

Central Coast Council

Terrigal Boardwalk

Review of Environmental Factors

TBP-EN-GN-RPT-003

Final | 30 October 2018



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Contents

	Page
Abbreviations	i
Executive Summary	ii
1 Introduction	1
1.1 Background	1
1.2 Scope of the REF	1
2 Site Location and Context	3
3 Proposal Description	6
3.1 Strategic Need for the Proposal	6
3.2 Proposal Objectives	7
3.3 Options Development	8
3.4 Options Analysis	8
3.5 Preferred Option	9
3.6 Delivery Timeframe	10
3.7 Concept Design	10
3.8 Construction Method	13
4 Legislative and Planning Framework	16
4.1 Environmental Planning and Assessment Act 1979	16
4.2 Other Relevant Legislation	19
5 Consultation	23
5.1 Previous Consultation	23
5.2 Community Engagement Plan	23
5.3 Agency Consultation	24
5.4 ISEPP Notification and Consultation	24
5.5 Planned Future Consultation	25
6 Environmental Assessment	28
6.1 General	28
6.2 Physical Environment	30
6.3 Landscape and Visual	37
6.4 Biodiversity	50
6.5 Noise and Vibration	63
6.6 Traffic and Access	65
6.7 Aboriginal Heritage	67
6.8 Socio-Economic	69
6.9 Other Impacts	71

7	Environmental Factors Considered	74
7.1	Assessment of Clause 228 Factors	74
7.2	Principles of Ecologically Sustainable Development	76
7.3	Consideration of National Environmental Significance Factors	77
8	Conclusion	78
8.1	Justification	78
8.2	Objects of the EP&A Act	78
8.3	Conclusions	78
9	References	79

Tables

Table 1: Summary of the issues addressed in each chapter

Table 2: Concept design details

Table 3: Construction methodology for each defined construction zone

Table 4: Relevant State Environmental Planning Policy

Table 5: Relevant LEP land use zoning policies

Table 6: Relevant Commonwealth legislation

Table 7: Relevant state legislation

Table 8: Summary of the Council's Community Engagement Plan

Table 9: Summary of ground conditions

Table 10: Tide levels at Fort Denison shown at metres above chart and Australian height datum.

Table 11: Landscape character and visual amenity impact ratings

Table 12: Landscape character zones

Table 13: Viewpoint and receiver sensitivities

Table 14: Landscape character assessment

Table 15: Visual impact ratings

Table 16: Vegetation communities within the proposal footprint.

Table 17: Marine habitat community descriptions.

Table 18: Likelihood of occurrence criteria

Table 19: Test of significance of impacts on threatened species

Table 20: Other environmental issues

Table 21: Assessment of Clause 228 factors

Table 22: Assessment of Ecological Sustainable Development

Table 23: Overall impact rating as a combination of sensitivity and magnitude (Roads and Maritime guidelines for landscape character and visual impact assessment) (Roads and Maritime Services, 2013)

Figures

Figure 1: Site location (Central Coast Council, 2017a)

Figure 2: Crown Land boundaries

Figure 3: Extract adopted from the Gosford City Council 'Terrigal Foreshore Improvements Landscape Masterplan' (2009)

Figure 4: Visualisation of the proposal looking south-east

Figure 5: Visualisation of the proposal looking south-south-west showing the lookout over the rock platform

Figure 6: Proposed construction methodology

Figure 7: Distinct geomorphological zones across the proposal

Figure 8: Landscape Character Zones

Figure 9: Visual envelope

Figure 10: Viewpoints assessed

Figure 11: Terrestrial vegetation communities

Figure 12: Marine and intertidal communities

Figure 13: Land zoning

Figure 14: Landscape Character Zones

Figure 15: Visual envelope

Figure 16: Viewpoints assessed

Abbreviations

Term	Meaning
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AS	Australian Standard
BC Act	<i>Biodiversity Conservation Act 2016</i>
BS	British Standard
CBD	central business district
CD	chart datum
CEMP	Construction Environmental Management Plan
Council	Central Coast Council
DCP	development control plan
DDA	<i>Disability Discrimination Act 1992</i>
EPA	Environmental Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>Fisheries Management Act 1994</i>
ESD	ecological sustainable development
HAT	highest astronomical tide
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i>
LALC	Local Aboriginal Land Council
LAT	lowest astronomical tide
LEP	Local Environment Plan
LGA	Local Government Authority
LLS	Local Land Services
mbgl	metres below ground level
MNES	matters of national environmental significance
MWL	mean water level
OEH	Office of Environment and Heritage
PWD	Public Works Department
RE1	land zoned for public recreation
REF	Review of Environmental Factors
SEPPs	State Environmental Planning Policies
The proposal	The proposed Terrigal Beach promenade to The Haven boardwalk
UL	unzoned land

Executive Summary

This review of environmental factors has been prepared to assess the environmental impacts of a proposed boardwalk to connect Terrigal Beach with The Haven precinct (the ‘proposal’).

Central Coast Council is the proponent for proposal and is also the determining authority for the Review of Environmental Factors under division 5.1 of the *Environmental Planning and Assessment Act 1979*.

Background

As a result of improved infrastructure and increased developer interest, Terrigal has become substantially more urban and a consolidated regional tourist attraction. A key tourist attraction and feature of Terrigal is the beach and waterfront area, including both the main Terrigal Beach and The Haven, a smaller beach directly to the east of Terrigal Beach.

At present, the existing rock headland and steep portion of the Scenic Highway/Terrigal Esplanade limits easy access between Terrigal Beach and The Haven precinct. An existing path along the Scenic Highway/Terrigal Esplanade connects Terrigal Beach to The Haven carpark; however, it is steep and moves users away from the foreshore. There is an option to climb over the rocks between Terrigal Beach and The Haven, although this alternative option is considered dangerous.

Proposed Boardwalk

The proposal is to construct an approximate 220 metre boardwalk connecting the existing pathway at the Terrigal rockpool to the west with The Haven precinct at the existing seawall adjacent to the Reef Restaurant to the east.

The proposal is located between the Terrigal Central Business District and cafes, sporting fields and parkland at The Haven. Upon completion, the boardwalk is hoped to become a tourist attraction and a destination enhancing experience which compliments the natural coastal environment.

Consultation

Central Coast Council will complete consultation as part of the proposal’s Community Engagement Plan. The plan covers the design, planning, pre-construction and construction stages of the proposal, targeting the community, relevant government agencies and other key stakeholders.

Assessment

The proposal has been assessed under division 5.1 of the *Environmental Planning & Assessment Act 1979* and the *State Environmental Planning Policy (Infrastructure) 2007*.

This review of environmental factors includes the assessment of key engineering, environmental and planning issues such as sea level rise, landscape and visual, biodiversity and socio-economic impacts.

Relevant Commonwealth, State and local environmental planning provisions have also been assessed.

Mitigation measures identified in this review of environmental factors aim to minimise the potential impact from the works during the construction and operational stages of the proposal.

Conclusion

This review of environmental factors recommends mitigation measures to ensure that the construction and operation of the boardwalk occurs without significant environmental impact.

Therefore, it is recommended that the proposal be approved under division 5.1 of the *Environmental Planning & Assessment Act 1979* by Central Coast Council.

1 Introduction

This review of environmental factors (REF) assesses the impacts of building and operating a new 220 metre boardwalk between Terrigal Beach and The Haven precinct (the ‘proposal’). Guided by the REF, Central Coast Council (‘Council’) will determine if the proposal should proceed in accordance with its authority under division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Background

Improved infrastructure and increased developer interest means Terrigal has become substantially more urban and a regional tourist attraction. However, the existing rock headland and steep roadway limits easy access between the beach and The Haven precinct. An existing path along the Scenic Highway/Terrigal Esplanade connects Terrigal Beach to The Haven carpark; however, it is steep and moves users away from the foreshore. There is an option to climb over the rocks between Terrigal Beach and The Haven, although this alternative option is considered dangerous.

This proposal intends to improve the amenity and accessibility for tourists visiting the region. It is Council’s ambition for the boardwalk to become a tourist attraction and a destination-enhancing experience that compliments the natural coastal environment.

1.2 Scope of the REF

This REF has been prepared to allow Council to fulfil its obligations as a determining authority under section 5.5 of the EP&A Act insofar as “examining and taking into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity”. The REF has been prepared to address the factors set out under clause 228 of the supporting *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and the objects of the EP&A Act, including supporting ecologically sustainable development.

The assessment has also been undertaken in accordance with the requirements of all relevant State and Commonwealth legislation including the NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Fisheries Management Act 1994* (FM Act) and the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act).

The findings of this REF will be considered when assessing the significance of the proposal’s impact. Specifically, where there is expected to be a significant environmental impact:

- Then the Minister of Planning would need to approve the proposal in accordance with division 5.2 of the EP&A Act. This would require Council making a development application to the Minister as supported with an environmental impact statement.

- If there is a significant impact on a threatened species listed (and protected) under the BC Act or FM Act, then Council would need to prepare either a species impact statement pursuant to section 1.7 of the EP&A Act or a Biodiversity Development Assessment Report pursuant to section 7.8 of the BC Act. The species impact statement would be prepared in accordance with section 7.6 of the *Biodiversity Conservation Regulation 2017* and any specific requirements set out by the Office of Environment and Heritage. The species impact statement would need approving (agreeing) by the Office of Environment and Heritage.
- On a matter of national environmental significance then Council would need to refer the proposal to the Commonwealth Department of Environment and Energy for a decision as to whether assessment and approval is needed under the EPBC Act.

An outline of the information provided in each chapter of this REF is provided in Table 1.

Table 1: Summary of the issues addressed in each chapter

Issues addressed	
Chapter 1	Proposal identification and the REF's purpose
Chapter 2	Site location and context
Chapter 3	Description of the proposal's need, objectives, options considered, preferred option, delivery timeframe and proposed construction methodology
Chapter 4	The statutory planning framework under which the proposal would be built
Chapter 5	The stakeholder and community consultation carried out in support of the proposal
Chapter 6	The environmental impact assessment of key issues including a description of the safeguards and management measures that would be used to mitigate the proposal's adverse impacts, and any licences and approvals needed to deliver the proposal
Chapter 7	Assessment of the proposal's consistency with the factors set out in clause 228 of the EP&A Regulation
Chapter 8	The justification for progressing with the preferred proposal and conclusions
Chapter 9	References
Appendix A	Survey and Geotechnical Investigations – Information Flyer
Appendix B	Landscape and Visual Assessment
Appendix C	Threatened Species Assessment
Appendix D	Darkinjung Local Aboriginal Land Council – Formal Response

2 Site Location and Context

The proposal is located between the Terrigal Beach promenade and The Haven precinct, as outlined by the red dotted line on Figure 1. It is located across four *reserves* on Crown Land, including Lot 1/DP 1060783 (Kincumber Recreation R48956 Reserve Trust) and Lot 6/DP 805477 (Central Coast Council R48416 Reserve Trust). The other two Crown Land lots north of the established *reserves* were unable to be established at the time of writing (refer to Figure 2).

The proposal footprint is partially unzoned land (UL) and partially zoned for public recreation (RE1) use in the Gosford Local Environmental Plan (LEP) 2014.

The broader area is characterised by coastal and landside recreation infrastructure, newer and older-style apartments and resorts, residential dwellings and local businesses and cafes. Section 6.3 provides for more information regarding the surrounding land uses and community facilities near the proposal footprint.



Figure 1: Site location (Central Coast Council, 2017a)



Figure 2: Crown Land boundaries

3 Proposal Description

3.1 Strategic Need for the Proposal

In October 1991, the Terrigal Chamber of Commerce, with Gosford City Council's support, convened a workshop and resolved the need to develop a Landscape Masterplan for the waterfront that integrated and linked the foreshores from the western edge of Terrigal Lagoon to the Terrigal beachfront area and The Haven precinct. A working group was formed to develop the Landscape Masterplan, which was delivered in 1996. Following the Landscape Masterplan was a feasibility study of the proposed boardwalk in 1998, both of which were adopted by Gosford City Council in 2009 as part of the Terrigal Haven Plan of Management. The aim of the Plan of Management was to provide a clear, concise and practical framework for Terrigal Haven, leading to strategies to protect and enhance identified key values while identifying opportunities that would ensure longer-term objectives of sustainable management.

The Plan of Management, in adopting the 1996 landscape masterplan, highlighted the potential need for a boardwalk (refer to Figure 3), stating the following:

“A new free-standing timber boardwalk links Terrigal Beach to The Haven. It begins at the existing rock platform and extends to the Sailing Club. The boardwalk will incorporate viewing platforms, seating and lighting.”

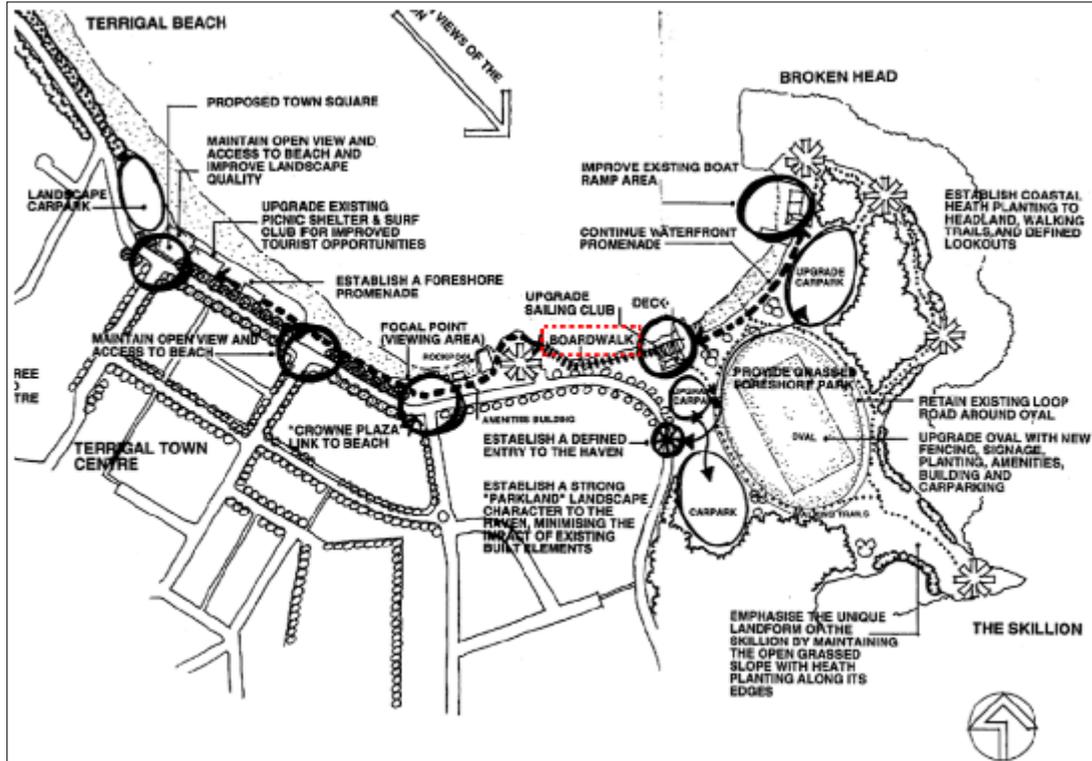


Figure 3: Extract adopted from the Gosford City Council 'Terrigal Foreshore Improvements Landscape Masterplan' (2009)

The most recent advancement in the proposition of a boardwalk was the development of a preliminary boardwalk design and associated render images in September 2017 (refer to section 3.3).

The design of the proposal is now being carried out as part of the Investigation into Terrigal Town Centre Public Domain Improvements approved by the Council's Operational Plan 2017-18 (Central Coast Council, 2017b). This plan has considered 'One Central Coast'; a 10-year Community Strategic Plan 2018-2028 developed by Council through engagement with the community to help set the priorities and confirm strategies and activities that best achieve the community's desired outcomes for the future.

3.2 Proposal Objectives

The proposal's functional requirements presented below are intended to support Council's objective of improving amenity and accessibility for locals and tourists visiting the region by creating a boardwalk that enhances the visitor experience through complimenting the natural coastal environment.

The functional requirements have been used to define the proposal's objectives and guide its design. These objectives are:

- Provide public access along the foreshore.
- Be accessible, safe and secure for all users.
- Avoid and minimise potential adverse environmental impacts.

3.3 Options Development

This section describes the options Council developed and considered for the proposal that were based on:

- Developing a preliminary design and associated render images in 2017.
- Reviewing key design components from local and international examples to develop ideas and initial thoughts for a concept design.
- Holding workshops that considered:
 - Relevant design criteria, including boardwalk functional requirements and architectural principles.
 - Design constraints (environmental, geology, geohazard, coastal risk/hazard) based on baseline studies and a site visit to support to preliminary concept design development.
- Developing three boardwalk options summarising the respective opportunities and constraints.
- Completing a multi-criteria analysis workshop attended by a mix of people with different technical backgrounds to assess the benefits, impacts and value of each option against the proposal's objectives relative to a baseline of doing nothing, while also considering the engineering/constructability and tourist attraction value.

3.4 Options Analysis

This section describes how each of the three options performs against the proposal's objectives relative to the do-nothing option.

Do nothing

The option of doing nothing would involve business as usual access between Terrigal Beach and The Haven precinct. Community members would be required to walk along Scenic Highway/Terrigal Esplanade between the two areas, which involves a steep ascent and descent. At low tide, some community members may continue to scramble over the rocks, leading to ongoing safety risks. As such, this option does not meet the objectives of providing a safer and more accessible route between Terrigal Beach and The Haven. While, this option avoids any environmental impact, it was discounted as it was concluded that any development impact could be managed to minimise impacts to an acceptable level against the community benefit provided by building a boardwalk.

Do something options

Three options were developed for consideration. These included:

- **Option 1: Nature Walk**
 - Light weight timber boardwalk that would follow the natural cliff line around the headland.
- **Option 2: Views and Lookout Platforms**
 - Elevated boardwalk with that would integrate seating and viewing platforms. Composed of timber and perforated metal decking that would allow people to view the water beneath the viewing platforms.
- **Option 3: Cable-Stay Boardwalk**
 - Cable stayed boardwalk that would include a striking support mast. Mast would be visible only from The Haven, allowing for fewer piles and intermediate support structures.

3.5 Preferred Option

All options considered would address Council's proposal objectives of providing public access along the foreshore and being accessible, safe and secure for all users. With regards to avoiding and minimising potential adverse environmental impacts, the appropriate environmental safeguards would have been considered for all proposed boardwalk designs. However, Option 3 would likely have had the highest environmental impact given the greater visual impact and increased need for materials.

In addition to the key objectives, consideration was also made to value for money and the likely engineering performance. Based on these factors, Option 3 was discounted given its expected relatively higher construction cost and inherent engineering complexities.

Based on the above outcomes and consideration of which option best meets the Ecologically Sustainable Development (ESD) principles (refer section 7.2), it was decided that Option 2 would be taken forward as the preferred option. Option 2 was then developed into a concept design accounting for all known constraints in the area (e.g. coastal hazard risk, geohazard, geotechnical and environmental).

3.6 Delivery Timeframe

The proposed delivery timeframe is as follows.

Planned determination of proposal	Late 2018 – Early 2019
Appointment of contractor	Early 2019
Construction period	Early-mid 2019
Completion	Late 2019

3.7 Concept Design

The proposal's likely form and structure has been detailed in Table 2.

Table 2: Concept design details

Details	
Length	Approximately 220 metres
Route	Terrigal Beach to The Haven
Materials/finishes	The materials/finishes on the proposal are not confirmed, however expected to be a combination of the following: <ul style="list-style-type: none"> • Decking (Blackbutt, Spotted Gum or Grey Ironbark) • Perforated/mesh flooring (Aluminium, Fibreglass) • Balustrade (Flat metal balustrades – stainless steel, Flat metal balustrades – powder coat aluminium)
Urban design	New landscape planting to be integrated into the eastern end of boardwalk within the existing setting
Ancillary components	There are likely to be two laydown areas/site compounds required during the construction (refer section 3.8)

Figure 4 and Figure 5 show the preferred option within the existing landscape at Terrigal.



Figure 4: Visualisation of the proposal looking south-east



Figure 5: Visualisation of the proposal looking south-south-west showing the lookout over the rock platform

3.8 Construction Method

Table 3 identifies all the likely activities that would take place during construction across the four distinct zones presented in Figure 6, taking into consideration the access constraints along the Haven foreshore.

3.8.1 Early works

Indicatively, two laydown areas would be used to temporarily store construction materials, equipment and take receipt of prefabricated sections of the boardwalk. The establishment of these laydown areas would form the basis of the early works required for the construction. The main works are expanded on in Table 3.

- Laydown Area 1: The Haven precinct carpark (or a nearby location).
- Laydown Area 2: within an enclosed area at the western end of the proposal.

Specific laydown areas would be confirmed during the detailed design with contractor-input. If they substantially differ from the above locations, then Council would carry out a consistency assessment or prepare an addendum REF to ensure any supplementary impacts are considered and safeguarded against. The laydown areas would be established before the main works (e.g. they would form early works).

3.8.2 Main Works

Table 3 summarises the method of main works, which may vary based contractor inputs and recommendations made. Access to the site would be via the existing local state and local roads in proximity to the site. Vehicles would deliver materials as required to the respective laydown areas detailed previously.

The barge is expected to contain the equipment needed to complete the main works (e.g. piling). Construction personnel are likely to be transported to the barge from the laydown areas (on land), and vice versa, via a small boat that would use the ramp at The Haven. Works are expected to be carried out during standard work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1 pm Saturdays). However, certain activities like piling may need to be undertaken during the night-time period while the wave climate is more favourable (refer to section 6.5).

The boardwalk would incorporate LED lighting, so some interaction with electrical infrastructure (e.g. utilities, conduits, cables, trenches) may be required. Locations where activities would occur would be established during the detailed design phase, however it is expected to be largely within the proposal footprint. Any damage to existing utilities resulting from the construction of the proposal, aside from that resulting from normal wear and tear must be repaired.

To account for potential cumulative impacts, a conservative assumption has been made that any works within each zone may occur at the same time. Although this event is considered unlikely, it ensures that a worst-case assessment has been used to assess the proposal's impacts.

Table 3: Construction methodology for each defined construction zone

	Areas within the construction zones	Brief description of the proposed works
Construction Zone 1	<ul style="list-style-type: none"> • Terrigal rockpool • Existing footpath onto the rock platform at western end of proposal 	<ol style="list-style-type: none"> 1. Closure of the Terrigal rockpool 2. Carry out cliff stabilisation and remediation works 3. Install piles to rock 4. Assemble and install boardwalk steelwork and decking
Construction Zone 2	<ul style="list-style-type: none"> • Rock platform area • Barge footprint in the ocean 	<ol style="list-style-type: none"> 1. Establishment of marine plant into fixed position north of the rock platform, if required 2. Install piles into rock and prefabricated steel pier 3. Lift prefabricated boardwalk superstructure to the piers and fix into position 4. Install decking and other fixtures as required
Construction Zone 3	<ul style="list-style-type: none"> • Intertidal zone between the rock platform and the proposed sandstone wall extension 	<ol style="list-style-type: none"> 1. Establishment of temporary causeway over the intertidal zone to enable land-based access 2. Install piles into rock and prefabricated steel pier 3. Lift prefabricated boardwalk superstructure to the piers and fix into position 4. Install decking and other fixtures as required
Construction Zone 4	<ul style="list-style-type: none"> • Beach area at eastern end of proposal • Existing sandstone wall at the Haven precinct 	<ol style="list-style-type: none"> 1. Establishment of platform to enable access for land-based plant along beach 2. Remove part of existing seawall for realignment and extension 3. Excavate sand to top of rock level and install sandstone blockwork wall 4. Fill behind new blockwork wall in staged increments 5. Reinstate drainage and culvert 6. Install footpath and miscellaneous items

Note: Along the entire length of the boardwalk the coastal headland and associated flora lies within the construction footprint.



Figure 6: Proposed construction methodology

4 Legislative and Planning Framework

The planning framework for this proposal is defined by a range of environmental planning instruments. This chapter outlines the intent and applicability of the instruments, and the State and Commonwealth legislation that define the planning pathway.

4.1 Environmental Planning and Assessment Act 1979

This proposal will be determined under the EP&A Act pursuant to its classification under *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP). Chapter 1 describes the purpose of the REF and the process of determination under the EP&A Act.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by State Environmental Planning Policy (Coastal Management), State Environmental Planning Policy (State and Regional Development) 2011 or State Environmental Planning Policy (Major Development) 2005. As such, it remains permissible as development without consent under ISEPP.

Relevant State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) that apply to the proposal are detailed further in section 4.1.1 and 4.1.2.

4.1.1 State Environmental Planning Policies

The relevant SEPPs, and how the applicable requirements have been addressed in the REF, are detailed in Table 4.

Table 4: Relevant State Environmental Planning Policy

Policy	Relevance to the Proposal	Addressed in this REF
<i>State Environmental Planning Policy (Infrastructure) 2007</i>	<p>Division 12 Clause 66(1)(a)(i) of the ISEPP identifies that development of a raised walking path (including boardwalk) to be carried out by or on behalf of a public authority is exempt development (i.e. does not require planning approval). It is noted that the proposal will likely comply with Division 12 Clause 66(3)(a) i.e. that the proposal will comply with the requirements of Clause 20.</p> <p>However, the applicability of Division 12 Clause 66(3)(b) and (c) cannot be confirmed without further environmental</p>	<p>As detailed in section 5.4, consultation under ISEPP is not required for the proposal.</p> <p>Investigations pertinent to Division 12 Clause 66(3) (b) and (c) have been undertaken as part of this REF. Refer to section 6.4 for an assessment of the potential impacts to native vegetation, and section 6.2 for an assessment of the potential impacts to stormwater run-off and erosion.</p>

Policy	Relevance to the Proposal	Addressed in this REF
	<p>investigations (i.e. this REF).</p> <p>As such, consistent with the precautionary principle (refer to section 7), the development has been progressed as permitted without consent where division 5.1 of the EP&A Act applies.</p> <p>Part 2, Clause 16 of the ISEPP contains provisions to consult with public authorities prior to the commencement of certain types of development.</p>	
<p><i>State Environmental Planning Policy (Coastal Management) 2018</i></p>	<p>This SEPP seeks to balance social, economic and environmental interests by promoting a coordinated approach to coastal management. The proposal is in an area classed as both a Coastal Environment Area and a Coastal Use Area, and therefore Part 2, Division 3 and Division 4 apply. These provisions identify what the determining authority (i.e. Council) must consider when approving a project, including whether the proposal is likely to cause adverse impacts on a number of environmental considerations.</p>	<p>The environmental considerations specified in Division 3 and 4 have been considered in the following sections:</p> <ul style="list-style-type: none"> • Potential biophysical, hydrological and ecological impacts have been considered in section 6.4. • Potential coastal environmental values and natural coastal processes have been considered in section 6.2. • Potential impacts to the water quality of the marine environment have been considered in section 6.4. • Potential impacts to marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms have been considered in section 6.4. • Potential impacts to existing public open space and safe access to and along the foreshore have been considered in section 6.8. • Potential impacts to visual amenity and scenic qualities of the coast have been considered in section 6.3. • Potential impacts due to overshadowing and loss of views have been considered in section 6.3. • Potential impacts to Aboriginal cultural heritage, practices and places have been considered in section 6.7. • Potential impacts to cultural and built environment heritage have been considered in section 6.9. • Potential impacts to use of the surf zone have been considered in section 6.8.

4.1.2 Local Environmental Plans

The proposal is in the Central Coast local government area (LGA), which has recently been formed due to the merger of the previous Gosford City and Wyong Shire LGAs. Local development control and land use zoning and planning is governed under the Gosford LEP 2014 and further guided by the associated Gosford Development Control Plan (DCP) 2013.

As the proposal is development without consent it is not subject to local environmental planning policy or development control. However, the LEP is useful in identifying the proposal's consistency with the land use policy as described in Table 5.

Table 5: Relevant LEP land use zoning policies

Public Recreation (RE1) Objectives	Proposal consistency
<ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes. To provide a range of recreational settings and activities and compatible land uses. To protect and enhance the natural environment for recreational purposes. To identify areas suitable for development for recreation, leisure and cultural purposes. To ensure that development is compatible with the desired future character of the zone. 	The proposal would enable the land to be better used for public amenity through enhancing the natural environment.
Unzoned Land (UL) Objectives	Proposal consistency
<ul style="list-style-type: none"> Need to consider the objectives for development and be satisfied that it is appropriate and compatible with permissible land uses in in the zones of the adjoining land. 	As stated above for RE1, the proposal is consistent with the objectives of that land use.

4.2 Other Relevant Legislation

The relevant legislation and how the applicable requirements have been addressed in the REF are detailed in Table 6 and Table 7.

Table 6: Relevant Commonwealth legislation

Legislation	Relevance to the proposal	Addressed in this REF
<i>Disability Discrimination Act 1992</i> (DDA)	This Act aims to eliminate, as far as possible, discrimination against persons on the ground of disability in areas including access to premises and the provision of facilities, services and land.	A primary objective of the proposal is to be accessible for all users, which would achieve DDA compliance along the boardwalk (refer to section 3.2).
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Under this Act, an action will require approval from the Minister if it has, will have, or is likely to have, a significant impact on a matter of national environmental significance (MNES). MNES include: <ul style="list-style-type: none"> • World Heritage properties. • National Heritage places. • Ramsar Wetlands. • Nationally threatened species and ecological communities. • Migratory species. • Great Barrier Reef Marine Park. • Commonwealth marine areas. • Nuclear actions, including uranium mining. 	The biodiversity assessment undertaken in section 6.4 has considered the potential for the proposal to impact listed threatened or endangered species and communities listed under the EPBC Act. Furthermore, a review of the online database for MNES (known as the Protected Matters Search Tool) indicated that there are no other recorded MNES within 10km of the proposal. Therefore, it is not anticipated that any MNES would be impacted by the proposal.

Table 7: Relevant state legislation

Legislation	Relevance to the proposal	Addressed in this REF
<i>Biodiversity Conservation Act 2016</i>	This Act provides the legislative policy to maintain a healthy, productive and resilient environment. It aims to conserve biodiversity and ecological processes at a state level by establishing a framework for assessing and protecting environmental and public interests.	A biodiversity assessment has been undertaken in section 6.4. This includes consideration of threatened species listed under the Act that have been recorded in the study area. The study determined that there are no threatened species or ecological communities, as defined in the BC Act or EPBC Act were directly observed on the site
<i>Coastal Management Act 2016</i>	This Act provides for the protection of the coastal environment for the benefit of both present and future generations. The proposal is in an area classed as both a Coastal Environment Area and a Coastal Use Area, and therefore Part 2 (Division 3 and 4) of the State Environmental Planning Policy (Coastal Management) 2018 applies (refer to 6.2). These provisions identify what the determining authority (i.e. Council) must consider when approving a project, including whether the proposal is likely to cause adverse impacts on a number of environmental considerations.	An assessment of the proposal's potential impacts on items noted in the Coastal SEPP has been carried out in the following sections; Aboriginal heritage (section 6.7), visual amenity (section 6.3) and biodiversity (section 6.4). These assessments conclude that no significant adverse impacts against the items identified in Part 2 (Division 3 and 4) are anticipated.
<i>Crown Lands Management Act 2016</i>	Relevant licences and leases for works undertaken on Crown Land lots are issued under the Act.	The respective licences and leases expected to be required are presented in section 0.
<i>Fisheries Management Act 1994</i>	This Act provides the legislative framework to protect fish, stocks and habitat as well as provide regulatory controls for fishing and management strategies. As the proposal involves works in the marine environment, Department of Primary Industries (DPI) Fisheries have been consulted (refer to Chapter 5) to determine if any approvals or licences are required under the Act. Preliminary feedback received noted that a licence under section 199 of the Act would be required should dredging or reclamation be required for construction of the works.	<p>Consideration of fish habitat and potential management strategies are included in the biodiversity assessment in section 6.4.</p> <p>At present, no dredging or reclamation has been proposed as part of the construction methodology outlined in Chapter 3. However, should this change during detailed design, The DPI Fisheries would be consulted regard the need for a licence under section 199 of the Act.</p> <p>Under Part 7 of the Act a permit would be required for harming marine vegetation. The works are likely to result in removal of macroalgae for the piling works.</p> <p>The project is unlikely to result in any significant impacts to threatened species and ecological communities listed in the FM Act.</p>

Legislation	Relevance to the proposal	Addressed in this REF
<i>Local Land Services Act 2013</i>	This Act established 11 regional Local Land Services (LLS). The proposal falls within the Greater Sydney LLS. Under the Local Land Services State Strategic Plan (2016), a key strategy is managing Crown Land for environmental, social and economic outcomes. Examples include preparing plans of management, controlling weeds and pests, and enhancing biodiversity. Weeds such as Climbing Asparagus Fern <i>Asparagus aethiopicus</i> and Lantana <i>Lantana camara</i> were observed on site, and therefore management measures to control the spread of weeds have been proposed	Mitigation measures to avoid the spread of weeds during construction are presented in the biodiversity assessment in section 6.4.
<i>Marine Pollution Act 2012</i>	This Act protects the sea and waters from oil and other noxious substances pollution discharged from vessels, and sets out provisions to prevent pollution in the marine environment. As construction would be required in the marine environment, the requirements of this Act apply.	The potential impacts of the proposal on the marine environment have been considered in the biodiversity assessment in section 6.4. Providing management measures are implemented and monitored, the risk of oil or noxious liquid spills into the marine environment is considered to be low.
<i>Protection of the Environment Operations Act 1997 (POEO Act)</i>	This Act is administered by the NSW Environment Protection Authority and focuses on environmental protection and provisions for the reduction of water, noise and air pollution and the storage, treatment and disposal of waste. Introduces licencing provisions for scheduled activities that are of a nature and scale that have a potential to cause environmental pollution. Also includes measures to limit pollution and manage waste The proposal is not a scheduled activity under Schedule 1 of the Act, and therefore it is not anticipated that an Environmental Protection License would be required	The potential for impacts associated with pollution and waste disposal are considered in waste management (section 6.9) and hazards and risk (section 6.2), and appropriate mitigation measures to avoid pollution have been provided.
<i>Waste Avoidance and Resource Recovery Act 2001</i>	This Act provides a legal framework concerning the minimisation, recycling and reuse of waste in NSW. The waste management hierarchy principles in order of priority as outlined in the Act are: <ul style="list-style-type: none"> • Avoidance of unnecessary resource consumption. • Resource recovery (including reuse, reprocessing, recycling and energy recover). • Disposal. 	The construction of the proposal would require materials and generate new waste streams. The potential impacts of the proposal on waste have been considered in section 6.9. Construction waste would be managed in accordance with the hierarchy.

4.2.1 Crown Lands Management Act 2016

The proposal is located across four Crown Land lots, of which one the Council is Reserve Trustee (see section 2). Given that this land is a Crown Reserve under the *Public Land* provisions of the *Local Government Act 1993*, a lease (to allow Council to locate the boardwalk on the land for a fixed period) or licence (to allow construction to temporarily take place) would be required by Council (as the proponent).

The non-council Crown Land managers will either likely fall under the Category 1 or Category 2 classification defined under the *Crown Lands Management Act 2016*. This classification will define who will issue licences and leases on the three other lots. If the work takes place under a Category 2 Crown Land manager then the Minister would likely need to approve the licence. The Minister would also likely need to approve any lease given the intended design life being longer than 10 years. These licences and leases would be approved in accordance with *Crown Lands Management Act 2016*, *Crown Land Legislation Amendment Act 2017* and *Crown Land Management Regulation 2018*.

Given that a leaseholder of a Crown Land Reserve has the effective control of the leased area, Council would need to also consider whether there are any existing leases and/or licenses that need surrendering, as an existing and proposed lease/license cannot operate simultaneously.

Consultation with the Department of Industry – Crown Lands and Water indicated that if Council requires structures to be erected on Crown Land not under Council management then an appropriate tenure or reserve addition will need to be sought. It is understood that a licence is usually the preferred tenure for structures below the high tide water level. However, it was also detailed that there is the opportunity to apply for an adjustment to Council's existing boundary *reserve*.

It is recommended that Council continue to liaise with the Department of Industry throughout the design development process.

5 Consultation

This Chapter discusses the consultation carried out to date and any future proposed consultation.

5.1 Previous Consultation

Council first consulted on the proposal in 2009 in preparing the Terrigal Haven Plan of Management.

5.2 Community Engagement Plan

Council continues to consult on the proposal as guided by a Community Engagement Plan. The objectives of this plan are to:

- Encourage the community and stakeholders to view and provide feedback on the design.
- Communicate the benefits and features of the boardwalk, as well as its predicted impacts.
- Report back to the community on the outcomes of community consultation and next steps.
- Inform stakeholders of proposed timelines and expected temporary impacts during construction.

A summary of the Community Engagement Plan is detailed in Table 8. It covers the design, planning, pre-construction and construction stages of the proposal; and the mechanisms for targeting the community, relevant government agencies, and other key stakeholders.

Under the plan, the broader community was made aware of the proposal in May 2018. The flyer was developed to inform the community of the survey and geotechnical investigations that were being carried out to support the proposal (see **Appendix A**).

Since then, Council started consultation with the Darkinjung Local Aboriginal Land Council (DLALC) in early September 2018 to establish if the proposal would impact on any areas considered to have significance to the Aboriginal people. The outcomes of that consultation are detailed in section 6.7.

5.3 Agency Consultation

During preparation of this REF, the following consultation was undertaken with government agencies:

- Council consulted with Roads and Maritime Services (Roads and Maritime) in June 2018. Roads and Maritime confirmed that following an inspection of the site, there were no navigational concerns regarding the proposal. This was taken into account when considering the requirement for ISEPP consultation, as detailed in section 5.4.
- Council consulted with NSW Department of Primary Industries (DPI) DPI Fisheries in July 2018. DPI Fisheries requested more information regarding the aquatic habitats situated in the proposal footprint, which has been taken into account when undertaken the biodiversity assessment in section 6.4. DPI Fisheries also requested that further information on whether dredging and reclamation would be required once the detailed design is available, in order to determine whether a licence would be required to undertake the works under section 199 of the *Fisheries Management Act 1994*.
- Council consulted with NSW Department of Industry – Crown Lands & Water in June 2018, who noted that no consent or approvals would be required for the proposal if the construction footprint and proposal would be wholly contained within Lot 1/DP 1060783 (Kincumber Recreation R48956 Reserve Trust). The Department requested to be kept informed as the development progresses.

5.4 ISEPP Notification and Consultation

Part 2, Clause 16 of the ISEPP contains provisions to consult with public authorities prior to the commencement of certain types of development, if certain circumstances apply as outlined in Clause 16(2).

It was determined that ISEPP consultation was not required for the following reasons:

- The proposal is not adjacent to land reserved under the *National Parks and Wildlife Act 1974* or on land in Zone E1 National Parks and Nature Reserves.
- The proposal is not adjacent to an aquatic reserve or marine park declared under the *Marine Estate Management Act 2014*, nor is development in the foreshore area within the meaning of the *Sydney Harbour Foreshore Authority Act 1998*.
- The proposal does not comprise a fixed or floating structure over navigable waters, as confirmed with the Roads and Maritime Services.
- The proposal is not for the purposes of a health services facility, correctional centre or group home, nor is it for residential purposes in bush fire prone land.
- The proposal would not increase the amount of artificial light in the night sky and is on land within the dark sky region.

- The proposal is not on defence communications facility land.
- The proposal is not on land in a mine subsidence district.

5.5 Planned Future Consultation

Council is planning to display various materials relating to the proposal including the concept design, this REF and other visual aids for a four-week period beginning early November 2018. The materials would be made available online, at the Council's offices and at several dedicated pop-up-stands in the local area. Council would collate all feedback it receives and prepare a community engagement report that summarises and responds to the questions and concerns.

Regular project updates would be provided to the community and key interest groups regarding key progress milestones, through flyers, website announcements or letterbox drops.

Furthermore, as the proposal progresses, it is recommended that Council keep relevant government agencies such as Roads and Maritime, DPI Fisheries and NSW Department of Industry – Crown Lands & Water informed.

Table 8: Summary of the Council's Community Engagement Plan

Stage	Timing	Key purpose of engagement	Key messages	Key engagement activities	Stakeholders targeted
Design	Early 2018	Consult and inform	Seek feedback on design options and agreed concepts	<ul style="list-style-type: none"> • Community information sessions • Online consultation tools • Project letters • One on One meetings with key stakeholders • Media 	<ul style="list-style-type: none"> • Darkinjung LALC • Guringai Tribal Link Aboriginal Corp. • Terrigal Beach Preservation Group • Terrigal – Wamberal Life Saving Club • Terrigal View Club • Terrigal Country Women's Association Branch • Terrigal Rotary Club • Terrigal – Wamberal RSL Sub-Branch • Terrigal Trotters • Terrigal Beach Markets • Local Real Estate Agents • Lighthouse 2 Skillion Walk Organisers • Brisbane Water Police • Terrigal Area Residents Association • Local Members of Parliament • Community Environment Network • State Government Agencies • Crowne Plaza Hotel • Diving Club • Local Property Owners • Personal trainers in the area • Diverse range of retail outlet, residents and tourists

Stage	Timing	Key purpose of engagement	Key messages	Key engagement activities	Stakeholders targeted
Planning	Ongoing	Collaborate	Seek formal approvals for planned works	Written correspondence	<ul style="list-style-type: none"> • NSW Fisheries • NSW Crown Lands • NSW Roads and Maritime Services
Pre-Construction	ASAP	Inform	<ul style="list-style-type: none"> • Scope of works • Timing • Construction impacts • Identify Central Coast Council contact 	<ul style="list-style-type: none"> • Website • Letterbox drop • Media • Electronic signboard 	<ul style="list-style-type: none"> • Affected business owners • Affected residents • Foreshore users • Darkinjung LALC • Guringai Tribal Link Aboriginal Corp.
Construction	Early 2019	Inform	<ul style="list-style-type: none"> • Update timing of works • Reinforce construction impacts • Identify Contractor 	<ul style="list-style-type: none"> • Website • Letterbox drop • Media 	<ul style="list-style-type: none"> • Affected business owners • Affected residents • Foreshore users

6 Environmental Assessment

6.1 General

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

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the guidelines Is an EIS required? (DUAP 1995) as required under clause 228(1) of the EP&A Regulation. The factors specified in clause 228(2) of the EP&A Regulation are also considered in section 7.1.

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

Also detailed in this Chapter of the REF is how the proposal would be managed through environmental management plans and specific safeguards, to reduce potential adverse environmental impacts throughout detailed design, construction and operation. Safeguards and mitigation measures have been developed in accordance with Clause 228 of the EP&A Regulation.

The relevant tables detailed in each respective section include a comprehensive list of safeguards and mitigation measures that include “pre-construction”, “construction” and “operation” mitigation measures. This list may not be definitive as any additional measures detailed in the as part of the determination of the proposal must also be included.

6.1.1 Construction Environmental Management

The majority of the mitigation measures outlined in this REF relate to the construction phase. To construct the boardwalk, the successful contractor would be required to prepare a Construction Environmental Management Plan (CEMP). The CEMP would identify the responsibilities for implementing environmental control measures, undertaking environmental reporting requirements, and for compliance monitoring. The CEMP would present all the required actions to be undertaken to fully comply with the mitigation measures presented in this REF, with any other conditions attached to other approvals or permits granted for the proposal.

6.1.2 Safeguards and Management Measures

The general environmental safeguards for the proposal are listed below.

General
Pre-Construction
<ul style="list-style-type: none"> • Council would appoint an appropriately qualified and experienced contractor and project manager to oversee the delivery of the boardwalk.
<ul style="list-style-type: none"> • A project risk assessment including environmental aspects and impacts would be undertaken prior to the commencement of construction.
<ul style="list-style-type: none"> • A CEMP would be prepared by the Contractor prior to construction commences and implemented during construction.
<ul style="list-style-type: none"> • A consultation and stakeholder involvement plan would be implemented during construction as part of the CEMP. The plan would include the names and contact details of a nominated person for the receipt of all complaints.
Construction
<ul style="list-style-type: none"> • Maintain the site in a tidy manner.
<ul style="list-style-type: none"> • Regular inspections by the site-based environmental manager to monitor environmental compliance and performance during construction.

6.2 Physical Environment

This section describes the hydrodynamic and physical environmental impacts on the aquatic and terrestrial environment associated with the proposal.

6.2.1 Existing Environment

Topography

The proposal would run parallel to the coastline along the headland between Terrigal Beach and The Haven. The topography of the headland is of variable steepness along the length of the proposal, and includes a rocky platform adjacent to Terrigal rockpool.

Geology and Geomorphology

Reference to the 1:100,000 geological map of Gosford-Lake Macquarie indicates that the site is underlain by the Terrigal Formation, which is characterised by sandstone with some shale and clay deposits. This is consistent with the encountered conditions observed during the investigation.

The proposal footprint can be classified into three distinct geomorphological zones as shown in Figure 7.

The ground conditions encountered in each zone are summarised in Table 9. The relevant mitigation measures that have considered the existing geology and geomorphology are detailed in section 6.2.3.

Table 9: Summary of ground conditions

Zone	Description	Ground conditions
Zone 1	Wave-cut platform Exposed rock creating the headland between Terrigal Beach and The Haven	Exposed sandstone and shale bedrock of the Terrigal Formation. The wave-cut platform is a sandstone bed approximately 1.6 metre thick. It has minor weathered interbeds of shale resulting in undercutting of the rock platform. The cliff behind the wave-cut platform is approximately 14 metres high. It is formed of soil and/or extremely weathered rock, overlying interbedded weathered layers of sandstone and shale. Vegetation has established on top of the cliff. Notable rockfalls in the area have occurred in 1994, 1997 and 2018.
Zone 2	Tidal Zone	Shallow marine sands overlying the base Terrigal Formation of sandstone and shale bedrock. Exposed rock can be seen in the shallow water.
Zone 3	Beach zone	Shallow marine sands (approximately one metre deep) overlying the Terrigal Formation of sandstone and shale bedrock.

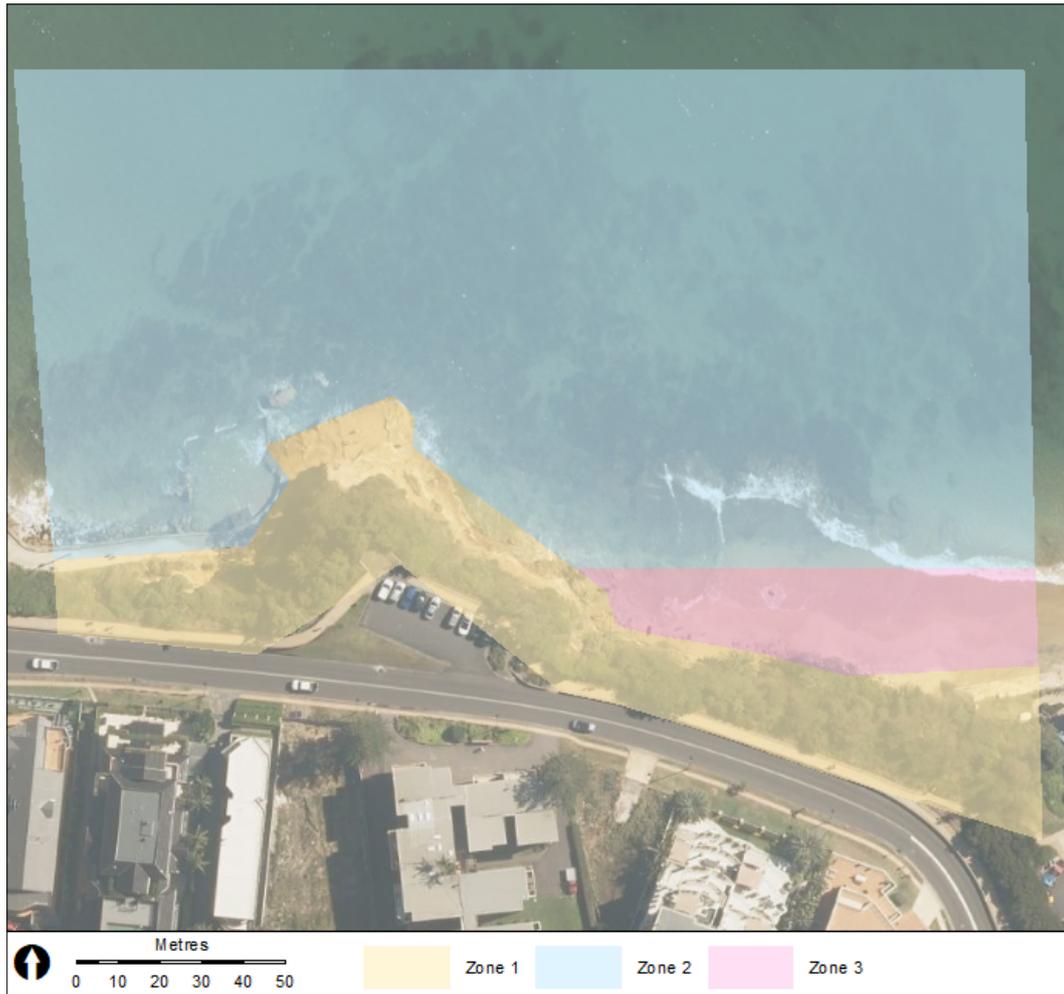


Figure 7: Distinct geomorphological zones across the proposal

Soils

The proposal may have minor impacts on soil along the headland area south of the proposal, particularly at the western and eastern tie-in areas at Terrigal Beach and The Haven respectively. For completeness, the existing soil conditions have been presented below.

Acid Sulfate Soils

A review of the Gosford LEP 2014 Acid Sulfate Soils map indicated that the proposal footprint is classified as having Class 5 acid sulfate soils, identifying that the proposal not underlain by actual or potential acid sulfate soils.

Contaminated land

There are no contaminated land records, or associated notices or prosecutions issued by the Environment Protection Authority (NSW EPA) on or local to the proposal footprint.

There are no operations on or near the proposal footprint that are listed on the POEO Act register. The area also holds no development history involving activities that present an associated contamination risk. Therefore, the risk of existing contamination at the site is low.

Surface, Groundwater and Flooding

Rainfall within the proposal footprint would either flow over the exposed rock areas or permeate into the marine sands. Rainfall across the remainder of the proposal footprint covering Terrigal Esplanade/Scenic Highway is collected by a kerb and gutter system and discharged unattenuated at the southern end of Terrigal Beach. The quantity, rate and volume of runoff is considered insufficient to have had any coastal process or morphological impact.

Four boreholes were drilled in 2018 along the eastern side of the proposal footprint around the rock platform to the Haven precinct confirmed groundwater to be about 0.5 metres below ground level (mbgl).

Based on flood mapping (Gosford City Council, 2015) the proposal footprint is not located within flood prone land.

Coastal Environment

The coastline at Terrigal is influenced by tidal, wave and storm conditions. Over time, these conditions are expected to change in response to predicted climate change and sea-level rise.

Tides and Storm Conditions

The data in Table 10 is taken from the Australian National Tide Tables (2018) for Fort Denison. The tide levels at this location are assumed to be representative of open coast water levels, and are therefore adopted for the site at Terrigal Beach. This data shows that there is about a 2.1 metre change in tide height in the area, which is not anticipated to change over the next 50-years. However, the maximum height is expected to increase by 0.4 metres as a result of climate change.

Table 10: Tide levels at Fort Denison shown at metres above chart and Australian height datum.

Tide Level	Present Day (2018)		Year 2069	
	(CD ¹)	(AHD)	(CD)	(AHD)
Highest astronomical tide (HAT)	2.1	1.2	2.5	1.6
Mean water level (MWL)	1.01	0.1	1.4	0.5
Lowest astronomical tide (LAT)	0.0	-0.9	0.4	-0.5

CD = Chart Datum which approximates to LAT and is about 0.93m below Australian Height Datum (AHD).

During extreme weather events, there can be an additional increase in average sea level height due to storm surge. At the open coast, storm surge can cause the water level to rise up to 0.6 metres above the highest astronomical tide (Worley Parsons, 2004).

Waves

The coastal processes experienced at Terrigal are largely influenced by the offshore wave climate from the east. Using model and study data (Worley Parsons, 2004 and Lawson and Treloar, 1984) it is predicted that during a 100-year storm event, the peak wave period can rise to 11.6 seconds, with a significant wave height at the site of 2.5 metres.

Sea Level Rise

Council adopts a medium local sea rise projection for determining future hazards when planning for development in the LGA. This projection is based on a prediction of how concentrations of greenhouse gases in the atmosphere will change in the future because of human activities. Therefore, the proposed height of the boardwalk has been increased by about 0.5 metres to account for the projected sea level rise over the next 50 years.

Coastal Hazard

General

Net sediment transport in the region where waves break and at the shoreline of Terrigal Beach primarily results from two processes. These processes are termed longshore sediment transport and onshore/offshore (cross-shore) sediment transport. Windblown sand (aeolian transport) as well as stormwater systems and lagoon entrances may also contribute to the movement of sediment on the beach.

Longshore Sediment Transport

During storm events, Terrigal Beach experiences net northerly alongshore sediment transport offshore over the reef systems. Due to rip currents during storms, sand is transported offshore to the reef where it cannot return to the active beach system. As a result, Terrigal Beach is assumed to experience long term recession.

Onshore/Offshore Sediment Transport

The onshore movement of sand under low swell conditions would also be prevented by these reef systems. It should be noted however, that local rips may occur at any location along the beach.

Aeolian Sediment Transport

Terrigal Beach is not expected to experience any significant aeolian sediment transport due to the proximity of development and vegetation to the beach.

Sediment Transport at Stormwater Systems

At the south end of Terrigal Beach, a box culvert with seven openings and surrounding rock protection provides local scour, but has minimal impact on coastal processes.

Bushfire Risk

A review of the NSW Rural Fire Service mapping indicates that part of the proposal footprint is located within bushfire prone land. However, the risk of a bushfire impacting upon the proposal is considered to be low.

6.2.2 Impact Assessment

Construction

Hydrodynamic Effects

The proposal involves activities that would cause physical disturbance to the aquatic environment. These include piling and the installation of the prefabricated superstructure elements using a barge mounted crane. The scale of the disturbance would be minimal and insufficient to cause any dynamic changes in current speed, wave characteristics or flushing.

Localised Sediment Disturbance, Turbidity and Smothering

The proposal construction footprint is within an area of subtidal sand and sub-benthic sediment. As such, the proposed pile installation and use of temporary jack-ups would cause limited sediment disturbance over a small area and this would only occur where work takes place over the sub-benthic sediment.

Locally, the distributed coarser sediments would settle out of suspension almost immediately while the finer sediments could mobilise over a greater area as they would remain buoyant in the water column.

As most of the sediment is expected to settle out of suspension within a few minutes there is expected to be no risk of turbidity. Also, the small amount of sediment generated under the proposal would mean there is no predicted or expected smothering impacts. Any impacts would be further limited by the proposal to undertake the piling work at night under calm conditions, when there would be the least water movement.

Accidental Spills

The materials required for the proposal would be generally inert and harmless except for the small quantities of welding materials, lubricants, solvents, fuels and oils. As such, there would be some potential for:

- Accidental spills, including:
 - Accidents during loading, unloading and installation work.
 - Leaks and drips from poorly maintained machinery and equipment.
 - The mismanaged storage of waste materials, including potential for debris to enter the water.
- These risks would be greater when undertaking work over, or in, the ocean namely:

- Drilling / hammering the piles.
- Transferring equipment and machinery.
- Installing the substructures and superstructures.

The principal impact from any spills would be pollution and water quality impacts on the aquatic environment. The impact would depend on the quantity and type of material spilt. However, providing relevant standard controls are implemented the impacts are expected to be minimised.

Accidental material spill within the ancillary facility may occur from storing, handing and/or transferring the required small volumes of welding materials, lubricants, solvents, fuels, oils and diesels.

Erosion and Scour

Any work taking place in the aquatic environment has the potential to cause erosion and scour impacts. This is caused from introducing new structures typically on, or close to, the ocean floor, as this may alter sediment transport patterns.

During construction of the proposal, the temporary use of jack-ups during lifting and piling work would be the only equipment that would impact on the ocean floor. However, the associated equipment would only be in place for a few weeks. Some localised impacts are expected within a few metres of where jack and/or anchor point would be temporarily installed, however this would be an insufficient amount of time to cause any material scour or erosional impacts. The number of jack-ups/anchors would be reduced to the minimum required, and where possible, the placement of these locations would be selected to avoid areas of sensitive habitat.

Terrestrial Impacts

There are unlikely to be any earthworks proposed, with the extent of excavation limited to the tie-in area at The Haven. As such, the potential for causing soil erosion or sediment laden runoff would be minor.

Accidental spills within the site compound may occur from storing, handing and/or transferring the required small volumes of welding materials, lubricants, solvents, fuels, oils and diesels.

No operational impacts to terrestrial soils are anticipated, as no significant change to existing operations is proposed.

Operation

Erosion and Scour

Piles would be installed into rock along the foreshore. As water flows around these structures there is the potential to create local scour and erosion. However, the conditions under which erosion and scour occur in the aquatic environment vary depending on local sediment conditions and hydrodynamics. In this location, the only expected impacts would be limited to within a few metres of each pile.

Accidental Spills

There is always the potential for an accidental spill or discharge during operation. While this is the case, it would be managed under standard controls. As such, the impacts are expected to be safeguarded against and therefore minimised.

6.2.3 Safeguards and Management Measures

Sea Level Rise
<p>Operation</p> <ul style="list-style-type: none"> The boardwalk would be elevated to a height of 4.5m AHD to avoid impacts of wave, tidal, storm and future sea level rise conditions. During extreme inundation events, the boardwalk would be closed.
Water Quality
<p>Construction</p> <ul style="list-style-type: none"> Water quality control measures would be implemented to prevent any materials leaving the established site (e.g. sediment entering drain inlet). All fuels, chemicals and liquids would be stored in an impervious bunded area a minimum of 40m away from flooded or poorly drained areas. Measures would be implemented to ensure debris is not tracked off site and onto public roads e.g. vehicle wash downs, street sweeping etc. Emergency spill kits would be kept on site at all times. All staff to be made aware of the location of the spill kit and be trained in its use.
Erosion and Sediment Control
<p>Construction</p> <ul style="list-style-type: none"> Erosion and sediment control measures would be implemented and maintained to: <ul style="list-style-type: none"> Mitigate the risk of rockfall during construction Prevent sediment moving off site and sediment-laden water entering any water course, drainage lines, or drain inlets. Reduce water velocity and capture sediment on site. Minimise the amount of material transported from site to surrounding pavement surfaces. Divert clean water around the site. Erosion and sedimentation controls would be checked and maintained on a regular (including clearing of sediment from behind barriers) by the appointed Site Construction Contractor. Erosion and sediment control measures would not be removed until the works are complete or areas are stabilised.

6.3 Landscape and Visual

This section describes the proposal's impacts on the landscape character and visual amenity of the area. The full landscape and visual assessment is provided in **Appendix B**.

6.3.1 Method

The study area covers the theoretical extent (zone) of the proposal's visual impact, roughly 350 metres around the proposal footprint.

Landscape character is a composition of the built, natural and cultural aspects that make up an area and provide a sense of place. Visual amenity relates to how people relate to an area's landscape character.

The landscape can be divided into distinct zones with similar characteristics. Viewpoints representative of sensitive locations within the landscape are then selected.

An impact assessment is made by defining how sensitive the characteristics of the landscape are to the scale of changes (magnitude) introduced by the proposal. Also considered are how sensitive the visual receivers are to the impacts on the landscape character. In combination, this defines an impact rating based on the following combination of the sensitivity of the landscape character (zone) and magnitude of change introduced by the proposal.

Table 11: Landscape character and visual amenity impact ratings

	High	Moderate	Low	Negligible
High	High Impact	High Moderate Impact	Moderate Impact	Negligible Impact
Moderate	High -Moderate Impact	Moderate Impact	Moderate - Low Impact	Negligible Impact
Low	Moderate Impact	Moderate - Low Impact	Low impact	Negligible Impact
Negligible	Negligible Impact	Negligible Impact	Negligible Impact	Negligible Impact

Source: Roads and Maritime (2013)

6.3.2 Existing Environment

Terrigal is characterised by a north facing beach foreshore (Terrigal Beach and Haven Beach) with headland that extends the extent of the proposal. The surrounding area includes retail, commercial, residential at Terrigal CBD and along the Scenic Highway/Terrigal Esplanade with extensive public recreational land uses extending from Broken Head to the Skillion.

Landscape Character Zones

The study area was divided into four landscape character zones (LCZ) as shown in Figure 8.



Figure 8: Landscape Character Zones

A description of the land use characteristics and sensitivity to change for each of the LCZs identified is detailed in Table 12.

Table 12: Landscape character zones

Zone	Land use characteristics	Sensitivity to change
LCZ 1: The Haven Open Space	<ul style="list-style-type: none"> • Flanked by Broken Head and The Skillion headlands. • Large area of well used turfed open space comprising playing fields, car parking and café. • Open landscape with extensive views towards the ocean, particularly from the elevated headlands either side. • The headlands include stands of dense coastal vegetation. 	<u>High</u> sensitivity: <ul style="list-style-type: none"> • A scenic and popular area of open space.
LCZ 2: The Haven Beach and Rock Platform	<ul style="list-style-type: none"> • Approximately 200m long steep, open and sandy beach, tucked between Broken Head and the rock platform that separates it from Terrigal Beach. • The beach faces north to northwest and is a popular for launching boats for fishing, recreation and diving. • The beach is backed by several car parks, an oval and café, as well as dense vegetation along the western cliff face. • A large stepped sandstone seawall extends along much of the beach. • The exposed rock face and intertidal zone around the rock platform contribute strongly to the scenic nature of the landscape 	<u>High</u> sensitivity: <ul style="list-style-type: none"> • Little existing built form is present.
LCZ 3: Terrigal Esplanade Residential Development	<ul style="list-style-type: none"> • Multi-storey apartment buildings along the southern side of the Scenic Highway/Terrigal Esplanade, facing the ocean. 	<u>Moderate</u> sensitivity: <ul style="list-style-type: none"> • Multi-storey apartment buildings have a sensitivity to change in the landscape.
LCZ 4: Terrigal Beach	<ul style="list-style-type: none"> • Terrigal Beach is a 2.8km long stretch of sand that trends southwest from the rocks on the north side of Wamberal Lagoon and finishes at the rocks on the southern end of Terrigal Beach. • A foreshore reserve lies between the road and the beach and contains Terrigal Surf Life Saving Club (built in 1924), car parking and a park. • A shopping centre and a large resort backs the southern half of the beach. 	<u>Moderate</u> sensitivity: <ul style="list-style-type: none"> • LCZ has a scenic setting a sensitivity to change in the landscape.

Viewpoints and Receivers

Figure 9 shows the zone of visual influence or the visual envelope, which is the maximum area over which the proposal would be visible. It extends east and west along the foreshore and is limited to the south by vegetation and topography of the headland.

The figure does not include the extents from which the proposal would be visible from the ocean. This viewpoint would be presented as part of additional imagery provided to the community during the consultation period (refer to section 5).



Figure 9: Visual envelope

Five viewpoints (refer to Figure 10) were selected to represent the range of sensitive receivers in the visual envelope.



Figure 10: Viewpoints assessed

A description of the viewpoints and sensitivities are detailed in Table 12. Also presented in the figures following Table 12 is the approximate location of the proposal (indicated in yellow), with the extended sea wall in grey.

For all viewpoints, it should be noted that the selection of appropriate materials and finishes for the boardwalk would help integrate the structure into the landscape and likely reduce the visual impact.

Table 13: Viewpoint and receiver sensitivities

Viewpoint and location		Direction	Receiver representation and sensitivity
VP1	The Haven beach (Reef Restaurant)	West	<p><u>High</u> sensitivity:</p> <ul style="list-style-type: none"> Existing view takes in the restaurant, sandstone sea wall and extends along the sand to the western end of the beach, ending at the cliff backed rock platform. The existing coastal rocks in this location are exposed at low tide, with the view changing subtly during the day. View is scenic with limited built form visible along the western stretch of beach.
VP2	Outlook from the rock platform between Terrigal and The Haven beaches	East	<p><u>High</u> sensitivity:</p> <ul style="list-style-type: none"> The outlook extends over the rocky intertidal zone along the partly vegetated cliff line, beach and Reef Restaurant to the open space of The Haven. The mix of sand, rock and ocean is highly picturesque. There is no existing path connecting the two sides of the beach which makes accessibility to the rock platform challenging and dangerous at times, including the risk of rockfall.
VP3	The ramped path leading to the Terrigal rockpool and rock platform at the southern end of Terrigal Beach	East	<p><u>High</u> sensitivity:</p> <ul style="list-style-type: none"> The partially vegetated sandstone cliff rises behind the path and blocks views beyond it. The mix of sand, rock and ocean is highly picturesque.
VP4	Pedestrians and cyclists from the elevated path alongside Scenic Highway/Terrigal Esplanade at the southern end of Terrigal Beach	North-east	<p><u>Moderate</u> sensitivity:</p> <ul style="list-style-type: none"> Panoramic ocean views extend over the vegetated sandstone cliff in the foreground towards the Terrigal rockpool, rock platform and the ocean off Terrigal Beach. The mix of sand, rock and ocean is picturesque although some built form is visible.
VP5	Beach users looking west along Terrigal Beach	East	<p><u>Moderate</u> sensitivity:</p> <ul style="list-style-type: none"> The existing view takes in an existing sandstone retaining wall, lighting columns, footpath, Terrigal rockpool, rock platform and sandstone cliffs separating Terrigal from The Haven Beach. The elevated topography of Broken Head is in the background. The view is scenic with some limited built form visible.



Viewpoint 1 – Looking west along The Haven Beach towards the rock platform and Terrigal Beach



Viewpoint 2 – Looking east towards The Haven from the rock platform



Viewpoint 3 – Existing view west from ramped pathway along southern end of Terrigal Beach



Viewpoint 4 – Existing view north west from path along Terrigal Esplanade



Viewpoint 5 – Existing view west from Terrigal Beach

6.3.3 Impact Assessment

Construction

Certain landscape character and visual impacts would first occur during construction because of the introduction of equipment, work platforms, mobile cranes and construction equipment along the road corridor.

This work would have the greatest impact on the values associated with LCZ 2 and LCZ 4 where the effects would be:

- Loss of the composition of the landscape character and its setting.
- Removal of components and the visual separation along the shoreline and connection between Terrigal Beach and The Haven.
- Temporary introduction of machinery and equipment into the landscape, affecting the overall amenity and setting.

Construction of the proposal would temporarily affect the visual amenity of most the receivers in Table 15. This would be most notable for those residents overlooking the construction works (VP1) who may be affected for up to six months. The magnitude of impact would depend on the stage of construction and proximity of the work. It is expected that the greatest amenity impacts would take place during the drilling phases and when the prefabricated boardwalk structures are being lifted into place.

Operation

Landscape Character Assessment

Table 14: Landscape character assessment

Zone	Description of changes to LCZ	Sensitivity	Magnitude	Impact
LCZ 1	Located outside of this LCZ and is not expected to impact the spatial quality of The Haven open space.	High	Negligible	<u>Negligible</u>
LCZ 2	<p>The boardwalk and associated sea wall would likely form prominent new built form elements along the western end of the beach and adjacent rock platform.</p> <p>While improving access to the beach, the boardwalk would alter the existing natural setting, reducing the visibility of the rock platform from the eastern end of the beach and spatially dividing the western end of the beach from the adjacent cliff.</p> <p>Access would be reduced to a small section of the beach. There would also be a slight increase in overshadowing beneath and adjacent to the boardwalk structure.</p>	High	Moderate	<u>Moderate/High</u>
LCZ 3	The proposal is located at a lower elevation to these dwellings, obscured by vegetation and topography.	Moderate	Negligible	<u>Negligible</u>
LCZ 4	The boardwalk and associated retaining walls would form prominent new built form elements along this section of the cliff and rock platform.	Moderate	Moderate	<u>Moderate</u>

Overall, the landscape character assessment indicates that the proposal would have the greatest impact on LCZ 2, with moderate impacts at LCZ 4 and negligible impacts at the other two established character zones.

Visual Impact Assessment

Table 15: Visual impact ratings

ID	Viewpoint location	Type of receiver	Sensitivity	Magnitude	Impact rating
VP1	The Haven Beach (Reef Restaurant)	Tourists, residents, restaurant customer	High	Moderate	<u>Moderate/High</u>
VP2	Outlook from the rock platform between Terrigal and The Haven beaches	Tourists, residents,	High	Low	<u>Moderate</u>
VP3	The ramped path leading to the Terrigal rockpool and rock platform at the southern end of Terrigal Beach	Tourists, residents,	High	Low	<u>Moderate</u>
VP4	Pedestrians and cyclists from the elevated path alongside Scenic Highway/Terrigal Esplanade at the southern end of Terrigal Beach	Pedestrians, cyclists	Moderate	Low	<u>Moderate/Low</u>
VP5	Beach users looking west along Terrigal Beach	Tourists, residents,	Moderate	Moderate	<u>Moderate</u>

Overall, the visual impact assessment indicates that the proposal would have the greatest impact on VP1, with moderate or moderate/low impacts at the other four established viewpoints.

6.3.4 Safeguards and Management Measures

Landscape and Visual
Construction
<ul style="list-style-type: none"> • Locate storage areas and associated ancillary works in cleared or otherwise disturbed areas. • Retain and protect existing trees and vegetation adjacent to the works where possible, minimising clearing where possible. • Restore all areas disturbed by construction to existing condition. • Trim headland trees (if required) rather than remove them. Works to be undertaken by a qualified arborist.
Operation
<ul style="list-style-type: none"> • Limit visual contrast and reflectivity of boardwalk structure through appropriate colour choice for built form materials. • Minimise boardwalk deck thickness where possible to decrease visual profile. • Ensure the size and number of supporting columns is minimised where possible. • Ensure any infill to base of columns compliments the colour and texture of the existing rock. • Ensure retaining walls and sea walls visually integrate with existing landscape through appropriate selection of materials. • Provide high quality finishes to boardwalk to facilitate long term durability of the design for effect with minimal maintenance. • Ensure components are considered as a whole, creating a cohesive design language. • Provide new landscape planting to integrate into the eastern end of boardwalk with existing setting. • Plant selection to consider longevity and ongoing maintenance.

6.4 Biodiversity

This section summarises the proposal's marine and terrestrial biodiversity impacts.

6.4.1 Method

The biodiversity values of the site were assessed using desktop methods and an ecological site inspection. Desktop methods included:

- Searches of the Office of Environment (OEH) BioNet database for threatened species records within 5km of the proposal footprint.
- EPBC Act Protected Matters Search Tool for a 5km buffer from the proposal footprint.
- Review of recent aerial photography obtained from the NSW Government (2016).

The site inspection was completed on the 13 June 2018 by an Arup terrestrial ecologist and a marine ecologist. During the site inspection, the proposal footprint and surrounds was traversed on foot, with a focus on the intertidal areas of the site. Due to limitations associated with safe access on the headland area, most of the vegetated areas on the headland were not able to be accessed directly. All the observations on terrestrial vegetation communities and fauna habitats were completed from the existing pathway on top of the slope or from the beach and lower rock outcrop.

The marine surveys involved traversing the intertidal zone during low tide on foot. All marine habitats were recorded, with a focus on the species and coverage of any seagrass or macroalgae communities.

The results of the desktop and field investigations have been used to describe the ecological features of the proposal footprint. Maps of the terrestrial and marine vegetation communities and habitats have been prepared using GIS and the results of the site inspection. This baseline information has been used to complete an assessment of the likelihood of occurrence of threatened species, listed under the BC Act and the EPBC Act.

6.4.2 Existing Environment

The proposal is located in the Wyong sub-bioregion, within the Sydney Basin bioregion as defined by the Interim Biogeographic Region of Australia framework. Surrounding land include areas of urban development and public open space, with areas of steep rocky headlands and coastal cliffs where native vegetation and habitats have been retained. Terrigal Beach is located adjacent to the proposal, to the north-west.

The proposal is located in a coastal environment, with the alignment traversing a stretch of sandy beach, intertidal rock pools and across a sandstone headland. These intertidal areas are largely intact and have not been subject to historical disturbance associated with previous development. On the eastern edge of the intertidal zone there is an existing tidal swimming pool, with a constructed wall extending seaward and constructed rock steps.

The terrestrial biodiversity elements of the proposal footprint consist of small patches of native vegetation on steep, sandstone cliffs. There has been previous development on the headland for transport infrastructure, with a road and footpath along the southern boundary of the proposal. Due to this disturbance, there is high weed and exotic cover within the coastal headland vegetation communities retained in the proposal footprint.

Native Vegetation

The native vegetation cover within the proposal footprint is contained to small patches on steep slopes and upper crest of the headland. The condition of the vegetation communities across the proposal footprint can generally be described as a degraded condition. A summary of the vegetation communities identified within the proposal footprint is provided in Table 16 and Figure 11.

Table 16: Vegetation communities within the proposal footprint.

Vegetation community	Description	Photograph
Managed native and exotic grasses	On the eastern side of the proposal footprint, there is shallow slope of mown grass. The area likely contained Prickly Couch <i>Zoysia macrantha</i> and Green Couch <i>Cynodon dactylon</i> .	
Coastal headland heath	There is a small patch of coastal headland heath located on the most seaward edge of the proposal footprint. Access to this area was limited, however species belonging to <i>Allocasuarina</i> , <i>Melaleuca</i> , <i>Banksia</i> , <i>Leptospermum</i> and <i>Kunzea</i> were present.	
Mixed open forest and shrubland	This vegetation community is the most common throughout the proposal footprint. Native trees observed include Sweet Pittosporum <i>Pitosporum undulatum</i> , Coastal Banksia <i>Banksia integrifolia</i> , <i>Melaleuca sp.</i> and Tuckeroo <i>Cupaniopsis anacardioides</i> ,	

Vegetation community	Description	Photograph
Exotic and native grasses, vines and sedges	This vegetation community is not shown in Figure 11, as it only occurs on the steep seaward facing slopes of the headland. This area contains a mixture of native and exotic grasses, vines, sedges and forbs. There are large areas that are covered by <i>Aloe sp.</i>	



Figure 11: Terrestrial vegetation communities

Native Fauna and Habitats

During the site investigation, only common, least concern birds and lizards were directly observed foraging within the area of terrestrial vegetation on the headland and on the beach. Despite the small size and generally poor condition of this vegetation there are still some habitat resources that may support common, urban-adapted species.

The native vegetation within the proposal footprint is a small, fragmented patch of habitat, with limited connectivity to other habitat areas. The patch may provide some connectivity values as a stepping stone for more mobile species that are well adapted to urban environments.

Marine Ecology

The marine environment within the study area provides a range of habitats including:

- Coastal headland vegetation (degraded and dominated by weed species).
- Open exposed and intertidal sand.
- Intertidal/subtidal bedrock and boulders (highly diverse marine flora and fauna).
- Exposed sandstone (with scattered benthic species).

These features provide a diverse assortment of habitat for coastal bird species and intertidal species (dominated by macroalgae, molluscs and encrusting sponges). The Terrigal sandstone headland is surrounded by a typical intertidal community that are common along semi-exposed coast line of Central Coast NSW.

Surrounding the sandstone headland are diverse intertidal habitats dominated by macroalgae beds, from the rock pool around the front extending to the east of the headland. Closer to the beach area of the headland there are sand deposits with boulders covered in encrusting coralline algae, and some macroalgae attached to the boulders and progressing towards the exposed beach. To the east of the headland, large ascidian beds dominate the exposed bed rock between the exposed beach and subtidal macroalgae beds. Note that no seagrass meadows were observed during the site investigation, nor are they known to occur in this area.

The marine and intertidal habitat communities are described in Table 17 with their distribution in the proposal footprint shown in Figure 12.

Table 17: Marine habitat community descriptions.

Marine intertidal communities	Description	Photograph
<p>Diverse Macroalgae beds</p>	<p>These macroalgae beds on boulders and bed rock are dominated by:</p> <ul style="list-style-type: none"> • Green strap algae (<i>Caulerpa filiformis</i>). • <i>Sargassum sp.</i> • Fan brown algae (Dictyotaceae – Padina). • Coralline algae. <p>Amongst the algae were fish, a range of gastropods, octopus and crustaceans.</p>	
<p>Sand deposits with boulders</p>	<p>This region was a transition habitat between the macroalgae beds with greater regions of exposed and mobile sands utilised by fish coming in with the tide to access habitat and feeding grounds in and amongst the boulders. Macroalgae is less prevalent here and dominated by encrusting coralline algae.</p>	
<p>Ascidian beds</p>	<p>Further east of the headland there are large ascidian beds (<i>Pyura stolinifera</i>) that cover exposed bedrock within the intertidal section before the beach area.</p>	

Marine intertidal communities	Description	Photograph
<p>Exposed sand stone walls</p>	<p>Along the wall of the sand stone headland there are washed out crevasses containing a host of gastropods, barnacles, limpets and chitons.</p>	
<p>Sand (beach)</p>	<p>The sand is composed of mobile exposed sands with no marine vegetation cover.</p>	



Figure 12: Marine and intertidal communities

Threatened Species and Ecological Communities

No threatened species or ecological communities, as defined in the BC Act, FM Act or EPBC Act were directly observed on the site. An assessment of the potential for threatened species previously recorded within 5km of the proposal footprint in the BioNet database to occur within the proposal footprint has been carried out. The criteria for likelihood of occurrence in the proposal footprint is summarised in Table 18, and is based on the type, quality and size of the habitat features in the proposal footprint. The full assessment of potential species is provided in **Appendix C**.

Details on the habitat characteristics of each species used in the assessment in Table 18 has been taken from the OEH species profiles website.

Table 18: Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey.
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
Negligible	Suitable habitat is absent from the study area.

No threatened species have been assessed as having a high likelihood of occurrence within the proposal footprint (see **Appendix C**). This is largely due to the very small area of good quality, terrestrial habitat within the proposal footprint located on the upper slopes and crest of the headland area.

There are five species that have been assessed as having a moderate likelihood of occurrence within the proposal footprint. These species are known to occur in coastal habitats, particularly beaches, dunes and coastal headlands and include:

- Coast Headland Pea *Pultenaea maritima*.
- Sand Spurge *Chamaesyce psammogeton*.
- Pied Oystercatcher *Haematopus longirostris*.
- White-bellied Sea-eagle *Haliaeetus leucogaster*.
- Grey-headed Flying-fox *Pteropus poliocephalus*.

Potential habitat for Sand Spurge is located on the beach and lower slopes of the headland, where it joins the beach and sand exists for growth. Coast Headland Pea may occur in the area of coastal headland heath.

Pied Oystercatchers may forage and nest on the beach during low tide, but are less likely to use the rocky headland areas of the proposal footprint.

White-bellied Sea-eagles may forage over the site, and there is a potential for a nest to be established in some of the larger trees on the headland. No nests were observed during the site investigation and there are no historical records of nesting within or adjacent to the site..

Grey-headed Flying Foxes may also be transient visitors to the site, with foraging resources present in the form of flowering or fruiting trees. There are no known roosts within close proximity to the proposal footprint. The nearest, known flying-fox camp is located approximately 1.5km to the south-west of the site.

Within the marine environment there is a low likelihood that Black Rock Cod *Epinephelus daemeli* would occur in the rocky intertidal area. Impacts to this habitat would be restricted to the installation of piles only.

Weeds and Pests

The patch of native and exotic vegetation on the slope and crest of the headland had a relatively high cover of weed and exotic species. The following Weeds of National Significance were directly observed during the ecological site inspection:

- Climbing Asparagus Fern *Asparagus aethiopicus*.
- Lantana *Lantana camara*.

6.4.3 Impact Assessment

The proposal is unlikely to result in a significant affect threatened species that have been assessed to have a moderate likelihood of occurrence within the proposal footprint. The results of this assessment against the requirements of Section 7.3 of the BC Act are provided in Table 19.

Table 19: Test of significance of impacts on threatened species

Criteria	Proposal response
<p>In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction</p>	<p>The proposed development is not expected to have an adverse impact on any threatened species that are considered to have a moderate likelihood of occurrence within or adjacent to the proposal footprint.</p> <p>The construction of the boardwalk would not impact on any of the coastal heath or open forest communities on the headland, that may provide habitat for Sand Spurge and Coast Headland Pea.</p> <p>Impacts to foraging and roosting areas for Pied Oystercatcher are minor, with some impacts to the sandy beach at the toe of the headland only.</p> <p>Nesting and roosting resources for White-bellied Sea-eagle would also not be directly impacted, and the proposal would not impact on the ability of this species to forage in surrounding waters.</p> <p>There would also be no loss of foraging resources for any Grey-headed Flying-foxes that may visit the proposal footprint.</p>
<p>In the case of an endangered ecological community or critically endangered ecological community, whether the proposed</p>	<p>There are no endangered or critically endangered ecological communities located within the proposal footprint.</p>

Criteria	Proposal response
<p>development or activity:</p> <ul style="list-style-type: none"> 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 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 	
<p>In relation to the habitat of a threatened species or ecological community:</p> <ul style="list-style-type: none"> the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and 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 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, 	<p>The construction of the boardwalk would not directly impact on any of the terrestrial habitat resources within the proposal footprint. There would be some loss of bare sands on the beach and the rocky headland, through the installation of the piled structure. These areas do not provide important resources for any threatened species.</p> <p>The proposal would not result in any fragmentation or isolation of terrestrial habitats.</p>
<p>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),</p>	<p>There are no areas of outstanding biodiversity value that would be impacted by the proposal.</p>
<p>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</p>	<p>The proposal may result in an increased impact associated with the following key threatening processes:</p> <ul style="list-style-type: none"> Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments. Invasion and establishment of exotic vines and scramblers. Invasion, establishment and spread of Lantana. <p>These impacts are related to the construction phase of the proposal and can be managed as part of the Construction Environmental Management Plan for the proposal. Measures would need to be included for the management of litter and debris being released into the marine environment, and weed management to avoid the spread of Lantana and exotic vines and scramblers.</p>

The proposed development of the boardwalk around the Terrigal headland would result in some minor, direct impacts to the identified biodiversity features of the proposal footprint. All the direct impacts would occur within the intertidal and tidal zones of the proposal footprint, and on top of the lower rocky headland. The majority of the proposal footprint impacting on bare sands in the beach and the bare rock of the headland.

Based on the current footprint the proposal would result in the following approximate areas of impacts to tidal communities:

- Beach: 234 m²
- Sandstone headland: 125 m²
- Mixed sand and boulder: 92 m²
- Macroalgae beds: 98 m²

Based on the current footprint, impacts to the ascidian beds would be avoided.

The construction of the boardwalk would result in impacts to the intertidal zone. There is high potential to damage sections of the intertidal reach due to the required access needed to install piles and supporting structures. While various standard measures can be used to reduce the impact to the intertidal zone during construction not all impacts could be mitigated to the extent that some intertidal habitat would be lost. Over time however, the vegetation would re-establish, while additional habitat would likely establish on the boardwalk piers.

There will also be some longer-term impacts associated with shading underneath the boardwalk reducing light penetration to the macroalgae beds. Impacts could be further minimised if the designs consider ways to reduce shading (e.g. allowing light to filter through planks or using transparent material). Shading is expected to be incorporated into the design (refer to section 3.5). In addition, most of the boardwalk structure would sit closer to the rock wall where there is more open sand and the intertidal boulders rocky outcrop habitat becomes sparse. The greatest areas of impact are immediately around the sandstone outcrop where the dense and diverse intertidal/subtidal area is located. This area of shading in the macroalgae beds a maximum of 98 m². Due to the height and width of the structure, shading will not be complete and it is likely the macroalgae beds will be able to persist.

The proposal would have negligible impacts to terrestrial habitats, with some minor loss of native vegetation communities including the mixed open forest and shrubland along the cliff face from the proposed extension of the sea wall at the Haven precinct. This vegetation community is already disturbed by previous development and weed cover.

Once completed, the boardwalk structure would likely have minimal impact on the coastal vegetation and intertidal habitat.

6.4.4 Safeguards and Management Measures

Biodiversity
Pre-Construction
<ul style="list-style-type: none"> • Carry out a pre-clearing fauna survey to identify any nests or roosts within the proposal footprint. • Prepare a weed management plan for the removal and treatment of any weeds of national significance within the proposal footprint.
Construction
<ul style="list-style-type: none"> • If vegetation clearing is required, coastal headland species native to the region should be reinstated and where possible weed species should be removed. These actions would improve the habitat value of this stretch of vegetation. • Avoid where possible impacting on the diverse macroalgae beds and minimise impact by relocating vegetated/ habitat boulders in positions where piles and or temporary footings may be located. • Accessing the site during high tide and or low tide where minimal impact through bumping and or disturbing the macroalgae beds may occur. • Use minimal piles where possible. Consider one large pile vs multiple pile for each support location. Have a longer distance between pile locations. • Minimise the spread of access paths commit to one or two access locations to reduce impact extending outside access areas. • Avoid work during rough weather conditions inclusive of wind and wave action. • Remove and all temporary structures that may damage the surrounding areas during rough conditions and or once construction of a section is complete remove all temporary structures to reduce macroalgae and or marine fauna inhabiting the temporary structures.

6.5 Noise and Vibration

This section summarises the proposal's noise and vibration impacts.

6.5.1 Existing Environment

Ambient noise is largely influenced and dominated by crashing waves, road traffic along the Scenic Highway/Terrigal Esplanade, and general urban activity. Noise levels and local to the proposal footprint is affected by the sea-state, the strength of the waves and the direction of the wind. Typically, noise levels are far lower at night and in the early morning when the sea is calmer and urban activity is lower.

The noise sensitive receivers in the area include:

- Residential property along Scenic Highway/Terrigal Esplanade.
- Public open space, most notably including the foreshore and beach front at Terrigal Beach and The Haven.
- Community facilities at The Haven (recreational fields).
- Commercial properties at The Haven (Reef Restaurant).
- Marine mammals in the ocean.

6.5.2 Impact Assessment

Construction

During construction, noise would be generated from a range of activities. Likely key sources of construction noise would be generated during the piling works, and while mobile cranes, excavators and trucks are being used. Of these, the vibration generating activities are likely to be the piling activities, however none of the above receivers or respective in proximity to the site buildings are at risk of being sensitive to vibration impacts.

Indicatively, there are four construction zones where similar activities could be potentially taking place concurrently (refer to section 3.8). Noise would also be generated in establishing and operating the laydown areas, although this is expected to be completed prior to the main works commencing.

It is expected that during the construction period there may be intermittent noise impacts upon the receivers identified, particularly if activities across the established construction zones (see section 3.7) are occurring concurrently. It should be noted that the majority of noise generation would occur along the foreshore, so the headland between the residential receptors is likely to result in some natural noise mitigation.

Construction works are expected to be carried out during standard work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1 pm Saturdays). However, certain activities like piling may need to be undertaken during the night-time period while the wave climate is more favourable, which may have sleep disturbance.

It is recommended that the contractor complete a construction noise assessment when the proposed methodology is established to ensure that noise impacts are minimised where practical.

Operation

There are expected to be no operational noise impacts.

6.5.3 Safeguards and management measures

Noise and Vibration
Construction
<ul style="list-style-type: none"> Works are to be carried out during standard work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1 pm Saturdays) where possible. Outside of standard hours work should be minimised where possible. If required, (e.g. for piling) it should be approved by Council.
<ul style="list-style-type: none"> Preparation of a Construction Noise and Vibration Management Plan to be incorporated into the CEMP to manage noise during the construction stage.
<ul style="list-style-type: none"> Work would be undertaken in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009).
<ul style="list-style-type: none"> Surrounding residences and businesses would be provided with reasonable notice (minimum of one week) of the proposed work (including proposed starting date, work methods and duration) according to the Council's community liaison and notification policies.
<ul style="list-style-type: none"> Vehicle and plant parking areas, materials stockpiles and equipment storage areas would be in areas away from (where practically possible) surrounding receptors.
<ul style="list-style-type: none"> Noise intensive works would occur at the least sensitive times of the day, wherever possible.
<ul style="list-style-type: none"> Workside construction training would alert construction workers to noise concerns and include education on noise sensitive issues and reducing noise where possible.
<ul style="list-style-type: none"> Trucks with mufflers would be maintained in good working order.
<ul style="list-style-type: none"> Smaller equipment options or rubber-tracked equipment would be selected where equipment is fit-for-purpose and it is economically feasible.
<ul style="list-style-type: none"> Equipment would be maintained according to manufacturer's specifications, to reduce adverse noise impacts.
<ul style="list-style-type: none"> Alternative work practices would be considered which generate less noise in high impact locations, for example using electric equipment instead of diesel or petrol-powered equipment.
<ul style="list-style-type: none"> Plant and equipment would be turned off when it is not being used.
<ul style="list-style-type: none"> Equipment would be fitted with silencers, acoustical enclosures and/or other noise attenuation measures, where feasible.
<ul style="list-style-type: none"> Consultation would be undertaken with landowners and business owners to determine any specific vibration requirements. Appropriate construction methods and schedules that comply with the agreed vibration requirements and Standards BS 6472-1992 and AS 2436-1981 would be developed.

6.6 Traffic and Access

This section describes the land and maritime based traffic, transport and access impacts associated with the proposal.

6.6.1 Method

A review of the existing road infrastructure and carparking at and in proximity to the proposal was completed.

6.6.2 Existing Environment

The proposal is surrounded by several arterial roads; the most significant of which is the Scenic Highway/Terrigal Esplanade that connects Terrigal Beach and The Haven precinct. This road is likely to be busy during peak periods, such as summer holidays, with an increasing number of visitors using the recreational facilities such as the boat ramp and football field.

There is car parking at The Haven precinct and at the top of the rock-face, with on-street parking also available in the CBD.

There are footpaths in areas along the eastern peninsula near The Haven precinct, and between Terrigal Beach and The Haven precinct. These range from formalised footpaths connecting local roads to beaches and informal walking trails along the coastal fringe, which are used by beach visitors and surfers.

There is a cycleway along Scenic Highway/Terrigal Esplanade and a secure Taxi Rank at the Crowne Plaza Terrigal in proximity to the proposal and laydown areas.

6.6.3 Impact Assessment

Construction

The construction period would generate a small number of heavy and light vehicle (worker) movements around the proposal. The workers would typically arrive and leave site during the week, and potentially at the weekend or in the evening if there are out of hours work. Heavy vehicle movements would involve the mobilisation and demobilisation of equipment between the site and laydown areas. There would be occasional deliveries and potentially the need for occasional semi-trailer movements to deliver oversized equipment such as prefabricated boardwalk sections.

Construction traffic would have limited impact on the road network. However, more significant would be any traffic management controls, temporary diversions and road closures. However, there are not expected to be any traffic diversions within the Terrigal CBD.

Adequate parking for construction vehicles would be available, particularly at areas at and proximate to The Haven precinct. Depending on the location of the eastern laydown area and the traffic management controls implemented, there may be a minor loss of public parking.

It would be expected that skip bins would be used for waste collection to eliminate the need for dump trucks to be positioned at the site all day.

Operation

Pedestrian access between Terrigal Beach and the Haven precinct would be maintained once the boardwalk is open. Increased accessibility to Terrigal Beach would be provided to a wider demographic of the community through the proposal.

6.6.4 Safeguards and Management Measures

Traffic and Access
Construction
<ul style="list-style-type: none"> • A Traffic Management Plan would be prepared by the Construction Contractor in accordance with Council's requirements.
<ul style="list-style-type: none"> • Notification of surrounding properties of construction activities and the identified construction routes and site access points throughout construction.
<ul style="list-style-type: none"> • Public notification about the timing of the construction of the boardwalk would be undertaken through local newspapers and Council's website, and placed on notices at formal carparks at The Haven precinct.
<ul style="list-style-type: none"> • No idling of trucks to occur on public roads prior to 7am (Monday- Friday) and 8am (Saturday).
<ul style="list-style-type: none"> • Designated construction haulage routes would be determined in advance of construction to minimise impacts on local roads and nearby sensitive receivers e.g. residential areas.
<ul style="list-style-type: none"> • Signage would be placed at entrances/exits to alert truck drivers to the designated entry and exit points.

6.7 Aboriginal Heritage

This section summarises the potential Aboriginal heritage impacts.

6.7.1 Method

The desktop assessment included a basic search of the Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) database on 16 May 2018, to identify any heritage items near the site.

In addition, a review was undertaken of an Aboriginal Heritage Impact Assessment for previous works to The Haven precinct provided by Council (Darkinjung Local Aboriginal Land Council, 2009). This provided useful context regarding the potential for sites and objects of significance to the Aboriginal people near the works.

6.7.2 Existing Environment

The proposal falls within the Darkinjung Local Aboriginal Land Council (DLALC) boundary, which extends from the Hawkesbury River to the south, Lake Macquarie to the north, the McDonald River and Wollombi to the west, and the Pacific Ocean to the east. The site has a long history of Aboriginal occupation, with Aboriginal sites being found through the LGA, including surface scatters, rock art, caves and shelters, engravings, middens and artefacts. The Haven is a significant area to the local Darkinjung people, supported by the 2009 Aboriginal Heritage Impact Assessment which indicated that The Haven has registered Aboriginal sites.

The AHIMS search identified that there are no previously recorded Aboriginal objects and items. However, there are typical landscape features at the site (e.g. rocky outcrop, cliff face, rock art) that are known to have significance to Aboriginal people.

6.7.3 Impact Assessment

Construction

Council commenced consultation with the DLALC in early September 2018 to identify if the proposal would impact on any areas considered to have significance to the Aboriginal people. The Council received formal feedback from the DLALC in October 2018 that detailed appropriate safeguards that should be implemented during the construction phase of the proposal (see **Appendix D**). However, the DLALC also indicated that given the Aboriginal Heritage Impact Assessment for previous works to The Haven precinct was completed in 2009, an additional impact assessment of the area should be undertaken.

As a result, a site visit was undertaken on 23 October 2018 by culture and heritage officers representing the DLALC. The Aboriginal heritage due diligence assessment indicated that the proposal does not have the potential to harm Aboriginal objects or places.

This consultation process ensured that Council acted in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales.

6.7.4 Safeguards and Management Measures

Aboriginal Heritage
<ul style="list-style-type: none"> The DLALC to complete an updated Aboriginal Heritage Impact Assessment that considers the proposal footprint.
<ul style="list-style-type: none"> An unexpected heritage finds procedure should be developed prior to construction works taking place. In the case of Aboriginal cultural heritage sites or material being discovered, work should cease. The area should be avoided and the Office of Environment & Heritage (OEH), along with DLALC, should be contacted immediately.
<ul style="list-style-type: none"> The DLALC to be notified before any works or earth movement.
<ul style="list-style-type: none"> Contact to be made via email to the cultural & heritage team 30 days prior to works commencing.
<ul style="list-style-type: none"> The DLALC to be engaged for monitoring of earth movement and works.

6.8 Socio-Economic

This section describes the potential socio-economic impacts.

6.8.1 Method

The assessment considered the community, business and industry impacts and benefits from the proposal. Specifically, it considered impacts on:

- The local community in terms of its adoption or opposition to the proposal based on its characteristics and profile.
- Social amenity and infrastructure in the area.
- The community's values such as amenity, character, health and safety, cohesion, environment, sense of place, fears and aspirations.

6.8.2 Existing Environment

The proposal is in the Central Coast LGA. About 328,000 people were living in the LGA at the time of the 2016 census (Australian Bureau of Statistics, 2018). The local demographic helps define the area's community cohesion and values. It also assists in profiling how adaptable the community is likely to be to the change.

The demographic of the area demonstrated people in the Central Coast LGA to be largely consistent with the state and national averages, but with a slightly older age demographic who have little reliance on public transport to travel to and from work. The demographic is typical of a community that is actively engaged and can mobilise in response to changes that would affect them as a collective of individuals. This has been confirmed through the consultation response from the community described in Chapter 5.

In addition to the above details, census data indicates that 5.4% of the NSW population in 2016 reported needing help in their day to day lives due to a disability (ABS, 2016). Although this statistic is not Central Coast specific, it does support Council's argument and need for providing safe and accessible access between Terrigal Beach and The Haven (refer to section 3.2).

Terrigal is a major suburb in the Central Coast region of NSW, located around 12 kilometres east of Gosford on the Pacific Ocean. Its unique combination of water, landscape, beach lifestyle and public spaces makes it a well-visited destination by those travelling in the Central Coast. At present, Terrigal offers a range of land uses, focussed on residential, tourism, retail, recreational, cultural and hospitality facilities. The proposal footprint is largely used for recreational purposes, reflecting its zoning designation (refer to section 2). The area is used for:

- Ocean swimming.
- Stand-up paddle boarding, surfing and other recreational water sports.
- Recreational boating and fishing.
- Walking.

- General amenity value (with people sitting along the foreshore).

The community facilities near the proposal footprint include:

- Terrigal Beach, Terrigal rockpool and The Haven Beach.
- Terrigal boat ramp.
- The Haven car park.
- Cafés and restaurants, including Reef Restaurant, Splash Café and Restaurant, and Haven Beach Café.
- Hotels, holiday rentals, shops and cafes on the Scenic Highway/Terrigal Esplanade at Terrigal including the Crown Plaza.
- Terrigal Rugby Club and associated sporting fields.
- Public parkland associated with Broken Head and the Skillion.

6.8.3 Impact Assessment

Construction

There would be temporary amenity impacts on the local community including residents, businesses, workers, visitors and tourists, generated from construction activity in the area, principally relating to temporary noise, vibration, visual and traffic and transport impacts.

The existing walkway between the precincts would remain open during construction. However, access to the rock face, tie-in area at the Terrigal rockpool and parts of the beachfront at The Haven would be restricted, resulting in a temporary loss of access and amenity for regular users (residents) and tourists. It is also expected that a traffic access route adjacent to the Reef Restaurant would be created, impacting on access to the foreshore at The Haven. Signage and notification on Council's website would advise the community of any access interruptions.

This may be potential negative temporary impacts on local business (e.g. Reef Restaurant) from loss of carparking, residential properties on the Scenic Highway/Terrigal Esplanade from noise/air quality impacts, and user experiences when attempting to access the community spaces (e.g. Terrigal rockpool, The Haven boatshed, sporting facilities at The Haven) from a lack of access. However, due to the minor nature of the works and the limited construction period, this impact is expected to be minor.

Coastal recreation activities that currently occur in the vicinity including fishing, paddle boarding, surfing and swimming may be temporarily impacted through the creation of an exclusion zone preventing these coastal activities from taking place.

Operation

Once the boardwalk is open there would be public access restrictions to parts of the rock platform, and areas of the sand in the western portion of the beach at The Haven on safety grounds. This would be offset by the creation of viewpoints and places to stop and sit along the boardwalk. Overall, while the proposal would restrict access to certain areas of safety grounds it would make the foreshore more accessible to a wider demographic including older people and people with mobility difficulties.

It is expected that the boardwalk would attract people to the area resulting in associated benefits to the community, local businesses and facilities. However, the additional tourists/visitors are not expected to result in undue stress to public amenity (e.g. community facilities, car parking spaces).

6.8.4 Safeguards and Management Measures

Socio-Economic
<p>Construction</p> <ul style="list-style-type: none"> Measures to safeguard against the proposal's noise (refer to section 6.5), traffic (refer to section 6.6) and air quality (refer to section 6.9) impacts be used to minimise the above impacts. No additional or supplementary measures are therefore proposed.

6.9 Other Impacts

Standard safeguards and management controls that are proven effective at mitigating any impacts can be put in place for the areas detailed in Table 20.

Table 20: Other environmental issues

Aspect	Existing Environment	Impact Assessment
Air Quality	<p>The boardwalk traverses a natural coastal setting that offers no major air pollution sources.</p> <p>The area receives consistent sea breezes that prevent any build up air pollution in the local air shed.</p> <p>There are no point source industries locally that would contribute to atmospheric pollution. The key air pollution sources would be vehicle emissions from the Scenic Highway/Terrigal Esplanade.</p> <p>Terrigal Formation (sandstone with some shale and clay deposits) is present in the proposal footprint.</p>	<p>During construction, there may be some minor air quality impacts resulting from the exhaust emissions of construction vehicles and equipment. However, any such impacts would be short-term, minor and localised, and unlikely to result in any significant impacts.</p> <p>Potential sources of dust during the works would be generated through the earthworks. Given then sandstone geology at the site, there may be a greater risk of dust generation. However, it is assessed that the dust impacts would be generally minor and manageable through the implementation of appropriate mitigation measures to minimise off site impacts.</p> <p>There are not expected to be any odorous sources during construction and/or operation.</p>
Non-Aboriginal Heritage	<p>A review of Commonwealth, State, local and agency non-Aboriginal heritage registers carried out in May 2018 confirmed there to be no items or objects within or close to the site.</p> <p>Based on the history of the area, there is considered to be a low archaeological potential.</p>	<p>No non-Aboriginal heritage impacts are expected.</p>
Waste Management	<p>There is an obligation on Council to minimise waste generation and resource consumption, while promoting the use of recycled materials. Council is also obliged to recuse any materials such as excavated sediment (sand), rock and spoil.</p>	<p>The construction works would result in the generation of the following waste materials:</p> <ul style="list-style-type: none"> • Minor vegetation removal required along the cliff-face. • Left-over construction material (e.g. off-cuts from boardwalks). • Personal waste from construction personnel. <p>Waste generated at the site would be managed in accordance with the provisions of the Protection of the Environment Operations (Waste) Regulation 2005.</p>
Cumulative Impacts	<p>A review of the Central Coast Council planning application database and Department of Planning's major projects registers indicates that there are no other committed or approved development near the proposal footprint that would take place at the same time construction of the boardwalk is planned. However, it is understood that the Terrigal rockpool will be upgraded in 2019.</p>	<p>There may be some cumulative impacts (e.g. visual, noise, air quality, socio-economic) if the Terrigal rockpool upgrade works occur concurrently with the proposal.</p>

6.9.1 Safeguards and Mitigation Measures

Air Quality
<p>Construction</p> <ul style="list-style-type: none"> • All construction vehicles and equipment would be maintained in good working condition in accordance with the manufacturer's specifications. • Dampen larger exposed soil surfaces where required to prevent dust impacts, such as around car parks. • Exposed surfaces would be revegetated at the completion of the construction works.
Non-Aboriginal Heritage
<p>Construction</p> <ul style="list-style-type: none"> • An unexpected heritage finds procedure should be developed prior to construction works taking place. If previously unidentified European heritage archaeological items are uncovered during the works, all works must cease in the vicinity of the material/find and Council staff notified immediately.
Waste Management
<p>Construction</p> <ul style="list-style-type: none"> • Resource management hierarchy principles would be followed (NSW EPA, 2014): <ul style="list-style-type: none"> - Avoid unnecessary resource consumption as a priority. - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, Recycling and energy recovery). - Disposal is undertaken as a last resort. • Each subcontractor must ensure that they would monitor and report on all waste generated during the construction phase. • Waste material would not be left on site once the works have been completed. • Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day. • Waste generated at the site would be managed in accordance with the provisions of the <i>Protection of the Environment Operations (Waste) Regulation 2005</i>.

7 Environmental Factors Considered

7.1 Assessment of Clause 228 Factors

Clause 228 of the EP&A Regulation provides those factors that must be taken into account concerning the impact of an activity of the environment. These factors are assessed in Table 21 in relation to the proposal.

Table 21: Assessment of Clause 228 factors

Clause	Impact			
	N/A	Negative	Nil	Positive
<i>(a) any environmental impact on a community</i>			✓	
Comment The proposal would provide a significant contribution to the amenity and accessibility within Terrigal. Any environmental (inclusive of visual) impacts during construction would be short-term, and are unlikely to cause a material change to the existing environment.				
<i>(b) any transformation of a locality</i>				✓
Comment The boardwalk would significantly add to the local amenity of the existing residents and visitors through development of a safe and accessible link between Terrigal Beach and The Haven precinct.				
<i>(c) any environmental impact on the ecosystems of the locality</i>			✓	
Comment The construction of the boardwalk is likely to have impacts on the intertidal species within the proposal footprint (e.g. macroalgae, molluscs and encrusting sponges). Over time however, the vegetation would re-establish, while additional habitat would establish on the boardwalk piers.				
<i>(d) any reduction of the aesthetic recreational, scientific or other environmental quality or value of a locality</i>			✓	
Comment During construction, there would be a negative impact through removing access to the Terrigal rockpool and rock platform, and minimising the beach area available at the Haven precinct. It is also likely that there would be impacts on the intertidal species within the proposal footprint (e.g. macroalgae, molluscs and encrusting sponges). However, once constructed, the proposal would add to the aesthetic value of area. Further, over time, the marine vegetation would re-establish, while additional habitat would establish on the boardwalk piers.				
<i>(e) any effect on a locality place or building having aesthetic anthropological archaeological architectural cultural historical scientific or social significance or other special value for present or future generations</i>			✓	
Comment There is low potential of the site having aesthetic anthropological, archaeological architectural cultural historical scientific or social significance or other special value for present or future generations. There are no recorded indigenous sites or place identified near the site. Mitigation measures are recommended that cover the construction stage should any indigenous or non-indigenous items or relics are uncovered during the construction stage.				
<i>(f) any impact on the habitat of protected fauna</i>	✓			

Clause	Impact			
	N/A	Negative	Nil	Positive
<i>(within the meaning of the National Parks and Wildlife Act 1974)</i>				
Comment				
The site does not contain habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>).				
<i>(g) any endangering of any species of animal, plant or other form of life whether living on land in water or in the air</i>			✓	
Comment				
The construction of the boardwalk is likely to have impacts on the intertidal species within the proposal footprint (e.g. macroalgae, molluscs and encrusting sponges). Over time however, the vegetation would re-establish, while additional habitat would establish on the boardwalk piers.				
<i>(h) any long-term effects on the environment</i>			✓	
Comment				
Based on the assessments completed as part of this REF, no long-term effects on the environment are expected from the boardwalk.				
<i>(i) any degradation of the quality of the environment</i>			✓	
Comment				
The quality of the environment is likely to experience some minor disturbance during the construction period, but is expected to re-establish after this period.				
<i>(j) any risk to the safety of the environment</i>				✓
Comment				
The proposal would not add to the safety risk of the area, rather it would provide a safer and more accessible access between Terrigal Beach and the Haven precinct for the benefit of future residents and visitors.				
<i>(k) any reduction in the range of beneficial uses of the environment</i>				✓
Comment				
The boardwalk would enhance the natural environment through developing a safe and accessible means for residents and visitors to get from Terrigal Beach to The Haven precinct. Any coastal recreation activities (e.g. swimming, paddle boarding) would not be impacted upon during operation.				
<i>(l) any pollution of the environment</i>			✓	
Comment				
The proposal is unlikely to result in pollution of the environment. Potential impacts (including air quality, noise, and contamination) would be managed through compliance with a Construction Environmental Management Plan (CEMP).				
<i>(m) any environmental problems associated with the disposal of waste</i>		✓		
Comment				
There are unlikely to be any significant environmental problems associated with the disposal of construction waste. Once operational, the boardwalk would not generate significant waste disposal other than typical general waste which would be managed with garbage bins and recycling solutions.				
<i>(n) any increased demands on resources (natural or otherwise) that are or are likely to become in short supply</i>			✓	
Comment				

Clause	Impact			
	N/A	Negative	Nil	Positive
The proposal would not result in increased demands on resources beyond which can be supplied.				
<i>(o) any cumulative environmental effect with other existing or likely future activities</i>			✓	
Comment No cumulative environmental impacts are expected.				
<i>(p) any impact on coastal processes and coastal hazards including those under projected climate change conditions</i>			✓	
Comment The proposal is unlikely to cause any impacts on coastal processes and coastal hazards and any related climate change impacts.				

7.2 Principles of Ecologically Sustainable Development

Council is committed to ensuring that this proposal is implemented in a manner that is consistent with the principles of Ecologically Sustainable Development (ESD) outlined in Section 6(2) of the *NSW Protection of the Environment Administration Act 1991* and Schedule 2 of the Regulations (Gosford City Council, 2017).

The boardwalk is a coastal enhancement proposal that would substantially improve natural value of the area through providing more accessibility. The ESD principles are assessed in Table 22.

Table 22: Assessment of Ecological Sustainable Development

ESD Principles	Comment on Proposed Activity
<p>a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In the application of the precautionary principle, public and private decisions should be guided by:</p> <p>(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and</p> <p>(ii) an assessment of the risk-weighted consequences of various options.</p>	<p>This REF has assessed key engineering, environmental and planning issues which concludes that the proposal is unlikely to lead to irreversible damage to the environment.</p> <p>Mitigation measures have been presented that would reduce potential impacts during the construction stage, which was assessed for a worst-case event (refer section 3.7).</p> <p>Mitigation measures have been presented that would reduce potential impacts during the operation stage (e.g. allowing light to filter through boardwalk, designing the boardwalk at an appropriate height to account for sea-level rise and wave impacts etc.)</p>
<p>b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or</p>	<p>The boardwalk would enhance the natural landscape through providing greater, and safer accessibility along</p>

enhanced for the benefit of future generations.	the Terrigal foreshore for future residents and visitors. The boardwalk would also function as a place of social interaction and break-out area that would contribute to the amenity of future populations.
c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.	While various standard measures can be used to reduce the impact to the intertidal zone during construction not all impacts could be mitigated to the extent that some intertidal habitat would be lost. Over time however, the vegetation would re-establish, while additional habitat would likely establish on the boardwalk piers. Once completed, the boardwalk structure would likely have minimal impact on the coastal vegetation and intertidal habitat. Further, the boardwalk would be architectural designed to allow light to filter through, contributing to the conservation of ecological integrity.
d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as: (iii) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, (iv) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (v) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	The proposal is unlikely to result in significant environmental impacts and the generation of significant pollution.

7.3 Consideration of National Environmental Significance Factors

A review of the Protected Matters Search Tool indicated that no MNES would be impacted by the proposal. Therefore, the proposal is not considered a controlled action under the EPBC Act, and a referral to the Commonwealth Department of Environment and Energy is not required.

8 Conclusion

8.1 Justification

With improved infrastructure and increasing developer interest, Terrigal has become an area popular for tourists.

The existing rock headland and steep roadway currently prevents easy access between Terrigal Beach promenade and The Haven precinct. An existing road side path connects these destinations, although it is steep and results in a disconnected journey which displaces persons from a direct marine foreshore experience.

The proposal is intended to improve the amenity and accessibility for tourists visiting the region.

8.2 Objects of the EP&A Act

This REF has been prepared to assess the environmental impacts of the proposal in accordance with division 5.1 of the EP&A Act and has assessed those matters listed in Clause 228 of the EP&A Regulation.

The proposal would not result in a significant impact on any Areas of Outstanding Biodiversity Values, declared critical habitat, threatened species, populations or ecological communities or their habitats. Therefore, a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The REF has been prepared in accordance with *State Environmental Planning Policy (Infrastructure) 2007* and key Commonwealth, State and local planning provisions, policy and strategy.

The REF has assessed key engineering, environmental and planning issues including landscape and visual, water quality and quantity, heritage, traffic and access, geotechnical and contamination based on a number of supporting technical studies. The REF includes mitigation measures and safeguards to ensure that construction and operation of the boardwalk occurs with minimal environmental impact.

In this regard, an Environmental Impact Statement is not required.

8.3 Conclusions

The proposed Terrigal Beach promenade to The Haven boardwalk is intended to improve the amenity and accessibility for tourists visiting the region. It is anticipated that upon completion, the boardwalk would become a tourist attraction and a destination enhancing experience which compliments the natural marine environmental assets.

9 References

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- Roads and Maritime Services (2013), *EIA-N04 Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment*. Roads and Maritime Services, Sydney, NSW.
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Appendix A

Survey and Geotechnical Investigations – Information Flyer



Survey and geotechnical investigation works

Terrigal Boardwalk

What's Happening

Council contractors are undertaking a detailed survey of four sites in Terrigal as the first step in the process of investigating the possibility of creating a Boardwalk from The Haven to the Terrigal Esplanade.

The survey works will include the position and level of all current structures, site features, pavement, kerb levels, street furniture, stormwater pits, existing trees, property boundaries and current services. A CASA certified drone will also be used at times of low tide to enhance the survey work. Public access to parts of the Surf Club car park and to the proposed boardwalk area will be restricted for geotechnical works starting on May 21 and finishing on May 24.

The immediate area around the site will be cordoned off at times to facilitate the works and signage will be in place. Thank you for your patience as these works are carried out.

Timeframe

Survey Works Tuesday 15 May to Wednesday 16 May

Geotechnical Works: Monday 21 May to 24 May

Central Coast Council Works

Building stronger communities

Contact

Central Coast Council

Economic Development: 43525 8222

Appendix B

Landscape and Visual Assessment

Landscape and Visual

This section provides a Landscape Character and Visual Impact Assessment (LCVIA) of the proposal. It also identifies mitigation measures and design recommendations to avoid, minimise or improve potential landscape character and visual amenity outcomes.

It should be noted that this assessment covers only operational phase impacts. There are likely to be increased landscape character and visual impacts during the construction phase of the proposal due to various construction activities as described previously in section 3.7, although these would be of a temporary nature only, and have therefore not been assessed.

A1.1 Methodology

A1.1.1 Study Area

The study area for this LCVIA has been selected to cover the main geographical extent of potential visual and landscape character impacts of the proposal. The area of study extends approximately 350m in all directions from the centre of the boardwalk alignment.

A1.1.2 Landscape Character Assessment

Landscape character can be defined as the aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. It includes all aspects of a tract of land – built, planted, natural topographical and ecological features.

Landscape Character Zones

To enable the assessment of impacts on landscape character, landscape character zones (LCZs) are determined for the relevant area of study. LCZs are defined as areas having a distinct, recognisable and consistent pattern of elements making one LCZ different from another.

Impact Rating

The overall impact rating of the proposal on any given LCZ is based on themes of magnitude and sensitivity. The severity of these impacts is calculated using the matrix shown in Table 12, taken from the Roads and Maritime Guidelines for Landscape Character and Visual Impact Assessment (Roads and Maritime Services, 2013).

Sensitivity – The degree to which a particular landscape type can accommodate change arising from a development, without detrimental effects on its character. This includes factors such as:

- Existing land use.
- The pattern and scale of the landscape.

- Visual enclosure, openness of views and distribution of visual receivers.
- The value placed on the landscape.

Areas with a high sensitivity to change include zones with significant landscape features, landscape types with inherent natural values and landscapes with heritage or cultural values. Lower sensitivity is often associated with built up urban environments such as industrial areas.

Magnitude – the magnitude of the effects of the development within the landscape. Consideration is given to:

- Existing built form in the landscape and how closely the development matches this in mass, scale and form.
- The scale or degree of change to the landscape resource.
- The nature of the effect and its duration including whether it is permanent or temporary.

A1.1.3 Visual Impact Assessment

While landscape character assessment seeks to identify impacts on the physical character of the study area, visual impact assessment is concerned with a proposal's effects on public and private visual receivers.

Viewpoint Selection

Following a thorough desktop study and site visit, representative viewpoints with the potential to be visually affected by some element of the proposal are identified and selected for further analysis. Viewpoints are selected to illustrate:

- A range of receiver types including public and private domain views (residents, motorists and users of public open space).
- A range of view types including elevated, panoramic and filtered views.
- A range of viewing distance from the proposal.
- Any key or protected views identified within relevant planning literature.

Limitations

It should be noted that selected viewpoints are by no means an exhaustive list of all receivers that might be impacted by the proposal. They have been selected to be representative of the spread and type of receivers throughout the study area.

Impact Rating

The overall impact rating of the proposal on any given viewpoint is based on themes of magnitude and sensitivity. The severity of these impacts is calculated using the matrix shown in Table 12.

Sensitivity – Each visual receiver type has an inherent and varied sensitivity to change in the visual scene based on the personal context in which their view is being experienced. This sensitivity has a direct bearing on the perception of visual impact experienced by the receiver and qualifies the quantitative impacts. The number of viewers also has a bearing on sensitivity. Viewpoints have a varied number of potential receivers depending on whether the viewpoint is public or private, the popularity of the viewing location and its ease of accessibility.

Views from public reserves and open space are often given the highest weighting due to the increased number of viewers impacted.

Examples of sensitivity levels:

- Negligible – Vacant lot, uninhabited building, car park.
- Low – Minor or major roads, service providers, industrial areas.
- Moderate – Residential properties with limited views, some commercial properties, scenic public roads (e.g. official tourist routes).
- High – Public open space, public reserves, living areas or gardens/balconies of residential properties with direct views of proposal.

Magnitude - a measure of the magnitude of the visual effects of the development within their setting. A series of quantitative assessments are studied to give an overall magnitude rating, including distance from development, quantum of view, period of view and most importantly, scale of change.

Table 23: Overall impact rating as a combination of sensitivity and magnitude (Roads and Maritime guidelines for landscape character and visual impact assessment) (Roads and Maritime Services, 2013)

	High	Moderate	Low	Negligible
High	High Impact	High Moderate Impact	Moderate Impact	Negligible Impact
Moderate	High - Moderate Impact	Moderate Impact	Moderate - Low Impact	Negligible Impact
Low	Moderate Impact	Moderate - Low Impact	Low impact	Negligible Impact
Negligible	Negligible Impact	Negligible Impact	Negligible Impact	Negligible Impact

A1.2 Site Context

Land Use

As seen in Figure 13, the proposal is located to the northeast of Terrigal’s CBD. The surrounding area contains retail, commercial, residential and public recreational land uses.

The Scenic Highway/Terrigal Esplanade south of the proposal is predominately residential, featuring brick apartment buildings.

The Terrigal CBD features a mix of low to medium density commercial and retail properties. The Haven forms a large area of public open space to the east of the proposal with a large carpark that services beach goers.

In the ocean off the coast of Terrigal lies the Ex-HMAS Adelaide artificial reef, a reserve gazetted over submerged Crown Lands.



Figure 13: Land zoning

Landform and Topography

The character of the area along the proposal alignment presents a Hawksbury sandstone coastal landscape, heavily influenced by the ocean. The alignment is bordered to the south by an inclined cliff line with variable steepness.

As the proposal extends around the headland, the rock face becomes very steep. There are rocky outcrops and Terrigal rockpool at the base of the slope and within the intertidal zone between the beach and the headland.

The Haven is flanked by two rocky headlands known as The Skillion and Broken Head. They are considered as local landmarks, exhibiting rock from the Triassic period and visible from many surrounding locations. The typical inner bay landform and rolling waves are drawcard for surfers and visitors.

Vegetation

Remnant vegetation and planted native species from the Coastal Headland Low Forest, Coastal Headland Grassland and Coastal Headland Shrubland plant communities can be seen around Terrigal, however most remnant vegetation has been removed along the coastline for development.

Native and exotic grasses, groundcovers, shrubs and trees can be found along the cliff line adjacent to The Haven Beach. The native species identified include Scrub she-oak (*Allocasuarina distyla*), Coastal rosemary (*Westringia fruticosa*), Prickly-leaved paperbark (*Melaleuca nodosa*), Common hop bush (*Dodonaea triquetra*), Finger hakea (*Hakea dactyloides*), Lomandra species and Banksia species.

A1.3 Landscape Character Assessment

To enable the assessment of potential landscape character impacts of the proposal, the following LCZs presented in Figure 8 have been determined within the study area:

- LCZ 1: The Haven open space.
- LCZ 2: The Haven Beach and rock platform.
- LCZ 3: Terrigal Esplanade residential development.
- LCZ 4: Terrigal Beach.

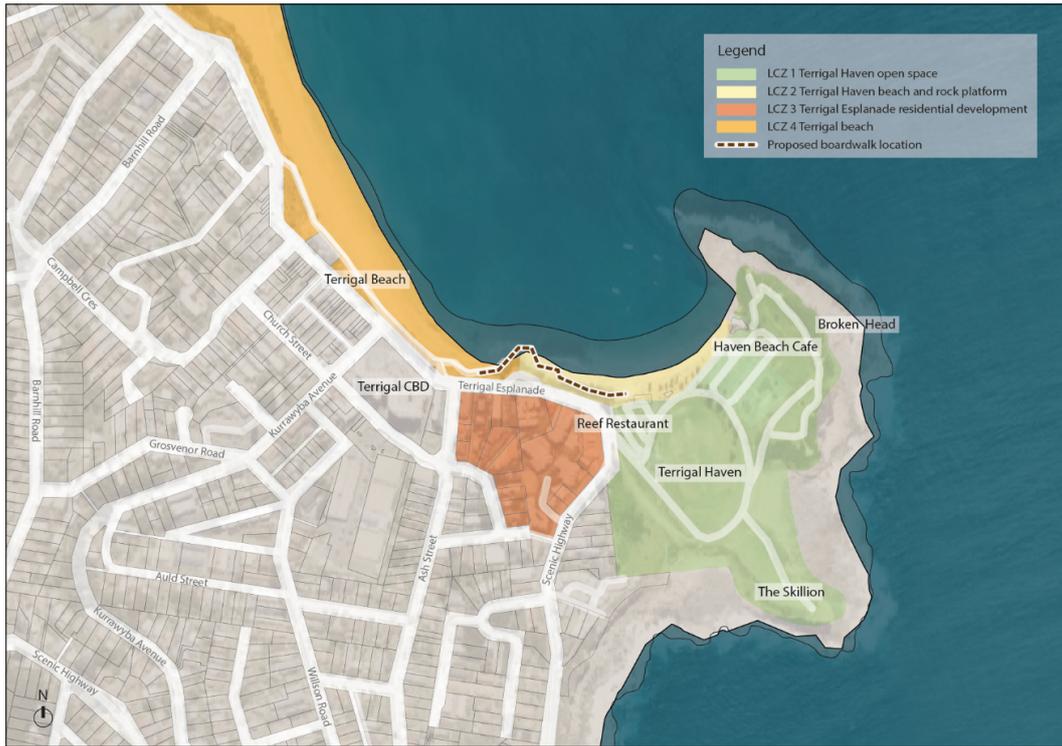


Figure 14: Landscape Character Zones

LCZ1: The Haven Open Space

This zone is flanked by Broken Head and The Skillion headlands and is characterised by a large area of well used turfed open space comprising playing fields, car parking and café. The landscape is open with extensive views towards the ocean, particularly from the elevated headlands either side. The headlands include stands of dense coastal vegetation. As a scenic and popular area of open space, it has a **High** landscape sensitivity.

The proposal is located outside of this LCZ and is not expected to impact the spatial quality of The Haven open space, leading to a **Negligible** magnitude rating.

While the boardwalk may be visible from some locations within the parkland, no impact on the landscape character of this LCZ is expected.

Sensitivity	High
Magnitude	Negligible
Impact Rating	Negligible

LCZ2: The Haven Beach and Rock Platform

This LCZ comprises an approximately 200m long steep, open and sandy beach, tucked between Broken Head and the rock platform that separates it from Terrigal Beach. The beach faces north to northwest and is a popular for launching boats for fishing, recreation and diving. The beach is backed by several car parks, an oval and café, as well as dense vegetation along the western cliff face. A large stepped sandstone seawall extends along much of the beach. The exposed rock face and intertidal zone around the rock platform contribute strongly to the scenic nature of the landscape. Little existing built form is present and the LCZ is considered to have a **High** sensitivity.

The boardwalk and associated sea wall would likely form prominent new built form elements along the western end of the beach and adjacent rock platform. While improving access to the beach, the boardwalk would alter the existing natural setting, reducing the visibility of the rock platform from the eastern end of the beach and spatially dividing the western end of the beach from the adjacent cliff. Access would be reduced to a small section of the beach. There would also be a slight increase in overshadowing beneath and adjacent to the boardwalk structure. Overall, a **Moderate** magnitude of change is expected, leading to a **Moderate/High** landscape character impact rating.

Sensitivity	High
Magnitude	Moderate
Impact Rating	Moderate/High

LCZ 3: Terrigal Esplanade Residential Development

The character of this area is defined by multi-storey apartment buildings along the southern side of the Scenic Highway/Terrigal Esplanade, facing the ocean. These dwellings have a scenic setting and a **Moderate** sensitivity to change in the landscape.

The proposal is located at a lower elevation to these dwellings, obscured by vegetation and topography. The proposal would have a **Negligible** effect on the spatial quality of this zone and hence no impact on landscape character.

Sensitivity	Moderate
Magnitude	Negligible
Impact Rating	Negligible

LCZ 4: Terrigal Beach

Terrigal Beach is a 2.8km long stretch of sand that trends southwest from the rocks on the north side of Wamberal Lagoon and finishes at the rocks on the southern end of Terrigal Beach.

The beach has long been a popular holiday destination for Sydneysiders, backed by increasing residential development since the 1960s. A foreshore reserve lies between the road and the beach and contains Terrigal Surf Life Saving Club (built in 1924), car parking and a park. A shopping centre and a large resort backs the southern half of the beach. This LCZ has a **Moderate** sensitivity to change in the landscape.

The proposal would be located at the southern eastern tip of the beach, connecting to the existing footpath adjacent to a Terrigal rockpool. The boardwalk and associated retaining walls would form prominent new built form elements along this section of the cliff and rock platform. The structure would alter the existing natural setting, reducing the visibility of the rock platform and reducing access to the rocks. It should be noted that the current access to the rock platform is a safety concern due to cliff instability. Overall, a **Moderate** magnitude of change is expected, leading to a **Moderate** landscape character impact rating in this LCZ.

Sensitivity	Moderate
Magnitude	Moderate
Impact Rating	Moderate

A1.4 Visual Impact Assessment

A1.4.1 Existing Visual Environment

The visual character of the study area is defined by its topography, open space, sweeping ocean views and medium density built form. The rock platform and steep cliff line between Terrigal and The Haven beaches forms a major visual feature of the area, creating distinct east/west visual separation. The exposed rock face and intertidal zone strongly contribute to the scenic nature of the views to and from this location.

Key relevant views within the study area include:

- Scenic local foreshore views west along The Haven Beach towards the cliff and rock platform.
- Sweeping panoramic ocean views from the Reef Restaurant.
- Scenic views out from the rock platform towards Terrigal and The Haven beaches.
- Foreshore views east along Terrigal Beach.

A1.4.2 Visual Envelope

The approximate extent of visibility of the proposal is indicated in the visual envelope diagram, Figure 9. Visibility of the proposal extends east and west along the foreshore and is limited to the south by vegetation and local topography. The figure does not include the extents from which the proposal would be visible from the ocean.



Figure 15: Visual envelope

Selected Viewpoints

After a site visit, the following key viewpoints were selected for further analysis as shown in Figure 10:

1. The Haven Beach near the Reef Restaurant – looking west
2. Rock platform - looking east
3. Terrigal Beach footpath – near the Terrigal rockpool
4. Terrigal Esplanade footpath – looking east
5. Terrigal Beach footpath – looking east



Figure 16: Viewpoints assessed

A1.4.3 Viewpoint 1

This viewpoint is representative of the view west from The Haven Beach in vicinity of the Reef Restaurant. The existing view takes in the restaurant, sandstone sea wall and extends along the sand to the western end of the beach, ending at the cliff backed rock platform. The existing coastal rocks in this location are exposed at low tide, with the view changing subtly during the day. The view is scenic with limited built form visible along the western stretch of beach and can be considered to have a **High** visual sensitivity.

The proposed enlarged sea wall would extend further west along The Haven Beach, although would be mostly continuous with the existing sandstone seawall. The boardwalk, however, would be visible curving around the face of the sandstone cliff, introducing a new structure into the landscape and reducing the natural setting of the rock shelf. The supporting columns would also be visible as well as the viewing gallery jutting into the ocean. A **Moderate** magnitude of change is expected.

Overall, a **Moderate/High** visual impact is expected on this viewpoint due to the increase in built form and the reduction in visibility of the cliff and rock platform. It should be noted that the selection of appropriate materials and finishes for the boardwalk would help integrate the structure into the landscape and likely reduce the visual impact.

Sensitivity	High
Magnitude	Moderate
Impact Rating	Moderate/High



Viewpoint 1 – Looking west along The Haven Beach towards the rock platform and Terrigal Beach. The approximate location of the proposal is indicated in yellow, with the extended sea wall in grey.

A1.4.4 Viewpoint 2

This view is representative of the outlook from the rock platform between Terrigal and The Haven beaches. The outlook extends east over the rocky intertidal zone along the partly vegetated cliff line, beach and Reef Restaurant to the open space of The Haven. The mix of sand, rock and ocean is highly picturesque and the viewpoint is considered to have a **High** visual sensitivity.

It should be noted that there is no existing path connecting the two sides of the beach which makes accessibility to the rock platform challenging and dangerous at times, including the risk of rockfall.

The proposal would be visually prominent from this viewpoint, extending along the cliff line with associated railings, support columns and viewing decks. Although reducing the natural quality of this section of the coastline, the proposal would provide new viewing opportunities, with panoramic ocean views. Due to the provision of these replacement views, the proposal is considered to have a **Low** magnitude of change from this viewpoint.

Overall, a **Moderate** visual impact is expected on this viewpoint due to the increase in built form and the reduction in visibility of the cliff and rock platform. It should be noted that the creation of new viewing opportunities through the provision of platforms within the proposal concept design, helps reduce the overall level of visual impact experienced. It should be noted that the selection of appropriate materials and finishes for the boardwalk would help integrate the structure into the landscape and likely reduce the visual impact further.

Sensitivity	High
Magnitude	Low
Impact Rating	Moderate



Viewpoint 2 – Looking east towards The Haven from the rock platform. The approximate location of the proposal is indicated in yellow, with the extended sea wall in grey.

A1.4.5 Viewpoint 3

This viewpoint is representative of the view available from the ramped path leading to the Terrigal rockpool and rock platform at the southern end of Terrigal Beach. The partially vegetated sandstone cliff rises behind the path and blocks views beyond it. The mix of sand, rock and ocean is highly picturesque and the viewpoint is considered to have a **High** visual sensitivity.

The proposal would be visually prominent from this viewpoint, extending along the cliff line with associated railings, support columns and viewing decks. The proposal would introduce a new structure into the landscape, reducing the natural quality of the rock platform, although due to the presence of the existing path in the foreground of the view, the proposal is considered to have only a **Low** magnitude of change.

Overall, a **Moderate** visual impact is expected on this viewpoint due to the increase in built form and the reduction in visibility of the cliff and rock platform. It should be noted that the selection of appropriate materials and finishes for the proposal would help integrate the structure into the landscape and likely reduce the visual impact further.

Sensitivity	High
Magnitude	Low
Impact Rating	Moderate



Viewpoint 3 – Existing view west from ramped pathway along southern end of Terrigal Beach. The approximate location of the proposal is indicated in yellow.

A1.4.6 Viewpoint 4

This viewpoint is representative of the view available to pedestrians and cyclists from the elevated path alongside Scenic Highway/Terrigal Esplanade at the southern end of Terrigal Beach. Panoramic ocean views extend over the vegetated sandstone cliff in the foreground towards the Terrigal rockpool, rock platform and the ocean off Terrigal Beach. The mix of sand, rock and ocean is picturesque although some built form is visible. The viewpoint has a **Moderate** visual sensitivity.

The proposal would be visible beneath the viewer extending along the cliff line with associated railings, seating and viewing decks. The proposal would reduce the natural quality of the rock platform, although due to the presence of the existing path in the foreground and the lower elevation of the structure compared to the viewer, the proposal is considered to have only a **Low** magnitude rating.

Overall, a **Moderate/Low** visual impact is expected on this viewpoint due to the slight increase in built form and the reduction in visibility of the cliff and rock platform. It should be noted that the selection of appropriate materials and finishes for the boardwalk would help integrate the structure into the landscape and likely reduce the visual impact further.

Sensitivity	Moderate
Magnitude	Low
Impact Rating	Moderate/Low



Viewpoint 4 – Existing view north west from path along Terrigal Esplanade. The approximate location of the proposal is indicated in yellow.

A1.4.7 Viewpoint 5

This viewpoint is representative of the view available to beach users looking west along Terrigal Beach. The existing view takes in an existing sandstone retaining wall, lighting columns, footpath, Terrigal rockpool, rock platform and sandstone cliffs separating Terrigal from The Haven Beach. The elevated topography of Broken Head in the background. The view is scenic with some limited built form visible and can be considered to have a **Moderate** visual sensitivity.

The proposal would be visible curving around the face of the sandstone cliff with associated supporting columns visible beneath the structure, as well as the viewing platform jutting into the ocean. Existing views towards The Haven Beach may be partially obstructed. The proposal would introduce a new structure into the landscape, leading to a **Moderate** magnitude of change in the view.

Overall, a **Moderate** visual impact is expected on this viewpoint due to the increase in built form and the reduction in visibility of the cliff and rock platform. It should be noted that the selection of appropriate materials and finishes for the boardwalk would help integrate the structure into the landscape and likely reduce the visual impact.

Sensitivity	Moderate
Magnitude	Moderate
Impact Rating	Moderate



Viewpoint 5 – Existing view west from Terrigal Beach. The approximate location of the proposal is indicated in yellow.

A1.5 Mitigation

The purpose of mitigation is to avoid, reduce or where possible remedy or offset any significant adverse effects on the environment arising from the proposed development.

Construction Phase

- Locate storage areas and associated works in cleared or otherwise disturbed areas.
- Consider aesthetics of site hoardings. Preference for neutral colours and designs in proximity to open space to help them blend into surrounding environment.
- Maintain site hoarding and perimeter site areas regularly to include the prompt removal of graffiti.
- Retain and protect existing trees and vegetation adjacent to the works where possible. Minimising clearing where possible.
- Trim rather than remove trees. Works to be undertaken by a qualified arborist.
- Restore all areas disturbed by construction to existing condition.

Operation Phase

- Limit visual contrast and reflectivity of boardwalk structure through appropriate colour choice for built form materials.
- Minimise boardwalk deck thickness where possible to decrease visual profile.
- Ensure the size and number of supporting columns is minimised where possible.
- Ensure any infill to base of columns compliments the colour and texture of the existing rock.
- Ensure retaining walls and sea walls visually integrate with existing landscape through appropriate selection of materials.
- Provide high quality finishes to boardwalk to facilitate long term durability of the design for effect with minimal maintenance.
- Ensure components are considered as a whole, creating a cohesive design language.
- Provide new landscape planting to integrate eastern end of boardwalk with existing setting.
- Plant selection to consider longevity and ongoing maintenance.

Appendix C

Threatened Species Assessment

Threatened Species

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
Plants				
Biconvex Paperbark <i>Melaleuca biconvexa</i>	V	-	V	Negligible Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects
Coast Headland Pea <i>Pultenaea maritima</i>	V	-	-	Moderate Occurs in grasslands, shrublands and heath on exposed coastal headlands and adjoining low coastal heath.
Coast Groundsel <i>Senecio spathulatus</i>	E	-	-	Negligible Grows on frontal dunes
Camfield's Stringybark <i>Eucalyptus camfieldii</i>	V	-	V	Negligible Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges.
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	E	-	V	Negligible grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.
Narrow-leaf Wilsonia <i>Wilsonia backhousei</i>	V	-	-	Negligible Occurs on the margins of salt marshes and lakes.
Sand Spurge <i>Chamaesyce psammogeton</i>	E	-	-	Moderate Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (<i>Spinifex sericeus</i>) and Prickly Couch (<i>Zoysia macrantha</i>)
Amphibians				
Green and Golden Bell Frog <i>Litoria aurea</i>	E	-	V	Negligible Occurs in marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha spp.</i>) or spikerushes (<i>Eleocharis spp.</i>).
Fish				

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
Black Rock Cod <i>Epinephelus daemeli</i>	-	V	V	Low Suitable habitat within the rocky reefs, caves and gutters.
Birds				
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	E	-	-	Negligible Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.
Barking Owl <i>Ninox connivens</i>	V	-		Negligible Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Requires hollows for breeding.
Black-browed Albatross <i>Thalassarche melanophris</i>	V	-	V, M	Low – may flyover or visit Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents.
Flesh-footed Shearwater <i>Ardenna carneipes</i>	V	-	M	Low – may flyover or visit Pelagic species of the open ocean.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V	-	-	Negligible Tall mountain forests in spring and summer, and lower altitude eucalypt forests and woodlands in autumn and winter.
Eastern Osprey <i>Pandion cristatus</i>	V	-	M	Moderate Occurs in coastal areas, especially the mouths of large rivers, lagoons and lakes. Forages on fish in open, clear water. The nearest known Eastern Osprey nest is at Brendan Franklin Oval near Terrigal Lagoon.
Little Eagle <i>Hieraaetus morphnoides</i>	V	-	-	Negligible Occupies open eucalypt forest, woodland or open woodland.
Little Lorikeet <i>Glossopsitta pusilla</i>	V	-	-	Negligible Forages primarily in the canopy of open <i>Eucalyptus</i> forest and

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
				woodland, yet also finds food in <i>Angophora</i> , <i>Melaleuca</i> and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity
Little Shearwater <i>Puffinus assimilis</i>	V	-	-	Low – may flyover or visit Pelagic species of the open ocean.
Masked Owl <i>Tyto novaehollandiae</i>	V	-	-	Negligible Lives in dry eucalypt forests and woodlands from sea level to 1100 m.
Providence Petrel <i>Pterodroma solandri</i>	V	-	-	Low – may flyover or visit Pelagic species of the open ocean.
Pied Oystercatcher <i>Haematopus longirostris</i>	E	-	-	Moderate 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.
Powerful Owl <i>Ninox strenua</i>	V	-	-	Negligible Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest, but generally requires large tracts of habitat.
Red-tailed Tropicbird <i>Phaethon rubricauda</i>	V	-	M	Low – may flyover or visit Marine species that breeds in coastal cliffs and under bushes in tropical Australia
Regent Parrot <i>Polytelis anthoepus monarchoides</i>	E	-	V	Negligible Principal foraging habitat is mallee woodlands, though foraging also occurs in riverine forests and woodlands.
Shy Albatross <i>Thalassarche cauta</i>	V	-	V, M	Low – may flyover or visit Pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea.
Sooty Owl <i>Tyto tenebricosa</i>	V	-	-	Negligible Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
				well as moist eucalypt forests.
Sooty Oystercatcher <i>Haematopus fuliginosus</i>	V	-	-	Moderate Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.
Square-tailed Kite <i>Lophoictinia isura</i>	V	-	-	Negligible Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.
Sooty Tern <i>Onychoprion fuscata</i>	V	-	-	Low – may flyover or visit Marine species, that roosts on offshore islands or coral cays.
Southern Giant Petrel <i>Macronectes giganteus</i>	E	-	E, M	Low – may flyover or visit Pelagic species that nests on Antarctic and subantarctic islands.
Stephen’s Banded Snake <i>Hoplocephalus stephensii</i>	V	-	-	Negligible Rainforest and eucalypt forests and rocky areas up to 950 m in altitude.
Swift Parrot <i>Lathamus discolor</i>	E	-	CE	Negligible Migrates to mainland Australia from Mar-Oct. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.
Wandering Albatross <i>Diomedea exulans</i>	E	-	V, M	Low – may flyover or visit Pelagic species that nests on Antarctic and subantarctic islands.
White-bellied Sea-eagle <i>Haliaeetus leucogaster</i>	V	-	-	Moderate Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat.
Wompoo Fruit-dove <i>Ptilinopus magnificus</i>	V	-		Negligible Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests.

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
Mammals				
Eastern Bentwing Bat <i>Miniopterus schreibersii oceanensis</i>	V	-	-	Negligible Hunts in forested areas. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	-	Negligible Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.
Eastern Freetail Bat <i>Mormopterus norfolkensis</i>	V	-	-	Negligible Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range and roosts in tree hollows.
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	V	-	-	Negligible 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.
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	-	V	Moderate Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.
Koala <i>Phascolarctos cinereus</i>	V	-	V	Negligible Occurs in eucalypt forests and woodlands.
Little Bentwing Bat <i>Miniopterus australis</i>	V	-	-	Low Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas
Humpback Whale <i>Megaptera novaeangliae</i>	V	-	V	Low – pass through adjacent waters Oceanic and coastal species.
Southern Myotis <i>Myotis macropus</i>	V	-	-	Negligible Generally roost in groups of 10

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
				- 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forages over water in rivers and streams.
Southern Right Whale <i>Eubalaena australis</i>	E	-	E	Low – pass through adjacent waters Oceanic and coastal species, but can move inshore for breeding and calving.
Sperm Whale <i>Physeter microcephalus</i>	V	-	-	Negligible Marine mammal, with a preference for deeper water beyond continental shelf.
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	-	E	Negligible 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. Traverses home range along well vegetated creek lines.
Squirrel Glider <i>Petaurus norfolcensis</i>	V	-	-	Negligible Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.
Yellow-bellied Glider <i>Petaurus australis</i>	V	-	-	Negligible Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i>	V	-	-	Low Forages in most habitats across its very wide range, with and without trees. Can roost in tree hollows, buildings or mammal nests.
Reptiles				
Green Turtle <i>Chelonia midas</i>	V	-	V	Negligible Ocean dwelling species. Requires beaches with dunes for nesting.
Leatherback Turtle	E	-	E	Negligible

Species name	BC Act	FM Act	EPBC Act	Likelihood of occurrence
<i>Dermochelys coriacea</i>				Ocean dwelling species. Requires beaches with dunes for nesting.

- EPBC Act – Indicates the Commonwealth conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*, coded as Critically Endangered (CE), Endangered (E), Vulnerable (V).
- TSC Act – Indicates the New South Wales conservation status of each taxon under the *Biodiversity Conservation Act 2016* coded as Endangered species (E1), Vulnerable (V).
- FM Act – Indicates the New South Wales conservation status of each taxon under the *Threatened Species Conservation Act 1995* (Repealed), coded as Endangered species (E1), Vulnerable (V).

Appendix D

**Darkinjung Local Aboriginal
Land Council – Formal
Response**



11 October 2018

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Dear Sanjay

RE: Environment Assessment report – proposed Terrigal boardwalk.

Thank you for the opportunity to formally respond to as listed above.

Darkinjung Local Aboriginal Land Council (DLALC) has now reviewed the document and is satisfied with the Environment Assessment. DLALC would like to make the following recommendations

Recommendation:

1. DLALC Must be notified before any works or earth movement, Darkinjung to be contacted via email to cultural & heritage team 30 days before any works commence.
2. Darkinjung to be engaged for Monitoring of earth movement and works.
3. In the case of Aboriginal cultural heritage sites or material being discovered, work should cease. The area should be avoided and the Office of Environment & Heritage along with Darkinjung should be contacted immediately.
4. Please note, under the National Parks and Wildlife Act (1974) it is an offence to harm (destroy, deface or damage) or desecrate an Aboriginal object or Aboriginal Place, or in relation to an object, move the object from the land on which it has been situated. Penalties range from \$275,00 and 1 year imprisonment to \$555,000 and 2 years imprisonment for an individual up to 1,100,000 for a corporation.

Please do not hesitate to contact me on the details listed above should you require any further information in regards to the project.

Kind regards,

A handwritten signature in black ink, appearing to read 'Anthony Freeman'.

Anthony Freeman
Heritage Officer – Culture and Heritage