



# STIRLING COASTAL BOARDWALK CONCEPT DESIGN REPORT (FEASIBILITY STUDY) JULY 2025

# **UDLA**

### TABLE 1 **EDITION DETAILS**

PROJECT NAME				
Title	Stirling Coastal Boardwalk (Feasibility Study) Concept Design Report			
Production Date	JULY 2025			
Prepared By	UDLA			
Status	FINAL			
<b>UDLA Project Code</b>	STIBCD			

### TABLE 2 DOCUMENT REGISTER

DOCUMENT REGISTER						
Version	Date	Amendments	Prepared By			
FINAL	30/07/2025	-	UDLA			

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IMAGE 1: MELALEUCA LANCEOLATA (REWILD PERTH, N.D.)

We acknowledge the Whadjuk Nyoongar\* people as the Traditional Owners of the land on which the site stands today. We pay respect to Whadjuk Nyoongar people, and Elders both past and present whose knowledge and wisdom has and will ensure the continuation of cultural and traditional practices.

<sup>\*</sup> As explained in Kaartdijin Noongar (https://www.noongarculture.org.au/language/) Noongar is identified as a single language, but are several approved ways of spelling certain words. UDLA notes that the local Aboriginal Elders have advised the City through the Reconciliation Action Plan working group that their preferred spelling is 'Wadjak' and 'Nyoongar' UDLA uses the spelling 'Noongar' and "Whadjuk" and has incorporated both throughout the report.

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# 1.0 INTRODUCTION

# 1.1 PROJECT BACKGROUND

### **CONTEXT**

The City of Stirling (CoS / the City) is exploring the feasibility of an environmentally-sensitive boardwalk that will seamlessly connect two of Perth's most iconic beaches: Scarborough and Trigg.

The initiative aims to enhance the coastline, with an aspiration to create an immersive experience of the unique dunal landscape that invites Connection to Country and celebrates Whadjuk Noongar culture.

West Coast Highway – a major arterial route running parallel to the existing Principal Shared Path (PSP) alongside the proposed project site – carries high volumes of traffic, including commuters and heavy vehicles. The increasing popularity of bikes, e-scooters and skateboards, have decreased perceptions of safety amongst some path users.

Following renewed community interest in the project, Elected Members agreed to investigate the feasibility of a Coastal Boardwalk and a Feasibility Study was included in the City's Corporate Business Plan for 2024-28.

Being situated within a Class A Reserve and home to a recorded Threatened Ecological Community (TEC), any work within the proposed project site needs to be carefully considered.



FIGURE 1: PROPOSED COASTAL BOARDWALK (CITY OF STIRLING, 2024)

### 1.2 PURPOSE OF REPORT

# **OVERVIEW**

This report outlines the Design Team's approach to developing a concept design that informs the Feasibility Study currently being undertaken by the City. It builds on the City's work to date and provides a foundation for community engagement.

As the proposed project site is environmentally sensitive, the City commissioned a Preliminary Environmental Opportunities and Constraints Assessment (Coterra, 2024) prior to commencing the preliminary design investigations presented in this Concept Design report – ensuring the options developed align with the Assessment's recommendations. A gap analysis was completed as part of the Preliminary Assessment identifying that further environmental studies will be required as this project progresses.

As part of the Concept Design (Feasibility Study), the City also commissioned preliminary geotechnical investigations, to complement the efforts by the Design Team, specifically:

- A site Feature Survey undertaken by MNG
- A reconnaissance flora survey and basic fauna survey undertaken by Natural Area
- An Engineering methodology prepared by HERA Engineering.

The material presented in this report is based on the collective findings from these efforts and was socialised with Government agencies and Aboriginal Elders from the local area ahead of further community consultation.

# **PREVIOUS WORK FEASIBILITY JUNE 2025** 2005 / 2013

- The coastal boardwalk proposal between Scarborough and Trigg beaches was considered by Council in 2005 and 2013.
- In 2005, Council decided not to proceed based on community and stakeholder consultation results.
- In 2013, officers recommended proceeding with a detailed design brief, but the motion was not supported at the Council meeting.
- In recent years, three Notices of **Motion** regarding the boardwalk have been presented to Council.

- Design Considerations & **Principles** to translate vision and
- Context analysis (desktop) to understand constraints & opportunities.

to guide whole process.

- Stakeholder engagement to understand expectations & aspirations (de-risk project).
- Further environmental and geotechnical surveys, including flora & fauna investigations, to inform the development of options, location and concept design.
- Development & evaluation of potential journeys through the site.
- Testing of preferred journey and refinement to develop concept design & costs.
- Economic Impact Assessment (undertaken separately)

# **FUTURE**

- Community Consultation by CoS.
- Progress to Design **Development** (subject to Council approval).



# 2.1 METHODOLOGY

In preparing the Concept Design to inform the Feasibility Study for the Boardwalk, the Design Team applied a methodology which is grounded in research (Phase 1), an iterative design process (Phases 2-5) and documentation of the outcomes (Phase 6).

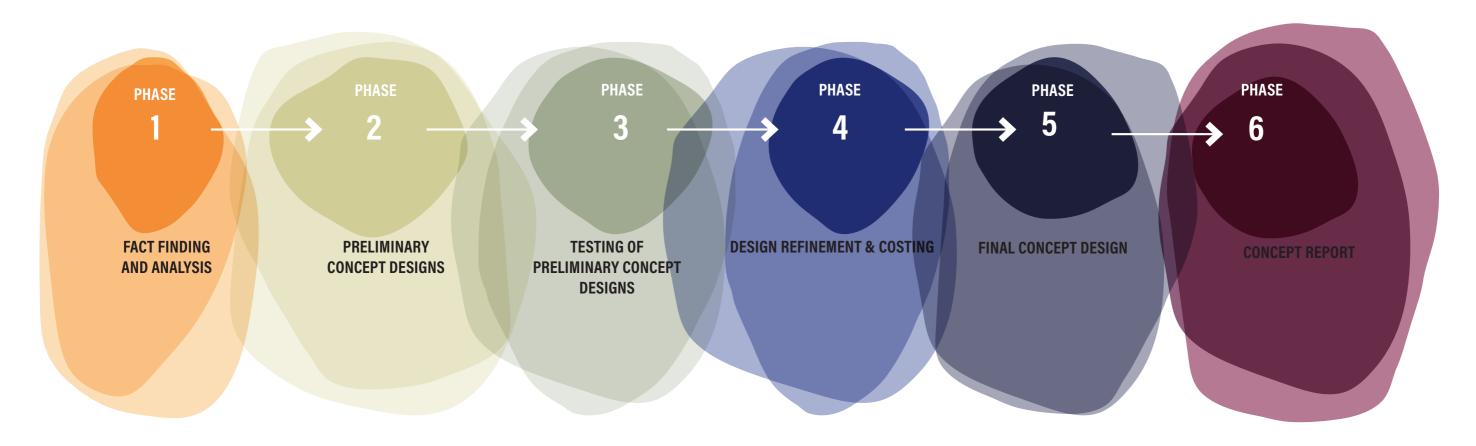
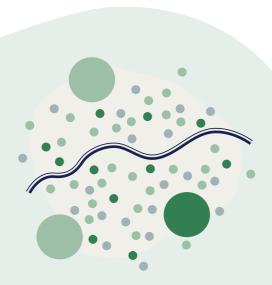


FIGURE 2: METHODOLOGY

# 2.2 DESIGN PRINCIPLES

As part of the design process, three preliminary principles were developed to communicate the intent and ensure alignment with community feedback which those principles are based on.



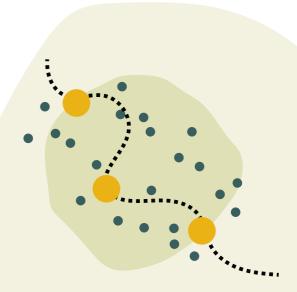
# APPLYING A LIGHT TOUCH APPROACH

- Minimise interventions to preserve the site's natural character and ecological balance.
- Use sustainable materials and low-impact designs that integrate harmoniously with the environment.
- Ensure that any changes are subtle and reversible, maintaining the site's integrity.



# CELEBRATING THE 'ICONIC' DESTINATION

- Focus on highlighting the natural features of the beach and foreshore areas.
- Create a seamless connection between key destinations (Scarborough and Trigg).
- Emphasise the site's unique and memorable aspects.
- Restoration of natural vegetation



# ENABLING AN IMMERSIVE EXPERIENCE

- Design spaces that engage all five senses to enhance visitor connection.
- Integrate elements that reflect the cultural significance of the land.
- Facilitate a 'Connect to Country' experience through thoughtful design.

FIGURE 3: DESIGN PRINCIPLES

# 2.3 PROJECT CONSIDERATIONS

In conversation with both Government Stakeholders and Aboriginal Elders and members of the Aboriginal community, the Ngalang Maya Wangkiny Group (refer Section 5), a range of considerations were developed to align with the Design Principles and thus inform the assessment of the potential location and alignment of the boardwalk.

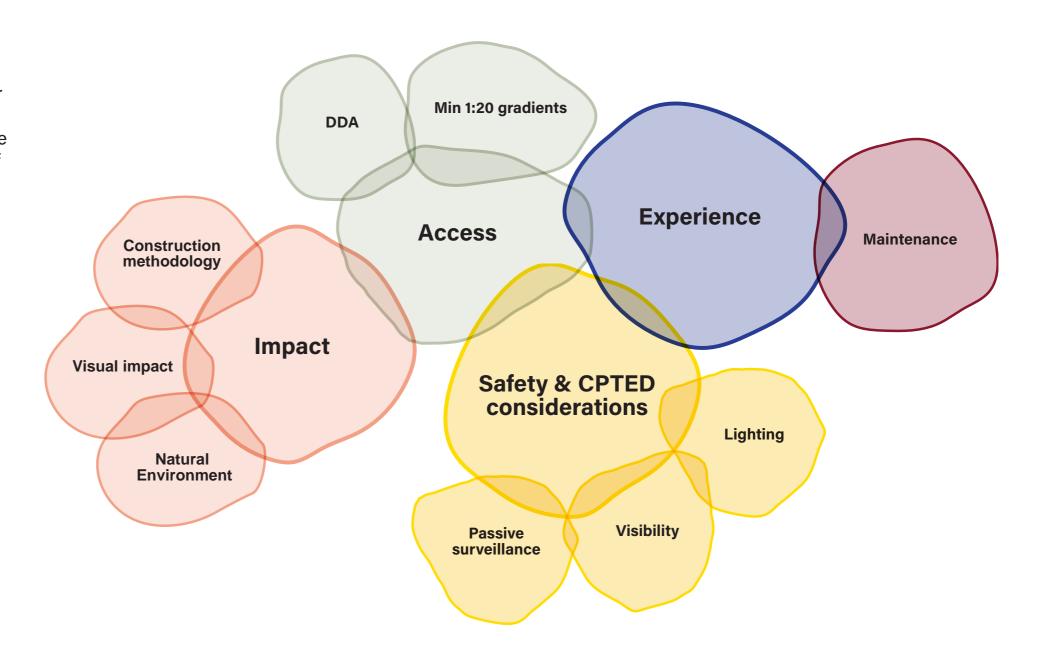


FIGURE 4: DESIGN CONSIDERATIONS

# 2.4 **JOURNEY EXPLORATIONS**

# Two potential locations and alignments for the boardwalk were explored as part of the design process.

- Journey A offered a "promenade-style" option running parallel to the existing PSP, aiming to align with existing infrastructure and avoid the dune system.
- Journey B took a more experiential approach, proposing a boardwalk that connects Scarborough Beach to South Trigg Beach through the dunes.

Both journeys presented opportunities and constraints identified through fieldwork, workshops, and stakeholder engagement. These are further detailed in Sections 3 and 5 of this report.

Journey B emerged as the preferred option due to:

- Lower environmental impact (ie. little impact on "Very Good" and no impact on the TEC within a 15m buffer).
- Enhanced experiential value, located away from traffic noise.
- Greater opportunities for storytelling and cultural interpretation.
- Potential for ecological restoration within the dune system.
- Reduced construction impacts by applying screw piling method and working within already degraded areas. More clearing required for Option A.
- Better separation of pedestrians and cyclists / e-scooters etc.

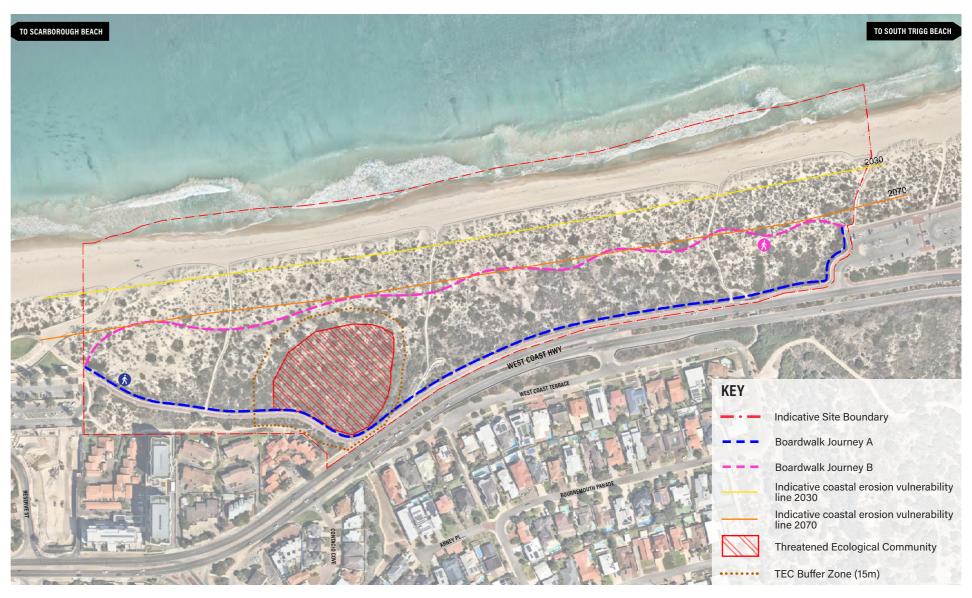
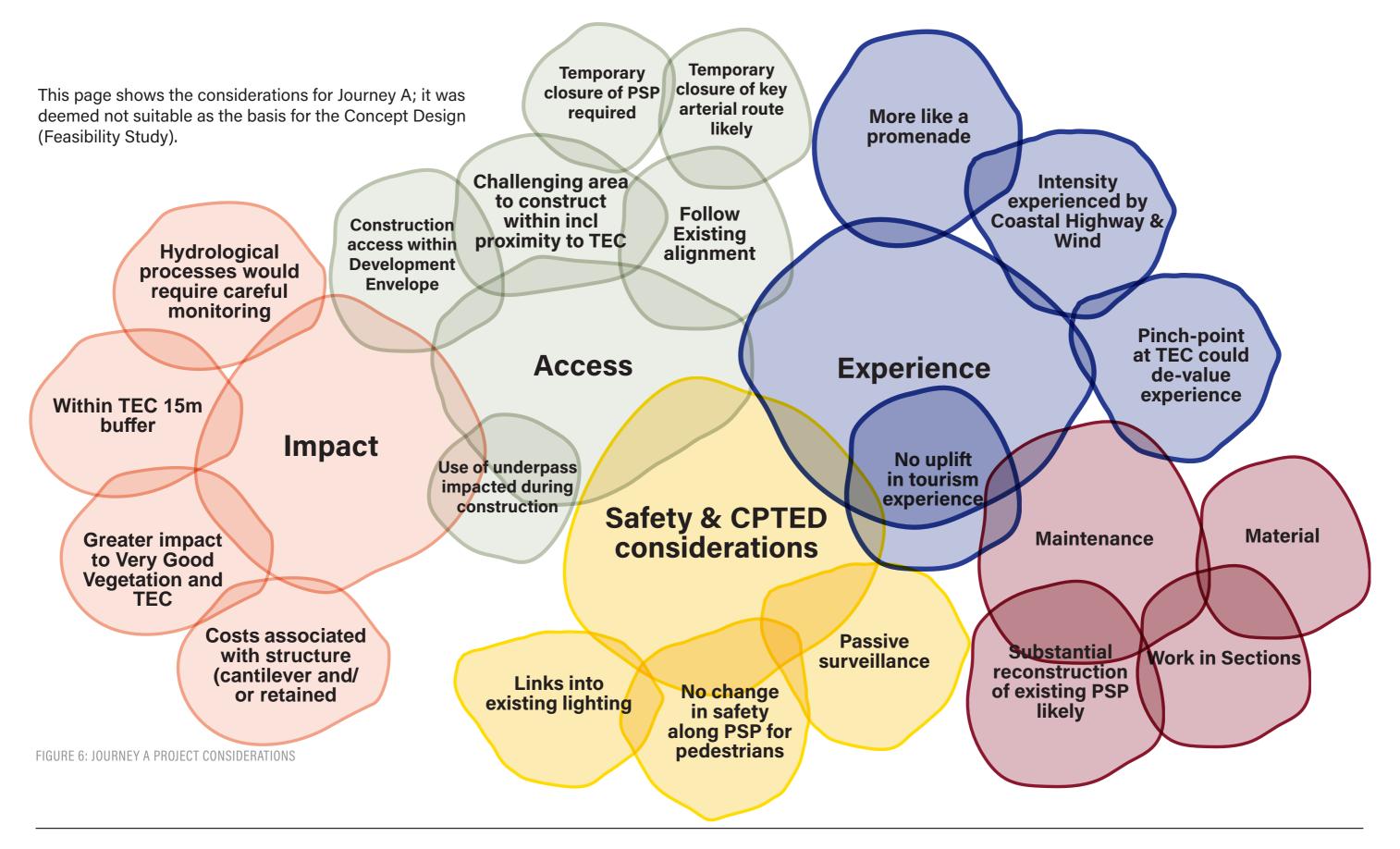


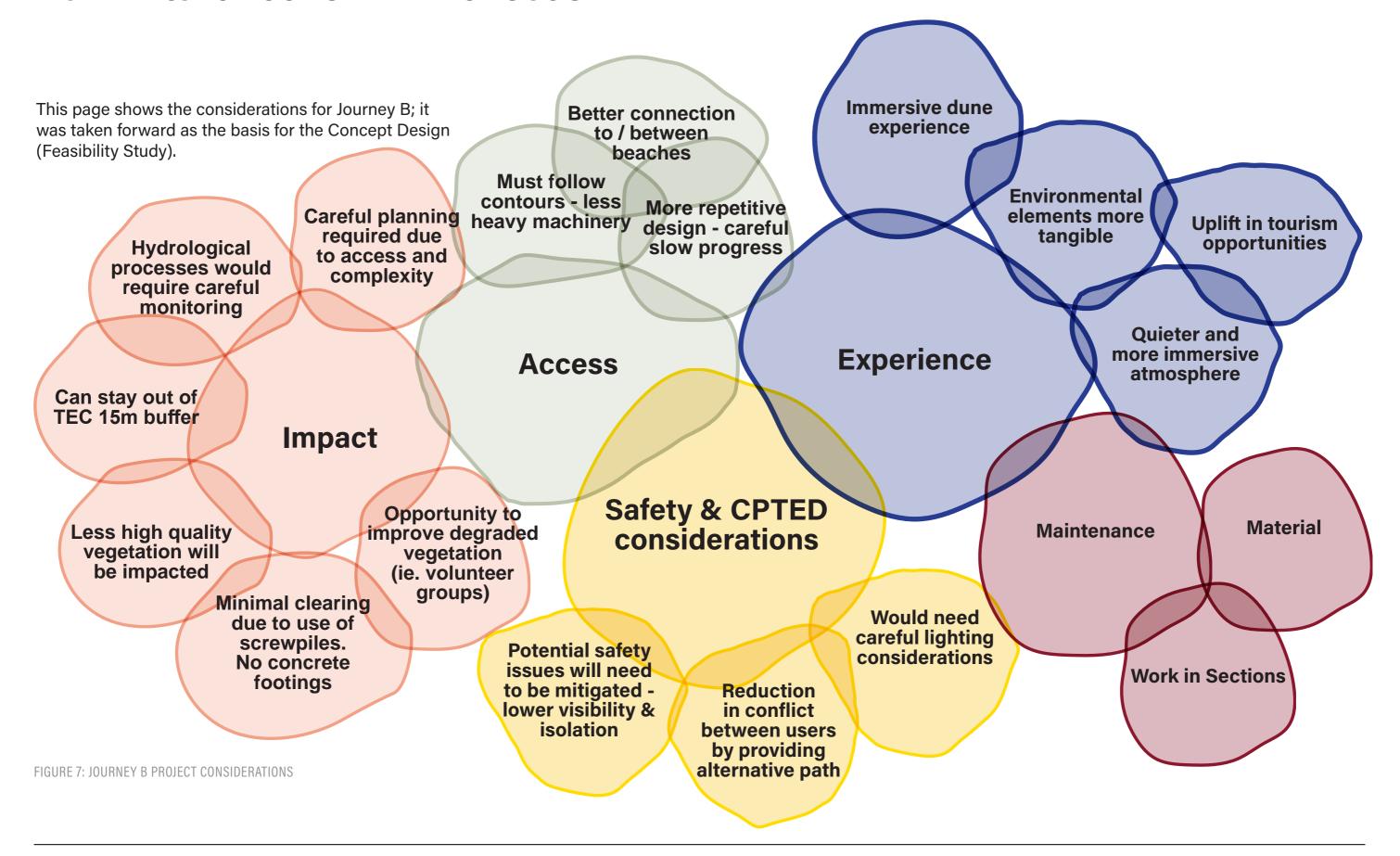
FIGURE 5: JOURNEY OPTIONS - INDICATIVE LOCATION MAP



# 2.5 PROJECT CONSIDERATIONS JOURNEY A



# 2.6 PROJECT CONSIDERATIONS JOURNEY B





# 3.1 DOCUMENT REVIEW - COTERRA REPORT

### **SUMMARY**

A preliminary Environmental Opportunities and Constraints Assessment was undertaken by the City of Stirling prior to the preliminary design investigations. This report (Coterra, 2024) has informed the early considerations for the concept design, particularly around the following aspects:

### **Ecological Sensitivity**

Coterra's site investigations revealed key environmental constraints that must inform the feasibility and alignment of the proposed boardwalk.

### **Vegetation and Habitat**

The site lies within Bush Forever Site No. 308 and an Environmentally Sensitive Area, both of which impose ecological and regulatory limitations. It includes a Critically Endangered Threatened Ecological Community — Callitris preissii / Melaleuca lanceolata woodlands — covering 0.93 hectares and containing 13 Callitris preissii trees. Vegetation types range from good to degraded condition, with active revegetation currently underway by the City of Stirling.

### **Coastal Hazards and Landform Risks**

The CHRMAP identifies coastal erosion as a major long-term risk, particularly west of the 2070 hazard line. Inundation is not expected before 2122. Soils are unstable and prone to erosion. Although no known Aboriginal or European heritage sites are recorded, the area is Bushfire Prone and shows signs of illegal dumping, including potential asbestos contamination.

# **Community Safety and Connectivity**

The coastal corridor experiences high public use but lacks dedicated pedestrian infrastructure. The current shared path along West Coast Highway presents safety concerns due to its proximity to traffic and conflicts with cyclists. Community feedback suggests safer and more accessible alternatives should be explored.

### **Key recommendations from the Coterra Report:**

- Conduct a flora and vegetation survey in spring 2025 to confirm the extent and condition of the Threatened Ecological Community (TEC).
- Undertake a Level 1 fauna assessment to identify conservation-significant species and inform design measures (e.g. a fauna underpass).
- Review the site's disturbance history to assess contamination risks (e.g. asbestos).
- Minimise impact on vegetation in good condition; use elevated structures where appropriate and reintroduce local native species in disturbed areas
- Prepare a Construction Environmental Management Plan (CEMP) and Foreshore Management Plan (FMP).
- Engage an environmental consultant to support survey planning and alignment refinement.

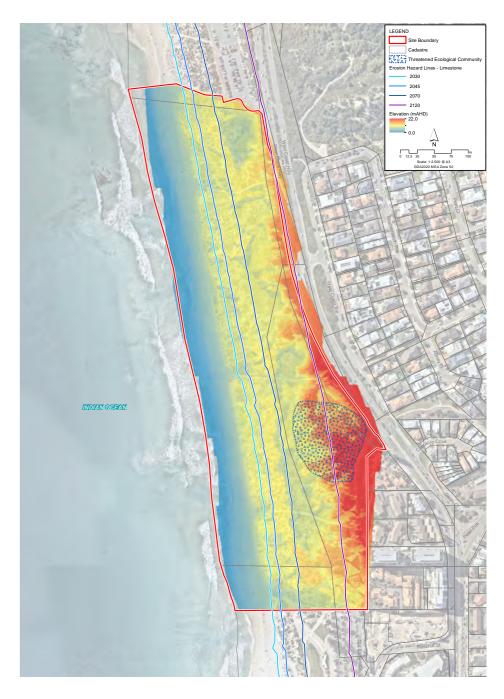


FIGURE 8: MAP SHOWING TECS, EROSION HAZARD ZONES, DUNE INSTABILITY, AND PROPOSED BOARDWALK ALIGNMENT. SUMMARISES KEY ECOLOGICAL AND COASTAL CONSTRAINTS (COTERRA ENVIRONMENT 2024).

### 3.2 **DOCUMENT REVIEW - GALT REPORT**

# **SUMMARY**

**Preliminary Geotechnical Investigations were** commissioned by the City and undertaken by GALT Geotechnics to investigate the two potential alignments described in Section 2. 4 and establish the geotechnical make-up of the site, for consideration by the Design Team.

The Geotechnical Survey Report, provided by the City to the Design Team, offered the following key considerations:

- The typical soil profile shows natural sand as the dominant soil type, presence of sand with organic matter and limestone (isolated bands only). This makes the site susceptible to erosion.
- No groundwater was encountered however, seasonal perching of groundwater possible.
- Boardwalk footings best supported by driven or screw piles, as opposed to concrete footings
- Minimise ground disturbance by routing boardwalk along already degraded areas.

The full report was reviewed by HERA Engineering with a memorandum provided in Appendix A. Section 3.4 provides further information on how the above was considered in the engineering approach.



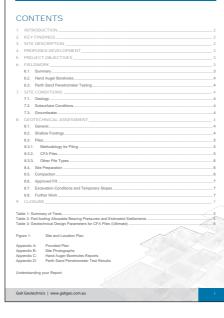










FIGURE 9: PAGES FROM THE GEOTECHNICAL REPORT, 2025. (GALT GEOTECHNICS)

# 3.3 INVESTIGATIONS - ENVIRONMENTAL REPORT

# **SUMMARY**

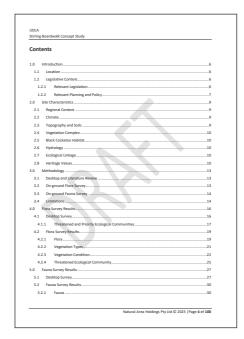
As part of the Concept Design (Feasibility Study), an Environmental Survey and Report was undertaken by Natural Area to expand on the preliminary investigations by Coterra (refer Section 3.1), and to confirm environmental values of the site to guide design decisions.

Key outcomes that have influenced the design include:

- Vegetation conditions range from "very good" to "completely degraded", with the former concentrated in the eastern portion of the site, directly west of West Coast Highway and the principal shared path
- 36% of flora species are introduced / not native
- Alignment to avoid the TEC by minimum 15m with additional actions required to mitigate risk of impacts to TEC
- Prevent hydrological changes that impact the of the TEC or impact surface flows into the community
- Align boardwalk with areas considered "degraded" or "completely degraded"
- Lighting design to be best-practice for wildlife
- Elevate boardwalk to allow terrestrial fauna movement, maintain connectivity and enable ventilation and natural light at ground level

The full Environmental Report including recommendations can be found in Appendix D.











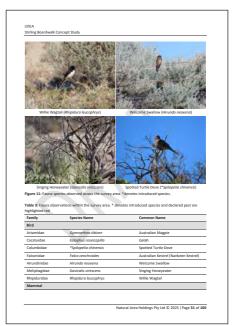


FIGURE 10: PAGES TAKEN FROM ENVIRONMENTAL REPORT, 2025. (NATURAL AREA.)

# 3.4 ENGINEERING APPROACH

### **SUMMARY**

Referring to the findings from the Geotechnical Report (Galt, 2025), the following assumptions were made to inform the engineering approach:

- Shallow and deep piled footings are considered suitable.
- Driven or bored piles would be most suitable but alternatives such as screw piling should be considered.
- Compaction to a dry density ration (DDR) of at least 95% MMDD recommended.

### The design intent is to

- Create a light-weight boardwalk to reduce the overall load for the supporting structure
- Use twin screw piling with timber or steel rafters spanning between the piles, to negate the need for concrete footings and to limit ground disturbance.

# The construction strategy is to

- Access via existing tracks wherever possible
- Use GPS survey & set-out for screw pile locations
- Install pre-fabricated rafters and joists, working from centre of boardwalk outwards
- Screw pile installation using compact tracked or walk-behind rigs.

Further detail, including a Preliminary Construction Plan and Typical Cross Sections, is provided in Appendix B & C.

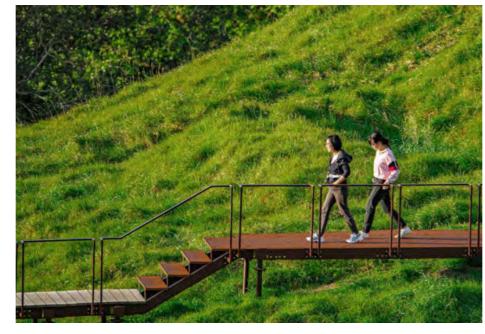


IMAGE 2: EXAMPLE OF SIMPLE SCREW PILES IN MANGAWHAU BOARDWALK (ISTHMUS., 2025)



IMAGE 4: CONSTRUCTION WITH SIMPLE SCREW PILES IN MANGAWHAU BOARDWALK (ARCHI PRO)



IMAGE 3: EXAMPLE OF SIMPLE SCREW PILES (GOLIATH TECH)

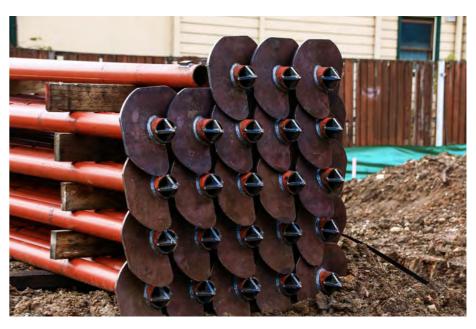


IMAGE 5: SIMPLE DESIGN FOR SCREW PILES (SCREW PILING AUSTRALIA)



# 4.1 PRECEDENTS

A precedent study was undertaken as part of this feasibility concept design to explore local and international boardwalks, a selection of which is provided on this page.

Other notable local examples are the Valley of the Giants boardwalk near Denmark, Shark Bay Boardwalk, Kalbarri Skywalk and the Roeebuck Bay Lookout in Broome.

This investigation assisted in benchmarking our design principles and provided design inspiration, for both the design team, the City and project stakeholders.



IMAGE 6: MAIN LOOK UP OF THE BOARDWALK (ISTHMUS., 2025)

# INTERNATIONAL PRECEDENT MAUNGAWHAU TIHI BOARDWALK

The Maungawhau Tihi Boardwalk, located on a culturally and spiritually significant waahi tapu site for Mana Whenua iwi, provides a valuable precedent for sensitive boardwalk design. It successfully balances tourism with preservation by using low-impact construction techniques, such as hand-screwed foundations and elevated pathways that avoid ground disturbance. Natural, permeable materials were used to minimise environmental effects and honor the maunga's heritage. These principles are relevant to the Stirling Coastal Boardwalk, which is also located in a protected area, requiring a design that minimises disruption to the site's natural, environmental, and cultural values.



IMAGE 7: WEST END - AERIAL PHOTO (ROTTNEST ISLAND, N.D.)

# LOCAL PRECEDENT: WEST END - WADJEMUP (ROTTNEST ISLAND)

The West End of Wadjemup (Rottnest Island) serves as a key precedent for the Stirling Coastal Boardwalk due to shared environmental and classification similarities, including both being A-Class reserves. The West End's rugged, untouched landscape and eco-sensitive hiking trail through similar terrain demonstrate how to balance conservation with public access. Its floating boardwalk design, which avoids disturbing vegetation and natural features, offers a valuable model for constructing the Stirling Coastal Boardwalk with minimal ecological impact.

# 4.2 BENCHMARKING

# APPLYING A LIGHT TOUCH APPROACH

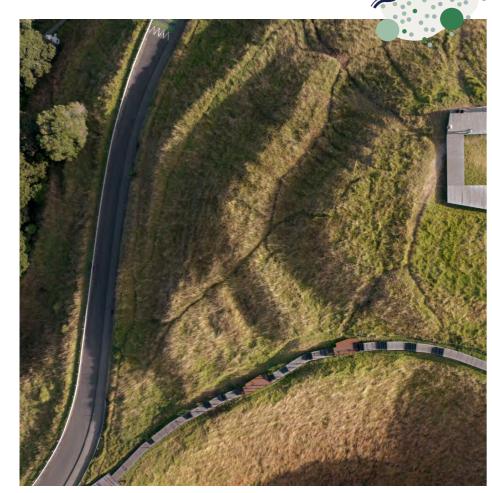


IMAGE 8: MAUNGAWHAU TIHI (ISTHMUS., 2025)

This example demonstrates a light touch construction approach to a environmental and culturally sensitive site. It utlised screw piles to minimise impact on the existing environment.

# **ENABLING AN IMMERSIVE EXPERIENCE**



IMAGE 9: CLOSER LOOK OF THE BOARDWALK (ROTTNEST ISLAND, N.D.)

The Rottnest Island Boardwalk demonstrates a simple design that allows the user to deeply connect with the landscape. It deliberately stays close to the natural ground level to negate the need for handrails and thus blends in seamlessly with the surrounds.

# **CELEBRATING THE 'ICONIC' DESTINATION**

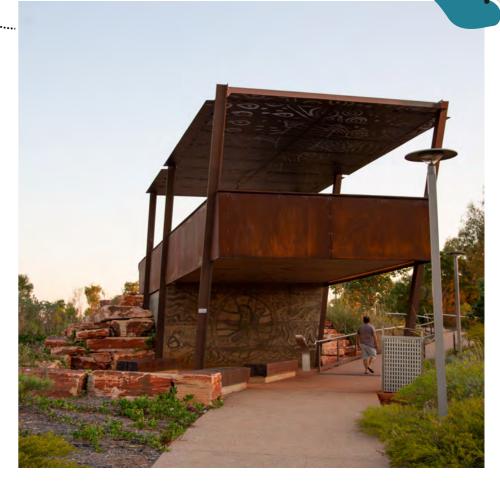


IMAGE 10: ICONIC SHADE STRUCTURE/ LOOKOUT IN ROEBUCK BAY (UDLA)

The Roebuck Bay Lookout creates a series of spaces, surfaces and vantage points for respite, prospect and storytelling. This project demonstrates an integrated approach to weaving artistic approach into shade structures and other art opportunities to assist with the story telling elements.

# 4.3 DESIGN RATIONALE OVERALL

The site presents a unique set of opportunities and constraints, which have informed the concept design rationale for the project.

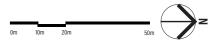
In unpacking these and evaluating the potential impact of a boardwalk through the dunes, consideration was given to:

- Coastal vulnerability (2030 & 2070 Coastal Erosion lines)
- Cultural story of the site
- Access to the site, including transport modes
- Circulation through the site and the experience of current journeys
- Existing landforms, including site elevation and features
- Opportunities for views
- Environmental values
- Interaction with adjacent areas (i.e. Scarborough Foreshore to the South)
- Existing amenity / any gaps
- Construction approach

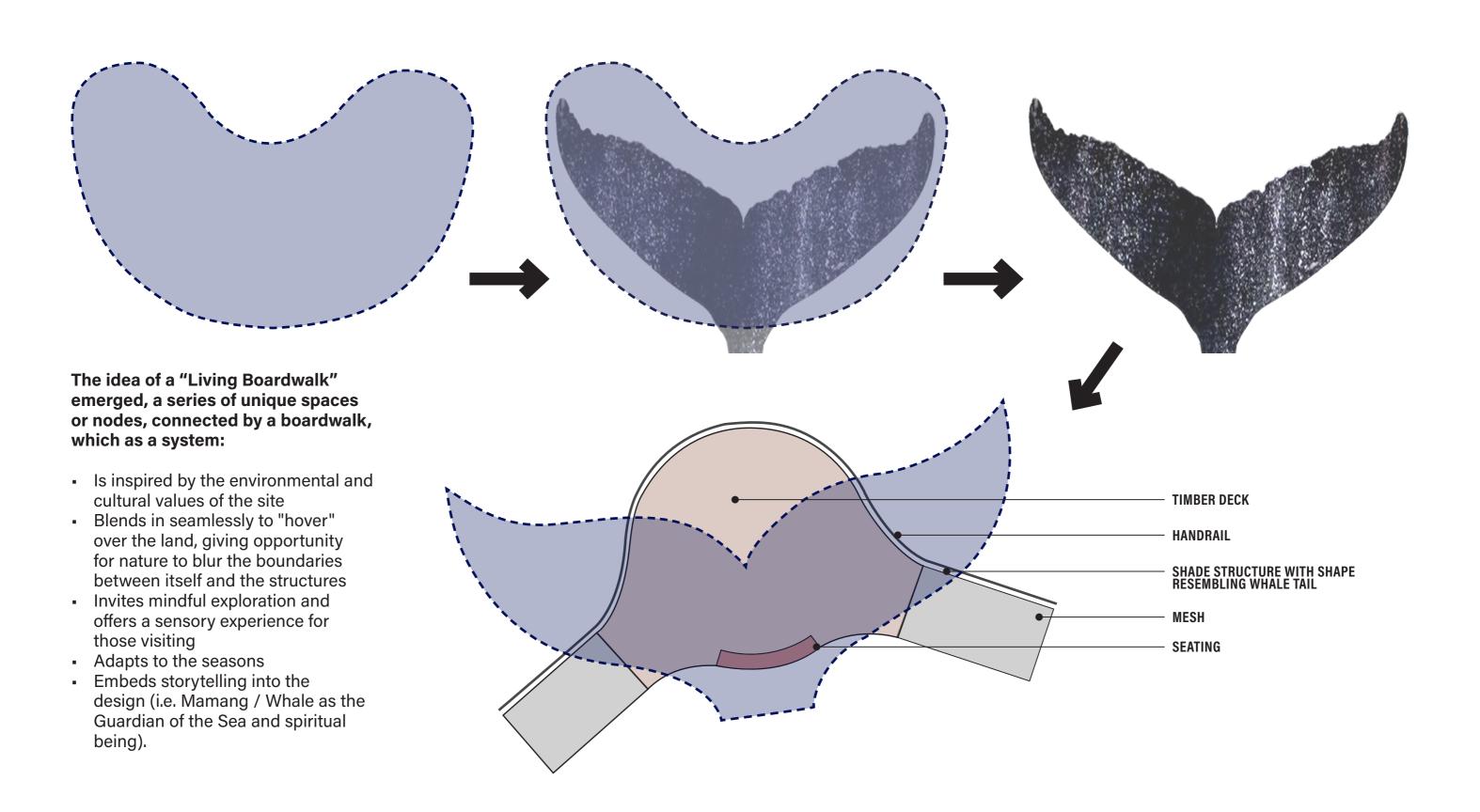
The design team undertook several visits to the site, collaborated with the City to generate extensive drone footage of the site, and conducted a site feature survey (MNG, 2025) to inform this process.



FIGURE 12: SITE EXPLORATION & TESTING MAP



# 4.4 DESIGN RATIONALE IN DETAIL



# 4.5 DESIGN OPTIONS

Aligning with the design rationale and the project aspirations, the following three options were explored:

### Option A - Boardwalk only

This option presents the most simple and cost effective design concept, providing access through the dune without a significant uplift in amenity. It resembles a simple boardwalk structure as seen across the WA coast.

# Option B - Boardwalk & Select Nodes

This option offers a greater level of amenity than Option A with nodes placed in select locations (ie. intersections with existing beach access tracks). It offers better accessibility due to provision of rest points across the boardwalk.

Option C - Boardwalk & Series of Nodes
This option presents the most aspirational design concept, proposing a series of different nodes to create a unique, immersive experience of the foreshore.

A Cost Plan was prepared by DCWC for all options; a copy is attached to this report as Appendix F.

Option B is considered the preferred option as it aligns with the project aspirations and stakeholder feedback.







### 4.6 PRELIMINARY MASTERPLAN

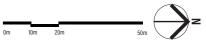
The preliminary masterplan (Option B) proposes a journey through the centre of the dunes, with six Primary Nodes, supported by a series of smaller rest points, landings and connections.

The six Primary Nodes represent the Noongar 6 seasons with the intent for each node to offer an experiential, cultural, and / or educational experience as part of the wider journey through the site. Each of the six Primary Nodes comprises an individually designed shade structures to give it a unique character and collectively, these nodes create an immersive experience.

The boardwalk journey intends to avoid very good / good vegetation while leveraging off natural experiential opportunities such as views, natural vegetation and an immersive dune experience. It is located predominantly to the east of the 2070 Coastal Erosion line.

The function and amenity of the boardwalk and all nodes developed during the Concept Design phase is outlined in the concept plans shown on the subsequent pages. Option B incorporates Node Types A and B only, noting the number and type of nodes will be explored in the subsequent design stages. A full package of these drawings is provided as Appendix E.





# PRIMARY NODE (A) CONCEPT PLAN 4.7

### **PRIMARY NODE PURPOSE:**

6 large gathering nodes will represent the 6 Noongar seasons through their themes, the sharing of stories, promoting education and providing an immersive coastal dune experience.

### **SIZE & USER CAPACITY**

- 50m2
- Accommodating 20 30 people, an average primary school class

### **AMENITY**

- Custom Shade Structure resembling the tail of a humpback whale
- Seating including provision of seats with back
- Interpretive Signage / Aboriginal Story Telling
- A water fountain located on two primary nodes

### **MATERIALITY**

- Timber decking, colour appropriate for Scarborough Dune System
- Custom Complimentary Balustrade where required
- **Custom Seat Configuration**

### **BOARDWALK PURPOSE**

Accessible boardwalk

### SIZE

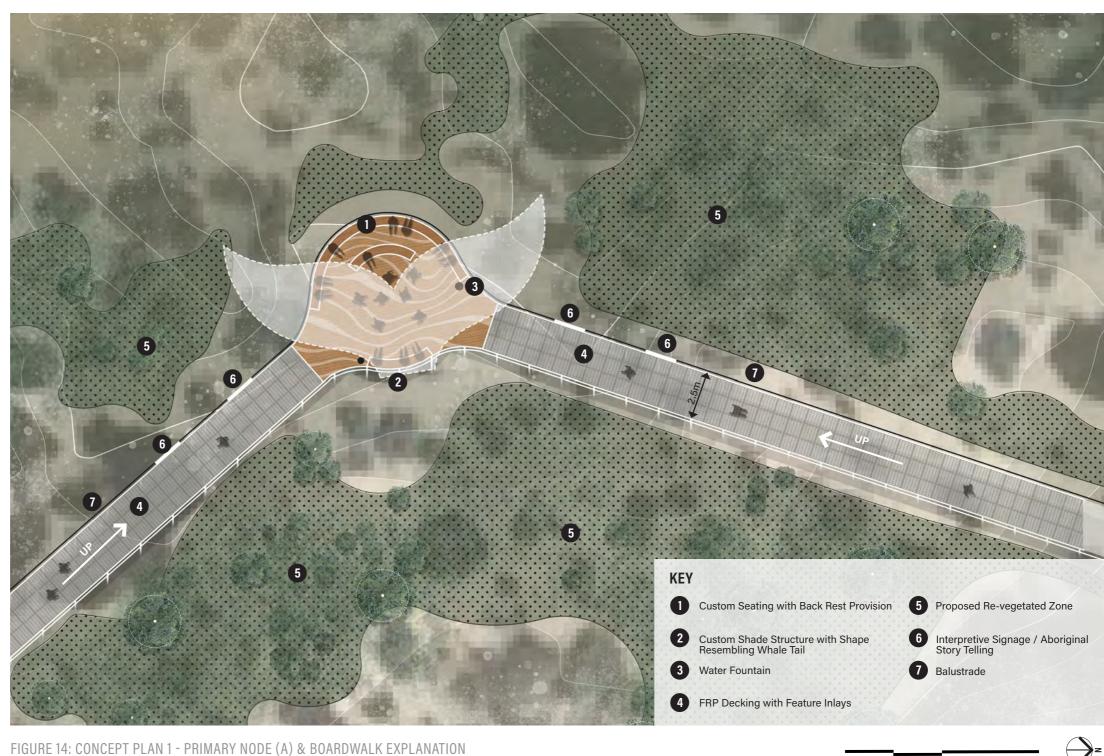
• 2.5m wide

### **AMENITY**

- Lighting
- Kickrail
- Balustrade provision approx 50%

### **MATERIALITY**

- FRP
- Corten Steel Kick rail
- Lightweight balustrade





# 4.9 CONNECTION NODE (B) CONCEPT PLAN

### **PURPOSE:**

Connector to the existing access path at the same level

### **SIZE & USER CAPACITY**

• 20-30m2

### **AMENITY**

- Shower \*Shower infrastructure needs formalisation & drainage consideration
- Seating
- Interpretive Signage / Aboriginal Story Telling
- Water fountain

# **MATERIALITY**

FRP to ensure any sand build up can be cleared

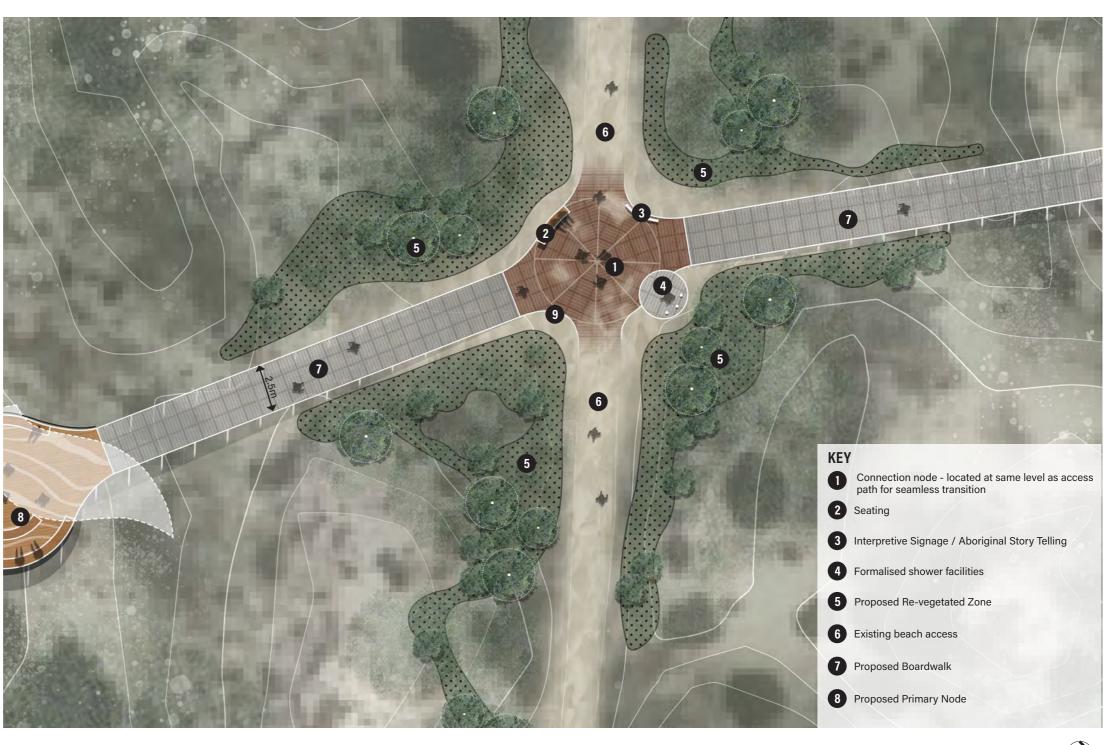
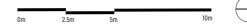


FIGURE 16: CONCEPT PLAN 3 - CONNECTION NODE (D)



# 4.8 SECONDARY NODE (D) & LANDING NODE (C) CONCEPT

THESE TYPE OF NODES WERE DEVELOPED FOR OPTION C BUT ARE NOT INCLUDED IN OPTION B (PREFERRED)

# **SECONDARY NODE (D)**

# **PURPOSE:**

Designated rest points along the board walk, spaced no more than 75m apart

# **SIZE & USER CAPACITY**

- Up to 20m2
- Accommodating 10-12 people

### **AMENITY**

- Seating
- Interpretive Signage / Aboriginal Story Telling

### **MATERIALITY**

- Timber Decking, colour appropriate for Scarborough Dune System
- Custom seat configuration

# LANDING NODE (C)

### **PURPOSE:**

Connector to the existing infrastructure

### SIZE

• 20 - 30m2

# **AMENITY**

- \* Shower infrastructure already exists at landing nodes
- Seating
- Interpretive Signage / Aboriginal Story Telling
- Water fountain

### **MATERIALITY**

- Exposed aggregate, patterning
- Seating wall

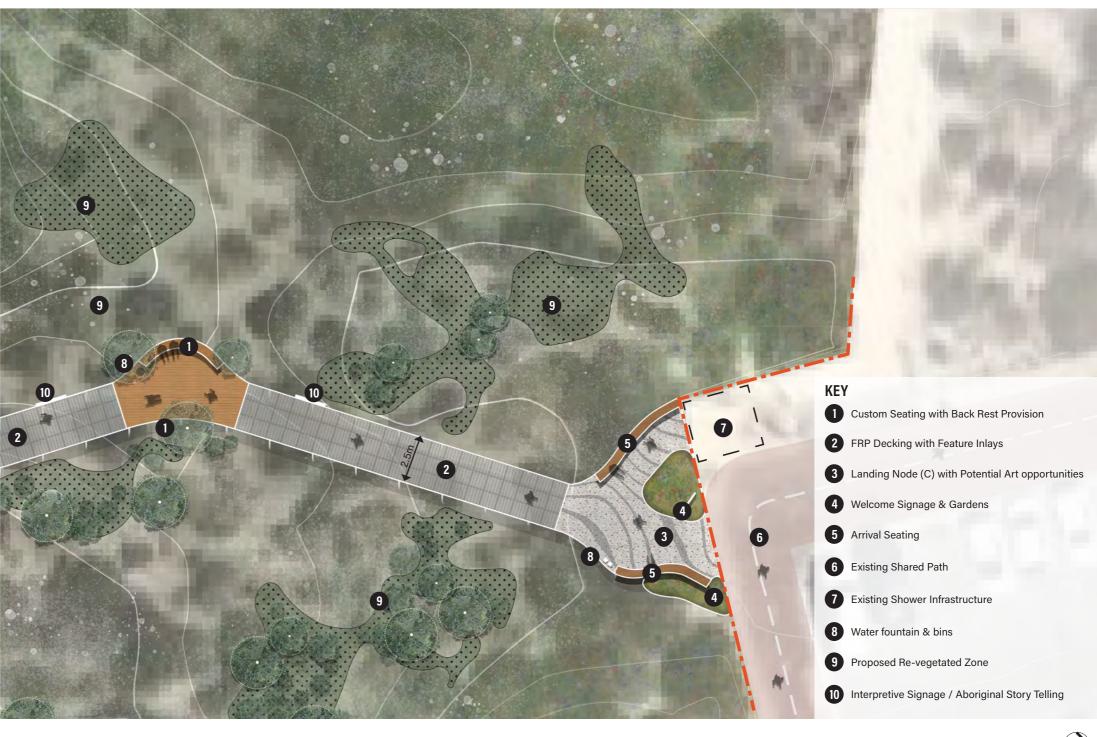
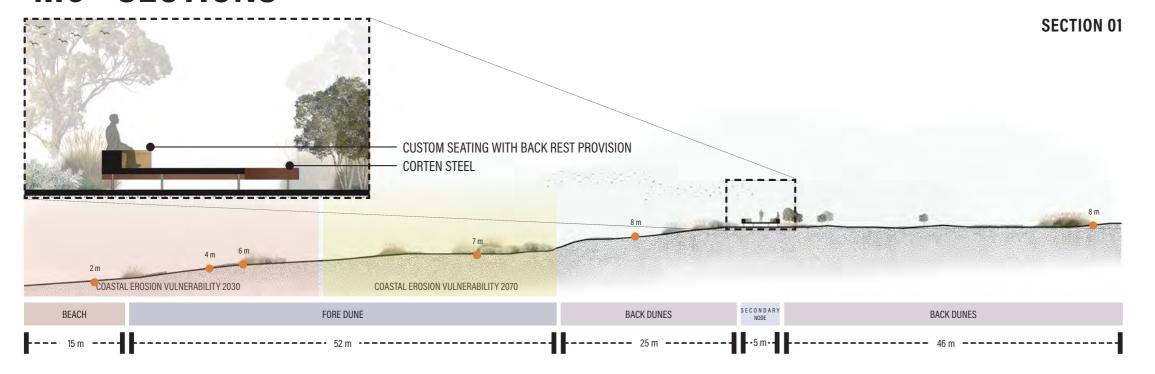
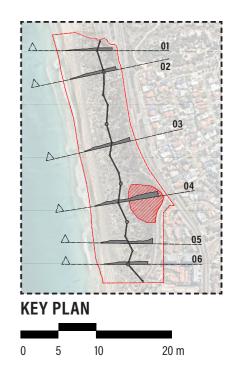


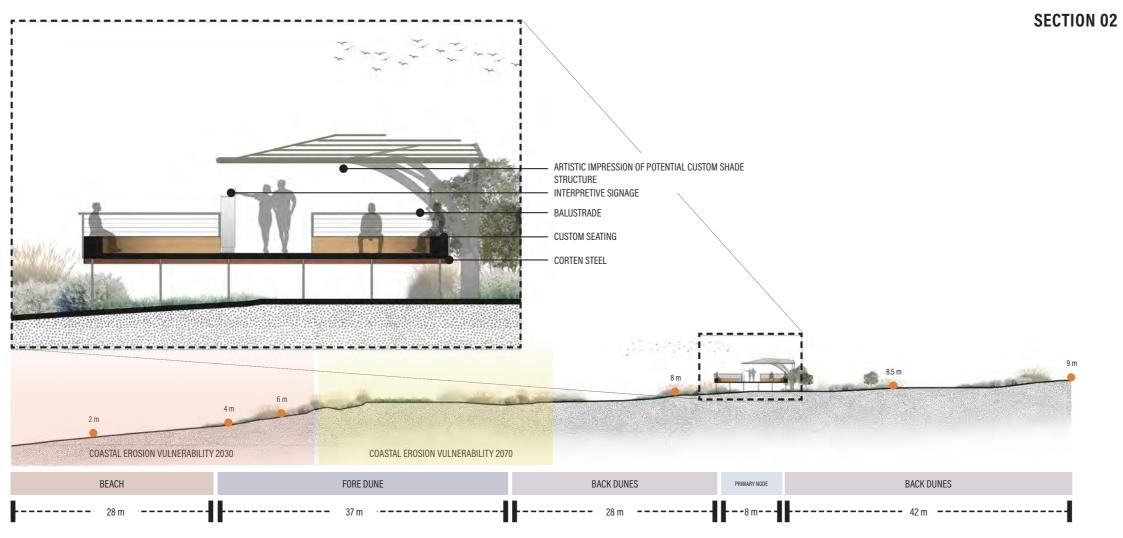
FIGURE 15: CONCEPT PLAN 2 - SECONDARY NODE (B) & LANDING NODE (C)



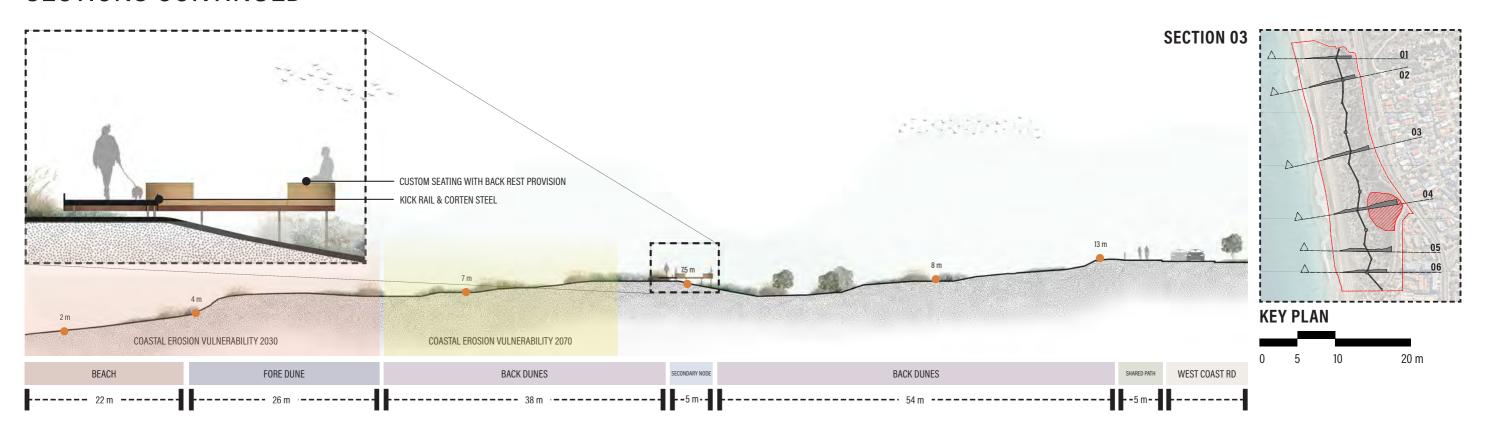
# 4.10 SECTIONS

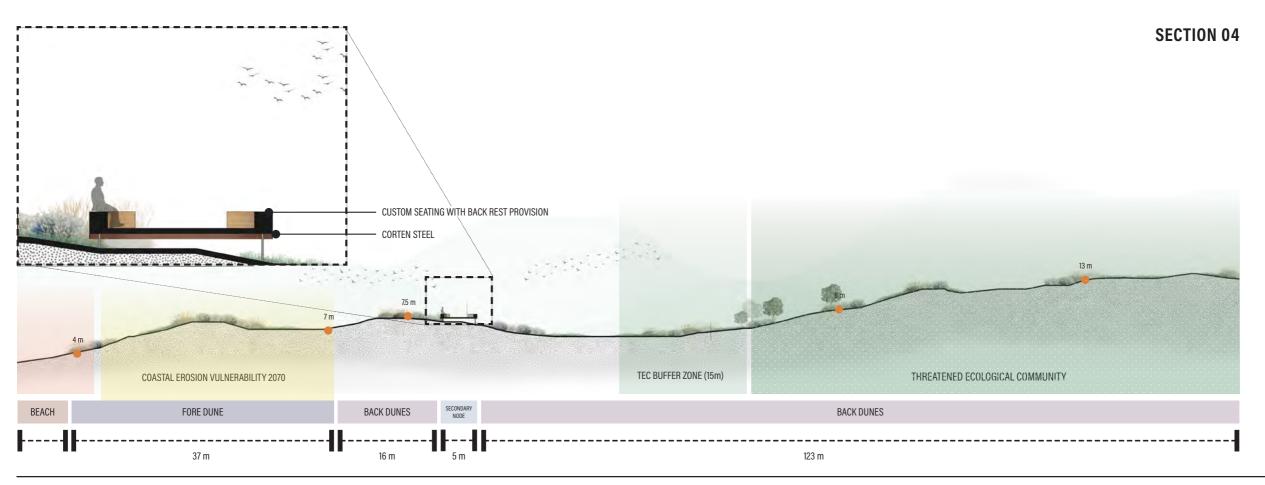




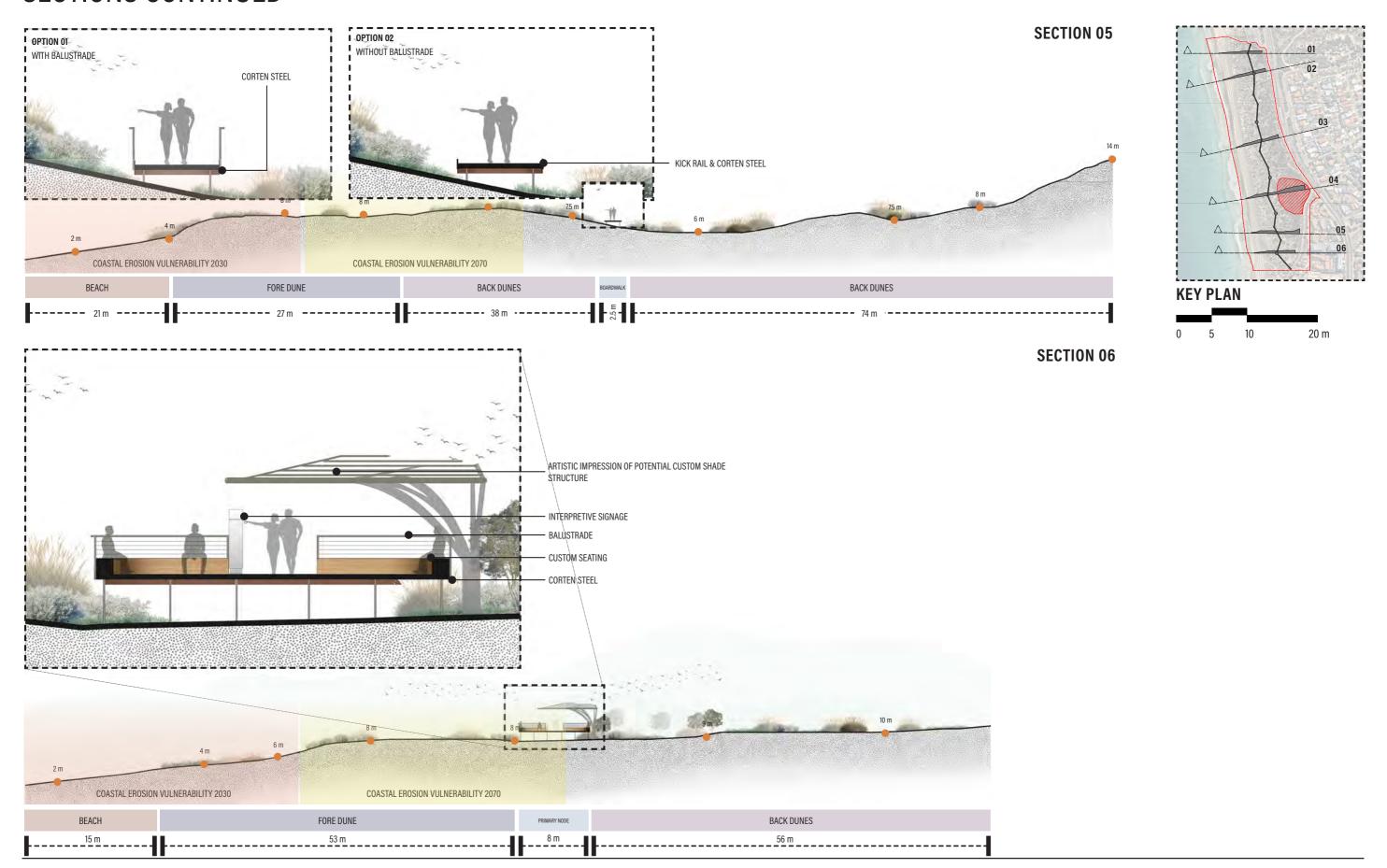


# **SECTIONS CONTINUED**





# **SECTIONS CONTINUED**



# 4.11 CONCEPT VISUALISATIONS

The images presented on this page were created using different visualisation mediums and are illustrative only. They do not represent the final concept design.







# 4.12 MATERIAL GUIDANCE

The materiality of the boardwalk and nodes aims to evoke a more earthy feel – working with the surrounding environment through a 'touch the earth lightly' approach.



IMAGE 11: ICONIC LOOKOUT, SIMILAR SIZE TO PROPOSED PRIMARY NODES WITH CUSTOM SHADE STRUCTURE AND INTERPRETIVE ARTWORK (UDLA)



IMAGE 12: CUSTOM SHADE STRUCTURE, LOCAL COLOURFUL EXAMPLE - OPPORTUNITY TO BE CURATED DESIGNED (UDLA)



IMAGE 13: FRP WITH MATERIAL CHANGE IN PRIMARY & SECONDARY NODES (ARCHATRAK)



IMAGE 14: FRP COLOUR TO MATCH DUNE ENVIRONMENT, LOW TO BE ABLE TO ENGAGE WITH VEGETATION (ARCHATRAK)



IMAGE 15: CUSTOM KICK RAIL TO WRAP AROUND THE BOARDWALK AND NODES - MINIMUM 300MM WIDE (UDLA)



IMAGE 16: CUSTOM WOODEN SEATING WITH BACKREST (UDLA)

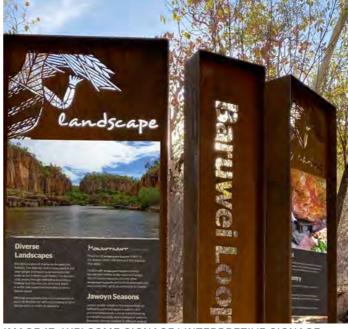


IMAGE 17: WELCOME SIGNAGE/ INTERPRETIVE SIGNAGE & STORYTELLING OPPORTUNITIES, & QR CODES (THE INTERPRETIVE DESIGN COMPANY)



IMAGE 18: TEXTURED DECKING OPPORTUNITIES WITH FRP & SIMPLE BALUSTRADE (TREADWELL GROUP)

# 4.13 PLANTING GUIDANCE

Planting must be environmentally sensitive – enhancing the resilience of the existing dune system while contributing to the visual amenity of the overall boardwalk experience. The flora identified on site provides a foundation for the space's look and feel.

Opportunities to incorporate six-season planting within the dune environment should be explored – ensuring minimal impact on the existing TEC. State Government would be consulted on a proposed species list within proximity to the TEC to ensure compatibility. Any planting will be limited to areas disturbed by construction or those that are degraded or of poor quality along the boardwalk. Each location must be assessed to ensure planting viability.

There is also an opportunity to introduce more restorative planting across the wider site as part of this project – to be explored further in future stages.

Species identified on site are detailed in the Environmental Report – Appendix 4.



IMAGE 19: EXISTING PLANTING CONDITION ON SITE (COS)



IMAGE 20: OCEAN REEF MARINA- COASTAL PLANTING ALONG PATHWAY, PROVIDING VISUAL AMENITY WHILE SPECIES ARE APPROPRIATE FOR A COASTAL SITE.(UDLA)



CALLITRIS PREISSII ROTTNEST ISLAND PINE H: 10-20M X W: 6M



MELALEUCA LANCEOLATA
ROTTNEST ISLAND TEA TREE
H: 5-10M X W: 2-5M





EUCALYPTUS GOMPHOCEPHALA
TUART
H: 30M X W: 15M

# PLANTING GUIDANCE CONTINUED

# FOREDUNE/BEACH INTERFACE



SPINIFEX LONGIFOLIUS **BEACH SPINIFEX** H: 1M X W: 2M



OLEARIA AXILLARIS **COASTAL DAISY BUSH** H: 1-2M X W: 1-2M



SCAEVOLA CRASSIFOLIA THICK-LEAVED FAN FLOWER H: 1.5M X W: 1.5M



LEPIDOSPERMA GLADIATUM **COAST SWORD SEDGE** H: 1M X W: 1M



ACACIA ROSTELLIFERA SUMMER-SCENTED WATTLE H: 5-10M X W: 3M

**SPACES** 



DIANELLA REVOLUTA **BLUE FLAX-LILY** H: 1M X W: 1.5M

REST NODES / PATH JUNCTIONS / INTERPRETIVE



CARPOBROTUS VIRESCENS **NATIVE PIGFACE** H: 0.3M X W: 3M



RHAGODIA BACCATA **BERRY SALTBUSH** H: 1M X W: 2M



MID-DUNE / BOARDWALK EDGES

CONOSTYLIS CANDICANS **GREY COTTONHEADS** H: 0.3M X W: 0.5M



LEUCOPHYTA BROWNII **CUSHION BUSH** H: 0.7M X W: 1M



ACANTHOCARPUS PREISSII PRICKLE LILY H: 0.5-1M



SPYRIDIUM GLOBULOSUM **BASKET BUSH** H: 2-5M X W: 2-4M



ATRIPLEX ISATIDEA **CUSHION BUSH** H: 0.5-2.5M X W: 2M



FICINIA NODOSA **CUSHION BUSH** H: 1M X W: 1M



HIBBERTIA RACEMOSA STALKED GUINEA FLOWER H: 0.5M X W: 0.3M



PIMELEA FERRUGINEA PINK RICE FLOWER H: 0.7M X W: 0.7M



BEYERIA CINEREA **CINEREA** H: 0.15M X W: 0.1M

### INTERPRETATION & ART OPPORTUNITIES 4.14

### **Cultural narratives, songlines and themes were** explored during the concept design process.

The humpback whale was the most prominent story and therefore was included as a key feature in the boardwalk narrative. There is potential to explore this further, through artwork, stories and community or school involvement. Precedent examples that demonstrate ways to engage with these themes have be provided below.

For example, the proposed custom shelters located on the primary nodes present an unique opportunity to involve local and international artists. Other ideas included the use of "audio boxes" telling stories narrated by Aboriginal Elders, lighting (ie. KAYA) to enhance the feel of the site, and the inclusion of sculptures and other elements which are purposefully integrated into the design of each node to align with the Noongar 6 seasons.



KEY PLAN FOR ART & INTERPRETIVE OPPORTUNITIES (BASED ON OPTION C)



AMC PARK TRAIL - SAND BLASTING





THE OVAL AT SUBI EAST - BIDI TRAIL & SIX SEASON PLANTING  $(\overline{1})(3)$ 





COLLIE MURAL TRAIL -INTEGRATED ARTWORK (i)



ROEBUCK BAY - ART OPPORTUNITY (3D PRINTING)





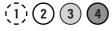
**CURTIN YARNING CIRCLES -**SHELTER/ ART OPPORTUNITY







AMC PARK REVITALISATION - SCHOOL INVOLVEMENT OPPORTUNITIES







INTERACTIVE STORY TELLING OPPORTUNITY (QR CODE)







STIRLING COASTAL BOARDWALK- CONCEPT DESIGN REPORT

# 5.0 ENGAGEMENT

# **5.1 GOVERNMENT STAKEHOLDERS**

Two engagement sessions were conducted with key State Government Agencies including the Department of Planning, Lands and Heritage (DPLH), Department of Water and Environmental Regulation (DWER), and the Department of Biodiversity, Conservation and Attractions (DBCA): one face-to-face workshop, including a walk of the site, and one online meeting to provide a progress update.

The intent for this engagement was to understand government expectation around any development within the Class A Reserve project site, to explore constraints and opportunities in a collaborative way and to identify any red flags.

The following provides an overview of the discussion points which have influenced the concept design and the ideas presented in this report, with further engagement planned, should the project be deemed feasible.

- Government stakeholders welcomed the opportunity to be involved in the project at this early stage
- Design principles, specifically the "light touch" approach considered a good basis for further discussions.
- Project considerations to include safety (ie. CPTED)
- Further reviews, more detailed planning and approvals will be required if the concept progresses.
- Discussion regarding TEC buffer
- Potential to close boardwalk overnight to minimise impact on foreshoe vegetation & TEC resulting from antisocial behaviour
- Opportunities for revegetation and cultural storytelling to be maximised across the site.

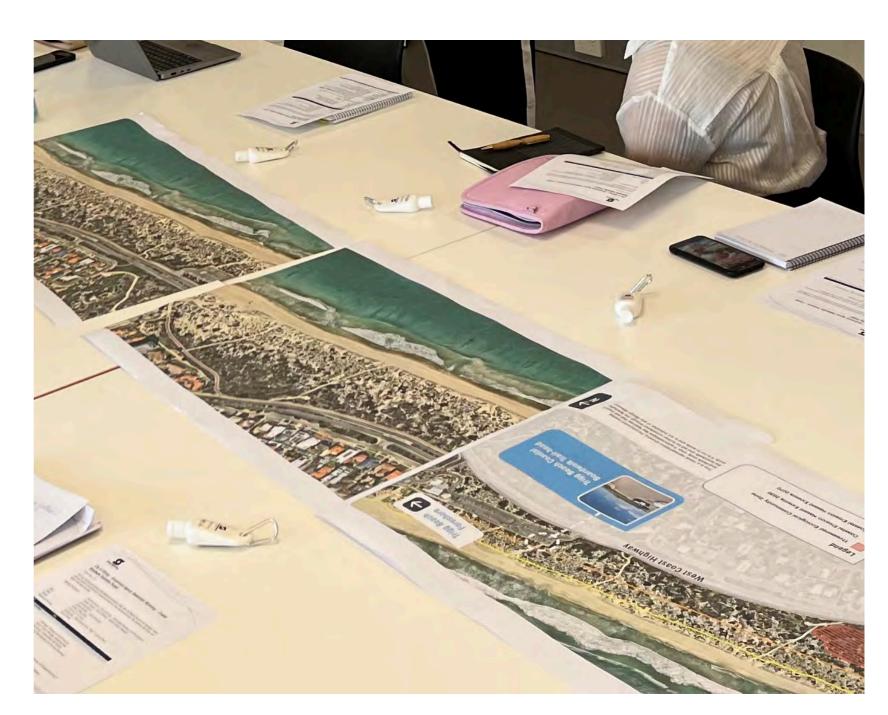


IMAGE 21: WORKSHOP WITH GOVERNMENT STAKEHOLDERS (UDLA)

STIRLING COASTAL BOARDWALK - CONCEPT DESIGN REPORT 39

# 5.2 NGALANG MAYA WANGKINY GROUP ENGAGEMENT

Initially, the City attended a Ngalang Maya Wangkiny (our place talking) Group meeting in March 2025 to discuss the proposed boardwalk feasibility study and identify the relevant members with cultural knowledge of the area who could assist with sensitively sharing knowledge and information.

Two workshops were held to understand the cultural significance of the project site and to explore opportunities for Aboriginal storytelling, education and knowledge sharing which the boardwalk could enable.

**Workshop 1** explored a preferred alignment, and delved into themes inspired by Country. Key takeaways included:

- The area is part of a larger songline, and a large fish trap was located in the area.
- Opportunities to highlight totems, and different species.
- Project highlights potential to involve schools through artwork and educational opportunities such as utilising OR codes.
- Boardwalk users being able to interact and touch country as an immersive experience. Prefer no handrails where possible.

**Workshop 2** discussed a more refined boardwalk alignment, and explored cultural narratives in detail. Themes from Workshop 1 were expanded on and informed the ideas presented in Section 4 of this report.

Key takeaways from Workshop 2 included:

- The humpback whale story is important and could be integrated into the boardwalk narrative.
- Each primary node could represent the 6 seasons including flora and fauna.
- Iconic sculptural shade structures on each primary node to assist in storytelling opportunities.



IMAGE 22: WORKSHOP 1 WITH NGALANG MAYA WANGKINY GROUP, CITY OF STIRLING & UDLA. (UDLA)

STIRLING COASTAL BOARDWALK- CONCEPT DESIGN REPORT

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# 6.0 NEXT STEPS STIRLING COASTAL BOARDWALK-CONCEPT DESIGN REPORT

## 6.1 NEXT STEPS

The concepts and ideas presented in this report are preliminary and will require further investigations. This page provides an overview of potential next steps for consideration by the City.

### **COMMUNITY ENGAGEMENT**

A key focus of the next stage will be community engagement to gather feedback from the community on the concept design for the boardwalk, to be considered in the subsequent detailed design development (subject to Council approval).

Additionally, there are ample opportunities for the community to actively participate in the delivery of the project, for example:

- A collaborative mural along the boardwalk;
- Contribution to an artist brief for sculptures and / or structures along the boardwalk.

It was evident in conversation with the **Ngalang Maya Wangkiny Group** that there is an opportunity to
tell the story of the humpback whale and the songlines
of the site. The design process should actively involve
local artists from the Whadjuk Noongar community, with
a strong emphasis on Aboriginal artists and cultural
representation. It would also offer an opportunity for
Aboriginal and Non-Aboriginal community members to
collaborate and in doing so, work towards reconciliation
in a meaningful way.

### DRAINAGE AND STRUCTURAL CONSIDERATIONS

Structural and geotechnical considerations explored during the Concept Design phase require further refinement to integrate engineering requirements with landscape architectural aesthetics.

Drainage is a critical consideration, particularly due to the inclusion of formal shower facilities and drinking fountains at node points along the boardwalk. It is proposed that drainage infrastructure be attached to the underside of the boardwalk to limit the visual impact and eliminate the need for site distrubane. Given the site's elevation changes, the use of pumps may be necessary to ensure effective water management. There is a need to manage the existing drainage issues present on site.

### FORESHORE MANAGEMENT PLAN

It is recommended that the City consider the development of a Foreshore Management Plan to guide the development within the area stretching from South Trigg Beach to Scarborough Foreshore. This follows a recommendation in the Coterra report. This FMP should include a detailed Construction Management Plan for the construction phase of the project (subject to Council approval). This will include further detailed studies including a spring survey and relevant environmental studies to further identify coastal and environmental risks and impacts, as well as how these will be managed.

### HABITAT RESTORATION PROJECT

A detailed flora and fauna study is essential to inform the design. For this project, suitable plant selections were explored based on the Environmental Report prepared by Natural Area, and there is an opportunity to identify and implement restoration strategies within the dune system, including the re-vegetation of degraded areas surrounding the boardwalk. These efforts will not only support the ecological health of the dunes and improve environmental conditions, but will also enhance the user experience by creating a more immersive and visually appealing landscape along the boardwalk.

### PROJECT ADVOCACY

Delivery of the project, if considered feasible, will rely on government support both in terms of approvals and funding. This will require advocacy and ongoing collaboration with key state agencies many of which were consulted during the Concept Design phase.

STIRLING COASTAL BOARDWALK - CONCEPT DESIGN REPORT

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### **MEMORANDUM**

То		From	
Сс		Project Number	25054
Date	19 Jun 2025	Doc No	MEM-001
Pages	3	Revision	А
Subject	Trigg Coastal Boardwalk – Geotechnical Findings Summary		

### 1. Purpose

This intention of this memo is to summarize the key geotechnical considerations relevant to the design and construction of the proposed pedestrian boardwalk between Trigg Beach and Scarborough Beach, based on the findings presented in the geotechnical investigation report prepared by Galt Geotechnics (dated 30 May 2025).

The intent of this summary is to combine the geotechnical data, assessments, and recommendations into a single source document to assist with preliminary structural planning, foundation selection, and construction methodology development—particularly in the context of the local dune environment and access constraints along the Trigg coastline.

### 2. Geotech Overview:

The following is a high level summary of the findings of the geotechnical investigations undertaken by Galt Geotechnics.

### **Project Overview**

The City of Stirling engaged Galt Geotechnics to carry out a preliminary geotechnical investigation for a proposed 0.8 km long boardwalk between Trigg Beach and Scarborough Beach. Two alignments were investigated:

- Boardwalk Journey A adjacent to West Coast Highway.
- Boardwalk Journey B within the coastal dune system, closer to the shoreline.

The boardwalk is targetted to be a timber and/or steel structure, supported by either shallow or deep footings (e.g., screw piles), and installed with as minimal disturbance to the existing natural dune environment as possible

### **Subsurface Conditions**

### General Soil Profile:

- Soils are generally loose to dense calcareous sand (Safety Bay Sand).
- Topsoil and fill layers (including construction debris) were observed at some test sites, notably along Journey A.
- No limestone was encountered to the tested depths (up to 2.0 m with PSP to 4.05 m).

### Density and Strength:

- Shallow sands are typically loose to medium dense, becoming dense to very dense with depth.
- PSP blow counts support increasing density with depth, suitable for bearing structural loads with appropriate treatment.

### Groundwater:

Was not encountered within 2.0 m of depth during the investigation.



 Historical max groundwater levels (from the Perth Groundwater Atlas) are 4–5 m below existing ground levels—indicating a low groundwater table relative to boardwalk footing levels.

### 3. Concept Design Incorporation:

The following is a high level summary of how the findings of the geotechnical investigations have influence the Concept Design (SK001 rev A Attached)

### Foundation Type - Use of Screw Piles

The choice of screw piles as the primary foundation system is consistent with the report's recommendations for deep footings in areas with restricted access, low allowable bearing pressures, and the need for minimal ground disturbance. In particular:

- Screw piles are identified in the report as a viable solution for low-load applications where environmental sensitivity is a concern (Section 8.3.3).
- They can be installed using lightweight, tracked machinery or handheld torque heads, reducing the need for excavation and heavy equipment access.
- Their installation causes minimal vibration and spoil, making them highly suitable for the coastal dune system along Boardwalk Journey B, where preservation of vegetation and topography is critical.

The geotechnical report also highlights the importance of relying primarily on shaft resistance for pile capacity in sandy soils, especially where base disturbance may reduce end-bearing effectiveness. Screw piles inherently mobilise shaft resistance along their helical plates and shaft length, matching this criterion well

### **Span and Structural Configuration**

The proposed structural concept—with twin screw piles supporting a cross-raking rafter beneath a joist and deck system—offers several benefits in line with geotechnical constraints:

- Minimised footing count reduces the number of intrusions into the dune, limiting ecological and visual impact.
- Transverse rafter spans between piles allow flexibility in pile positioning to avoid obstructions or localised unsuitable soils (e.g., pockets of fill or organics as noted in HA04 and HA06).
- The elevated deck structure allows for preservation of the natural dune shape and promotes drainage and vegetation continuity beneath.

### **Settlement and Load Capacity Considerations**

The geotechnical investigation confirms that shallow sands along both alignments transition from loose to dense/very dense with depth, with increasing PSP resistance values suggesting that suitable load-bearing capacity exists below approximately 1.5 m depth. The screw pile design can be tailored to penetrate to these competent layers, avoiding loose near-surface zones and ensuring settlement control.

- Typical design parameters from the report (Table 3) suggest unit shaft resistance values of 40–80 kPa and base resistance of up to 5,000 kPa in dense sands, allowing for conservative design of low-load elements like pedestrian walkways.
- The report further recommends adopting tension shaft resistance at 80% of compression values, relevant if uplift forces or lateral load reversal are to be considered due to wind or thermal effects on an exposed coastal structure.



### **Construction Methodology and Environmental Impact**

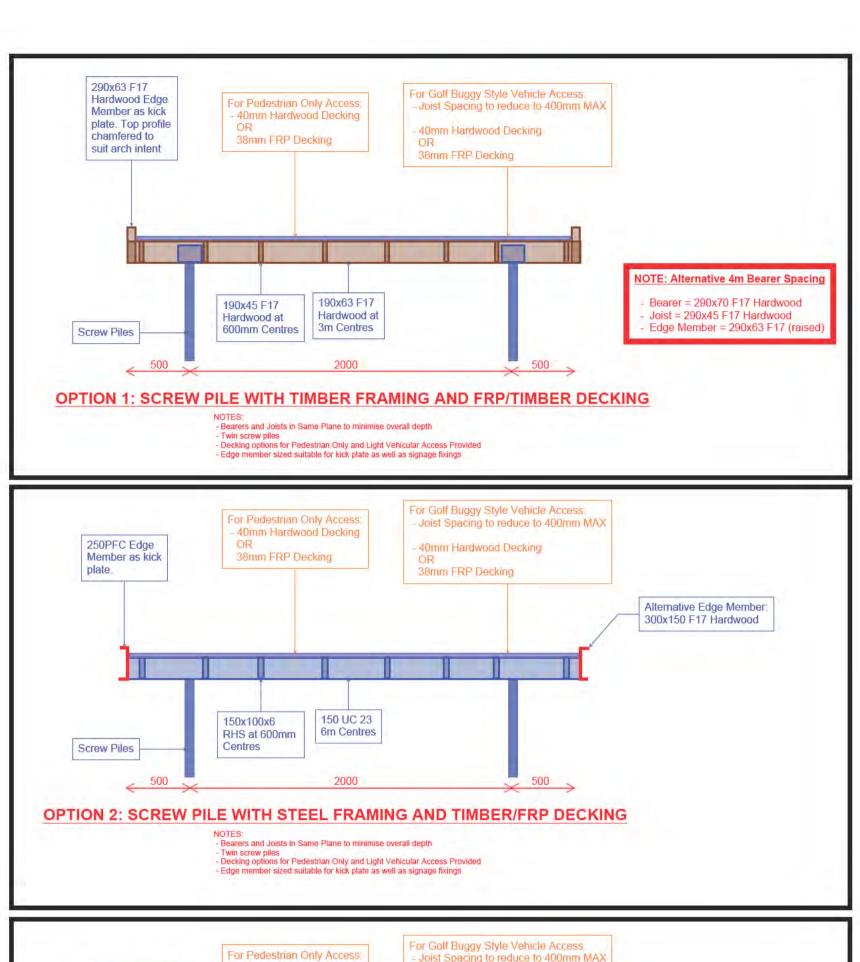
Screw piles support a low-impact construction sequence, which aligns with recommendations in Section 8.3 and Section 8.4 of the report:

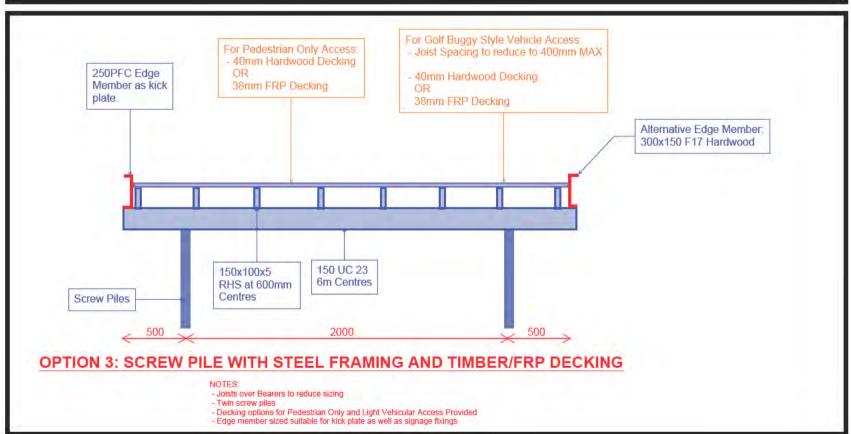
- Avoidance of bulk excavation means reduced risk of slope instability, especially in unretained sand slopes (1V:2H recommended maximum).
- Installation can be completed without the need for temporary shoring or dewatering, as groundwater
  was not encountered within 2 m, and the water table lies well below typical pile depths.

### 4. Conclusion

Overall, the current structural concept for the Trigg Beach boardwalk demonstrates a strong alignment with the geotechnical findings and recommendations of the investigation. The use of twin screw piles and an elevated, lightweight superstructure is appropriate for the site's sand-dominated profile, low groundwater levels, and environmentally sensitive coastal setting.

Final design refinements, including detailed pile design, rig selection, and settlement modelling, can proceed with confidence, supported by the comprehensive geotechnical data available.





### NOTES

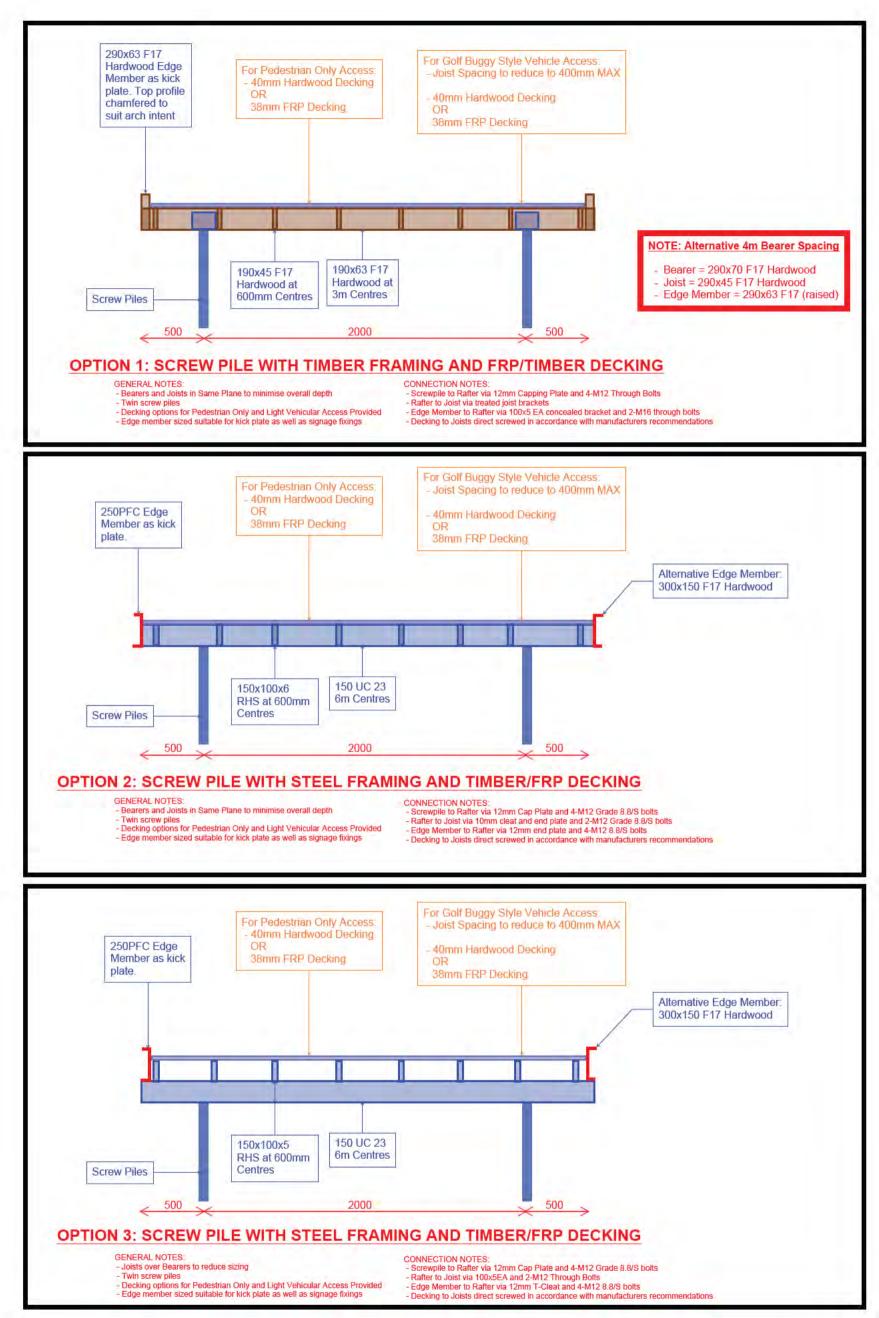
1. These cross sections are for discussion regarding the typical profile of the boardwalk only and do not cover the lookout/resting spaces

2. All steelwork would need to be HDG or 3-Coat paintq protective system

FRP decking profile would need to be a DDA compliant option

 Possible to explore the use of driven timber piles in lieu of screw piles





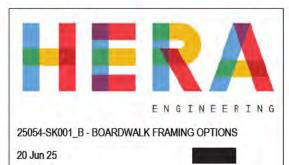
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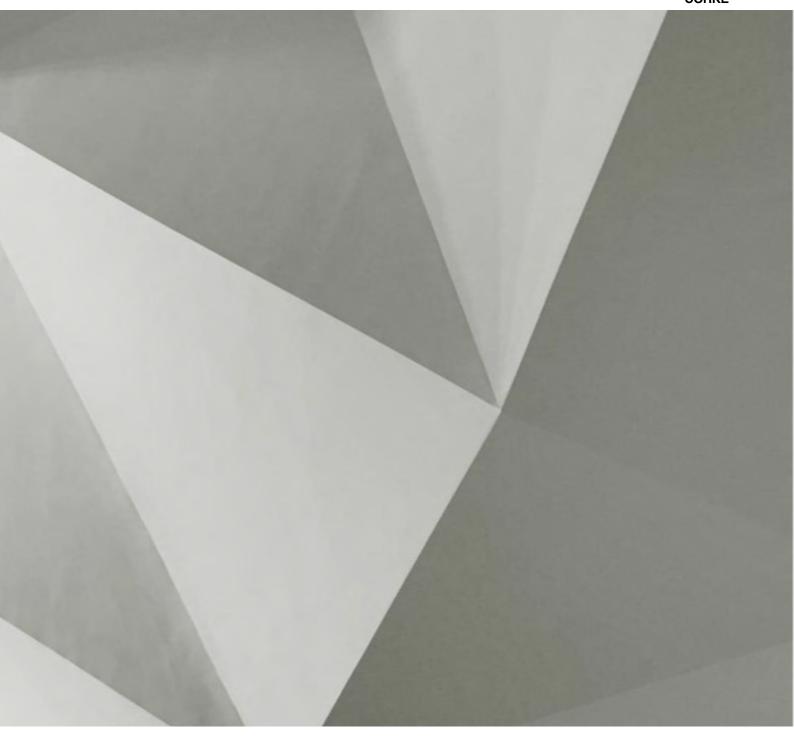
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3. FRP decking profile would need to be a DDA compliant option

4. Possible to explore the use of driven timber piles in lieu of screw piles





### **CITY OF STIRLING**

BOARDWALK CONCEPT ORDER OF MAGNITUDE

W25031 25 July 2025



# **Executive Summary**

The UDLA team has engaged Donald Cant Watts Corke (DCWC) to prepare an *Order of Magnitude Concept Estimate* for the potential development of a pedestrian boardwalk linking Trigg Beach and Scarborough Beach.

 The estimate will evaluate three distinct design options, each with two structural sub-options based on construction material.

### **Boardwalk Options Overview**

### Option 1 - Walkway Only

- A pedestrian boardwalk providing a continuous path between Trigg and Scarborough Beach.
- No additional features or connection nodes.
- Sub-options:
  - 1A Timber deck structure
  - 1B Steel deck structure
- o Allowance for revegetation of natural area.

Option 2 - Walkway with Medium Specification Connection Nodes.

- Includes the walkway solution with medium quality connection nodes (viewpoints, rest stops, or minor features).
- o Sub-options:
  - 2A Timber deck structure
  - 2B Steel deck structure
- Allowance for revegetation of natural area.

### Option 3 – High Specification Boardwalk

- Includes the walkway solution with high quality selected connection nodes (viewpoints, rest stops, or minor features).
- Sub-options:
  - 3A Timber deck structure
  - 3B Steel deck structure
- o Allowance for revegetation of natural area.



### The indicative budgets are:

Project Total
\$9,067,000
\$13,174,000
Project Total
\$8,919,000
\$12,958,000

A revegetation allowance of \$180,000.00 has been included within the construction cost of options 1A and B

Option 2A – Timber Framed Boardwalk with Medium Quality Nodes	Project Total
Estimated Construction Cost	\$12,567,000
Total Project Budget	\$18,258,000
Option 2B – Steel Framed Boardwalk with Medium Quality Nodes	Project Total
Estimated Construction Cost	\$12,697,000
Total Project Budget	\$18,448,000

A revegetation allowance of \$270,000.00 has been included within the construction cost of options 2A and B

Option 3A – Timber Framed Boardwalk with High Quality Nodes	Project Total
Estimated Construction Cost	\$13,822,000
Total Project Budget	\$20,081,000
Option 3B – Steel Framed Boardwalk with High Quality Nodes	Project Total
Estimated Construction Cost	\$13,929,000
Total Project Budget	\$20,236,000

A revegetation allowance of \$390,000.00 has been included within the construction cost of options 3A and B



### DCWC estimate the general maintenance as below:

- \$185,000.00 per annum for timber framed boardwalk.
- \$100,000.00 per annum for steel framed boardwalk.

### Note:

- All costs in this report exclude GST.

### Information Used:

- UDLA Concept Package June 2025
- HERA Boardwalk Framing Options 25054-SK001\_B

### Inclusions:

- A 10% Design Development allowance.
- A 10% Construction Contingency allowance.
- A 0.5% Building Act Compliance allowance.
- Professional Fees allowance of 12%.
- An Escalation allowance to December 2026 to cater for escalation of cost through time.

### Exclusions:

- Premiums for limited market responses or negotiation with single source.
- Any upgrades to infrastructure outside of the boardwalk perimeters.
- Service Diversions.
- Legal Costs, Agent Fees, Land Costs.
- Abnormal Ground Conditions / Contamination.
- Dewatering / Rock / Acid Sulphate Soils

# DONALD CANT WATTS CORKE

www.dcwc.com.au

ADELAIDE BRISBANE CANBERRA DARWIN MELBOURNE NEWCASTLE PERTH SYDNEY TOWNSVILLE