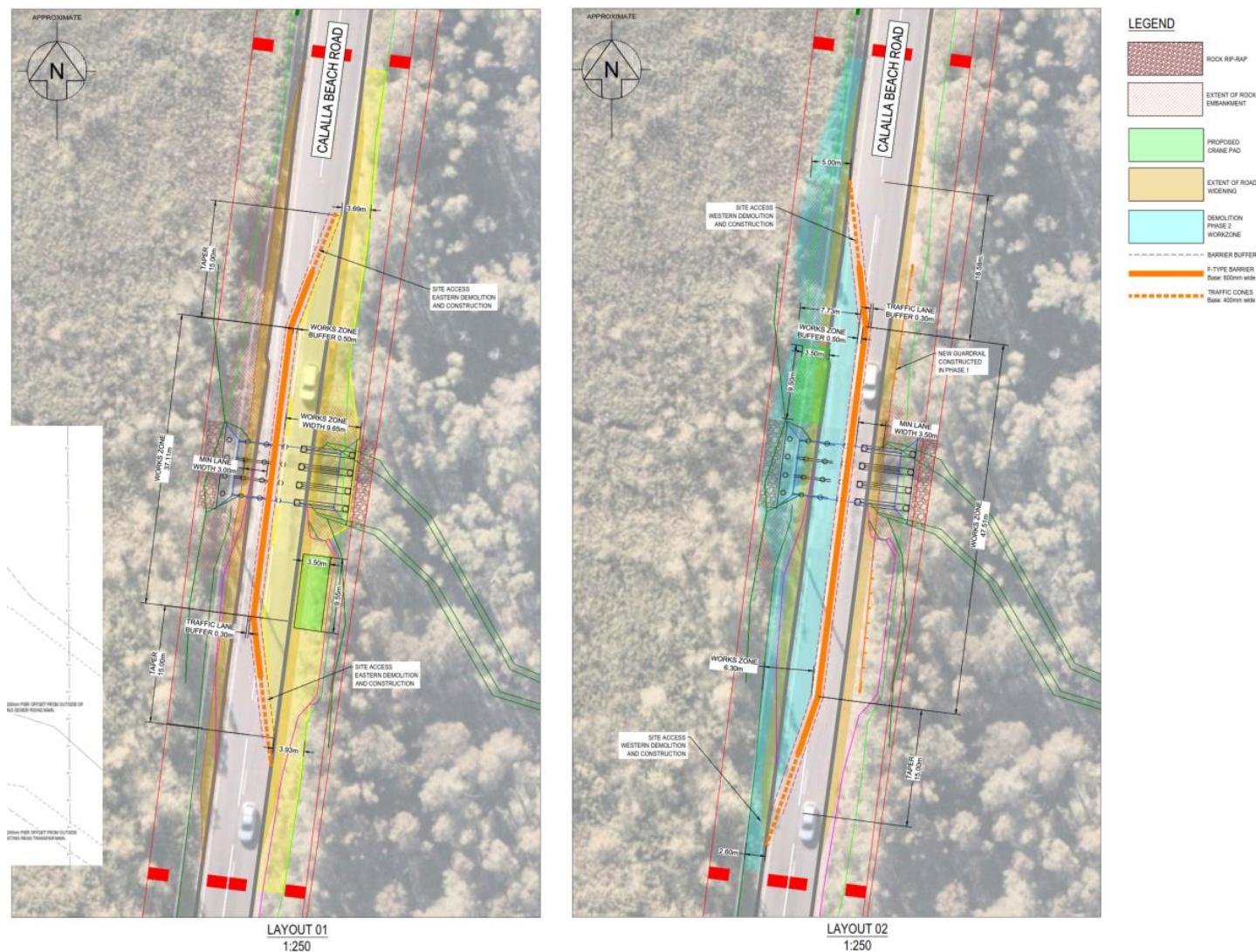


Figure 6. Indicative staging plan (SCC reference D23/374676)



1.3 Background and justification of proposal

Culburra Beach Rd provides the only vehicular access to Callala Beach and Myola. Replacement of the culvert crossing over Callala Creek in the event of failure, is therefore required to maintain residential access.

The culvert to be replaced is at the end of its life and is at increased risk of failure.

An extension in length of the culvert would provide for widening of Callala Beach Rd (increasing travel lanes from 3.0 m to 3.5 m with 1.5 m shoulders) to improve vehicle safety, provide safer cycling clearances, and provide for a shared-user path (SUP) crossing the creek – in line with future plans to widen Callala Beach Rd and construct a SUP between Callala Bay and Callala Beach. Replacement of the culvert would otherwise be like-for-like in capacity.

Early concept plans involved more extensive footprints (associated with 2.0 m wide shoulders and 4H:1V batters) which encroached into mapped Coastal Wetland and private property with potentially significant impacts on the environment. With the current design (including 1.5 m shoulders and 2H:1V max. batters), earthworks have been minimised and the construction footprint is contained within the existing road reserve to avoid encroachment into mapped Coastal Wetlands, minimise impact on native vegetation and other environmental values, and avoid the need for property acquisition.

Callala Beach Rd can experience water over-topping the road at the culvert location during flood events. Upgrade or other change to the culvert capacity has been considered, but would require a flood study, which is currently unfunded.

The current proposal is only for the emergency replacement of the culvert in the event that asset inspection determines that immediate replacement is required.

2. EXISTING ENVIRONMENT

2.1 Habitat and vegetation assessment

The site was assessed by a Council Environmental Officer on 27th February and 6th and 19th September 2023.

Investigations involved vegetation and habitat assessment, recording all flora species within and immediately adjacent to the subject site, determination of vegetation communities, targeted survey for potentially occurring threatened flora species (including *Distichlis distichophylla*, *Melaleuca biconvexa*, *Prostanthera densa*, *Syzygium paniculatum* and *Wilsonia backhousei*) and investigation of habitat availability on site for threatened fauna species and cryptic threatened flora species (including threatened terrestrial orchids *Calochilus pulchellus*, *Cryptostylis hunteriana*, *Genoplesium baueri* and *Prasophyllum affine*).

The site comprises a 120 m length of Callala Beach Rd crossing a broad, low-lying, vegetated depression associated with Callala Creek. Within the site, the Callala Beach Rd is elevated above the adjacent land, with short, steep embankments dropping either side of the road into swampland. A three-cell culvert occurs where the primary channel of Callala Creek intersects the road. Powerlines run parallel to the western side of the road.

Callala Creek exists as a defined channel on the lower side of the road, 9 m wide at the culvert outlet and narrowing to about 4 m wide within 10 m downstream, flowing in an easterly / south-easterly direction. The depth of water in the creek channel appears to be consistent with that of the culvert, being approximately 30 to 50 cm deep at the time of September 2023 site investigations. The tidal limit of Callala Creek is reported as being 30 m upstream of Callala Beach Rd (DNR 2006).

On the upstream (western) side of the culvert, the creek channel is less clearly defined and the vegetation reflects a spreading wetland that is subject to long-term inundation. The road acting as a hydraulic barrier, with only the central three-cell culvert providing drainage beneath the road, appears to have influenced the hydrology and vegetation communities either side. During drier periods of site investigation, there was no free-standing water and therefore no connectivity, immediately upstream of the culvert inlet.

Vegetation mapped as occurring in proximity to the site (refer to Figure 6) includes:

- PCT4009 Shoalhaven Lowland Flats Wet Swamp Forest. This PCT is associated with NSW Swamp Sclerophyll Forest on Coastal Floodplains threatened ecological community (TEC).
- PCT4056 Southern Estuarine Swamp Paperbark Creekflat Scrub. This PCT is associated with NSW Swamp Oak Floodplain Forest TEC.
- PCT4040 South Coast Selliera-Sea Rush Swamp Oak Saltmarsh. This PCT is associated with NSW Coastal Saltmarsh TEC, NSW Swamp Oak Floodplain Forest TEC, Commonwealth Coastal Swamp Oak Forest TEC and Commonwealth Subtropical and Temperate Coastal Saltmarsh TEC.
- PCT4091 Grey Mangrove-River Mangrove Forest. This PCT is not associated with any TEC.
- PCT3273 South Coast Lowland Shrub-Grass Forest. This PCT is not associated with any TEC.

The vegetation observed during site investigations either side of Callala Beach Rd in the vicinity of the site is most closely aligned with PCT4009 and is considered to be consistent with Swamp Sclerophyll Forest TEC. Refer to s3.2.2 and s3.3 for more information.

Vegetation on the eastern (downstream) side of the road consists of dense Swamp She-oak (*Casuarina glauca*) trees of varied age class, with a mid-storey of dense sedges and reeds, dominated by Twig Rush (*Baumea juncea*) and Common Reed (*Phragmites australis*). Occasional Woollybutt (*Eucalyptus longifolia*) saplings occur.

Vegetation on the western (upstream) side of the road is dominated by dense Common Reed, dense patches of *Melaleuca ericifolia* (Swamp Paperbark) and scattered Swamp She-oak – mostly of a younger age-classes, with very few mature trees.

At slightly higher elevations outside the wetter swamp areas (e.g. to the north of the site), Woollybutt and Swamp Mahogany (*Eucalyptus robusta*) trees dominate the canopy, with occasional Bangalay (*Eucalyptus botryoides*), and mid-storey vegetation featuring *Melaleuca ericifolia* (Swamp Paperbark), *Melaleuca linarifolia* (Flax-leaved Paperbark), *Androcalva fraseri* (Brush Currajong), *Exocarpus cupressiformis* (Cherry Ballart), *Breynia oblongifolia* (Coffee Bush), *Gahnia sieberiana* (Red-fruited Sword-sedge) and *Parsonsia straminea* (Silkpod).

The immediate road verges are disturbed and contain infestations of Whiskey Grass (*Andropogon virginicus*) and other invasive exotic species including African Lovegrass (*Eragrostis curvula*), Pigeon Grass (*Setaria* spp.), Paddys Lucerne (*Sida rhombifolia*), Fleabane (*Conyza* spp.), Coreopsis (*Coreopsis lanceolata*), Vasey Grass (*Paspalum urvillei*), Purple Top (*Verbena* spp.) and Cobblers Pegs (*Bidens pilosa*).

Occasional Hop Bush (*Dodonea triquetra*), Fern-leaf Wattle (*Acacia filicifolia*), Riceflower (*Pimelea liifolia*), Custard Apple (*Billardiera scandens*), Sydney Golden Wattle (*Acacia longifolia* subsp. *longifolia*), Silk Pod (*Parsonsia straminea*) occur along the narrow interface between the verge and the swampland.

Swamp She-oak trees along the eastern side of Callala Beach Rd provide canopy connectivity between sclerophyll forest occurring to the north and south of the site.

Threatened species, habitat resources and targeted survey findings

Microbats were observed roosting within two cavities (approx. 80 mm diameter and 200 mm deep) situated in the culvert ceilings at the eastern end of the outer culverts. These were identified as being Southern Myotis (*Myotis macropus*) (refer to Photo 10). Each cavity contained at least six Myotis. Interestingly, the vertical space between the culvert ceiling and water level was less than 0.9 m (approx. 0.7 m – 0.8 m at time of surveys), which is generally considered too low for use by microbats (TfNSW 2021).

A “Song Meter Mini Bat” recording device was installed facing the eastern side of the culvert from 13th October to 16th October 2023. Data was processed and analysed using Kaleidoscope Lite software. The purpose of this remote survey was to determine approximate times relative to sunset and sunrise that the Myotis are vacating and returning to the cavities, to inform future management options.

Vacating times of resident Myotis, taken as being when the species was first detected each evening, commenced between 30 minutes and 37 minutes after sunset.

Returning times, taken as the last Myotis recorded in the morning, were between 30 minutes and 50 minutes before sunrise.

Other microbat species including Large Forest Bat (*Vespadelus darlingtoni*) and threatened False Pipistrelle (*Pipistrellus tasmaniensis*) and were also recorded within the site.

An active Welcome Swallow nest with birds and eggs present occurred in the central culvert.

Mosquitofish (*Gambusia holbrooki*) were observed in shallow water on each site visit. No other aquatic species were observed.

No threatened flora including *Distichlis distichophylla*, *Melaleuca biconvexa*, *Prostanthera densa*, *Syzygium paniculatum* or *Wilsonia backhousei*, nor suitable habitat for locally occurring threatened orchid species were identified on site during vegetation surveys.

No Glossy Black Cockatoo (*Calyptorhynchus lathami*) feed trees (i.e., *Allocasuarina littoralis* with characteristic chewed cones), nor Yellow-bellied Glider (*Petaurus australis*) feed trees (i.e., *Corymbia gummifera* or *Eucalyptus punctata* with v-shaped feeding scars) occurred within or in close proximity to the site. No other signs of potential threatened fauna use of the site (e.g., bandicoot diggings, owl white-wash or other threatened fauna scats) were noted.

No hollow-bearing trees (HBTs) were found to occur within or in close proximity to the site.

Vegetation occurring within and in proximity to the site, either side of Callala Beach Rd was considered to be Swamp Sclerophyll Forest TEC. Refer to s3.2.2 and s3.3 for more information.

Saltmarsh vegetation is mapped as occurring downstream and within 100 m of the site, but no characteristic species were found to occur within the site.

Photos 1 through 10 below show the site, available habitat and relevant features.

Photo 1. Site facing north along Callala Beach Rd from southern limit of works



Figure 7. Vegetation mapped as occurring in the locality of the site

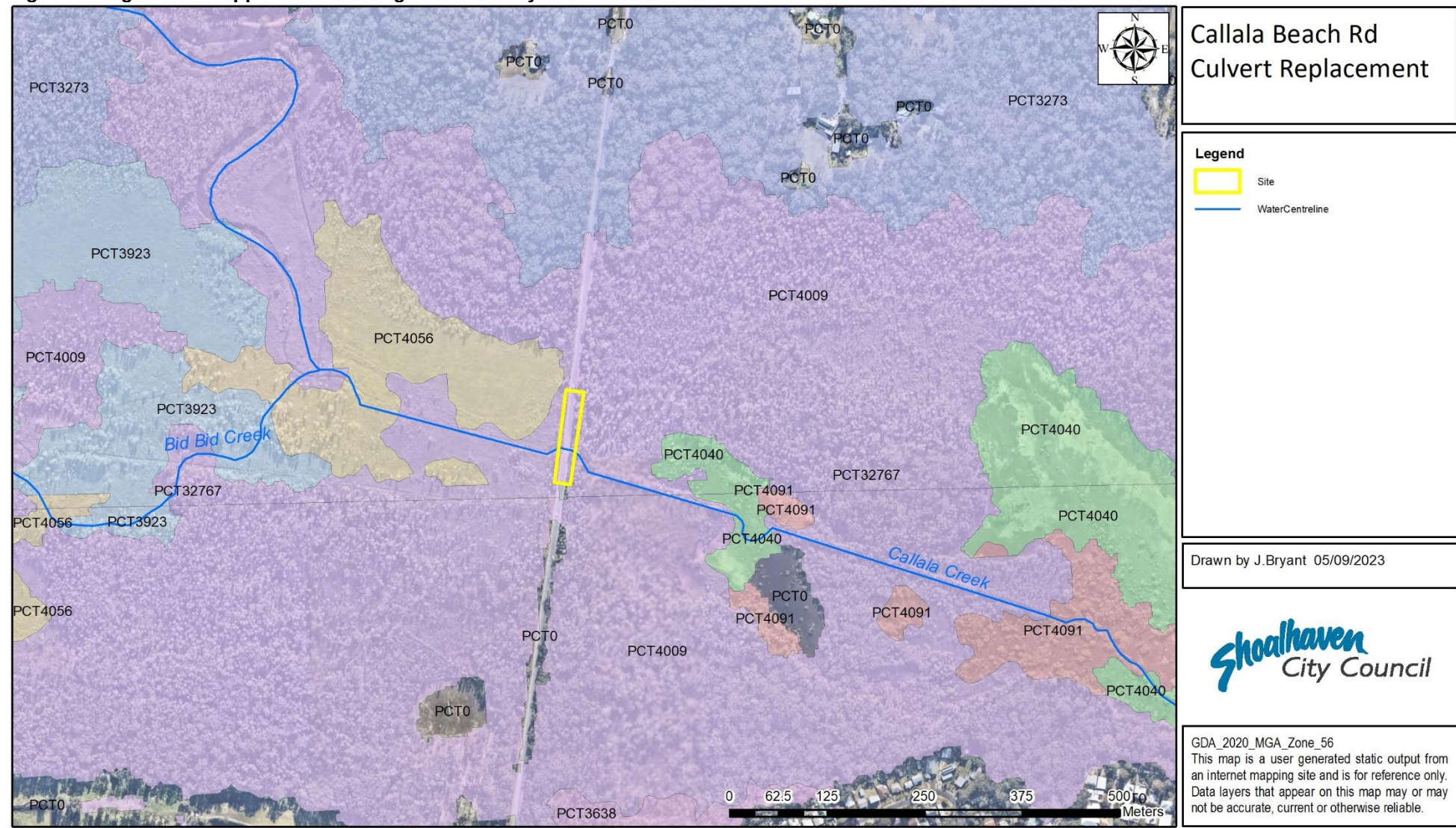


Photo 2. West side of Culburra Beach Rd at culvert



Photo 3. West side of culvert



Photo 4. Upstream (west side) channel of Callala Creek



Photo 5. East side of Culburra Beach Rd at culvert



Photo 6. East side culvert



Photo 7. Downstream (east side) Callala Creek



Photo 8. Callala Creek bed immediately downstream of culvert



Photo 9. Underside of culvert showing deterioration and Welcome Swallow nest (in spotlight)



Photo 10. Southern Myotis roosting in a cavity of the culvert ceiling



3. ASSESSMENT OF LIKELY IMPACTS ON THE ENVIRONMENT

3.1 Impacts associated with the proposal

The proposal would involve the following disturbance and direct impacts:

- Removal of 680 m² native vegetation consisting of young Swamp She-oak, Swamp Paperbark and Fern-leaf Wattle trees up to 100 mm diameter at breast height (DBH); Common Reed and Twig Rush; and under-pruning of Swamp Oak trees. Trees larger than 100 mm DBH may require under-pruning, but are unlikely to require removal, as their trunks are generally 6 m or more from the edge of the existing road and beyond the disturbance footprint. Some excavation and fill within the tree root protection zone of mature Swamp She-oak trees would occur. These trees are resilient, are tolerant of some disturbance and are unlikely to be detrimentally affected by the proposed works.
- Excavation within the creek for piles (up to 50.85 m³), base and apron slab (approx. 65.8 m³) and scour protection (approx. 46.62 m³), with treatment of Acid Sulfate Soils if – and as – required. Note that rock platforms for excavation and piling would be constructed within the works footprint (refer to Figure 6 and Section 1.1).
- Excavation of road batter and verge for western shoulder widening (replacement of soft soils up to 785.4 m³), with treatment of Acid Sulfate Soils if – and as – required.
- Temporary blocking of fish passage. Note that the need to stage the construction in order to maintain vehicular access along Callala Beach Rd, and the required construction methodology, may prevent the use of bypass pipes to maintain fish passage.
- Dewatering the culvert and wingwall apron footprint to construction base level (approx. 30cm below creek-bed) for construction of the base slab.
- Demolition of the existing culverts and associated habitat currently provided to resident fauna, including microbats.
- Traffic delays as a result of a half road closure.
- Temporary construction compound and stockpiles would be located in existing cleared areas and not encroach on sensitive environments or habitat features. Set down areas would be located within the works footprint or otherwise within existing cleared areas.

Other potential impacts on the environment, including indirect impacts have been considered, including:

- Impacts on threatened species;
- Impacts on indigenous and non-indigenous heritage;
- Impacts on water quality, the riparian zone and key fish habitat;
- Impacts associated with flood liable land.

Each of these is discussed below.

3.2 Threatened species impact assessment (NSW)

Section 1.7 of the EP&A Act 1979 applies the provisions of Part 7 of the NSW *Biodiversity Conservation Act 2016* and Part 7A of the NSW *Fisheries Management Act 1994* that relate to the

operation of the Act in connection with the terrestrial and aquatic environment. Each are addressed below.

3.2.1 Part 7A Fisheries Management Act 1994

Part 7A relates to threatened species conservation.

There are no threatened species listed under the Act which are mapped as occurring in proximity to the site¹, or likely to occur in proximity to the site.

No marine vegetation or threatened marine fauna would be directly impacted by the proposal.

The proposal would not create a new, permanent barrier to movement within the creek and is unlikely to result in indirect impacts which would affect threatened aquatic species or their habitats. Temporary disruption to fish passage may occur, but this will be minimised and mitigated against to every practical extent, e.g., through staging works and / or the use of bypass pipes to maintain fish passage during construction.

Further consideration of Parts 1 through 6 of the NSW DPI Threatened species assessment criteria, which considers impacts to threatened species, habitat of threatened species, and endangered ecological communities listed under the Act, is not warranted.

As demonstrated in Table 2 below (Part 7 of NSW DPI Threatened species assessment criteria), the proposal would not contribute significantly to key threatening processes, as listed under Part 7A of the Act.

It is concluded that the proposal is unlikely to result in any impact on threatened entities or their habitat; or contribute significantly to key threatening processes, as listed under Part 7A of the Act.

The proposed activity therefore does not require an Environmental Impact Statement (EIS) or Species Impact Statement (SIS) under the Act.

Table 2. Fisheries Management Act – Key Threatening Process Assessment

Key Threatening Process	Assessment
Degradation of native riparian vegetation along NSW water courses	Low adverse – the proposal would involve minimal vegetation removal within a riparian corridor, limited to young Swamp Oak and Swamp Paperbark trees, along with Common Reed and Twig Rush. Vegetation removal would occur on existing disturbed edges, would avoid removal of mature trees and would not compromise embankment stability.
Hook and line fishing in areas important for the survival on threatened fish species	Not applicable – proposal does not comprise or facilitate hook and line fishing.
Human-caused climate change	Not applicable – the proposal does not contribute to human-cause climate change.
Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams	The proposal would involve a like-for-like replacement of an existing culvert. The flow regime of

¹ Fisheries NSW Spatial Data Portal https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal

Key Threatening Process	Assessment
	Callala Creek would therefore not be affected by the proposal. Any disruption to flow during construction would be temporary.
Introduction of fish to waters within a river catchment outside their range	Not applicable – the proposal does not involve releasing fish.
Introduction of non-indigenous fish and marine vegetation to the coastal waters of NSW	Not applicable – the proposal does not involve the introduction of non-indigenous fish.
Removal of large woody debris from NSW rivers and streams	Not applicable – the proposal does not involve the removal of woody debris.
The current shark meshing program in NSW waters	Not applicable – the proposal does not involve shark meshing.

3.2.2 Part 7 Biodiversity Conservation Act 2016

An assessment of the potential for NSW threatened flora and fauna species occurring on-site or otherwise being impacted by the proposal was undertaken (Appendix D). The following threatened species or endangered ecological communities are known to occur on-site or are considered to have some potential to occur on-site or be otherwise impacted by the proposal:

- Green and Golden Bell Frog *Litoria aurea*
- East Coast Freetail-Bat *Micronomus norfolkensis*
- Eastern False Pipistrelle *Falsistrellus tasmaniensis*
- Greater Broad-nosed Bat *Scoteanax ruepelli*
- Large (Eastern) Bentwing-bat *Miniopterus orianae oceanensis*
- Southern Myotis (Large-footed Myotis) *Myotis macropus*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Southern Greater Glider *Petauroides volans*
- Yellow-bellied Glider *Petaurus australis*
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

Section 7.3 of the Act provides a ‘five-part’ test to determine whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Each Part is addressed below:

Part A - In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be place at risk of extinction.

Green and Golden Bell Frog *Litoria aurea*

Green and Golden Bell Frog inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha spp.*) or spikerushes (*Eleocharis spp.*). Optimum habitat for the species includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow

(*Gambusia holbrooki*), with a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas (OEH 2017).

The species is active by day and usually breeds in summer when conditions are warm and wet. Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs (OEH 2022c).

The site does not contain suitable breeding habitat for GGBF but contains potential refuge habitat (emergent reeds and other vegetation) and provides connectivity, via the culverts, between potential areas of habitat.

A 1996 record of GGBF occurs on Bid Bid Creek, approx. 1.6 km upstream from the site. A 2015 record of GGBF occurs 1.4 km east-north-east of the site, in Callala Bay. It is unknown if these records are associated with the Currumbene State Forest sub-population (north of Forest Rd) or if they are associated with an undocumented sub-population. The sparsity of records suggests that there is no GGBF sub-population associated with Callala Creek or Bid Bid Creek, but the possibility of GGBF occurring in the locality cannot be ruled out.

The proposal would not impact directly on any known population of GGBF or any potential breeding habitat.

Removal of potential refuge habitat would be negligible in the context of the available wetland vegetation either side of Callala Beach Rd.

Disruption to connectivity would be short-term during construction and would not occur in a location where a GGBF sub-population is known to migrate between over-wintering habitat and breeding habitat (such as occurs with the Brundee Swamp sub-population).

It is therefore considered unlikely that Green and Golden Bell Frog would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Microchiropteran Bats: East Coast Freetail Bat, Eastern False Pipistrelle, Greater Broad-nosed Bat, Large (Eastern) Bent-wing-bat and Southern Myotis

Eastern Coastal Freetail-Bat (*Micronomus norfolkensis*) occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. The species roosts mainly in tree hollows but will also roost under bark or in man-made structures. It will usually change breeding sites regularly (every few days), rendering it very difficult to confirm breeding sites. It has been known to occasionally aggregate in large breeding groups (including in buildings). It is usually solitary but has also been recorded roosting communally. The Eastern Freetail-Bat is considered to be probably insectivorous (OEH 2022a).

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings, however roost requirements poorly known. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer (OEH 2017).

Greater Broad-nosed Bat (*Scoteanax rueppellii*) utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.

The species forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young (OEH 2022b).

Southern Myotis (*Myotis Macropus*) generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. The species is dependent on waterways with pools of 3m wide or greater for foraging, with habitat surrounding the waterways (usually within 200m) being used for breeding and roosting. The species will forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December (OEH 2020b).

Large (Eastern) Bentwing-bat (*Miniopterus orianae oceanensis*) roosts primarily in caves, but it also uses derelict mines, storm-water tunnels, buildings and other man-made structures. The species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. The species hunts in forested areas, catching moths and other flying insects above the tree tops (OEH 2019).

Microbat young are typically born around November-December, with weaning around the following January-February (Richards & Hall 2012).

Only Southern Myotis are known to breed in culvert structures (TfNSW 2023).

Potential foraging habitat occurs within and in proximity to the site for each of these microbats.

Potential roosting habitat occurs as cavities within the existing culverts for Large Bentwing-bat and Southern Myotis, with Southern Myotis potentially utilising the habitat for breeding. It should be noted that the height of the culvert ceiling above the water level recorded as approx. 0.7m to 0.8m at the time of surveys, is generally considered unsuitable for microbats (TfNSW 2023).

At least twelve (12) Southern Myotis were observed roosting within two cavities (approx. 80 mm diameter and 200 mm deep) situated in the culvert ceilings at the eastern end of the outer culverts.

False Pipistrelle was identified from echolocation recordings.

Impact on potential foraging habitat for microbat species would be negligible in the context of the surrounding habitat.

The proposal would involve the demolition and replacement of the existing culverts which contain known roosting and potential maternity habitat for Southern Myotis and potential roosting habitat for Large (Eastern) Bentwing-bat, although this species was not detected within the site.

No hollow-bearing trees that may provide roosting habitat for False Pipistrelle, would be removed or otherwise impacted.

Works would be undertaken from April to September (inclusive) to every practical extent, to occur outside of the known breeding period for Southern Myotis.

Substitute habitat (i.e., constructed fauna boxes suited to microbats) shall be installed within the riparian corridor in proximity to the site, and a phased exclusion of cavities in the culverts shall be commenced, upon determination of this REF. Exclusion shall involve blocking a cavity (e.g. with

towels) to prevent re-entry after the microbats have vacated for nocturnal foraging (with timing based on site-specific echolocation records of activity, and confirmed with infrared cameras and then spotlights), and then sealing the empty cavity with rapid-set concrete or similar during the following day. Half of the available cavities shall be excluded each week commencing after installation of substitute habitat, until none remain, to encourage the microbats to utilise the nearby substitute habitat. Monitoring of the constructed habitat and existing culvert cavities shall be undertaken and the process re-evaluated based on the behaviour of the microbats and utilisation of substitute habitat. Consideration shall be given to temporary installation of constructed fauna boxes within the culvert to encourage their use by the microbats.

It is assumed that the proposed exclusion would be successful in forcing the resident microbats to utilise alternate available habitat. However, further investigation of the culverts would be carried out prior to commencement of works and any resident microbats would be captured and relocated by a suitably qualified and experienced ecologist, to nearby substitute habitat.

Sediment erosion controls would include the use of an in-stream combination hydrocarbon boom and silt curtain. This would be installed across the creek downstream of works, with the floating boom at water level and the curtain submerged, so as to not create a barrier to movement or a hazard for microbats to become entangled in.

The replacement culvert cells on Callala Beach Rd would incorporate wide joint spacing of 25-30mm with nominal depth of 190mm as replacement habitat for *Myotis*. Scabbling and / or tiling grout would be applied to the concrete within the gaps and over the adjacent ceiling (minimum 30 cm either side of gaps) to provide a roughened surface to the concrete for the microbats to climb and cling to.

The proposal would therefore avoid impact on the breeding cycle, would avoid direct impact on individuals, and would not remove habitat which is critical to the survival of these threatened microbat species.

It is therefore considered unlikely that East Coast Freetail Bat, Eastern False Pipistrelle, Greater Broad-nosed Bat, Large (Eastern) Bent-wing-bat and Southern *Myotis* would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of these species such that a viable local population of any of these species is likely to be placed at risk of extinction.

Grey-headed Flying-fox *Pteropus poliocephalus*

The Grey-headed Flying-fox (GHFF) is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle.

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. GHFF can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. They feed on the nectar and pollen of native trees,

in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines, also foraging in cultivated gardens and fruit crops (2020a).

The site contains marginal foraging habitat for GHFF consisting of flowering Eucalypt and Melaleuca trees and shrubs.

No GHFF camp exists in close proximity to the site, the nearest being at Huskisson approx. 5.6 km SSW of the site; Comerong Island approx. 12.5 km NNE of the site and Illowra Wetlands approx. 18 km NW of the site².

Impact on potential foraging habitat (680 m² of young Swamp She-oak, Swamp Paperbark and Fern-leaf Wattle) would be negligible in the context of the surrounding habitat.

Works would occur during standard construction hours, so would not impact on the primarily nocturnal feeding periods of this species.

It is therefore considered unlikely that Grey-headed Flying-fox would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Large Gliders: Southern Greater Glider *Petauroides volans* and Yellow-bellied Glider *Petaurus australis*

The Southern Greater Glider (SGG) is the largest gliding possum in Australia, with a head and body length of 35–46 cm and a long furry tail measuring 45–60 cm. The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The SGG favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. It shelters during the day in tree hollows and will use up to 18 hollows in their home ranges which are typically relatively small (1-3ha), but are larger in lower productivity forests and more open woodlands (up to 16 ha). Very loyal to their territory. It feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Greater Gliders are usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Females give birth to a single young in late autumn or early winter (March to June) which remains in the pouch for approximately 4 months and is independent at 9 months of age. Sexual maturity is reached in the second year. Longevity has been estimated at 15 years, so generation length is likely to be 7–8 years. The relatively low reproductive rate may render small, isolated populations in small remnants prone to extinction. The greater glider is considered to be particularly sensitive to forest clearance and to intensive logging. The greater glider is also sensitive to wildfire and is slow to recover following major disturbance. Notwithstanding relatively small home ranges, but in part because of low dispersal ability, greater gliders may be sensitive to fragmentation, have relatively low persistence in small forest fragments, and disperse poorly across vegetation that is not native forest. Modelling suggests that they require native forest patches of at least 160 km² to maintain viable populations (OEH 2023; TSSC 2016).

The Yellow-bellied Glider (YBG) is a large, active, sociable and vocal glider. The species occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type

² Source: <http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>

preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. The species feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Sap is extracted by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Yellow-bellied Gliders live in small family groups of two - six individuals and are nocturnal. The species use dens, often in family groups, in hollows of large trees. The Yellow-bellied Glider is very mobile and occupies large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources. Dispersal requires continuous habitat connectivity (gliding distance around 120m). Typically produce one young per year (in high quality habitat) but during poor conditions may only breed every second year. Key threats to the species include loss of hollows (generally >30cm) and important feed trees as a result of wildfire, in addition to landscape fragmentation. A highly vocal species with loud, high-pitched shrieks audible over 500m away (OEH 2022d).

Records of SGG and YBG occur in sclerophyll forest from approximately 250 m north of the site. A single record of YBG occurs in forest approximately 370 m south-east of the site.

No suitable foraging or den habitat occurs with the site.

Swamp She-oak trees (with Woollybutt and Swamp Mahogany) along the eastern side of Callala Beach Rd provide canopy connectivity between sclerophyll forest occurring to the north and south of the site. It is possible that YBG and to a lesser extent SGG, might utilise this vegetation as a movement corridor.

The proposal would not involve removal of any suitable foraging or den habitat.

Removal of trees would be limited to younger individuals along the immediate road edge and would not impact on larger trees. The existing canopy connectivity along the eastern side of Callala Beach Rd would be retained and its function as a movement corridor would not be affected.

It is therefore considered unlikely that Southern Greater Glider and Yellow-bellied Glider would be impacted by the proposed works, and the proposed activity is unlikely to have an adverse effect on the lifecycle of these species such that a viable local population of either of these species is likely to be placed at risk of extinction.

Part 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***

Vegetation within the site features Swamp She-oak trees and dense patches of Swamp Paperbark with a mid-storey of dense sedges and reeds, dominated by Twig Rush and Common Reed, with occasional Woollybutt saplings occurring within the site and mature Woollybutt and Swamp Mahogany trees present at higher elevations outside the site.

This vegetation aligns with PCT4009 and is considered to be consistent with Swamp Sclerophyll Forest TEC. Refer to Section 2.1 for more information.

Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (SSF) is the name given to the ecological community associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains (NSW Scientific Committee 2011).

SSF generally occurs below 20 m (though sometimes up to 50 m) elevation, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains in the NSW North Coast, Sydney Basin and South East Corner bioregions (NSW Scientific Committee 2011).

This swamp community has an open to dense tree layer of eucalypts and paperbarks although some remnants now only have scattered trees as a result of partial clearing. The trees may exceed 25 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality where the tree stratum is low and dense. For example, stands dominated by *Melaleuca ericifolia* typically do not exceed 8 m in height. The community also includes some areas of fernland and tall reedland or sedgeland, where trees are very sparse or absent (NSW Scientific Committee 2011).

The most widespread and abundant dominant trees include *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Paperbark) and, south from Sydney, *Eucalyptus botryoides* (Bangalay) and *Eucalyptus longifolia* (Woollybutt). Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* (Sweet Willow Bottlebrush), *Casuarina glauca* (Swamp She-oak) and *Eucalyptus resinifera* subsp. *hemilampra* (Red Mahogany), *Livistona australis* (Cabbage Palm) and *Lophostemon suaveolens* (Swamp Turpentine). A layer of small trees may be present, including *Acacia irrorata* (Green Wattle), *Acmena smithii* (Lilly Pilly), *Elaeocarpus reticulatus* (Blueberry Ash), *Glochidion ferdinandi* (Cheese Tree), *Melaleuca linariifolia* and *M. styphelioides* (Paperbarks). Shrubs include *Acacia longifolia*, *Dodonaea triquetra*, *Ficus coronata*, *Leptospermum polygalifolium* subsp. *polygalifolium* and *Melaleuca* spp. Occasional vines include *Parsonsia straminea*, *Morinda jasminoides* and *Stephania japonica* var. *discolor*. The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei*, *Pteridium esculentum*, *Hypolepis muelleri*, *Calochlaena dubia*, *Dianella caerulea*, *Viola hederacea*, *Lomandra longifolia*, *Entolasia marginata* and *Imperata cylindrica* (NSW Scientific Committee 2011).

Approximately 185 Ha of vegetation mapped as PCT4009 occurs contiguous with the site and a similar area again occurs in the nearby locality but disconnected (refer to Figure 7 above).

The proposal would involve the removal of approximately 680 m² of native vegetation along the existing road and vegetation interface. Vegetation to be removed consists of young Swamp She-oak, Swamp Paperbark and Fern-leaf Wattle trees up to 100 mm diameter at breast height (DBH); Common Reed and Twig Rush; and under-pruning of Swamp Oak trees. Some excavation and fill within the tree root protection zone of mature Swamp She-oak trees would occur. These trees are resilient, are tolerant of some disturbance and are unlikely to be detrimentally affected by the proposed works.

The removal of approximately 680 m² of SSF represents a negligible loss of 0.037% in the context of the surrounding contiguous SSF vegetation.

The replacement culvert would have the same capacity as existing and changes to the road profile would be negligible. Impacts on the EEC would therefore not result from changes to hydrology.

The existing canopy connectivity along the eastern side of Callala Beach Rd would be retained and its function as a movement corridor would not be affected. The proposed road widening and associated extension of the culvert would be relatively minor and would not reduce effective connectivity between the western and eastern sides of the road, relative to the existing situation.

The proposal would therefore not result in the fragmentation or isolation of areas of any EEC and is unlikely to adversely affect the extent or composition of any EEC such that a local occurrence of the EEC would be placed at risk of extinction.

Part C - In relation to the habitat of a threatened species or ecological community:

(iii) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity

(iv) 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

(v) 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.

No important habitat for threatened species would be removed or otherwise significantly impacted (see Part A).

No EEC would not be fragmented or isolated, nor removed or modified to an extent that would affect the long-term survival of the EEC occurring in the locality (refer to Part B).

The proposal will therefore not affect the long-term survival of any threatened species or endangered ecological community in the locality.

Part D – 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).

No “areas of outstanding biodiversity values” have been declared in the City of Shoalhaven.

Part E – 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.

Key threatening processes listed in the NSW *Biodiversity Conservation Act 2016* considered relevant to the proposed activity include:

- Clearing native vegetation
- Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands

Clearing of native vegetation is listed as a key threatening process, defined by the Scientific Committee's determination (OEH 2021) as:

“the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands.”

Clearing of native vegetation has been shown to:

- cause widespread fragmentation of ecological communities;

- reduce the viability of ecological communities by disrupting ecological functions;
- result in the destruction of habitat and loss of biological diversity;
- lead to soil and bank erosion, increased salinity and loss of productive land.

Removal of native vegetation associated with the proposal would be limited to 680 m² of young Swamp She-oak, Swamp Paperbark and Fern-leaf Wattle trees, Common Reed and Twig Rush, and under-pruning of Swamp Oak trees. Vegetation removal would occur along the existing, disturbed, road and vegetation interface.

The impact of the proposal with regard to clearing of native vegetation, is not considered to be significant as it is unlikely to lead to:

- destruction of habitat causing a loss of biological diversity and extinction of species or loss or local genotypes.
- fragmentation of populations resulting in limited gene flow between small, isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species.
- riparian zone degradation such as bank erosion leading to sedimentation that affects aquatic communities – the riparian corridor would be stabilised as a result of the works.
- disturbance of habitat which may permit the establishment and spread of exotic species which may displace native species.
- loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates.
- significant reduction of habitat for threatened species or ecological communities.

Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands is noted in the Scientific Committee's determination (OEH 2021) as occurring through:

“reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels”.

The proposal would extend the road embankments and would involve temporary disruptions to flow and fish passage, but would not result in any alteration to current flow regimes.

3.3 Threatened species impact assessment (Commonwealth EPBC Act 1999)

A Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Report was generated on 5th September 2023. Of those threatened species and endangered ecological communities reported as likely occurring or having habitat within the area of the report, the following were considered to have potential habitat within the site requiring further assessment:

- Green and Golden Bell Frog *Litoria aurea* (V)
- Grey-headed Flying-fox *Pteropus poliocephalus* (V)
- Yellow-bellied Glider *Petaurus australis* (V)
- Greater Glider *Petauroides volans* (E)
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (E)

(CE – Critically Endangered; E – Endangered; V – Vulnerable; M – Migratory).

Refer also to Likelihood of Occurrence Table in Appendix A.

Additional species listed under the Act, including migratory birds, may occur occasionally and transiently within the vicinity of the proposed activity but would not be affected by the proposal.

A significant impact assessment of EPBC listed threatened entities was undertaken in Table 3.

Table 3. EPBC Significant impact assessment

<i>Vulnerable species - Significant impact criteria</i> Species to consider: • Green and Golden Bell Frog (GGBF) • Grey-headed Flying-fox (GHFF) • Yellow-bellied Glider (YBG)	
Criteria	Assessment
lead to a long-term decrease in the size of an important population of a species	The proposed activity will not directly impact on a known local population of GGBF, GHFF or YBG, will not affect or disrupt breeding, will not impact on breeding habitat, and will have only a negligible impact on potential foraging and refuge habitat. Refer to Section 3.2.2 for more information.
reduce the area of occupancy of an important population	No
fragment an existing important population into two or more populations	No
adversely affect habitat critical to the survival of a species	No important habitat for any of these species will be impacted by the proposed activity. No breeding, and only very minimal potential foraging or refuge habitat for GGBF, GHFF and YBG would be impacted. Refer to Section 3.2.2 for more information.
disrupt the breeding cycle of an important population	Works would not affect breeding habitat. Refer above and to Section 3.2.2 for more information.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No important habitat will be impacted by the proposed activity. Refer to Section 3.2.2 for more information.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No invasive species will be introduced
introduce disease that may cause the species to decline	No disease will be introduced
interfere substantially with the recovery of the species	No
<i>Critically endangered and endangered species - Significant impact criteria</i> Species to consider: • Southern Greater Glider (SGG)	
Criteria	
lead to a long-term decrease in the size of a population	The proposed activity will not directly impact on a known local population of SGG, will not affect or disrupt breeding or impact on breeding habitat of SGG, and will not impact on potential movement corridors of SGG. Refer to Section 3.2.2 for more information.

reduce the area of occupancy of the species	No
fragment an existing population into two or more populations	No
adversely affect habitat critical to the survival of a species	No critical habitat for these species will be impacted by the proposed activity. Refer to Section 3.2.2 for more information.
disrupt the breeding cycle of a population	Works would not affect breeding habitat. Refer above and to Section 3.2.2 for more information.
modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No important habitat will be impacted by the proposed activity. Refer to Section 3.2.2 for more information.
result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No invasive species will be introduced
introduce disease that may cause the species to decline	No disease will be introduced
interfere with the recovery of the species	No
<i>Critically endangered and endangered ecological communities - Significant impact criteria</i> Communities to consider: Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (CSSF)	
Criteria	Assessment
reduce the extent of an ecological community	Approx. 680 m² vegetation constituting CSSF would be removed by the proposal, representing a negligible loss in the context of the surrounding vegetation. The proposed vegetation removal would not result in complete removal of the patch, nor fragmentation and would not occur on the extremities of the EEC's extent. The proposed vegetation removal would therefore not reduce the 'extent' of the EEC, would not fragment and would not affect the recovery or increase the likelihood of extinction of the EEC.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines adversely affect habitat critical to the survival of an ecological community	No. See above.
modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	No. Proposed drainage would occur as upgrades to existing swales and eroded drainage lines. No substantial effect on groundwater levels or localised hydrology would occur.

cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	No. Impacts would occur on existing edges and would not impact on species composition.
cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	No. The proposal would not introduce or promote the growth of invasive species or other impacts which would affect the integrity or occurrence of the EEC.
interfere with the recovery of an ecological community	No
Summary	The proposal would result in the removal of approx. 0.037% of a contiguous patch of CSSF from existing disturbed roadside – vegetation interface, and would not introduce impacts that would negatively affect species composition, vegetation integrity or occurrence of the EEC. It is therefore considered unlikely that the proposal would adversely affect the extent or composition of <i>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland</i> such that a local occurrence of the EEC will be placed at risk of extinction.

Conclusion of EPBC Significant Impact Assessment

The proposal is unlikely to have an adverse effect on a vulnerable, endangered, critically endangered or migratory species or its habitat, nor on the extent or integrity of an endangered ecological community such that its local occurrence is likely to be placed at risk of extinction.

No other matters of significance would be affected as a result of the proposed activity, i.e.:

- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- world heritage properties;
- national heritage places;
- the Great Barrier Reef Marine Park;
- nuclear actions; or
- a water resource, in relation to coal seam gas development and large coal mining development.

Further assessment and referral to the Commonwealth is therefore not required.

3.4 Indigenous heritage

Under Section 86 of the NSW *National Parks and Wildlife Act 1974* (NPW Act) it is an offence to disturb, damage, or destroy any Aboriginal object without an Aboriginal Heritage Impact Permit (AHIP). The Act, however, provides that if a person who exercises 'due diligence' in determining that their actions will not harm Aboriginal objects has a defence against prosecution if they later unknowingly harm an object without an AHIP (Section 87(2) of the Act). To effect this, the NSW Department of Environment, Climate Change and Water have prepared the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (hereafter referred to as the 'Due Diligence Guidelines') to assist individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for an AHIP.

Landscape features that are regarded as indicating a higher potential for Aboriginal objects, as outlined in the NSW Department of Environment, Climate Change and Water's Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (2010) include:

- within 200m of waters, or
- located within a sand dune system, or
- located on a ridge top, ridge line or headland, or
- located within 200m below or above a cliff face, or
- within 20m of or in a cave, rock shelter, or a cave mouth.

The site contains a crossing of Callala Creek.

A search on the Aboriginal Heritage Information Management System (AHIMS) on 12th December 2022 indicated that one recorded Aboriginal site (58-2-0463) occurred within the footprint of the proposal at the culvert crossing of Callala Creek.

MI Engineers engaged consultant archaeologist Dr Sue Feary to undertake an Aboriginal heritage due diligence assessment, which included a field inspection and informal consultations with Jerrinja Local Aboriginal Land Council, as the affected creek (Bid Bid/Callala Creek) has cultural significance to the Jerrinja community.

The site card for 58-2-0463 referred to the presence of fragmented shell associated with Callala / Bid Bid Creek. The field inspection for the due diligence assessment found the subject area to be low lying and prone to regular inundation from tidal and rainfall events and was assessed to have very low archaeological potential. The field inspection identified a small amount of fragmented shell in disturbed sediments near the existing culvert, adjacent to the sealed road pavement. These belong to the species *Anadara trapezia* (Sydney cockle), a species known locally by its Aboriginal name Bimbula and an important element of the traditional diet of coastal Aboriginal communities (Feary 2023).

The field inspection found no Aboriginal objects are present within the subject area and concluded that there was no evidence to associate the observed shell fragments with any kind of Aboriginal cultural activity and that the shell is likely to represent the remnants of a natural shell bed of Bimbulas that had been dredged up from the creek bed at some time in the past. Natural shell beds of Bimbula associated with tidal creeks are known to occur in the area and have been mistakenly identified in the past. The assessment also concluded that the shell material recorded as 58-2-0463 is an erroneous recording referring to natural deposits and should be removed from AHIMS (Feary 2023).

Bid Bid Creek, which is a tributary of Callala Creek, is known to have cultural significance to Aboriginal people, being associated with a local creation story about the Bhip woman. The Jerrinja Local Aboriginal Land Council was notified about the proposed development and the CEO indicated that some level of monitoring during the development would be appropriate (Feary 2023).

The due diligence assessment concluded that there are no constraints to replacement of the culvert on Aboriginal cultural heritage grounds, however, due to the associative cultural values of the creek, it was recommended that monitoring of initial ground disturbing works be undertaken, to ascertain the nature and extent of the natural shell deposits (Feary 2023).

As the proposal would occur on disturbed land and would not impact any recorded Aboriginal sites or places, the Due Diligence Guidelines requires no further assessment, an AHIP is not required, and the activity can proceed with caution.

The recommendations from the Aboriginal heritage due diligence assessment have been incorporated into the prescribed safeguards and mitigation measures of this REF.

3.5 Non-indigenous heritage

No items of local heritage significance or any items on the State Heritage Register or listed in the Shoalhaven Local Environmental Plan occur in close proximity to the site such that the proposed works might impact them.

3.6 Riparian corridors, Key Fish Habitat & Water quality

Impacts on riparian corridors, Key Fish Habitat (KFH) and water quality were considered with regard to the following:

- Likely and potential impacts on vegetation as a result of construction activities;
- Sediment movement into waterways as a result of construction activities;

Riparian corridors

While not mapped, a riparian zone exists associated with the Callala Creek channel.

As noted in section 2.1, upstream (west) of the Callala Beach Rd culvert crossing the creek channel is poorly defined, with few trees present. Downstream (east) of the culvert, the channel is well defined and lined primarily with Swamp She-oak trees.

The proposal would involve removal of young Swamp She-oak, Swamp Paperbark and Fern-leaf Wattle trees up to 100 mm diameter at breast height (DBH); Common Reed and Twig Rush; and under-pruning of Swamp Oak trees. No large, mature trees would be removed and vegetation removal along the creek channel would be minimal.

Disturbed soil would be stabilised following works and revegetation would be undertaken in proximity to the creek.

The existing canopy connectivity along the eastern side of Callala Beach Rd would be retained and its function as a movement corridor would not be affected. The proposed road widening and associated extension of the culvert would be relatively minor and would not reduce effective connectivity between the western and eastern sides of the road, relative to the existing situation.

The proposal would not impact on the function or integrity of the riparian corridor.

The proposal would therefore not result in significant impacts on riparian corridors.

It is therefore concluded that impacts on riparian corridors, resulting from the proposal, would be minimal and mitigations would further reduce immediate and long-term impacts.

Water Quality

Excavation would occur within the creek channel and along the road batters and verges.

Excavation and construction works would involve the installation and maintenance of sediment and erosion controls to minimise impacts associated with water contamination and sediment movement and deposition, including the use of a sediment curtain to capture sediment within the waterway.

Temporary rock platforms would be constructed within the disturbance footprint for the construction of piles.

No machinery would operate from within the water.

Soils would be tested for acid forming properties and if required, an Acid Sulfate Soil Management Plan (ASSMP) shall be prepared to provide monitoring, management, treatment and disposal requirements management in accordance with the ASSMAC and NSW EPA guidelines, to minimise the risk of impacts on water quality. Refer to Section 3.8 for more information.

Disturbed soil would be stabilised with hydromulch or similar following works and revegetation would be undertaken in proximity to the creek.

It is therefore concluded that sediment movement and the risk of impact on water quality, resulting from the proposal, would be minimal and mitigations would further reduce immediate and long-term impacts.

Key Fish Habitat

Key Fish Habitat (KFH) is mapped as occurring across the entire floodplain associated with Callala Creek (refer to Figure 8).

Proposed excavation, fill and construction of the replacement culvert structure and widened road embankments would constitute dredging and reclamation activities in KFH requiring a permit under the *Fisheries Management Act 1994*. Refer to Section 4.2 below.

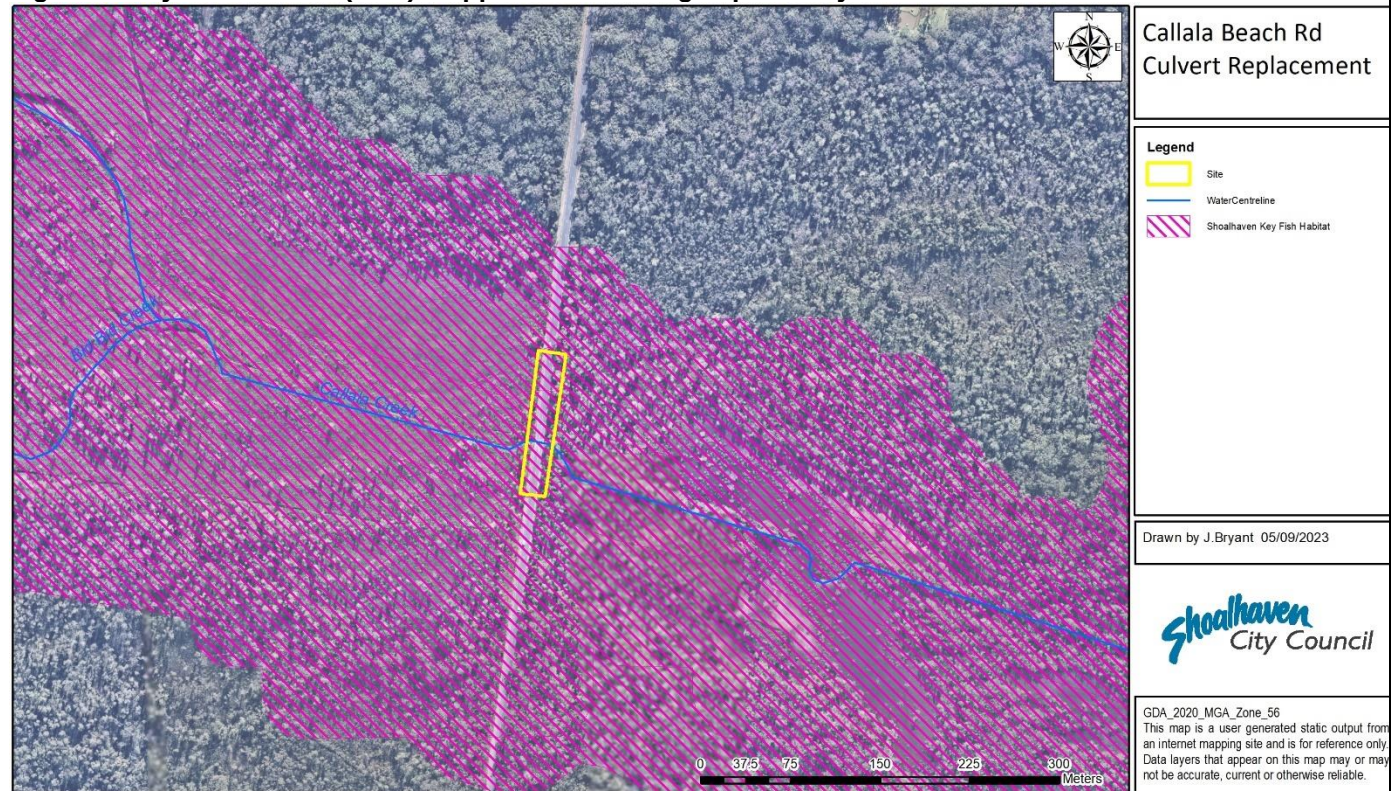
The proposed culvert replacement would be like-for-like in capacity and depth and would therefore not change the existing fish passage function of the culvert.

The proposed works may require temporary blocking of fish passage. To every practical extent, staging of works and the use of diversion pipes shall be utilised to avoid or minimise disruption to fish passage, but the nature of the works and constraints of the site may necessitate blocking fish passage for a portion – or all – of the anticipated 14-week culvert construction timeframe. It should be noted that during drier periods of site investigation, there was no free-standing water and therefore no connectivity, immediately upstream of the culvert inlet.

Dewatering shall involve the use of a 6 mm mesh screen over the inlet pipe to prevent fish being drawn into the pump. Monitoring of pools and relocation of any aquatic fauna shall be undertaken.

Aquatic habitat would therefore not be significantly altered or impacted by the proposal.

Figure 8. Key Fish Habitat (KFH) mapped as occurring in proximity to the site



3.7 Flood liable land

The Callala Creek floodplain is not mapped as flood liable land, but Callala Beach Rd is known to be subject to flooding during heavy and prolonged rain events where floodwater can overtop the road at the culvert location.

Upgrade or other change to the culvert capacity has been considered, but would require a flood study, which is currently unfunded.

SCC Senior Floodplain Engineer reviewed concept plans in mid-2022 and provided the following comments (18 July 2022, SCC reference D22/301548):

- A significant length of Callala Beach Rd passes through floodprone land. The only flood study completed for Callala Creek was undertaken by Forbes Rigby in 1994 and this report is attached. We have recently digitised the 1% AEP flood extent so this could be provided in GIS format to be shown on the mapping if desirable – although this mapping only covers Callala Creek downstream of Callala Beach Rd. It is noted that the concept plan shows lots of constraints but not flooding.
- Floodwater overtops a significant length of Callala Beach Rd in large flood events. Therefore the SUP construction should not result in filling to levels above the existing Callala Beach Rd crest level as this could have adverse flood impacts on existing property in Callala Beach. If any filling were proposed then this would need to be investigated in a flood impact assessment as per Schedule A3 in DCP Chapter G9.
- Whilst no changes to the existing Callala Creek culvert is proposed on these plans, it is understood that this was being investigated as a potential part of the overall project scope.

Any changes to the hydraulic capacity of this culvert (increased or reduced capacity) would need to be investigated in a flood impact assessment as changes could have adverse flood impacts on existing properties both upstream and/or downstream of Callala Beach Rd. There are a number of floodprone properties on Lackersteen Street (near the Callala Creek entrance) that could have worsened flooding from increased flows through the Callala Beach Rd culverts – although this may not be the case.

- General Arrangement Plan Sheet 2B: The SUP bridge / elevated walkway over Callala Creek needs to be carefully designed to ensure there are no adverse flood impacts upstream of Callala Beach Rd. The finished surface level should not exceed the existing Callala Beach Rd carriageway level and obvert level should not be lower than the existing Callala Beach Rd box culvert. Ideally the capacity of the SUP bridge / elevated walkway over Callala Creek should exceed the existing Callala Beach Rd box culverts.*
- Council has plans to complete a Flood Study for Callala Creek in the near future. There are significant flood isolation and evacuation concerns for the Callala Beach and Myola communities given that Callala Beach Rd is the only vehicle access and would be closed during flood events. The completion of a Callala Creek Flood Study and Floodplain Risk Management Study & Plan would allow these flood evacuation issues to be better investigated and mitigation measures implemented over time (such as raising Callala Beach Rd for example). The construction of the SUP at this stage should consider the potential future raising of Callala Beach Rd so this is not an option which becomes unviable due to the construction of the SUP first.*

The current, revised plans were subsequently reviewed by SCC's Senior Floodplain Engineer with the following comments provided (5 October 2023, SCC reference D23/459484):

- Replacing the existing culverts with the same size cells makes sense as this would largely avoid any downstream impacts that could arise from an increase culvert capacity. Any increase in culvert capacity would require a flood impact assessment to avoid potential adverse downstream impacts. No flood impact assessment is required to consider downstream impacts based on the proposal to match the existing culvert capacity.*
- The proposed culvert has an increased length and flatter grade, which combined would lead to a slightly reduced capacity. The lower invert level would however potentially slightly improve capacity due to a higher driving head. The benefits in extending this culvert are noted and this outcome is considered necessary. Overall the culvert capacity will likely be limited by downstream tailwater level conditions. This is the case for the more recent events in which Callala Beach Rd has overtopped over a long road length due to limited culvert capacity.*
- Raising the road could result in adverse flood impacts to upstream properties. This could only be tested from flood modelling. It is however noted that the road raising will only occur over a short length in the culvert location so floodwater can still overtop the relatively flat Callala Beach Rd on either side of the slightly raised section which would avoid adverse flood impacts. Flood modelling could be required before the remainder of Callala Beach Rd is raised. It is also noted that the only development upstream of Callala Beach Rd that could be impacted by a raised road is the Club Callala and golf club. Hence if the level of*

existing structures in this location could be compared to the level of Callala Beach Rd then it may be possible to avoid the need for modelling in the future.

- We do not have a contemporary flood study for Callala Creek. There was a flood study completed in 1994, but this was a 1D model and did not extend upstream of Callala Beach Rd and hence is not suitable for assessing changes to Callala Beach Rd or the culvert as per this project.*
- The culvert handrails and road guardrails are unlikely to have any adverse flood impacts. The flow velocity is low in this waterway which would reduce the likelihood of larger debris being mobilised during a flood event. The handrails and guardrails will not impact the culvert operation and would only partially impede floodwater during large events which overtop Callala Beach Rd.*

The proposal is therefore considered unlikely to negatively affect flood behaviour. The proposed culvert design would not substantially change culvert capacity and the minor increase to road height would occur over a short length of road in the culvert location only, allowing for floodwater to overtop the relatively flat Callala Beach Rd either side of the raised section, thereby avoiding adverse flood impacts.

3.8 Acid Sulfate Soil

Acid sulfate soils (A.S.S) are the common name given to sediments and soils containing iron sulfides which, when exposed to oxygen generate sulfuric acid. The majority of acid sulfate sediments were formed by natural processes in the Holocene geological period (the last 10,000 years). Formation conditions require the presence of iron-rich sediments, sulfate (usually from seawater), removal of reaction products such as bicarbonate, the presence of sulfate reducing bacteria and a plentiful supply of organic matter. These conditions tend to exist in mangroves, salt marsh vegetation or tidal areas, and at the bottom of coastal rivers and lakes. The relatively specific conditions under which acid sulfate soils are formed usually limit their occurrence to low lying parts of coastal floodplains, rivers and creeks. This includes areas with saline or brackish water such as deltas, coastal flats, backswamps and seasonal or permanent freshwater swamps that were formerly brackish. Due to flooding and stormwater erosion, these sulfidic sediments may continue to be re-distributed through the sands and sediments of the estuarine floodplain region. Sulfidic sediment may be found at any depth in suitable coastal sediments – usually beneath the watertable (ASSMAC 1998).

The majority of the site and surrounds associated with Crookhaven Creek floodplain are mapped as Class 2 Acid Sulfate Soils (A.S.S) (refer to Figure 9). The site is associated with tidal influence and brackish conditions. Geotechnical investigation found that the site contained dark silty clays (Geofirst 2022), suggesting high organic matter content. It is therefore likely that the soils present have acid forming properties.

The *Shoalhaven Local Environment Plan 2014* indicates that a risk of exposure of A.S.S exists for Class 2 A.S.S where works would occur below the natural ground surface or where works would involve lowering of the watertable.

The proposal would require dewatering of the creek to below the depth of the natural creek bed within the footprint of the culvert and wingwall apron for construction of the base slab. The proposal would also involve excavation to depths of 9.0 m (using hollow-flight auger) below the ground surface within the creek for construction of the piles; open excavation to depths ranging

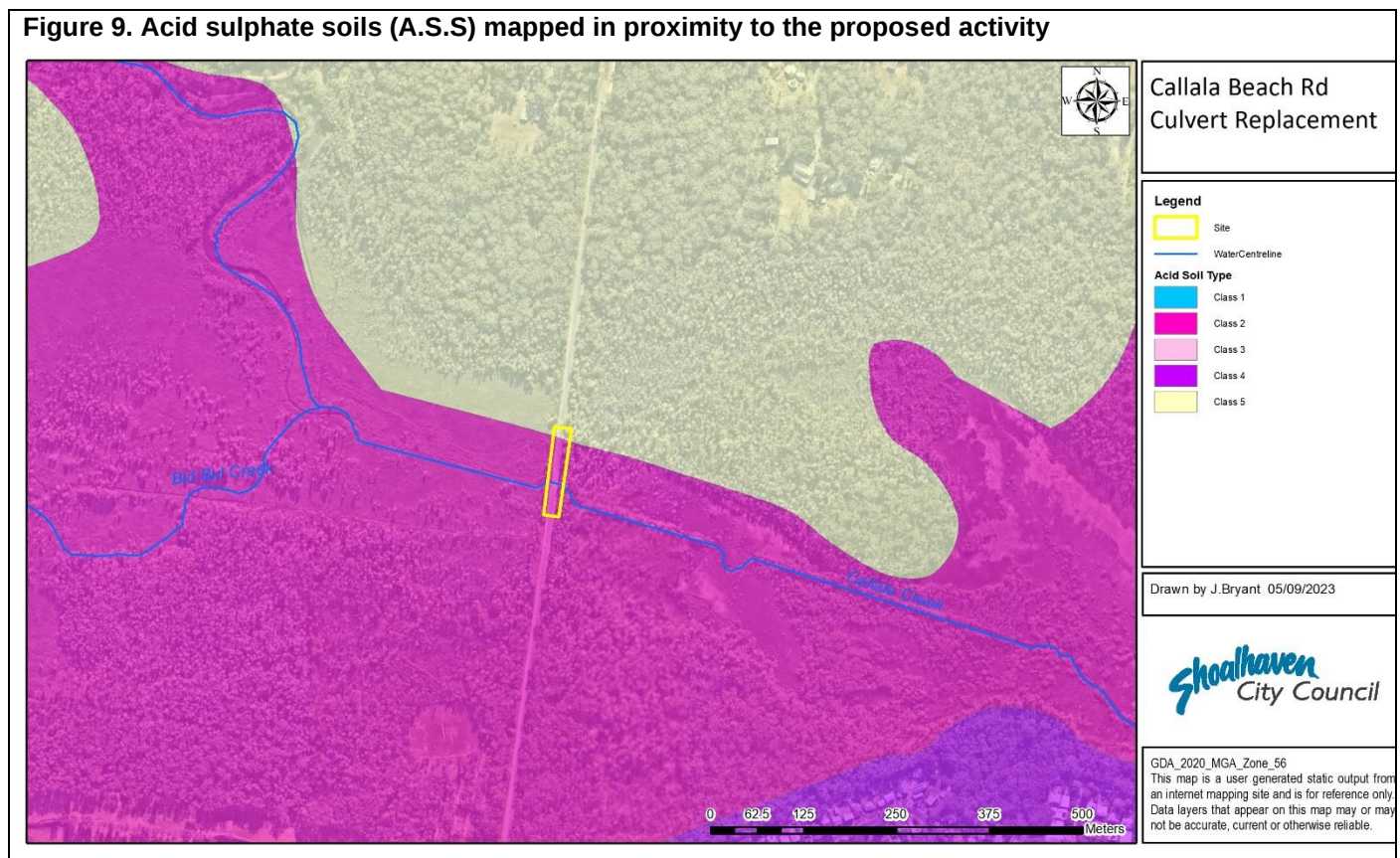
from 0.3 m up to approx. 1.0 m below the ground surface within the creek for construction of the culvert base slab and scour protection; open excavation to a depth of approx. 2.64 m for road widening.

A risk of exposure of A.S.S therefore exists as a result of proposed works.

Soil sampling (representative of excavation locations and depths) and a full Acid Base Account assessment utilising the SPOCAS³ analysis shall assess the presence of acidity, potential acidity and liming rate to neutralise the acid prior to disposal. If confirmed as acidic or potentially acidic, an Acid Sulfate Soil Management Plan (ASSMP) shall be prepared in accordance with the Acid Sulfate Soil Manual (ASSMAC 1998). The ASSMP should detail soil and water monitoring requirements; management of groundwater; establishment of a bunded treatment area in a suitable on-site or nearby location; and treatment and disposal of potential A.S.S in accordance with the ASSMAC and NSW EPA guidelines.

These requirements are reflected in the safeguards and environmental impact mitigation measures prescribed in Section 7 of this REF.

Figure 9. Acid sulphate soils (A.S.S) mapped in proximity to the proposed activity



3.9 Other considerations

In the context of this environmental assessment, the area to be affected by the proposed activity:

- is not an Aboriginal Place in the context of the NSW National Parks and Wildlife Act 1974, nor is it known to contain Aboriginal artefacts

³ Suspension Peroxide Oxidisation Combined Acidity and Sulfur.

- is not mapped as “potentially contaminated land”

3.10 EP&A Regulation – Section 171 matters of consideration

Section 171(2) of the *Environmental Planning and Assessment Regulation 2021* lists the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment under Part 5 of the EP&A Act. These matters are addressed in Table 4.

Table 4. Section 171 Matters of consideration

Does the proposal:	Assessment	Reason
a) Have any environmental impact on a community?	Positive	The proposal is for the replacement of a culvert (which is at the end of its life and at increased risk of failure) on Callala Beach Rd crossing Callala Creek, in addition to widening Callala Beach Rd in this location. The proposed widening of Callala Beach Rd would improve vehicle safety, and provide safer cycling clearances crossing the creek – in line with future plans to widen Callala Beach Rd and construct a SUP between Callala Bay and Callala Beach. Replacement of the culvert would be like-for-like in capacity, with an extension in length to account for the shoulder widening of the road. Callala Beach Rd is the only vehicular access to Callala Beach and Myola. Replacement of the culvert in the event of its failure is therefore required to maintain access. The proposed activity would involve temporary disruptions to traffic during construction, but would not have any impact on community services and infrastructure such as power, water supply, wastewater, waste management, educational, medical or social services.
b) Cause any transformation of a locality?	Negligible / Positive	The proposal would involve widening of the road for safety and future upgrades to the road, but would otherwise be a like-for-like replacement of the culvert. The locality’s current use would remain unchanged.
c) Have any environmental impact on the ecosystem of the locality?	Low adverse	The five-part test of significance (Section 3.2) concludes that the proposed activity would not have a significant impact upon threatened species or endangered ecological communities. No food resources critical to the survival of a particular species would be removed. Aquatic ecosystems are not likely to be affected by the proposed activity and there is not likely to be any long-term or long-lasting impact through the input of sediment and nutrient into the ecosystem.

		No changes to flow regimes are likely to occur. Refer to prescribed environmental safeguards and mitigation measures (Section 7).
d) Cause a diminution of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Negligible	Removal of riparian / roadside vegetation would be minimal, would be limited to younger trees, shrubs and sedges, and would occur along the existing road – vegetation interface. In the context of the locality, the visual impact of the proposal is considered to be minimal. Scientific and environmental qualities of the site would not be affected (refer particularly to Sections 3.1 and 3.6 above). The proposed activity would have no impact on these values.
e) Have 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?	Negligible	The site of the proposed activity has no significant aesthetic, architectural, cultural, historical, scientific or social values. No items in the vicinity of the work site which are listed on the State Heritage Register and the Shoalhaven Local environmental Plan would be impacted by the proposal (refer to Section 3.5). The site is not within an Aboriginal Place declared under the National Parks and Wildlife Act 1974. In accordance with the NSW Department of Environment, Climate Change and Water's Due Diligence Code of Practice, the proposed activity does not require an Aboriginal Heritage Impact Permit as the activity is unlikely to harm an Aboriginal artefact (refer to Section 3.4).
f) Have any impact on the habitat of protected fauna (within the meaning of the Biodiversity Conservation Act 2016)?	Low adverse	No vegetation which constitutes important terrestrial habitat would be removed or otherwise impacted. The existing culverts contain cavities which provide suitable habitat for fauna including microbats. Replacement culverts would be installed with cavities as substitute. Additionally, constructed fauna boxes would be installed on trees within the riparian corridor in proximity to the site. (refer to Sections 3.2.2 and 7 of this REF for more information). Aquatic habitat would not be significantly altered or impacted by the proposal. The prescribed environmental safeguards and mitigation measures (Section 7) would mitigate indirect impacts to fauna and habitat including through control of sediment.
g) Cause any endangering of any species of animal, plant or other form of life, whether living on	Low adverse	The five-part test of significance, provided in Section 3.2 above, concludes that the proposed activity would not have a significant impact upon threatened fauna.

land, in water or in the air?		Southern Myotis – found to be utilising the culverts as roost habitat – would be subjected to a monitored, phased exclusion, coinciding with provision of substitute habitat. The prescribed environmental safeguards and mitigation measures (Section 7) would minimise the risk of impact to resident fauna including threatened microbat species.
h) Have any long-term effects on the environment?	Negligible	Works would be relatively short term and the noise generated will occur during normal working hours. The proposed activity would not use hazardous substances or use or generate chemicals which may build up residues in the environment. The proposed replacement culvert would be like-for-like in capacity, so would not result in changes to creek flow or the hydrology of the associated wetlands. The possible impacts have been discussed in detail under Section 3. Refer also to the prescribed environmental safeguards and mitigation measures in Section 7.
i) Cause any degradation of the quality of the environment?	Low-adverse	Testing for Acid Sulfate Soil and development of a management plan involving appropriate treatment, monitoring and disposal would be undertaken as required. Aquatic ecosystems are not likely to be affected by the proposed activity and there is not likely to be any long-term or long-lasting impact through the input of sediment and nutrient into the ecosystem. The proposal would not intentionally introduce noxious weeds, vermin, or feral animals into the area or contaminate the soil. Environmental safeguards and mitigation measures (Section 7) would be employed to minimise risk of impacts.
j) Cause any risk to the safety of the environment?	Low-adverse	The proposed activity would not involve hazardous wastes and would not lead to increased bushfire or landslip risks. The activity is unlikely to adversely affect flood or tidal regimes or exacerbate flooding risks (refer to (h) above). The prescribed environmental safeguards and mitigation measures in Section 7
k) Cause any reduction in the range of beneficial uses of the environment?	Negligible	The site and local environment will remain relatively unchanged.
l) Cause any pollution of the environment?	Low adverse	The proposal would involve a temporary and local increase in noise during the construction phase due to the use of machinery. However, this will not affect any sensitive receivers such as residential areas, schools, childcare centres and hospitals.

		Sediment and erosion control in accordance with the Blue Book will be implemented to minimise movement of sediment into waterways. It is unlikely that the activity (including the environmental impact mitigation measures) would result in water or air pollution, spillages, dust, odours, vibration or radiation. The risk of contamination and spills from machinery including fuel and hydraulic fluids would be minimised through prescribed environmental safeguards and mitigation measures (Section 7).
m) Have any environmental problems associated with the disposal of waste?	Negligible	There would be no trackable waste, hazardous waste, liquid waste, or restricted solid waste as described in the <i>NSW Protection of the Environment Operations Act 1997</i> .
n) Cause any increased demands on resources (natural or otherwise) which are, or are likely to become, in short supply?	Low adverse	The amount of resources that would be used are not considered significant and would not increase demands on current resources such that they would become in short supply.
o) Have any cumulative environmental effect with other existing or likely future activities?	Low adverse	The assessed low adverse or negligible impacts of the proposal are not likely to interact. Prescribed environmental safeguards and mitigation measures (Section 7) shall be implemented to minimise the risk of cumulative environmental effects. The current proposal would not significantly affect habitat connectivity or reduce any significant vegetation.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	Negligible	The proposed activity would have no effect on coastal processes including those projected under climate change conditions. The site is not located in a coastal hazard area.
q) Any applicable local strategic planning statement, regional strategic plan or district strategic plan made under	Positive	The proposed activity is consistent with Planning Priority 2 (Delivering Infrastructure) of the <i>Shoalhaven 2040 Strategic Land-use Planning Statement</i> https://doc.shoalhaven.nsw.gov.au/displaydoc.aspx?record=D20/437277 The proposed activity is not inconsistent with the Illawarra Shoalhaven Regional Plan 2041 (ISRP): https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-

Division 3.1 of the Act		and-policies/Plans-for-your-area/Regional-plans/Illawarra-Shoalhaven-Regional-Plan-05-21.pdf
r) Any other relevant environmental factors	N/A	

4. PERMISSIBILITY

4.1 *Environmental Planning & Assessment Act 1979*

Section 4.1 (Development that does not need consent) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) states that:

“If an environmental planning instrument provides that specified development may be carried out without the need for development consent, a person may carry the development out, in accordance with the instrument, on land to which the provision applies.”

In this regard, clause 2.108(1) of the NSW State *Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport & Infrastructure SEPP) provides that:

“Development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land...”

As the proposal does not require development consent, and as it constitutes an ‘activity’ for the purposes of Part 5 of the EP&A Act, being carried out by (or on behalf of) a public authority, environmental assessment under Part 5 of the EP&A Act is required. This REF provides this assessment and ensures that Council as determining authority in consideration of the activity, meets its obligation under s5.5 of the 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 the activity.

4.2 *Biodiversity Conservation Act 2016*

The proposed development complies with the *Biodiversity Conservation Act 2016* for the following reasons:

- The proposed activity is unlikely to have a significant impact on threatened species and/or threatened ecological communities listed in the schedules of the Act. There is, therefore, no requirement to ‘opt in’ to the Biodiversity Offset Scheme.
- The design and mitigation measures (Section 7 of this REF) would ensure that no *serious and irreversible impacts on biodiversity values* (as defined by the BC Act) occur at the site of the proposed activity.
- The proposed activity is not within an area declared to be of “outstanding biodiversity value” as defined in the Act and Regulations.

Because of the above considerations, neither a species impact statement nor a biodiversity development assessment report is required for the proposed activity.

It is also a defence to a prosecution for an offence under Part 2 of the Act (harming animals, picking plants, damaging the habitat of threatened species or ecological communities etc) if the work was essential for the carrying out of an activity by a determining authority within the meaning of Part 5 of the Environmental Planning and Assessment Act 1979 after compliance with that Part.

The activity will not remove vegetation that is listed under Schedule 1 Threatened Species, Schedule 2 Threatened ecological communities and Schedule 6 Protected Plants. Therefore, the activity is considered permissible as this REF has been prepared and determined in accordance with the EP&A Act.

Refer to Section 3.2 for more information.

4.3 Fisheries Management Act 1994

The proposed works would involve dredging and reclamation in water land which is regulated under Part 7 of the *Fisheries Management Act 1994*.

Section 200 of the Act prescribes circumstances where a local government can carry out dredging or reclamation, *i.e.*;

- Under the authority of a permit (“Fisheries Permit”); or
- Work authorised under the Crown Land Management Act 2016; or
- Work authorised by a relevant public authority (other than a local government authority).

Under the *Policy and guidelines for fish habitat conservation and management* (NSW DPI 2013), DPI Fisheries focuses the application of the FM Act and FM Regulations and associated policies and guidelines on “key fish habitats”. Issue of a Fisheries Permit is typically required for activities constituting dredging or reclamation within or with potential to impact areas identified as Key Fish Habitat.

The site occurs within a waterway mapped as Key Fish Habitat (refer to Figure 8 above).

A Fisheries Permit covering works involving dredging and reclamation must be obtained from NSW DPI Fisheries.

No works within the creek or riparian corridor shall proceed until the Fisheries Permit is received.

All works shall be undertaken in accordance with the Fisheries Permit.

4.4 State Environmental Planning Policy (Resilience and Hazards) 2021

The *State Environmental Planning Policy (Resilience and Hazards) 2021* (RHSEPP) provides development controls and land-use planning frameworks associated with coastal management; hazardous and offensive development; and remediation of land.

Coastal Wetland under the RHSEPP is mapped as occurring either side of Callala Beach Rd in proximity to the site of the proposal (refer to Figure 10).

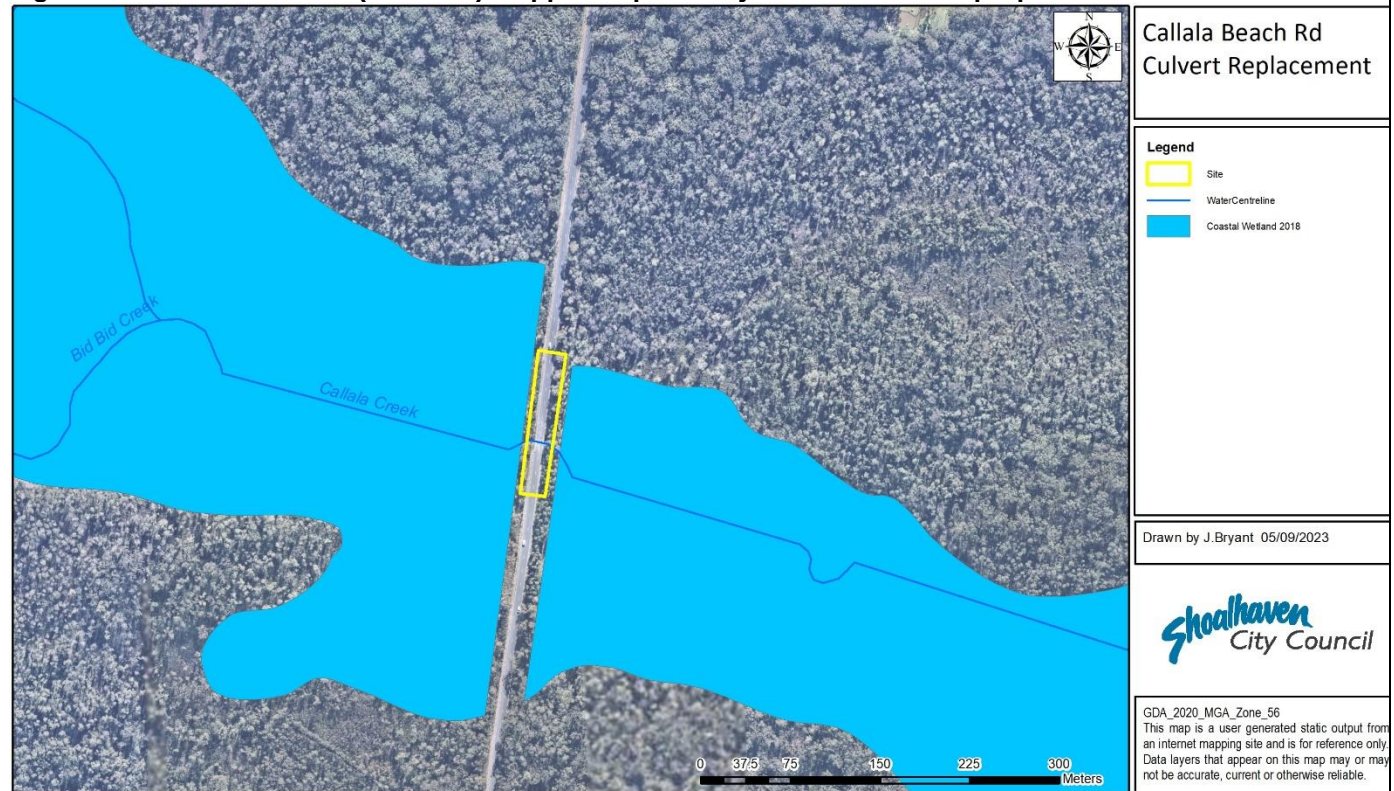
The footprint of the proposal was reduced through redesign to avoid any encroachment into the mapped Coastal Wetland (refer to s1.3).

As such, no works involving vegetation clearing, harm of marine vegetation, earthworks, levee construction, draining of the land, or environmental protection works, would be carried out on land identified as Coastal Wetlands (or Littoral Rainforest) on the *Coastal Wetlands and Littoral Rainforests Area Map*.

The proposed works therefore do not trigger the requirement for development consent under clause 2.7 of the RHSEPP.

Other issues covered by the RHSEPP are not applicable to the proposal.

Figure 10. Coastal Wetland (RHSEPP) mapped in proximity to the site of the proposal



4.5 Other

A summary of other relevant legislation and permissibility is provided in Table 5 below.

Table 5. Summary of other relevant legislation and permissibility

NSW STATE LEGISLATION	
<i>Environmental Planning and Assessment Act 1979 (EP&A Act)</i>	
Permissible	Not permissible
✓	☐
The Transport and Infrastructure SEPP provides for the proposed works to be undertaken without development consent (refer above). In circumstances where development consent is not required, the environmental assessment provisions outlined in Part 5 of the Act are required to be complied with. This REF fulfils this requirement.	
<i>Shoalhaven Local Environmental Plan 2014 (SLEP)</i>	
Permissible	Not permissible
✓	☐
Under the SLEP the proposed activity may have required development consent. The provisions of Transport and Infrastructure SEPP, however, prevail over the SLEP where there is an inconsistency by virtue of Section 3.28 of the EP&A Act. Consequently, development consent is not required.	

Protection of the Environment Operations Act 1997

Permissible ☒ Not permissible ☐

The proposed activity does not constitute scheduled development work or scheduled activities as listed in Schedule 1 of the Act. The proposed activity therefore does not require an environmental protection licence.

National Parks and Wildlife Act 1974 (NP&W Act)

Permissible ☒ Not permissible ☐

- The proposed activity would not encroach into National Park estate.
- The Act provides the basis for the legal protection and management of Aboriginal sites in NSW. Under Sections 86 and 90 of the Act it is an offence to disturb an Aboriginal object or knowingly destroy or damage, or cause the destruction or damage to, an Aboriginal object or place, except in accordance with a permit of consent under section 87 and 90 of the Act.
- As there are no recorded sites or visible objects and as the site is on 'disturbed land', the Due Diligence Guidelines requires no further assessment as it is reasonable to conclude that there is a low probability of objects occurring in the area of the proposed activity and an AHIP is not required. Refer to Section 3.4 for more information.

Heritage Act 1977

Permissible ☒ Not permissible ☐

The proposed activity would not disturb an item of state heritage significance. The proposal would occur in a previously disturbed area and constitutes 'minor works' under *'Relics of local heritage significance: a guide for minor works with limited impact'*. The proposal would not result in any direct impacts on heritage items or values. Works can be undertaken with caution under an applicable exception from an excavation permit under s139(1) and (2) of the *Heritage Act 1977*.

Refer to s3.5 of this REF for more information.

Water Management Act 2000

Permissible ☒ Not permissible ☐

- Local councils are exempt from s.91E(1) of the Act in relation to all controlled activities that they carry out in, on or under waterfront land by virtue of clause 41 of the *Water Management (General) Regulation 2018*.
- The proposal would not interfere with the aquifer and therefore an interference licence is not required (s.91F).

COMMONWEALTH LEGISLATION

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EP&BC Act)

Permissible ☒ Not permissible ☐

The proposed activity would not be undertaken on Commonwealth land and no matters of National Environmental Significance are likely to be significantly impacted by the proposed activity (Section 3.3). The proposed activity is therefore not a controlled action and does not require commonwealth referral.

Commonwealth Native Title Act 1993Permissible ☒ Not permissible ☐

The proposal would occur entirely within a Public Road reserve (Callala Beach Rd).
It is therefore assumed that Native Title has been extinguished as a Previous Exclusive Possession Act. No procedural rights are applicable.

5. CONSULTATION WITH GOVERNMENT AGENCIES

5.1 Transport & Infrastructure SEPP

Note that consultation under Chapter 2, Part 2.2 of the Transport & Infrastructure SEPP applies only to relevant development undertaken as development without consent under the provisions of Chapter 2.

Section 2.10 – Development with impacts on council-related infrastructure or services

No impacts to stormwater management systems, sewerage systems, water infrastructure, public places, nor excavation of footpaths, such as described under section 2.10(1) would occur. The design straddles and avoids sewerage and reclaimed effluent management system (REMS) infrastructure.

The proposed road widening and culvert replacement was referred to the Shoalhaven Traffic Committee, who provided no objection to the proposal (Council reference D23/296844).

The proposal would temporarily impact the form and function of a public road for which Council who is undertaking the works, is also the road authority.

Consultation under section 2.11 is therefore not required.

Section 2.11 – Development with impacts on local heritage

No listed heritage items occur in proximity to the proposal. Refer to Section 3.5 of this REF for more information.

Consultation under section 2.11 is therefore not required.

Section 2.12 – Development with impacts on flood liable land

The proposal would occur on land which is not mapped as being flood liable, but is known to be subject to flooding during heavy and prolonged rain events where floodwater can overtop the road at the culvert location.

SCC Senior Floodplain Engineer reviewed and provided advice on concept plans during development of the proposal and subsequently reviewed the current plans. Refer to section 3.7 of this REF for more information.

The proposal is considered unlikely to negatively affect flood behaviour. The proposed culvert design would not substantially change culvert capacity and the minor increase to road height would occur over a short length of road in the culvert location only, allowing for floodwater to overtop the relatively flat Calala Beach Rd either side of the raised section, thereby avoiding adverse flood impacts.

Section 2.13 – Consultation with State Emergency Service—development with impacts on flood liable land

The proposal would occur on land which is not mapped as being flood liable, but is known to be subject to flooding during heavy and prolonged rain events where floodwater can overtop the road at the culvert location.

The proposal would be carried out under a relevant provision for the purpose of section 2.13(2) TISEPP.

A written notice of intention to carry out the development was provided to NSW State Emergency Service (SES) (SCC reference D23/471908). The response received from SES (SCC reference D23/512048) included the following advice:

- Consider the impact of overland and mainstream flooding on the site and infrastructure up to and including the PMF, including stockpile site management. Refer to Transport for NSW guidance around the storage of materials in a floodplain.
- Pursue, if relevant, site design and stormwater management that minimises any risk to the community.
- Consider the impact of flooding up to and including the PMF on people using the road. Refer to Transport for NSW guidance on the use of traffic control devices in weather event situations.
- Ensure workers and people using the site during and after the upgrades are aware of the flood risk, for example by using signage and including riverine flooding in site induction.
- During site works, check the Bureau of Meteorology (BoM) website prior to start of the workday for any Flood Warnings. Consider closing the worksite and securing all materials and equipment prior to the start of the working day or as soon thereafter as possible if there is a risk of riverine flooding, on receipt of BoM advice, or when other evidence leads to an expectation of flooding.
- Consider developing a flood management plan to manage residual flood impacts during construction. This should address:
 - Reduced culvert capacity during replacement works and resultant increase in overtopping;
 - The potential for evacuation of vulnerable community members; and
 - Traffic control of a single lane road with significant traffic outflow and emergency and responder vehicle inflow during a weather event.
- In addition, if the construction phase of the upgrade causes disruption to the operation of local roads, this may impact the ability for emergency vehicles to use these routes. The NSW SES requests that notification be provided where there are likely to be significant delays in the operation of the roads affected by the work.

Consideration has been given to the risks associated with flooding in the locality and the impacts on the road and traffic.

A Construction Environmental Management Plan (CEMP) shall be produced by the contractor(s) which includes sediment and erosion controls, and construction methodology and staging.

A traffic management plan shall be developed and implemented to minimise disruption and reduce risk of incident along affected areas of Callala Beach Rd, in addition to any axillary sites (including construction compounds, stockpile sites and ASS treatment areas) during works.

Refer to safeguards and mitigation measures in section 7.

Section 2.14 – Development with impacts on certain land within the coastal zone

The proposal would not occur within a coastal vulnerability area. Consultation is therefore not required.

Section 2.15 – Consultation with public authorities other than councils

In consideration of the consultation requirements specified under section 2.15 of the Transport and Infrastructure SEPP, the proposed activity:

- would not be undertaken on adjacent to land reserved under the *National Parks and Wildlife Act 1974* or in Zone E1 or in equivalent zones.
- does not comprise a fixed or floating structure in or over navigable waters.
- would not increase the amount of artificial light in the night sky and located on land within the dark sky region as identified on the dark sky region map.
- would not be undertaken within Defence communications facility buffer (only relevant to the defence communications facility near Morundah).
- would not be undertaken on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*.
- would not be development on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region World Heritage Property—the World Heritage Advisory Committee and Heritage NSW.
- does not comprise development within a Western City operational area specified in the Western Parkland City Authority Act 2018, Schedule 2 with a capital investment value of \$30 million or more—the Western Parkland City Authority constituted under that Act.

The consultation requirements specified under section 2.15 of the Transport and Infrastructure SEPP therefore do not apply.

Section 2.16 – Consideration of Planning for Bush Fire Protection (PBP)

The proposed activity is not a type applicable to this clause *i.e.*, health services facilities, correctional centres, and residential accommodation. Consideration of PBP is therefore not required.

Summary

No further consultation under Chapter 2, Part 2.2 of the Transport & Infrastructure SEPP is required.

6. COMMUNITY ENGAGEMENT

Information regarding the project is currently available on Shoalhaven City Council's website: <https://www.shoalhaven.nsw.gov.au/Projects-Engagement/Major-Projects-Works/Callala-Shared-User-Path-Network-and-Callala-Beach-Road-Rehabilitation> as a component of a proposed future upgrade of Callala Beach Rd between Roskell Rd and Emmett St.

Council completed overarching consultation with residents, stakeholders and community consultative bodies (CCBs) Callala Bay Community Association and Callala Beach Progress Association, as part of road works and shared user path works proposed in the area. This included a Get Involved Shoalhaven web page with survey (from 30 August 2022 to 3 October 2022) and CCB presentations and meetings (17th October 2022 and 9th November 2022). The culvert was mentioned during these consultations, noting that the key feedback received was the future proofing of the road to prevent flooding.

The requirement for flood study works and design to future proof the road will be considered as part of a separate project. The current design works is for a like-for-like replacement of the culvert in the event of failure.

The Get Involved Shoalhaven web page was visited 446 times while the survey was open (30th August 2022 – 3rd October 2022), with a total of 51 survey participants (SCC reference D22/450233). The survey results showed great support for the proposed works, including the following results:

- 55.6% don't currently walk or cycle along Callala Beach Road but would if a formal off-road path is provided.
- 38.1% current walk or cycle along Callala Beach Road.
- 6.3% don't think a shared path along Callala Beach Road is needed.

Notification of upcoming works and potential delays shall be provided to users of Callala Beach Rd via variable message boards prior to commencement.

7. ENVIRONMENTAL SAFEGUARDS AND MEASURES TO MINIMISE IMPACTS

Safeguard / Measure	Responsibility
<i>Works planning, approvals, consultation & notification</i>	
1. Fisheries Permit: a) A Fisheries Permit covering works involving dredging and reclamation must be obtained from NSW DPI Fisheries. b) No works within the creek or riparian corridor shall proceed until the Fisheries Permit is received. c) All works shall be undertaken in accordance with the Fisheries Permit.	SCC Project Manager; SCC Environmental Officer; Construction Contractor
2. A Construction Environmental Management Plan (CEMP) shall be produced by the contractor(s) which includes but is not limited to: a) Sediment and erosion controls. b) Construction methodology and staging. c) Site-specific Unexpected Finds Protocols to manage potential instances of buried materials (including additional construction wastes), impacted soils and groundwater, or heritage items that may be encountered on-site during construction works. To every practical extent, staging of works and the use of diversion pipes shall be utilised to avoid or minimise disruption to fish passage.	Construction Contractor
3. Acid Sulfate Soils (ASS): a) Soil sampling (representative of excavation locations and depths) and a full Acid Base Account assessment utilising the SPOCAS⁴ analysis shall be undertaken to assess the presence of acidity, potential acidity and inform an acid sulfate soil management plan (ASSMP) if required. b) An ASSMP, if required, shall detail soil and water monitoring requirements during construction activities; management of groundwater; establishment of a bunded treatment area in a suitable on-site or nearby location; and treatment and disposal of potential acid sulfate soils in accordance with the NSW Acid Sulfate Soil Manual and NSW EPA guidelines.	SCC Project Manager; Construction Contractor;

⁴ Suspension Peroxide Oxidisation Combined Acidity and Sulfur.

Safeguard / Measure	Responsibility
c) If treatment of ASS is required, a bunded treatment area shall be established on existing clear and level ground which is at least 50m from any watercourse.	
4. The replacement culvert cells shall incorporate wide joint spacing of 25-30mm with nominal depth of 190mm as replacement habitat for Myotis. Scabbling shall be applied to the concrete within the gaps and over the adjacent ceiling (minimum 30 cm either side of gaps) to provide a roughened surface to the concrete for the microbats to climb and cling to. Where scabbling cannot be applied, tiling grout shall be applied instead. Alternatively, replacement culvert cells shall contain – or be modified to have – cavities of a similar size to those currently utilised by microbats.	SCC Project Manager
5. Works shall be undertaken from April to September (inclusive) to every practical extent, to occur outside of the known breeding period for Southern Myotis.	SCC Project Manager
6. Southern Myotis phased exclusion: a) Phased exclusion of cavities in the culverts shall be commenced upon determination of this REF, but shall be postponed if inspection of resident Myotis finds that lactating females or young are present. b) Substitute habitat consisting of three (3) constructed fauna boxes suited to microbats shall be installed within the downstream riparian corridor in proximity to the site. c) Exclusion of existing habitat in the culverts shall involve blocking a cavity (e.g. with towels) to prevent re-entry after the microbats have vacated for nocturnal foraging (with timing based on site-specific echolocation records of activity, and confirmed with infrared cameras and then spotlights), and then sealing the empty cavity with rapid-set concrete or similar during the following day. d) Half of the available cavities shall be excluded each week commencing after installation of substitute habitat, until none remain, to encourage the microbats to utilise the nearby substitute habitat. e) Monitoring of the constructed habitat and existing culvert cavities shall be undertaken and the process re-evaluated based on the behaviour of the microbats and utilisation of substitute habitat.	SCC Environmental Officer
7. This REF must be published on the determining authority's (Council's) website or the NSW planning portal, in accordance with clause 171(4) EP&A Regulation 2021 and the guidelines published under cl.170, as requiring an	SCC Environmental Officer

Safeguard / Measure	Responsibility
approval or permit under section 200 of the <i>Fisheries Management Act 1994</i>).	
Site Establishment	
8. An appropriate traffic management plan shall be developed and implemented to minimise disruption and reduce risk of incident along affected areas of Callala Beach Rd, in addition to any axillary sites (including construction compounds, stockpile sites and ASS treatment areas) during works.	Construction Contractor
9. Services within and in close proximity to the site shall be located, delineated and protected during works. Refer to existing service location plan (SCC reference D23/293648).	Construction Contractor
10. Any construction compound(s), machinery, vehicles and stockpiles shall be located within existing cleared areas of road reserves, nearby Council land, or other land under agreement, and shall not encroach into native vegetation or Coastal Wetland. A buffer of minimum 3 m to tree trunks and 5 m to watercourses shall be maintained.	SCC Project Manager; Construction Contractor
11. All machinery to be used shall be cleaned, degreased and in good working order prior to entering the site.	Construction contractor
12. The contractor shall keep an emergency spill kit on-site at all times with procedures to contain and collect any leakage or spillage of fuels, oils and greases from plant and equipment.	Construction contractor
13. No major equipment maintenance works shall be undertaken on-site.	Construction contractor
14. To avoid the risk of pollution from machinery, refuelling shall generally be done off site, however if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray shall be used to catch any accidentally spilt fuel.	Construction contractor
Construction works	
15. Immediately prior to demolition of the culverts, investigation shall be carried out by a suitably qualified and experienced ecologist to capture and relocate any resident microbats to nearby substitute habitat.	SCC Environmental Officer
16. Erosion and sediment controls in accordance with the 'Blue Book' (Landcom 2004) shall be installed and maintained to prevent the entry of sediment into waterways including but not limited to: • In-stream combination hydrocarbon boom and silt curtain downstream of site. • Sediment fencing downslope of compound / stockpile areas.	Construction Contractor

Safeguard / Measure	Responsibility
Sediment fencing downslope of works along Callala Beach Rd embankments. Erosion and sediment controls shall 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 is minimal.	
17. Coastal Wetlands and property boundaries in proximity to works shall be delineated and protected from encroachment and other impacts during adjacent works. No vegetation clearing or other works shall occur within Coastal Wetlands or private property.	Construction contractor
18. An Aboriginal site monitor shall be engaged from Jerrinja Local Aboriginal Land Council to monitor initial ground disturbing works to ascertain the nature and extent of the natural shell deposits as recommended by the associated ACHA (refer section 3.4 of this REF). Note that monitoring of excavation of constructed road pavement and batters is not required.	Construction Contractor
19. Staff working at the site will be instructed to stop work immediately on identification of any suspected Aboriginal heritage artefact. If any objects are found, NSW Department of Planning, Industry and Environment (ph:131 555) shall be contacted.	Construction Contractor
20. The extent of trees and other vegetation required to be removed shall be delineated prior to clearing works, to minimise the risk of encroachment into vegetation to be retained.	Construction contractor
21. Tree protection measures in accordance with AS4970 – <i>Protection of trees on development sites</i> shall be implemented to minimise the risk of impact to the structural root zones of trees to be retained.	Construction contractor
22. In the event that any wildlife be significantly disturbed or injured during works, Council's Environmental Officers are to be contacted on 4429 3405, or if unavailable, Wildlife Rescue – South Coast should be contacted on 0418 427 214, to rescue and relocate the animal(s).	Construction Contractor
23. No machinery shall operate within the water.	Construction Contractor
24. Temporary rock-check dams or sand-bagging (if required) shall use clean rock and/or sand.	Construction Contractor
25. Any dewatering shall be in accordance with the ASSMP (if required), and shall involve appropriate filtration and energy dissipation, e.g. discharging of pumped water into bunding of geofabric-wrapped straw bales (or similar) on a grassed area with a 20 m (minimum) buffer to the creek to allow to slow infiltration into the groundwater for filtration of	Construction Contractor

Safeguard / Measure	Responsibility
sediment. Sediment fencing shall be installed across the slope at low point of infiltration area. The inlet pipe shall be covered with a 6 mm mesh screen to prevent fish being drawn into the pump. Monitoring of pools and relocation of any aquatic fauna shall be undertaken.	
26. Any waste material shall be contained within the land-based site during construction and then be removed to an authorised waste disposal facility or an appropriate storage area for reuse elsewhere. No material shall be placed in any location or in any manner that would allow it to enter the waterway. Stockpiles of debris and construction materials shall be stored at least 10 metres outside the top of the creek banks. General refuse shall be disposed of to a covered container stored at the site. No waste shall be burnt or buried on-site or disposed of in the waterway.	Construction contractor
27. If engineering fill is imported to the site, all conditions prescribed in the applicable Resource Recovery Exemptions shall be complied with, including: - ensuring the producer of the waste has complied with the applicable Order such as testing and validation - ensuring the material has met all chemical and other material requirements specified in the applicable Order - keeping a written record of the following for a period of six years: - the quantity of material received - the name and address of the supplier	Construction contractor
28. If Virgin Excavated Natural Material (VENM) is taken to the site (i.e. without chemical testing and validation): - the material must meet the definition of VENM (http://www.epa.nsw.gov.au/waste/virgin-material.htm) - the supplier must fill out and complete the <i>VENM Certificate</i> The completed <i>VENM Certificate</i> shall be kept for at least six years and provided to the EPA upon any request.	Construction contractor
29. Any waste generated on site shall be reused in accordance with relevant Resource Recovery Orders and Exemptions, or otherwise disposed of at a licenced waste facility.	Construction Contractor
30. Disturbed table drains and road batters and upper creek embankments shall be stabilised following construction with jute mesh and seeding and /or hydromulch containing suitable grass and endemic sedge and shrub species – to be approved by Council's Environmental Officer.	Construction Contractor; SCC Environmental Officer

Safeguard / Measure	Responsibility
31. Remediation of construction compound(s) and any stockpile area(s) shall involve removal of all stockpiled material, dressing and turfing or seeding of grassed areas, as required to return the area to its existing state prior to establishment of the compound.	Construction Contractor
<i>Post construction</i>	
32. An asset form shall be trimmed to file 44574E on commissioning of the assets in Accordance with POL15/8 Asset Accounting Policy section 3.1.4 and POL16/79 Asset Management Policy section 3.3.	SCC Project Manager

8. SIGNIFICANCE EVALUATION & DECISION STATEMENT

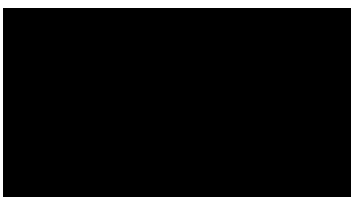
This Review of Environmental Factors has assessed the likely environmental impacts, in the context of Part 5 of the Environmental Planning and Assessment Act 1979, of a proposal by Shoalhaven City Council for the replacement of a culvert on Callala Beach Rd, crossing Callala Creek, in addition to widening Callala Beach Rd in this location.

In consideration of the proposal as described in Section 1, in accordance with any design plans referred to in this report, and assuming the implementation of all proposed safeguards and mitigation measures (Section 7), it is determined that:

1. It is unlikely that there will be any significant environmental impact as a result of the proposed activity and an Environmental Impact Statement is not required.
2. The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats, and a Species Impact Statement / BDAR is not required.
3. The following statutory approvals, licences, permits and external government consultations are required (refer to Section 7 safeguards and mitigation measures for more information):
 - NSW DPI Fisheries Permit for dredging and reclamation
4. The proposed activity may proceed.

In accepting and adopting this REF, Shoalhaven City Council commits to ensuring the implementation of the proposed safeguards and mitigation measures identified in this report (Section 7) to minimise and/or prevent detrimental environmental impacts.

Determined by:



Trevor Dando
Manager – Works & Services
Shoalhaven City Council

Date: 23 January 2024

9. REFERENCES

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APPENDIX A – Design Plans

***“CULVERT REPLACEMENT CALLALA BEACH ROAD (CHAINAGE
1.146km CALLALA BEACH, NSW 2540”*****MI Engineers****Project No. DN210351:****C001 Rev.D; C010 Rev.F; C011 Rev.F; C020 Rev.C; C060 Rev.C;
C061 Rev. D; C100 Rev.F; C110 Rev.C; C111 Rev.C; C120 Rev.C;
C130 Rev.C; C200 Rev.E; C210 Rev.C; C220 Rev. C; C221 Rev.C****SCC reference D23/293645**

APPENDIX B – Construction staging plan

“CALLALA BEACH CULVERT REPLACEMENT”**Construction Staging Plan (concept)****Shoalhaven City Council****SK-2720-01 and SK-2720-02****SCC reference D23/374676**

APPENDIX C – Aboriginal Cultural Heritage Due Diligence Assessment

***“Proposed replacement of a stormwater
culvert, Callala Beach Road, Jervis Bay, NSW:
Aboriginal cultural heritage due diligence
assessment”***

Sue Feary July 2023

SCC reference D23/293672

APPENDIX D – Threatened Species Likelihood of Occurrence



NSW Threatened Species Likelihood of Occurrence Table

The table of likelihood of occurrence evaluates the likelihood of threatened species to occur on the subject site. This list is derived from previously recorded species within a 5 km radius (taken from NSW BioNet Atlas) around the subject site. Ecology information unless otherwise stated, has been obtained from the *Threatened Biodiversity Profile Search* on the NSW OEH (Office of Environment & Heritage) online database (<https://www.environment.nsw.gov.au/threatenedspeciesapp/>).

Likelihood of occurrence in study area

1. Unlikely – Species, population or ecological community is not likely to occur. Lack of previous recent (<25 years) records and suitable potential habitat limited or not available in the study area.
2. Likely – Species, population or ecological community could occur and study area is likely to provide suitable habitat. Previous records in the locality and/or suitable potential habitat in the study area.
3. Present – Species, population or ecological community was recorded during the field investigations.

Possibility of impact

1. Unlikely – The proposal would be unlikely to impact this species or its habitats. No NSW *Biodiversity Conservation Act 2016* “Test of Significance” or EPBC Act significance assessment is necessary for this species.
2. Likely – The proposal could impact this species, population or ecological community or its habitats. A NSW *Biodiversity Conservation Act 2016* “Test of Significance” and/or EPBC Act significance assessment is required for this species, population or ecological community.

Note that where further assessment is deemed required, this is undertaken within the REF as a Test of Significance (in the case of NSW listed species) or an EPBC Significant Impact Assessment (in the case of Commonwealth listed species).

Review of Environmental Factors Part 5 Assessment EP&A Act 1979

<i>Endangered Ecological Community name</i>	<i>Status</i>	<i>Likelihood of presence within areas impacted by the activity</i>
<i>Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions (BC Act)</i>	Endangered - NSW BC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (BC Act)</i> <i>Subtropical and Temperate Coastal Saltmarsh (EPBC Act)</i>	Endangered - NSW BC Act Vulnerable - Commonwealth EPBC Act	Occurs near the site (within 200m) but site surveys confirmed that this EEC does not occur in close proximity such that it is at risk of being impacted by the proposal.
<i>Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (BC Act)</i>	Endangered - NSW BC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion (BC Act)</i> <i>Illawarra and south coast lowland forest and woodland ecological community (EPBC Act)</i>	Endangered - NSW BC Act Critically Endangered - Commonwealth EPBC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (BC Act)</i> <i>Illawarra– Shoalhaven subtropical rainforest of the Sydney Basin Bioregion (EPBC Act)</i>	Endangered - NSW BC Act Critically Endangered - Commonwealth EPBC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act)</i> <i>Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (EPBC Act)</i>	Endangered - NSW BC Act Critically Endangered - Commonwealth EPBC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Lowland Grassy Woodland in the South East Corner Bioregion (BC Act)</i> <i>Lowland Grassy Woodland in the South East Corner Bioregion (EPBC Act)</i>		Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.

Review of Environmental Factors Part 5 Assessment EP&A Act 1979

<i>Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion (BC Act)</i> <i>Illawarra– Shoalhaven subtropical rainforest of the Sydney Basin Bioregion (EPBC Act)</i>	Endangered - NSW BC Act Critically Endangered - Commonwealth EPBC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>River-flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (BC Act)</i> <i>River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (EPBC Act)</i>	Endangered - NSW BC Act Critically Endangered - Commonwealth EPBC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Robertson Basalt Tall Open-forest in the Sydney Basin and South Eastern Highlands Bioregions (BC Act)</i>	Critically Endangered – NSW BC Act	Site investigations confirmed that the EEC does not occur within or in close proximity to the site, such that there is any risk of impact on the EEC as a result of the proposal.
<i>Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (BC Act)</i> <i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community (EPBC Act)</i>	Endangered - NSW BC Act Endangered - Commonwealth EPBC Act	Indicative species and habitat of the EEC occur within and in proximity to the site, however, the vegetation community occurring was found to align more closely with Swamp Sclerophyll Forest EEC. Refer to s 3.2.2 of this REF for more information.
<i>Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (BC Act)</i> <i>Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (EPBC Act)</i>	Endangered - NSW BC Act Endangered - Commonwealth EPBC Act	Indicative species and habitat present. Vegetation community present is associated with the EEC. Further assessment was undertaken in s3.2.2 of this REF.

Species name	Status	Habitat requirements (www.environment.nsw.gov.au)	Likelihood of presence within areas impacted by the activity
FLORA			

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<i>Calochilus pulchellus</i> Pretty Beard Orchid	Endangered NSW BC Act	The habitat of this species varies considerably. At Vincentia the species grows in dense low wet heath in wet sand over sandstone. In Booderee National Park it grows in a tall heathy association. In Morton National Park on the Little Forest Plateau it occurs in low heath among scattered clumps of emergent eucalypts and Banksia in shallow coarse white sand over sandstone, in a near-escarpment area subject to strong orographic precipitation.	Unlikely to occur. No suitable habitat occurs within or in close proximity to the site.
<i>Cryptostylis hunteriana</i> Leafless tongue Orchid	Vulnerable EPBC Act Vulnerable NSW BC Act	Occurs in a wide variety of habitats from moist sandy soil to dense heathland, sedgeland and verges of fire trails. The larger populations typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).	Unlikely to occur. No suitable habitat occurs within or in close proximity to the site.
<i>Distichlis distichophylla</i> Australian Saltgrass	Endangered NSW BC Act	A coloniser of damp saline soils; found at the edges of salt marshes and on low dunes. Flowers and sets seed in late spring and summer.	Marginal potential habitat occurs but the species was not detected during survey.
<i>Genoplesium baueri</i> Bauer's Midge Orchid	Endangered EPBC Act Endangered NSW BC Act	Grows in dry sclerophyll forest and moss gardens over sandstone.	Unlikely to occur. No suitable habitat occurs within or in close proximity to the site.
<i>Melaleuca biconvexa</i> Biconvex Paperbark	Vulnerable EPBC Act Vulnerable NSW BC Act	Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Marginal potential habitat occurs but the species was not detected during survey.

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<i>Prasophyllum affine</i> Jervis Bay Leek Orchid	Endangered NSW BC Act	Highly localised species, known from 4 sites with 93% on private property. Found in heathland and sedge in well drained sandy soil (Stephenson 2011)	Unlikely to occur. No suitable habitat occurs within or in close proximity to the site.
<i>Prostanthera densa</i> Villous Mint-bush	Vulnerable EPBC Act Vulnerable NSW BC Act	Villous Mintbush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea. Plants regenerate from rootstock after fire and flower within the first year or two.	No suitable habitat occurs. Species was not detected during survey.
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	Vulnerable EPBC Act Endangered NSW BC Act	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	No suitable habitat occurs. Species was not detected during survey.
<i>Wilsonia backhousei</i> Narrow-leafed Wilsonia	Vulnerable NSW BC Act	This is a species of the margins of salt marshes and lakes.	No suitable habitat occurs within or in close proximity to the site. The species is known to occur downstream
AMPHIBIANS			
Green and Golden Bell Frog <i>Litoria aurea</i>	Vulnerable EPBC Act Endangered NSW BC Act	Marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat for the species includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), with a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas (OEH 2017).	Possibly occurring. Suitable habitat occurs. Further assessment was undertaken in s3.2.2 of this REF.
REPTILES			

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Green Turtle <i>Chelonia mydas</i>	Vulnerable <i>EPBC Act</i> Vulnerable <i>NSW BC Act</i>	Ocean-dwelling species spending most of its life at sea. Eggs are laid in holes dug in beaches throughout their range.	No suitable habitat occurs. The site is over 1.7km upstream of Jervis Bay along a shallow, poorly defined creek.
MICRO-CHIROPTERAN BATS			
East Coast Freetail-Bat <i>Micronomus norfolkensis</i>	Vulnerable <i>NSW BC Act</i> Vulnerable <i>EPBC Act</i>	Small tree hollows/fissures in bark for roosting in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Possibly occurring over or in proximity to the site. Further assessment was undertaken in s3.2.2 of this REF.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	<i>NSW BC Act</i> Vulnerable	Prefers moist habitat that contains trees greater than 20 m high with a dense understorey. They are fast flyers. Roosts in hollow trunks of eucalyptus trees, in colonies of 3 – 80. Also may roost in caves and old wooden buildings. This species changes roost every night. Roosts on consecutive nights are usually less than 750 m apart. This species has a home range of up to 136 ha (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW). Although they prefer habitat with a dense understorey, they prefer to forage along flyways to avoid the thick understorey. They prefer continuous forest and avoid remnant vegetation. However, they have been recorded in open forests (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW).	Possibly occurring over or in proximity to the site. Further assessment was undertaken in s3.2.2 of this REF.

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Greater Broad-nosed Bat <i>Scoteanax ruepelli</i>	Vulnerable NSW BC Act	Found mainly in gullies and river systems that drain the Great Dividing Range, it utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, below 500m, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m	Possibly occurring over or in proximity to the site. Further assessment was undertaken in s3.2.2 of this REF.
Large (Eastern) Bentwing-bat <i>Miniopterus orianae oceanensis</i>	NSW BC Act Vulnerable	Specific caves are known maternity sites with other caves being primary roosting habitat outside breeding period. Also uses derelict mines, storm-water tunnels, buildings and other man-made structures. Hunts in forested areas, catching moths and other flying insects above the tree tops.	Possibly occurring over or in proximity to the site. Further assessment was undertaken in s3.2.2 of this REF.
Southern Myotis (Large-footed Myotis) <i>Myotis macropus</i>	Vulnerable NSW BC Act	This species is predominantly roosts in caves, however, is known to roost in trees and man-made structures close to water. Roosts are generally located close to water, where the bats forage in small groups of three or four. They have a strong association with streams and permanent waterways in areas that are vegetated rather than cleared (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW) They feed on small fish, prawns and aquatic macroinvertebrates. They have a preference towards large still pools, rather than flowing streams. They will also forage an aerial insects flying over water. They use their large feet to capture prey items (Churchill 2008).	Possibly occurring over or in proximity to the site. Further assessment was undertaken in s3.2.2 of this REF.
BIRDS			

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Bar-tailed Godwit <i>Limosa lapponica</i>	Migratory EPBC Act	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas. Forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. They appear not to forage at high tide and prefer exposed sandy substrates on intertidal flats, banks and beaches. They also prefer soft mud; often with beds of eelgrass <i>Zostera</i> or other seagrasses. Occasionally they have been known to forage among mangroves, or on coral reefs or rock platforms among rubble, crevices and holes. They rarely forage in grassy or vegetated areas. On Heron Island they have been seen feeding on insect larvae among the roots of <i>Casuarina</i>. Roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh. In some conditions, waders may choose roost sites where a damp substrate lowers the local temperature.	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.
Caspian Tern <i>Hydroprogne caspia</i>	Migratory EPBC Act	Occur along the Australian coastline, and also occur inland along major rivers, especially in the Murray-Darling and Lake Eyre drainage basins, preferring wetlands with clear water to allow easy prey detection.	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.
Common Sandpiper <i>Actitis hypoleucos</i>	Migratory EPBC Act	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.

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		mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks.	
Common Tern <i>Sterna hirundo</i>	Migratory EPBC Act	Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh and, in bad weather, in coastal sand-dunes or coastal embayments. Common Terns forage in marine environments, often close to the shore, including sheltered embayments and in the surf-zone, but also well out to sea. They also forage in near-coastal terrestrial wetlands, including estuaries, rivers	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.

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		and swamps. Common Terns roost on unvegetated, intertidal sandy ocean beaches, sandy islands, shores of estuaries or lagoons, and sandbars, as well as on rocky shores, rock platforms or rocks protruding above the surface of the water Common Terns nest on the ground in the open, usually on bare substrates, occasionally near vegetation or in it, or on a floating mat of vegetation. They usually nest on islands, either marine or in lakes, only sometimes on mainland beaches or promontories or salt or freshwater marshes.	
Curlew Sandpiper <i>Calidris ferruginea</i>	<i>EPBC Act</i>: Migratory <i>NSW BC Act</i>: Endangered	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Forages on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beachcast seagrass or seaweed. They rarely forage on exposed reefs. In Roebuck Bay, northern Western Australia, they are also said to feed on part of the mudflats that have been exposed for a longer period, foraging in small groups.	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.

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		Roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. They have also been recorded roosting in mangroves in Inverloch, Victoria.	
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	Vulnerable NSW BC Act	The Dusky Woodswallow is often reported in woodlands is eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the great Diving Range and farther west. It is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalyptus, including mallee associations. It have also been recorded in shrublands and heathlands and carious modified habitats including regenerating forests; very occasionally in moist forests of rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with course woody debris. Birds are often observed in farmland usually at the edges of forests, woodlands or in roadside remnants or wind breaks with dead timber. Nesting occurs from late September to late February, with eggs present between October and early December. They nest in an open shallow untidy cup, frequently in an open hollow, crevice or stump.	Possibly occurring transiently in proximity to the site, but unlikely to utilise the site – no suitable habitat occurs.
Eastern Bristlebird- <i>Dasyornis brachypterus</i>	Endangered EPBC Act Endangered NSW BC Act	Sedgeland/heathland/dry sclerophyll and woodlands- / requires thick shrub/heath layer for shelter, nesting and foraging	Possibly occurring transiently in proximity to the site, but unlikely to utilise the site – no suitable habitat occurs.

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Eastern Curlew <i>Numenius madagascariensis</i>	Critically Endangered <i>EPBC Act</i>	Most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms (Marchant & Higgins 1993). The numbers of Eastern Curlew recorded during one study were correlated with wetland areas. Mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The birds are rarely seen on near-coastal lakes and in grassy areas. Roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands. Eastern Curlews are also recorded roosting in trees and on the upright stakes of oyster-racks. At Roebuck Bay, Western Australia, birds fly from their feeding areas on the tidal flats to roost 5 km inland on a claypan. In some conditions, waders may choose roost sites where a damp substrate lowers the local temperature. This may have important conservation implications where these sites are heavily disturbed beaches. It may be possible to create artificial roosting sites to replace those destroyed by development. Eastern Curlews	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.
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		typically roost in large flocks, separate from other waders.	
Eastern Ground Parrot <i>Pezoporus wallicus wallicus</i>	Vulnerable NSW BC Act	The Eastern Ground Parrot occurs in near coastal low heathlands and sedgeland, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground. When flushed, birds fly strongly and rapidly for up to several hundred metres, at a metre or less above the ground (OEH 2013)	No suitable habitat occurs.
Eastern Osprey <i>Pandion cristatus</i>	NSW BC Act Vulnerable	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable habitat occurs.
Flame Robin <i>Petroica phoenicea</i>	Vulnerable NSW BC ACT	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The ground layer of the breeding habitat is dominated by native grasses and the shrub layer may be wither sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valley below the ranges, and to the western slopes and plains. Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following revegetation. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other scrublands in coastal areas.	Possibly occurring transiently in proximity to the site, but unlikely to utilise the site – no suitable habitat occurs.

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Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	Vulnerable NSW BC Act	Tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
Glossy Black-cockatoo <i>Calyptrorhynchus lathamii</i>	Vulnerable NSW BC Act	The GBC inhabits open forest and woodlands of the coast where stands of she-oak occur. In the Jervis Bay region they feed almost exclusively on the seeds of the black she-oak <i>Allocasuarina littoralis</i> , shredding the cones with their bill	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
Gould's Petrel <i>Pterodroma leucoptera leucoptera</i>	NSW BC Act Vulnerable EPBC Act Endangered	Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown. The first arrival of Gould's petrel on cabbage tree Island occurs from mid to late September. Principal nesting habitat is located within two gullies which are characterised by steeply, sloping rock scree with a canopy of Cabbage Tree Palms. They nest predominantly in natural rock crevices among the rock scree and also in hollow fallen palm trunks, under mats of fallen palm fronds and in cavities among the buttresses of fig trees. They breed colonially and the nests are clumped and often less than 1 m apart. Egg laying takes place over a six week period commencing in early November.	No suitable habitat occurs.
Little Lorikeet <i>Glossopsitta pusilla</i>	Vulnerable NSW BC ACT	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.

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		productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like <i>Allocasuarina</i> .	
Little Tern <i>Sternula albifrons</i>	Endangered NSW BC Act Migratory EPBC Act	Mostly exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above the high tide mark near estuary mouths or adjacent to coastal lakes and islands. Nests in a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles.	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. No breeding habitat available.
Masked Owl – <i>Tyto novaehollandiae</i>	Vulnerable NSW BC Act	Dry eucalypt forests and woodlands from sea level to 1100 m. Inhabits forest but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Requires old growth elements-hollow bearing tree resources for nesting and prey source.	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.

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Olive Whistler <i>Pachycephala olivacea</i>	Vulnerable NSW BC Act	The Olive Whistler inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground, feeding on berries and insects. Make nests of twigs and grass in low forks of shrubs. Lay two or three eggs between September and January.	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
Pied Oystercatcher <i>Haematopus longirostris</i>	Endangered NSW BC Act	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. No breeding habitat available.
Powerful Owl <i>Ninox strenua</i>	Vulnerable NSW BC Act	Coastal Woodland, Dry Sclerophyll Forest, wet sclerophyll forest and rainforest- Can occur in fragmented landscapes Roosts in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i> , Black She-oak <i>Allocasuarina littoralis</i> , Blackwood <i>Acacia melanoxylon</i> , Rough-barked Apple <i>Angophora floribunda</i> , Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. requires old growth elements-hollow bearing tree resources for nesting and prey resource. Nests in large tree hollows in large eucalypts that are at least 150yrs old. Often in riparian areas. Large home range	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.

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Regent Honeyeater <i>Anthochaera phrygia</i>	Critically endangered EPBC Act Critically endangered NSW BC Act	Temperate woodlands and open forests- and drier coastal woodlands in some years (flowering coastal woodlands and forests including box-ironbark woodland, and riparian forests-that exhibit large numbers of mature trees, high canopy cover and abundance of mistletoes) Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: Eucalyptus microcarpa, E. punctata, E. polyanthemos, E. moluccana, Corymbia robusta, E. crebra, E. caleyi, C. maculata, E. mckieana, E. macrorhyncha, E. laevopinea, and Angophora floribunda. Nectar and fruit from the mistletoes Amyema miquelii, A. pendula and A. cambagei are also eaten during the breeding season.	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
Ruddy Turnstone <i>Arenaria interpres</i>	Migratory EPBC Act	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In southern Australia the Ruddy Turnstone prefers rockier coastlines and is less numerous on large embayments with extensive mudflats. The Ruddy Turnstone mainly forages between lower supralittoral and lower littoral zones of foreshores, from strand-line to wave-zone. They often forage among banks of stranded seaweed or other tide-wrack. They are also known to forage on exposed rocky platforms, coral reefs and mudflats. In the south-east Gulf of Carpentaria they feed only on mangrove	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.

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		mudflats, especially those near shingle beaches. Sometimes they feed around coastal lagoons and sewage treatment ponds, occasionally among low vegetation in saltmarsh, on exposed beds of seagrass, or among dunes on coral cays. The have sometimes been known to forage in grassy areas above the tideline, in short pasture, or in ploughed paddocks. The Ruddy Turnstone roosts on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris. They have also been observed roosting on rocky islets among grassy tussocks, and on mudflats and sandflats. They sometimes fly around, or land on, ships at sea	
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	Migratory <i>EPBC Act</i>	Prefers grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. Breeds in Siberia in the peat-hummock	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. Does not breed in Australia.
Sooty Oystercatcher <i>Haematopus fuliginosus</i>	Vulnerable <i>NSW BC Act</i>	Shore bird. Found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast. The availability of suitable nesting sites may limit populations. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks.	No suitable foraging habitat available – wetland vegetation is too tall and dense, and open water too deep. No suitable breeding habitat.
Square-Tailed Kite <i>Lophoictinia isura</i>	<i>Vulnerable NSW BC Act</i>	Summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.

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		woodlands and open forests. Shows a particular preference for timbered watercourses large hunting ranges of more than 100km ² . Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	
Swift Parrot <i>Lathamus discolor</i>	Endangered EPBC Act Endangered NSW BC Act	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. 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 Inland Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum <i>Eucalyptus globulus</i> .	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
Varied Sittella <i>Daphoenositta chrysoptera</i>	Vulnerable NSW BC Act	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
Wedge-tailed Shearwater <i>Ardenna pacificus</i>	Migratory EPBC Act	A pelagic, marine bird known from tropical and subtropical waters. The species tolerates a range of surface-temperatures and salinities, but is most abundant where temperatures are greater than 21 °C and salinity is greater than 34.6 ‰. In tropical zones the species may feed over cool nutrient-rich waters. The species has been recorded in offshore waters of eastern Victoria	Unlikely to occur. No suitable habitat available.

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		and southern NSW, mostly over continental slope with sea-surface temperatures of 13.9–24.4 °C and usually off the continental shelf in north-west Australia.	
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	NSW BC Act Vulnerable Migratory EPBC Act	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterized by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats. The species is mostly recorded in coastal lowlands, but can occupy habitats up to 1400 m above sea level on the Northern Tablelands of NSW and up to 800 m above sea level in Tasmania and South Australia. Birds have been recorded at or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds. They also occur at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and even urban areas. Breeding has been recorded on the coast, at inland sites, and on offshore islands. Breeding territories are located close to water, and mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest (including rainforest), closed scrub or in remnant trees on cleared land. Forages over large expanses of open water; this is particularly true of birds that occur in coastal environments close to the sea-shore, where they forage over in-shore waters. However, the White-bellied Sea-Eagle will also forage over open	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.

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		terrestrial habitats (such as grasslands). Birds may move to and congregate in favorable sites during drought or food shortage.	
White-throated Needletail <i>Hirundapus caudacutus</i>	Migratory EPBC Act	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats, and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes. They are sometimes recorded above islands well out to sea.	Possibly occurring transiently over the site, but unlikely to utilise the site. No suitable foraging or nesting habitat occurs.
MAMMALS			
Australian Fur-seal <i>Arctocephalus pusillus doriferus</i>	Vulnerable NSW BC Act	Prefers rocky parts of islands with flat, open terrain. They occupy flatter areas than do New Zealand Fur-seals where they occur together.	No suitable habitat present.
Eastern Pygmy-possum <i>Cercartetus nanus</i>	Vulnerable NSW BC Act	Rainforest, sclerophylla forest & woodland to heath – but heath & woodland preferred. Forages on banksias, eucalypts & bottlebrushes.	No suitable habitat present.

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Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Vulnerable EPBC Act Vulnerable NSW BC Act	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possibly occurring over or in proximity to the site. Foraging habitat occurs. Further assessment has been undertaken in s3.2.2 and 3.3 of this REF.
Koala <i>Phascolarctos cinereus</i>	Vulnerable NSW BC Act	Eucalypt woodland and forest Home range sizes vary with quality of habitat ranging from less than two ha to several hundred ha. Preferred tree species on the south coast are <i>Eucalyptus amplifolia</i> , <i>E.viminalis</i> , & <i>E.tereticornis</i> but numerous other species also known food trees.	No suitable habitat present.
New Zealand Fur Seal <i>Arctocephalus forsteri</i>	Vulnerable NSW BC Act	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Prefers rocky parts of islands with jumbled terrain and boulders. Feeds principally on cephalopods and fish, but also seabirds and occasionally penguins.	No suitable habitat present.
Southern Greater Glider <i>Petauroides volans</i>	Vulnerable EPBC Act	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha. Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. Very loyal to their territory.	Recorded in the locality (approx. 450m from site). No suitable foraging or den habitat within the site. Possibly using the site as a habitat corridor (low likelihood). Further assessment has been undertaken in s3.2.2 and 3.3 of this REF.

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Spotted-tailed Quoll <i>Dasyurus maculatus</i>	Endangered EPBC Act Vulnerable NSW BC Act	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines.	Unlikely to occur. No suitable habitat. Swampland vegetation too dense for movement of this species.
Yellow-bellied Glider - <i>Petaurus Australis</i>	Vulnerable NSW BC Act	Forest with old growth elements. Large Eucalypt Hollows for denning- Inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia mid storey. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	Numerous records in the locality (approx. 200m from site). No suitable foraging or den habitat within the site. Possibly using the site as a habitat corridor. Further assessment has been undertaken in s3.2.2 and 3.3 of this REF