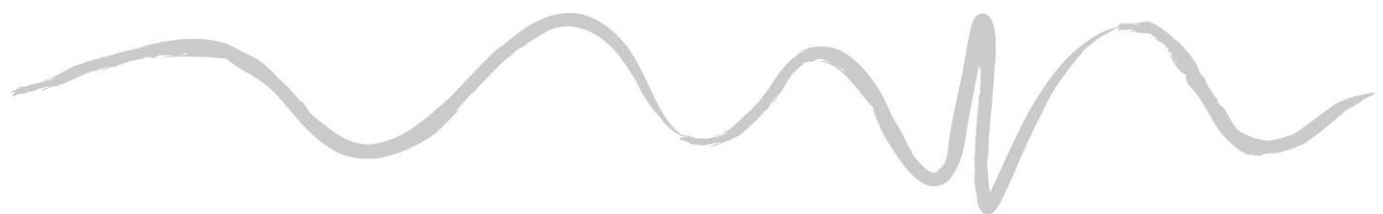


Design Report

Angels Beach to Lennox Head Coastal Walk and Shared Path



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Prepared for: Ballina Shire Council
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Introduction

1.1 Background

Ballina Shire Council (Council) is committed to providing both:

- A range of effective commuter transport options between and within major settlements; and
- Unique recreational opportunities and equitable access to coastal areas for as wide a cross section of the community as possible, particularly the less mobile.

To contribute to meeting these important commitments, Council proposes to provide both a shared path (for bicycles and pedestrians) and a “coastal walk” between Angels Beach and Lennox Head village.

Following detailed consideration, Council nominated its preferred routes for the coastal walk and shared paths. The proposed shared path, in combination with part of the shared path section of the proposed coastal walk and existing shared paths, will provide a continuous cyclist / pedestrian link between Ballina and Lennox Head. This will be a significant piece of social, recreational and transport infrastructure that the Council has been striving to provide for some time in response to widespread community demand.

The proposed coastal walk will provide access to Ballina’s stunning coastline between Angels Beach and Lennox Headland for as wide a cross section of the community as possible. This facility will offer considerable social, health, recreation and disability access benefits to the community, as well as a ‘platform’ for improved environmental and cultural understanding if complemented with interpretive features in future.

In response to Council’s emphasis in providing disabled access, the proposed coastal walk will feature a number of “finger paths” and sections built to shared path standard. In combination with car and bike parking facilities, these paths will facilitate access to highlights of the walk for less mobile people along a suitable grade without the need to walk long distances.

Council’s prescribed alignment for the proposed shared path follows existing roadways whereas that of the proposed coastal walk and finger paths run east of the Coast Road through natural areas and beside cliff tops, following existing informal paths where possible. Between South Angels Beach and Sharpes Creek it is proposed that the Coastal Walk be built to shared path standard (2.5 m wide asphalt or timber boardwalk) to provide access for pedestrians, cyclists and the less mobile to a range of the highlights of the Ballina coastline.

Council engaged GeoLINK to prepare concept design drawings of the coastal walk and detailed drawings of the shared path. This design report complements the drawings by providing further detail on the design process applied for each section of the proposed facilities. This is summarised by outlining:

- Design criteria – constraints and opportunities that influenced the design;
- Design options – a summary of the options considered (note that design criteria dictated that only one option was viable for many sections);
- Recommended design – a simple description of the recommended design, and in some instances the design options that were considered; and
- Construction considerations – the likely nature and extent of construction methods

Coastal Walk

2.1 Introduction

Section 2 should be read in conjunction with drawing numbers 1818/000 to 1818/016. Note that all chainages are approximate.

2.1.1 Design criteria

The following design standards were applied in the design of the coastal walk:

- *Walking Track Construction Guidelines* (Gorrell, 1985);
- *Australian Standard 1428.1-2009 Design for access and mobility Part 1: General requirements for access – New building work* (AS 1428);
- *Australian Standard 2156.2-2001 Walking tracks Part 1: Classification and signage* (AS 2156);
- *Australian Standard 2156.2-2001 Walking tracks Part 2: Infrastructure design* (AS 2156); and
- *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* (Austroads, 2009)

In addition the following design considerations apply to all sections of the coastal walk:

- Safety, including the potential for cyclist / pedestrian conflicts on the coastal walk;
- Environmental impacts, particularly vegetation clearing, Endangered Ecological Communities, sensitive areas and threatened species;
- Revegetation and rehabilitation requirements;
- Erosion and coastal hazard;
- Drainage, waterway and surface water impacts;
- Cultural impacts, in particular Aboriginal cultural heritage;
- Disabled access;
- Durability and maintenance;
- Linkages to key utility locations (e.g. car parking areas) and recreational locations (e.g. viewing points); and
- Visual impact and visual amenity.

2.1.2 Design options

Where design options are listed, the recommended design is the first option listed. Note that in some sections the nature and extent of constraints meant that the recommended design was the only option that could be considered.

2.1.3 Shared path sections

For shared path sections, asphalt is the recommended over concrete as the surface finish based on cost, ease of construction, surface quality and appearance. Generally a width of 2.5 m is recommended for shared paths based on Austroads (2009) although in response to certain constraints the recommended width is reduced to the Austroads (2009) minimum of 2.0 m.

With respect to disabled access shared path sections should conform to AS 1428, however the grade of certain sections exceeds the recommended maximum of 5% (cl. 10.2).

2.1.4 Walking path sections

For walking path sections, consolidated gravel is the recommended surface based primarily cost and the low aesthetic impact it has on natural areas relative to other surfaces. As prescribed by Council the construction standard of the walking path should meet the "shoe" or "path" standard set out in *Walking Track Construction*

Guidelines (Gorrell, 1985) produced by the National Parks and Wildlife Service which also provides guidance on stairs and drainage. Gorrell (1985) recommends a width of 1.5-2.0 m for a 2-way “shoe” standard path. A path width of 2.0 m is recommended in all cases other than a short stretch between Ch 3840-4020 where upgrading the existing path may be constrained possibly requiring a reduction of the path width to the minimum of 1.5 m.

Walking path sections would be classified as Class 2 or Class 3 under AS 2156.1 depending on grade in that the grade of Class 2 paths should not exceed 10%. Gorrell (1985) recommends a maximum grade of 8% on “shoe” standard path which is exceeded in a number of locations.

2.1.5 Shared path / walking path transitions

The proposed Coastal Walk facility, as prescribed in the brief, transfers from a shared path to a ‘shoe standard’ walking path at an undefined location at or near Flat Rock Tent Park, suggesting the tent park as an end point for the shared path facility. However, with the Flat Rock car parking area as a likely destination for many users approaching from the south, it is inevitable that some cyclists will continue through the tent park whether or not the facility is designed to accommodate them. Site investigations identified a unique vantage point near Ch 2000 south of Sharpes Creek where a lookout serviced by a shared path from the Flat Rock car park could be provided. Thus it is recommended that a continuous shared path is extended to this point

Where the walking path alignment is adjacent to the car parking areas at Sharpes Beach and Boulder Beach, due to the increased levels of local pedestrian traffic at these locations, it is recommended that an asphalt surface is provided in conjunction with the formalisation of these car parking areas.

2.1.6 Boardwalks and bridges

For boardwalks and bridges, an emphasis on timber is recommended based primarily on the reduced aesthetic impact this material has in natural surroundings. We have adopted the designs and advice of Outdoor Structures Australia as a leading designer and supplier of pre-fabricated and modular systems for these applications.

2.2 Ch 0-160 – Angels Beach, eastern side of The Coast Road

Specific design considerations

- Shared path standard;
- Adjacent to 80 km/hr road;
- Short stretch of kerb and gutter (Ch 0-15) but generally narrow shoulder and table drain;
- Width of shoulder away from kerb and gutter (Ch 15-160) is inadequate to accommodate shared path on existing surface;
- Shared paths immediately beside roadway not covered specifically in Austroads (2009) but refer Figure 5.1 of Austroads (2009);
- Vegetation, including established trees, and swale drain close to edge of existing road;
- Mature White Laceflower (*Archidendron hendersonii*) trees (listed as Vulnerable under the *Threatened Species Conservation Act 1995* TSC Act) are present immediately east of existing post and rail fence.

Design options

	<i>Vegetation clearing</i>	<i>Earthworks</i>
a. 2.0 m wide roadside shared path with retaining walls	Low	Low
b. 2.0 m wide roadside shared path with extended batter	Moderate	Moderate

To minimise earthworks and vegetation clearing, the path width for all options considered was limited to the minimum of 2.0 m as allowed under Austroads (2009) for a facility of this type. Note that the recommended width of 2.5 m under Austroads (2009) is intended to accommodate cyclists and pedestrians; however it is

likely that very few if any pedestrians will use the roadside shared path rather than the existing informal sandy path through the adjacent vegetation that will remain in place.

Recommended design

- Refer drawing number 1818/014 for typical sections;
- Provide transition at Ch 0 from existing off-road path to roadside path by replacing existing kerb and gutter as necessary with extended kerb ramp (to accommodate oblique angle of path relative to kerb line);
- 2 m wide asphalt shared path on widened road shoulder;
- Realign swale and remove vegetation as necessary (no threatened species identified as likely to be removed);
- Use retaining walls as necessary to minimise realignment of swale and vegetation removal; and
- Separation from vehicle traffic provided by 500 mm buffer from existing edge line and 600 mm wide standard NRLG median in accordance with Section 3.5.5 of RTA (2000) and Austroads (2009).

Construction considerations

- Traffic management will need to limit traffic to one lane while work is performed on this section;
- Because of sandy soil conditions and the limited extent of the earthworks required, only small plant will be necessary for earthworks and placement of retaining wall; and
- The extent of work is unlikely to extend more than 5 m from the existing edge of bitumen, and over much of this section this extent will be limited to around 3 m.

2.3 Ch 160-190 – Angels Beach, link to off-road path

Specific design considerations

- Shared path standard;
- Existing pedestrian path alignment presents tight corners and steep grades compared to those recommended in Austroads (2009) for maintaining cyclist speed; and
- Potential for increased risk of cyclist-cyclist and cyclist-pedestrian conflicts where the traffic streams recombine.

Design options

	<i>Vegetation clearing</i>	<i>Earthworks</i>	<i>Encourage cyclists to slow down benefiting all users</i>
a. 2.5 m wide asphalt path on existing alignment	Very low	Very low	Yes
b. 2.5 m wide asphalt path with rise flattened and existing alignment straightened	Moderate	Moderate	No

Recommended design

- Ch 160 provide island, pavement marking and signage to direct cyclists around tight bend;
- 2.5 m wide asphalt path;
- Follow existing alignment and grades and thereby impose speed restrictions on cyclists to reduce the risk of conflicts;
- Provide advance warning signs and pavement markings to warn users of bends and the potential for conflict;
- Maintain existing vegetation and timber post and rail fence; and
- Upgrade ‘finger path’ at Ch 190 to existing lookout to shared path standard (2 m wide asphalt) and modify lookout to provide disabled access.

Construction considerations

- Width of path will provide access for vehicles and small plant; and
- The extent of path construction work is unlikely to be more than 2 m either side of the centre line of the proposed alignment.

2.4 Ch 190-490 – Angels Beach informal car parking area and gravel track

Specific design considerations

- Shared path standard;
- Locally rare trees between existing informal track / car parking area and The Coast Road;
- Angels Beach car parking area to be upgraded in future; and
- Access to Angels Beach for recreational, Council and emergency vehicles required between proposed car parking area and existing vehicle access track at Ch 490.

Design options

Recommended design was the primary option considered.

Recommended design

- 2.5 m wide asphalt path along eastern side of existing informal track and proposed upgraded car parking area;
- Separation of path from nose-in parking in future car parking area to be provided by timber bollards;
- Revegetate remaining area to improve habitat value and discourage informal side paths;
- Provide signage, security gates at car parking area and at vehicle access track (Ch 490), and a passing bay (near Ch 400) to support vehicle access and warn users of potential for conflicts

Construction considerations

- Width of path will provide access for vehicles and small plant;
- Root barrier may be required to prevent longer term damage to the pavement; and
- The extent of path construction work is unlikely to be more than 2 m either side of the centre line of the proposed alignment.

2.5 Ch 490-730 – Angels Beach existing path

- No upgrade to the existing asphalt path is considered necessary.

2.6 Ch 730-750 – Intersection at The Coast Road pedestrian overpass

Specific design considerations

- Existing path meets shared path standard;
- Significant active revegetation has occurred around this intersection which contains a number of locally rare species;
- Existing sight lines are poor relative to Austroads (2009) which seek to allow cyclists to maintain speed;
- Clearing of vegetation may allow a 'wind-tunnel effect' to take hold whereby concentrated winds could lead to progressive and on-going damage to vegetation; and
- High risk of user conflict, especially considering approach grade from overpass. Although anecdotal advice suggests that accidents are rare, the risk will increase with increased traffic.

Design options

	<i>Vegetation clearing</i>	<i>Encourage cyclists to slow down benefiting all users</i>
a. Maintain current intersection arrangement	Very low	Yes

b. 'Open up' intersection	High	No
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Recommended design

- Maintain existing path, intersection arrangement, fencing, shower and vegetation;
- Provide advance warning signs and pavement markings to warn users of bends and the potential for conflict;

Construction considerations

- Construction limited to installation of signage and pavement markings.

2.7 Ch 750-1220 – Angels Beach north of The Coast Road pedestrian overpass

Specific design considerations

- Shared path standard;
- Natural setting with unique aesthetic value;
- Much of the section between Ch 900-1200 is subject to ephemeral flooding to depths of up to 400 mm;
- Coastal Cypress Pine EEC community occurs in areas where ephemeral flooding does not occur and is present as either regenerating smaller plants or as a major component of the forest structure;
- Mature trees directly adjacent to existing alignment including some very large Coastal Banksia. Some mature trees would require clearing if existing alignment is to be utilised;
- Stinking Cryptocarya (*Cryptocarya foetida*) (common in the general area, however listed as vulnerable under the TSC Act) seedlings throughout this area, including directly adjacent to alignment of existing path;
- Swamp Sclerophyll Endangered Ecological Community (EEC) primarily to the west of existing path and along much of its length;
- Littoral Rainforest EEC east and west of existing path and along much of its length; and
- A number of stakeholders, including those with Aboriginal heritage, have indicated that they prefer raised boardwalk through this section if any path upgrade is to occur.

Design options

	<i>Frequency of flood coverage</i>	<i>Aesthetic and cultural heritage concerns</i>	<i>Discourage people from making informal paths</i>
a. 2.5 m wide raised timber boardwalk	Low	Moderate	Yes
b. 2.5 m wide asphalt path	High	High	No

Recommended design

- Design and alignment to be refined based on further stakeholder consultation and detailed environmental investigations;
- Refer drawing number 1818/016 for typical details for current proposed design;
- 2.5 m wide (clear) raised timber boardwalk along alignment of existing sandy path; and
- Some trees may need to be removed subject to detailed environmental investigations.

Construction considerations

- Access likely to be limited to approach from the south due to sinuous nature of existing path alignment and density of established trees (Coastal Cypress Pine EEC) in section immediately north;
- While this area has sandy conditions, the presence of tree roots may hinder construction of the boardwalk;

- The proposed timber boardwalk can accommodate infrequent loading of a slow moving vehicle of 1.5 tonne gross weight;
- The extent of path construction work is unlikely to be more than 2 m either side of the centre line of the proposed alignment.

2.8 Ch 1220-1330 – Southern approach to Flat Rock Tent Park

Specific design considerations

- Shared path standard;
- Natural setting with unique aesthetic value;
- A number of mature Cypress Pines (Coastal Cypress Pine EEC) occur directly adjacent to existing path;
- Existing sandy path narrows and follows sinuous alignment through a stand of trees;
- Stinking *Cryptocarya* (*Cryptocarya foetida*) (common in the general area however listed as Vulnerable under the TSC Act) seedling throughout this area, including directly adjacent to alignment of existing path; and
- A number of stakeholders, including those with Aboriginal heritage, have indicated that they prefer raised boardwalk through this section if any path upgrade is to occur.

Design options

	<i>Minimise clearing of trees (EEC)</i>	<i>Alignment to slow cyclists</i>	<i>Discourage people from making informal paths</i>
a. 2.0 m wide asphalt path	Yes	Yes	No
b. 2.0 m wide raised timber boardwalk	No	Yes	Yes

To minimise vegetation clearing, the path width of all options considered was limited to the minimum of 2.0 m allowed under Austroads (2009). Additionally, the narrower width will further encourage cyclists approaching Flat Rock Tent Park to slow down before entering the park.

Recommended design

- 2.0 m wide asphalt path; and
- Design and alignment to be refined based on further stakeholder consultation and detailed environmental investigations, including specific identification and approval of trees to be removed.

Construction considerations

- Vehicle access likely to be unavailable on this section due to sinuous nature of proposed path and density of established trees;
- Base and asphalt will need to be hauled in and finished using small plant and hand equipment;
- Root barrier may be required to prevent longer term damage to the pavement;
- The extent of path construction work is unlikely to be more than 1.5 m either side of the centre line of the proposed alignment.

2.9 Ch 1330-1460 – Flat Rock Tent Park

Specific design considerations

- Shared path standard;
- Campground setting which can be very busy at times with campers, including children, expecting broad safe access throughout the site; and
- High 'value' campsites adjacent to boundary of park looking out onto surrounding vegetation.

Design options

	<i>Risk of cyclist / camper conflicts</i>	<i>Alignment to slow cyclists</i>	<i>Amenity of high 'value' campsites</i>
a. 2.5 m wide asphalt path along the southern and eastern boundary of the tent park	Low	Yes	Maintained
b. 2.5 m wide asphalt path linking the southern and northern pedestrian access points along a generally direct alignment	High	No	Reduced

Recommended design

- 2.5 m wide asphalt path along the southern and eastern boundary of the tent park;
- Provide screen planting to minimise loss of amenity and privacy of campsites adjacent to path; and
- Provide signage and pavement marking encouraging cyclists to maintain a slow speed and respect the amenity of the tent park.

Construction considerations

- Construction should be timed to avoid peak holiday periods.

2.10 Ch 1460-1740 – Flat Rock Tent Park to northern end of Flat Rock car parking area

Specific design considerations

- Shared path standard;
- Ch 1460 pedestrian beach access to Angels Beach;
- Car parking area south of toilet block to be upgraded including a turning circle for buses;
- Active revegetation site near Ch 1480-1540;
- Ch 1560 public toilet block;
- Ch 1560-1640 road narrows with high parking demand at times due to overflow from car parking areas limiting current traffic to one direction at a time;
- Ch 1650-1730 Car parking area at Flat Rock can be very busy at times with informal parking and traffic flow; and
- Ch 1700 pedestrian beach access to Flat Rock Beach.

Design options

	<i>Cost and scale of works</i>	<i>Risk of conflict (user/user and user/car)</i>	<i>Loss of parking</i>	<i>Quality of traffic flow</i>
a. Widen road to provide adequate space for parking on both sides and shared path	High	Low	Nil	Improved
b. Provide 1.2 m wide footpath (i.e. cyclists dismount) with kerb and gutter along eastern edge of road	Moderate	Moderate-high (cyclists likely to keep riding)	Nil	Moderate (existing)
c. Provide 2.0 m wide roadside shared path separated from road with 500 mm wide raised median and restrict parking on eastern side	Moderate	Low	Moderate	Moderate (existing)
d. Provide way marking only and require walkers to use existing road (i.e. no facility)	Nil	High	Nil	Moderate (existing)

Recommended design

- Ch 1460-1550 2.5 m wide asphalt path west of existing wallaby fence on eastern edge of revegetation area;
- Ch 1550-1670 2.5 m wide roadside asphalt path along eastern side of road. Road to be widened in accordance with Council's requirements. Separation of path from vehicle traffic provided by median. Median to be at least 1.0 m wide assuming parking permitted adjacent to median;
- Ch 1670-1740 separation of path from nose-in parking to be provided by timber bollards; and
- Ch 1700 provide bike rack near access to Flat Rock Beach.

Construction considerations

- To be confirmed based on Council's road widening requirements.

2.11 Ch 1740-2060 – Flat Rock car parking area to Sharpes Creek

Specific design considerations

- Shared path standard;
- Ch 1740-1900 extensive slashing conducted recently with a varied understorey of weeds and natives regenerating with scattered mature native trees. General coastal hind dune vegetation north of Ch 1900;
- Alignment of old sand mining access track evidenced by presence of river pebbles;
- Dense and apparently very healthy Littoral Rainforest EEC west of slashed area and general coastal hind dune vegetation. Some regenerating littoral rainforest species within slashed area and general coastal hind dune vegetation;
- Adequate space to align path through slashed area and general coastal hind dune vegetation;
- Ch 1950 stand of very large pandanus that, with the improved access offered by the path, may attract camping or other activities that may damage the pandanus; and
- Ch 2000 unique vantage point overlooking rocky outcrop at southern end of Sharpes Beach and Flat Rock offering a 'destination' for less mobile users accessing via Flat Rock car park and shared path.

Design options

Recommended design was the primary option considered.

Recommended design

- 2.5 m wide asphalt path;
- Ch 1950 modify alignment and provide spiky screen planting to reduce exposure of and discourage access to large pandanus stand;
- Ch 2000 install timber lookout suitable for disabled access at suitable vantage point; and
- Stairs and boardwalk from lookout down face of hind dune and over foredune to access beach would provide further amenity and an alternative to crossing Sharpes Creek in order to continue north.

Construction considerations

- Width of path will provide access for vehicles and small plant (from the south); and
- The extent of path construction work is unlikely to be more than 2 m either side of the centre line of the proposed alignment.

2.12 Ch 2060-2600 – Sharpes Creek to southern end of Sharpes Beach car parking area

Specific design considerations

- Walking path standard;
- The vicinity of Sharpes Creek has a remote and natural feel;

- The small waterway of Sharpes Creek will require a bridge span of approximately 20 m.
- The narrow strip of vegetation north of Sharpes Creek does not pose any clear ecological constraints to the alignment of the proposed walking path. It comprises a broken canopy of mostly Coastal Banksia with other scattered trees including Pandanus. The understory is heavily disturbed and has very dense infestations of Bitou Bush that have been treated but are regenerating. There are isolated littoral rainforest pioneer species present, however no established littoral rainforest occurs here; and
- Acquisition of private land north of the creek may be necessary to continue the path. Land tenure constraints are not considered further in the absence of survey data.

Design options

Recommended design was the primary option considered.

Recommended design

- 2.0 m wide (clear) timber bridge over Sharpes Creek;
- 2.0 m wide consolidated gravel path north of the creek; and
- Impacts of path construction on strip of remnant vegetation north of the creek to be offset with active revegetation; and
- Revegetation to include some small open patches of grass close to the Sharpes Beach car park for picnicking and passive recreation.

Construction considerations

- Width of path will provide access for vehicles and small plant (from the north);
- Root barrier may be required to prevent longer term damage to the pavement; and
- The extent of path construction work is unlikely to be more than 2 m either side of the centre line of the proposed alignment.

2.13 Ch 2600-2750 – Sharpes Beach car parking area

Specific design considerations

- Walking path standard;
- Very busy area at times with heavy parking demand; and
- Car parking area to be formalised and surf club proposed.

Design options

Recommended design was the primary option considered.

Recommended design

- 2.0 m wide asphalt path on eastern side of car parking area; and
- Separation of path from nose-in parking to be provided by timber bollards.

Construction considerations

- To be confirmed based on formalisation of car parking area and surf club proposal.

2.14 Ch 2750-2940 – Sharpes Beach car parking area to base of Skennars Head

Specific design considerations

- Shared path standard;
- Existing east-west shared path from Skennars Head residential area terminates near Ch 2880; and
- Ch 2940 unique vantage point overlooking Sharpes Beach offering a 'destination' for less mobile users accessing via Sharpes Beach car parking area and proposed shared path.

Design options

Recommended design was the primary option considered.

Recommended design

- 2.5 m wide asphalt path;
- Link with existing shared path near The Coast Road underpass; and
- Install timber lookout suitable for disabled access at pandanus stand near Ch 2940.

Construction considerations

- Width of path will provide access for vehicles and small plant;
- Subsurface conditions at northern section consist of red soil and basalt rock “floaters”;
- Turfing of disturbed areas will be required to control erosion within the steeper section of this work; and
- The extent of path construction work is unlikely to be more than 2 m either side of the centre line of the proposed alignment.

2.15 Ch 2940-4020 – Skennars Head

Specific design considerations

- Walking path standard;
- Steep sections at base of Skennars Head may require stairs;
- Ch 2940-2980 surrounding area suffering isolated but severe erosion;
- Numerous informal tracks linking base of Skennars Head with the STP outfall access track that runs along most of headland;
- Southern side of headland important feature within the viewshed looking north from Sharpes Beach;
- Impressive views south from southern part of headland over Sharpes Beach and whale watching vantage points at certain locations along the headland; and
- Extensive areas of Themeda Grassland on Seacliffs and Coastal Headlands EEC throughout open space on headland;

Design options

Placement of gravel to provide a formalised path throughout the majority of this section was rejected early in the design process due to aesthetic impacts and the level of service provided by the STP outfall access track, thus the recommended design was the primary option considered.

Recommended design

- Ch 2940-3120 upgrade existing informal paths to 2.0 m wide consolidated gravel path;
 - Ch 2940-2980 determine most suitable alignment to minimise grade, which may include some deviation west. Install any necessary stairs in accordance with Section 4.10 of Gorrell (1985);
 - Ch 2980-3120 use alignment of western-most existing informal path;
- Ch 3120-3840 use existing STP outfall access track. Monitor condition of track as pedestrian traffic increases and upgrade or maintain as necessary;
- Ch 3260 install timber viewing platform to offer views south over Sharpes Beach and acts as a whale watching vantage point;
- Deviate alignment of path away from existing STP outfall access track to avoid erosion hazard areas in the vicinity of Ch 3800 as necessary; and
- Ch 3840-4020 upgrade existing walking path and small bridge reducing path width to a minimum of 1.5 m where necessary.

Construction considerations

- Ch 2940-3120 Themeda Grassland on Seacliffs and Coastal Headlands EEC through stretch where existing informal path to be upgraded – use of vehicles and plant should be minimised to reduce impacts;
- Turfing of disturbed areas will be required to control erosion within the steeper section of this work; and
- Ch 3840-4020 the extent of path construction work is unlikely to be more than 1.5 m either side of the centre line of the proposed alignment.

2.16 Ch 4020-4110 – Little Boulder Beach (Boulder Beach car parking area)

Specific design considerations

- Walking path standard; and
- Some formalisation of existing car parking area likely to be required to integrate path

Design options

Recommended design was the primary option considered.

Recommended design

- 2.0 m wide roadside asphalt path; and
- Separation of path from nose-in parking to be provided by timber bollards.

Construction considerations

- No critical considerations identified.

2.17 Ch 4110-4160 – Boulder Beach headland

Specific design criteria

- Shared path standard;
- Themeda Grassland on Seacliffs and Coastal Headlands EEC on headland; and
- Ch 4160 unique vantage point overlooking Boulder Beach offering a 'destination' for less mobile users accessed via Boulder Beach car park and proposed shared path.

Design options

Recommended design was the primary option considered.

Recommended design

- 2.0 m wide asphalt path, minimum width recommended as pedestrian traffic is not expected to be high;
- Remove or upgrade dilapidated fish cleaning table;
- Revegetate areas adjacent to path; and
- Ch 4160 low key small timber platform suitable for disabled access at a location that offers views of surf, embayment and Lennox Headland to the north.

Construction considerations

- Themeda Grassland on Seacliffs and Coastal Headlands EEC on Boulder Beach headland – use of vehicles and plant should be minimised to reduce impacts;
- Turfing of disturbed areas will be required to control erosion; and

- The extent of path construction work is unlikely to be more than 2.0 m either side of the centre line of the proposed alignment.

2.18 Ch 4160-4520 – South Boulder Beach

Specific design considerations

- Walking path standard;
- Heavily used by surfers;
- Ch 4160-4200 Themeda Grassland on Seacliffs and Coastal Headlands EEC; and
- Ch 4260-4440 frontal dune east of boulder field features wind-pruned Littoral Rainforest EEC species immediately adjacent to existing path. Existing 0.8-1.2 m wide sandy path is benched into eastern face of the dune;
- Ch 4340-4380 eastern side of narrowest section of existing path comprises dry stone wall up to approximately 1.5 m high with steep eroding drop off on eastern side ;and
- Ch 4440 geo-bag stairs linking path to beach are in poor condition.

Design options

The width and condition of the existing path through this section does not meet the prescribed standard, however upgrading the path is severely constrained due to Littoral Rainforest EEC; the dry stone wall that provides critical stability to the dune and EEC vegetation; and coastal erosion. Removal of any EEC vegetation west of path has been proscribed by Council's environment officer requiring any widening and upgrading to be accommodated by an eastward widening of the path. Consideration of a timber boardwalk extending out from the dune was rejected early in the design process due to cost and coastal hazard risk, thus the recommended design was the primary option considered.

Recommended design

- Ch 4160-4440 2.0 m wide fine gravel path, using rounded river gravel or metal dust, to suit barefoot surfers;
- No removal of Littoral Rainforest EEC vegetation west of existing path;
- Ch 4160-4440 any widening of path to occur eastwards and adjacent to escarpments, provide fill batter and rock revetment where necessary;
- Ch 4440 upgrade stairs linking beach and path;
- Ch 4440-4520 upgrade as necessary existing path aligned behind foredune; and
- Ch 4520 to The Coast Road install 2.5 m wide asphalt surface finger path with adequate additional width on corners to provide for vehicle access. Upgrade informal car park at western end of finger path.

Construction considerations

- Placement of fill and rock revetment likely to result in damage to foredune vegetation east of existing path – any impacts should be offset by revegetation;
- Plant and vehicle access likely to impact on Themeda Grassland on Seacliffs and Coastal Headlands EEC in southern part of this section, therefore some work will have to be undertaken manually; and
- The extent of path construction work must not extend west of the existing path and may extend as far as 5.0 m east of the alignment of the existing path onto the existing boulder field.

2.19 Ch 4520-5060 – Boulder Beach and wetland

Specific design considerations

- Walking path standard;
- Remote undeveloped feel to beach and wetland area west of beach;
- Extensive boulder field along beach with scattered mature native trees and grass / weed dominated understorey and wetland to the west;

- Active revegetation west of southern parts of section; and
- Important local habitat for wallabies and other native fauna.

Design options

	<i>Aesthetic impact on remote natural setting</i>	<i>Exposure to coastal hazard</i>	<i>Cost</i>	<i>Personal security of users</i>
a. 2.0 m wide gravel path with timber boardwalk to span wetland deviating 20-100 m inland from crest of boulder field.	Moderate	Moderate to low	Moderate	Low
b. 2.0 m wide timber boardwalk near crest of boulder field.	High	High	High	Moderate to low

Recommended design

- 2.0 m wide gravel path with timber boardwalk to span wetland deviating 20-100 m inland from crest of boulder field;
- Transition between gravel path and timber boardwalk to be determined on site – all chainages approximate only;
- Design and alignment to be refined based on further stakeholder consultation and detailed environmental investigations;
- Ch 4520-4670 2.0 m wide gravel path;
- Ch 4670-4970 2.0 m wide timber boardwalk with approximate 40 m bridge span at Ch 4850-4890 to cross main waterbody of wetland where channel narrows; and
- Ch 4970-5060 2.0 m wide gravel path (likely to be subject to coastal hazard).

Construction considerations

- The extent of path construction work is unlikely to be more than 2.0 m either side of the centre line of the proposed alignment generally, with the area of disturbance being 2-3 times wider near either end of the bridge span;
- The waterway is likely to require two separate spans with a central pier;
- Subsurface conditions are likely to be sandy however further geotechnical investigation is required particularly for the proposed bridge; and
- Path may need to be widened to provide access for plant necessary to erect the bridge.

2.20 Ch 5060-6030 – Lennox Headland

Specific design considerations

- Walking path standard;
- Various steep sections may require stairs;
- Ch 5060-5100 surrounding area suffering isolated erosion;
- Remote undeveloped feel with dramatic views west and south;
- Unique and dominant part of viewshed from Boulder Beach and Boulder Beach headland (proposed lookout);
- Themeda Grassland on Seacliffs and Coastal Headlands EEC on eastern slopes of headland; and
- Existing path close to erosion hazard in some locations.

Design options

Recommended design was the primary option considered.

Recommended design

- Ch 5060-5100 2.0 m wide consolidated gravel path on most suitable alignment to minimise grade, which may include some deviation west. Install any necessary stairs in accordance with Section 4.10 of Gorrell (1985);
- Ch 5100-5700 new path to be developed by slashing a pathway up to 40 m to the west of existing path to remove traffic from Themeda Grassland EEC. Alignment to be confirmed;
- Surface of new track to be slashed only and condition monitored as traffic increases. If necessary, surface to be upgraded to consolidated gravel; and
- Ch 5700-6030 existing path. Monitor condition of track as pedestrian traffic increases and upgrade or maintain as necessary.

Construction considerations

- The extent of path construction work, where upgrade works are recommended, is unlikely to be more than 2.0 m either side of the centre line of the proposed alignment;
- Turfing of any disturbed areas will be required to control erosion.

Shared Path

3.1 Introduction

Section 3 should be read in conjunction with drawing numbers 1818/200 to 1818/218. Note that all chainages are approximate.

3.1.1 Design criteria

The following design standards were applied in the design of the shared path:

- *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths* (Austroads, 2009); and
- *Australian Standard 1742.2-2009 Manual of uniform traffic control devices Part 2: Traffic control devices for general use* (AS 1742)

In addition the following design considerations apply to all sections of the path:

- Safety, including the potential for cyclist / pedestrian / vehicle conflicts;
- Environmental impacts, particularly vegetation clearing, Endangered Ecological Communities, sensitive areas and threatened species;
- Revegetation and rehabilitation requirements;
- Erosion and coastal hazard;
- Drainage, waterway and surface water impacts;
- Cultural impacts, in particular Aboriginal cultural heritage;
- Disabled access;
- Durability and maintenance;
- Linkages to key utility locations (e.g. car parking areas) and recreational locations (e.g. viewing points); and
- Visual impact and visual amenity.

3.1.2 Design options

Where design options are listed, the recommended design is the first option listed. Note that in some sections the nature and extent of constraints meant that the recommended design was the only option that could be considered.

3.2 Ch 0-410 – Silver Gull Drive and The Terrace

Specific design considerations

- Quiet residential area, collector streets and local streets; and
- Council advised that on-road advisory pavement markings treatment is preferred.

Design options

Recommended design was the primary option considered.

Recommended design

- On road advisory pavement markings comprising PS-2 bicycle symbol 2.0 m on existing road pavement as per drawing numbers 1818/201, 202 and 211; and
- Vehicle traffic warning signage as shown on drawing numbers 1818/201 and 202.

Construction considerations

- Turfing of disturbed areas will be required to stabilise and restore the nature strips
- No other critical considerations have been identified.

3.3 Ch 410-920 – The Coast Road, North Angels Beach Estate

Specific design considerations

- Built up area;
- Concrete path would be generally expected in such locations;
- Ch 410-460 carriageway linking The Terrace and The Coast Road with a number of garden beds;
- Ch 460-850 footpath design prepared as part of North Angels Beach Estate; and
- Ch 850-880 existing footpath as part of North Angels Beach Estate;

Design options

North Angels Beach Estate proponents were required to design and install a footpath as part of the approval for that development. Council asked that this footpath design be adopted for a shared path under this project. Thus the recommended design was the primary option considered.

Recommended design

- 2.5 m wide concrete separated path – refer drawing number 1818/202;
- Ch 410-460 aligned on southern side of easement to minimise vegetation clearing;
- Ch 460-850 alignment generally follows that prepared by North Angels Beach Estate; and
- Ch 900-920 landscape planting around entrance to North Angels Beach Estate not included in survey – alignment may need to be modified on site.

Construction considerations

- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- Traffic control and OH&S on busy arterial road.

3.4 Ch 920-1340 – The Coast Road, existing kerb and gutter

Specific design considerations

- Vegetated roadside area of arterial road;
- Existing kerb and gutter;
- Ch 1060 pinch point where corner of private property extends into general alignment of road reserve of The Coast Road;
- Some stretches of this section have an embankment immediately adjacent to path alignment; and
- Various signs and a bus stop that will need to be relocated;

Design options

The recommended design was the primary option considered.

Recommended design

- Generally a 2.5 m wide concrete separated path – refer drawing number 1818/211;
- Ch 1040-1070 deviate path and relocate existing kerb and gutter to accommodate pinch point as shown on drawing number 1818/202;
- Ch 1060-1200 embankment adjacent to path will require a retaining wall – refer “The Coast Road Typical Section A” on drawing number 1818/212. Length and height of retaining wall to be determined on site. Maximum height of retaining wall approximately 1.0 m; and
- Ch 1270 relocate bus stop 1.0 m west of path alignment.

Construction considerations

- The extent of path construction work is unlikely to be more than 2.5 m either side of the centre line of the proposed alignment;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips
- Traffic control and OH&S on busy arterial road. Particularly Ch 1060 where relocation of existing kerb and gutter will require significant traffic management measures, most likely including a temporary closure of the north bound traffic lane. Traffic management to support other works are likely to be limited to warning traffic that work is occurring and a temporary local reduction in the speed limit; and
- Various temporary locations of bus stop likely to be required during works.

3.5 Ch 1340-2380 – The Coast Road

Specific design considerations

- Vegetated roadside area of arterial road; and
- Varying embankment and swale arrangements adjacent to path alignment. Refer drawing numbers 1818/212 and 213 for typical sections and indicative existing surface.

Design options

A general approach of minimising earthworks and vegetation clearing limited the options considered between Ch 1340 and Ch 1860 to (depending on the embankment arrangement) "Typical Section B" or "Typical Section C", as shown in drawing number 1818/212..

Between Ch 1860 and 2330, two options are presented for the path arrangement adjacent to an existing swale.

	<i>Realign swale and extend drains</i>	<i>Extent of vegetation removal</i>	<i>Amenity for users</i>
a. Option 1 cross section – 2.5 m wide asphalt path east of existing swale	Yes	Low	Moderate
b. Option 2 cross section – 2.5 m wide asphalt path west of existing swale	No	High	Good

Option 1 is recommended as the amenity of users is acceptable and within the safety guidelines while removal of vegetation is minimised – a relatively high qualitative weighting value of vegetation has been adopted. Should stakeholders value amenity, safety and minimisation of drainage works more highly than maintaining existing native, then there is no compelling reason why Option 2 should not be adopted in the final design.

Recommended design

- Ch 1340-1860 2.5 m wide asphalt path at grade adjacent to The Coast Road. Refer drawing number 1818/212 for "The Coast Road Typical Section B" and "The Coast Road Typical Section C";
- Provide rock lined swale to accept discharge from kerb and gutter on property side of Typical Section C and direct into realigned swale associated with Typical Section D – Option 1 (see below);
- Ch 1860-2330 2.5 m wide asphalt path at grade adjacent to The Coast Road. Refer drawing number 1818/212 for "The Coast Road Typical Section D – Option 1". Realign swale and extend existing drains as necessary; and
- Ch 2330-2380 2.5 m wide asphalt separated path – refer drawing no 1818/211. Crossing of Headlands Drive (no pavement marking) to be set back a minimum of 40.0 m from the intersection with The Coast Road

Construction considerations

- Ch 1340-2330 the extent of path construction work is unlikely to be more than 1.5 m east and 4.5 m west of the centre line of the proposed alignment;

- Ch 2330-2380 the extent of path construction work is unlikely to be more than 2.0 m either side of the centre line of the proposed alignment;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- Traffic management to support the works is likely to be limited to warning traffic that work is occurring and a temporary local reduction in the speed limit.

3.6 Ch 2380-3280 – The Headlands Estate, existing paths

- Proposed path north of Headlands Drive to be 2.5 m asphalt, alignment determined on site (no survey available); and
- No upgrade to the existing paths considered necessary.

3.7 Ch 3280-3500 – Headlands Drive

Specific design considerations

- Quiet residential area;
- Collector street; and
- Broad grass verges, some well established trees and garden beds.

Design options

	<i>Loss of garden bed at 76 Headlands Drive</i>	<i>Maintain 2.5 m wide path</i>
a. 2.5 m wide concrete path on eastern side of Headlands Drive between Killarney Crescent and 76 Headlands Drive, 2.0 m wide concrete path on western side of Headlands Drive north of number 76.	No	No (reduce to 2.0 m)
b. 2.5 m wide concrete path on eastern side of Headlands Drive between Killarney Crescent and crossing point 40 m south of Skennars Head Road.	Yes	Yes

Recommended design

- Ch 3280-3380 2.5 m wide concrete separated path – refer drawing number 1818/213 “Headlands Drive Typical Section”. Path to direct users to cross Headlands Drive south of driveway to 76 Headlands Drive;
- Ch 3390-3430 2.0 m wide concrete separated path – refer drawing number 1818/211; and
- Ch 3430-3490 2.5 m wide concrete separated path alignment to be determined on site (no survey available).

Construction considerations

- The extent of path construction work is unlikely to be more than 2.5 m either side of the centre line of the proposed alignment;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- Some traffic control will be required although 2-way traffic is likely to be able to be maintained.

3.8 Ch 3500-4860 – Skennars Head Road

Specific design considerations

- Vegetated roadside area of distributor road;
- Eastern end of section includes caravan park and a small number of property accesses on southern side of road, and access to football fields and entrance to Henderson Estate on northern side of road;
- Steep embankments and retaining walls in vicinity of entrance to Henderson Estate on northern side of road;

- East of Ch 4380 a small number of established trees on either side that may require removal in order to install proposed path;
- Ch 4380-4840 road traverses SEPP 14 wetland. The southern side of the road in this stretch includes several large Broad-leaved paperbark trees and some Hairy joint grass (Blackwood Ecological Services, 2011);
- Ch 4380-4840 Blackwood Ecological Services (2011) recommends aligning the path on the northern side of the road through the SEPP 14 primarily to prevent the loss of several large Broad-leaved paperbark trees on the southern side and minimise impacts on the relatively higher habitat value exhibited by the wetland on the southern side also; and
- The alignment further north will be on the eastern side of North Creek Road.

Design options

The recommended design is based on the following three key constraints.

- The proposed path alignment meets Skennars Head Road on its southern side (at Headlands Drive) and needs to align on the eastern side of North Creek Road further north (see **Section 3.9**). The eastern side of North Creek Road corresponds to the northern side of Skennars Head Road. Thus, these primary alignment constraints require at least one crossing of Skennars Head Road from south to north.
- The embankments and retaining walls near the entrance to the Henderson Estate provide a constraint that would require an on-road alignment of the proposed path for over 300 m if it was to be located on the northern side of Skennars Head Road.
- Aligning the proposed path on the southern side of Skennars Head Road through the SEPP 14 wetland would require the removal of around five large Broad-leaved paperbark trees and some Hairy joint grass. This side of the road is not recommended by Blackwood Ecological Services (2011).

The western extent of the key constraint on the northern side of Skennars Head Road (the embankments and retaining walls) is approximately 50 m east of the eastern extent of the key constraint on the northern side of Skennars Head Road (Broad-leaved paperbark trees and Hairy joint grass). Locating the necessary road crossing of the proposed path between these two extents provides good sight lines in either direction.

Based on the three key constraints described above, the alignment of the recommended design was identified as the optimum alignment early in the design process.

For the consideration of stakeholders, two cross section options are presented for the path alignment on the northern side of Skennars Head Road (refer drawing number 1818/214). The recommended design adopts Option 1, which uses a retaining wall and fence to accommodate a 2.5 m wide path (rather than a 2.0 m wide path under Option 2) and ensures the extent of construction work will be limited to the road reserve.

Recommended design

- Ch 3500-4370 southern side of Skennars Head Road;
- Ch 4380-4860 northern side of Skennars Head Road;
- Ch 3500-3620 existing concrete path;
- To prevent the removal of established trees the following steps, to be confirmed on site, should be taken:
 - Modify path alignment
 - Reduce path width to a minimum of 2.0 m, and/or
 - Introduce parking restrictions.

Recommended offset from obstacles 1.0 m (not binding). Recommended offset from face of kerb where parking is permitted 1.0 m, or 0.3 m where parking is not permitted;

- Ch 3620-3660 2.5 m wide asphalt separated path – refer drawing number 1818/211;
- Ch 3660-4000 2.5 m wide asphalt path at grade adjacent to Skennars Head Road – refer drawing number 1818/211;
- Ch 4000-4110 2.5 m wide asphalt separated path – refer drawing number 1818/211;

- Ch 4110-4370 2.5 m wide asphalt path at grade adjacent to Skennars Head Road – refer drawing number 1818/211;
- Ch 4380-4860 2.5 m wide asphalt path at grade adjacent to Skennars Head Road – refer drawing number 1818/211 “Typical Section Skennars Head Road – Option 1”

Construction considerations

- The extent of path construction work is unlikely to be more than 2.5 m either side of the centre line of the proposed alignment;
- Some mature trees may need to be removed but the recommended design allows for flexibility to prevent this in all but the most necessary cases;
- The foundations for the retaining walls on the northern side of Skennars Head Road will be in wet ground necessitating placement of basalt ballast;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- The works are likely to require significant traffic management measures, most likely including temporary local closures of the adjacent traffic lane.

3.9 Ch 4860-5140 – North Creek Road, south of Tara Downs

Specific design considerations

- Residential area;
- Distributor road; Assume road to be upgraded and widened in future;
- Steep longitudinal grades and varying embankment arrangements; and
- No existing kerb and gutter.

Design options

Initial designs sought to minimise the extent of stormwater infrastructure necessary by making use of the existing swales or surface flow drainage arrangements thereby largely avoiding the need for kerb and gutter, kerb inlet pits and stormwater pipes. Council’s review of these designs recommended that in light of future upgrades of North Creek Road it was preferable that the recommended design include kerb and gutter and associated stormwater infrastructure to complement future road upgrades. By including kerb and gutter in this way the designs would offer the added benefit of providing a separated path, rather than a path at grade, improving amenity for path users.

Recommended design

- Final design subject to stormwater calculations. It is estimated standard kerb inlet pits at approximately 50 m centres will be suitable;
- Ch 4860-4940 2.5 m wide concrete separated path – refer “North Creek Road Typical Section A” drawing number 1818/215;
- Ch 4940-5070 2.5 m wide concrete separated path – refer “North Creek Road Typical Section B” drawing number 1818/215. Note that path is as close as possible to property boundary to maximise lateral distances for future road upgrades;
- Ch 5070-5140 2.5 m wide concrete separated path – refer “North Creek Road Typical Section C” drawing number 1818/216. Note that path is as close as possible to property boundary to maximise lateral distances for future road upgrades;

Construction considerations

- The extent of path construction work is unlikely to be more than 2.5 m east the centre line of the proposed alignment. The western extent will be determined based on the road upgrade works;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- The works are likely to require significant traffic management measures, most likely including temporary local closures of the southbound traffic lane.

3.10 Ch 5140-5260 – North Creek Road, existing path south of Tara Downs

This section presents the following constraints:

- The width of the existing footpath immediately south of Tara Downs is not adequate to provide for a shared path. Widening of the path is severely constrained due to established trees and dry stone wall that has high heritage value and cannot be disturbed.
- The existing footpath on the western side of North Creek Road, south of Elevation Drive, is also of inadequate width and suffers similar constraints.
- North of Elevation Drive established landscaping and decorative signage presents further constraints.
- Additionally, alignment on the western side of North Creek Road is significantly constrained further north, between Aspects Drive and Montwood Drive, due to a very steep embankment requiring a return of any western-side alignment to the eastern side of the road.

As a result of these constraints it is recommended that a shared path facility not be provided over this section. The existing footpath provides a link for pedestrians however cyclists will be required to either dismount and walk their bikes or continue to ride on the footpath which, although common, is illegal.

It is recommended that the discontinuity of the shared path facility over this section be highlighted to users by way of signage as shown in drawing no 1818/208.

3.11 Ch 5260-6050 – North Creek Road, Tara Downs to Castle Drive

Specific design considerations

- Residential area;
- Distributor road;
- South of Ch 5640 no existing kerb and gutter. Assume road to be upgraded and widened in future; and
- Steep longitudinal grades and varying embankment arrangements.

Design options

Initial designs sought to minimise the extent of stormwater infrastructure necessary by making use of the existing swales or surface flow drainage arrangements thereby largely avoiding the need for kerb and gutter, kerb inlet pits and stormwater pipes. Council's review of these designs recommended that in light of future upgrades of North Creek Road it was preferable that the recommended design include kerb and gutter and associated stormwater infrastructure to complement future road upgrades. By including kerb and gutter in this way, the designs would offer the added benefit of providing a separated path, rather than a path at grade, improving amenity for path users.

Recommended design

- Final design subject to stormwater calculations. It is estimated standard kerb inlet pits at approximately 50 m centres will be suitable;
- Ch 5270-5430 2.5 m wide concrete separated path – refer "North Creek Road Typical Section A" drawing number 1818/215;
- Ch 5430-5630 2.5 m wide concrete separated path – refer "North Creek Road Typical Section C" drawing number 1818/216;
- Ch 5630-5670 2.5 m wide concrete separated path – refer "North Creek Road Typical Section D" drawing number 1818/216;
- Ch 5670-5860 2.5 m wide concrete separated path – refer "Typical Section Separate Path" drawing number 1818/211;
- Ch 5860-6040 2.5 m wide concrete separated path – refer "North Creek Road Typical Section D" drawing number 1818/216;

- Ch 5810 and 6050 align crossings of Palisade Way and Castle Drive a minimum of 10 m and 7 m east of intersection with North Creek Road respectively. Alignment shown is based on minimum curve radii of 5.0 m; and
- Turfing of disturbed areas will be required to stabilise and restore the nature strips

Construction considerations

- The extent of path construction work is unlikely to be more than 2.5 m east of the centre line of the proposed alignment. The western extent will be determined based on the road upgrade works;
- The works are likely to require significant traffic management measures, most likely including temporary local closures of the southbound traffic lane.

3.12 Ch 6050-6190 – North Creek Road, Castle Drive to Sandstone Crescent

Specific design considerations

- Residential area;
- Distributor road;
- Kings Court Reserve offers ample space and suitable grades to accommodate a separated path; and
- Significant established garden within road reserve immediately north of Kings Court Reserve.

Design options

	<i>Relocate power pole</i>	<i>Kerb side parking</i>	<i>Path amenity</i>	<i>Vegetation clearing</i>
a. 2 m wide path on existing road pavement, between existing kerb and travel lane	No	Lost for 2 properties	Moderate – roadside at grade, minimum width	Negligible
b. 2.5 m wide concrete separated path, between existing kerb and property boundary	Yes	Maintained	Good – separated from road, recommended width	Established native garden removed

Recommended design

- Ch 6060-6115 2.5 m wide concrete separated path – refer “Typical Section Separated Path” drawing number 1818/211;
- Ch 6115-6180 taper path width to 2.0 m, install suitable kerb ramp and transfer to roadside path at grade on existing road surface. Refer “North Creek Road Typical Section E” drawing number 1818/218;
- Ch 6180-6190 install suitable kerb ramp transfer to separated path; and
- Ch 6190 align crossing of Sandstone Crescent minimum of 4.5 m east of intersection with North Creek Road. Alignment shown based on minimum curve radii of 3.0 m to maintain adequate set back from power pole.

Construction considerations

- Ch 6060-6115 the extent of path construction work is unlikely to be more than 2.5 m either side of the centre line of the proposed alignment;
- Ch 6115-6180 the extent of path construction work is unlikely to be more than 3.0 m west of the existing kerb and gutter. The western extent will be determined based on the road upgrade works;
- Ch 6180-6190 the extent of path construction work is unlikely to be more than 2.0 m either side of the centre line of the proposed alignment;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- The works are likely to require significant traffic management measures, most likely including temporary local closures of the southbound traffic lane.

3.13 Ch 6190-6350 – North Creek Road, between Sandstone Crescent

Specific design considerations

- Residential area;
- Distributor road; and
- Three power poles significantly constrain separated path alignment.

Design options

	<i>Relocate power pole</i>	<i>Kerb side parking</i>	<i>Path amenity</i>
a. 2 m wide concrete separated path with three chicanes around power poles	No	Lost at chicanes but generally still available	Moderate-good – minimum width
b. 2 m wide path on existing road pavement, between existing kerb and travel lane	No	Lost for 5 properties	Moderate – roadside at grade, minimum width
c. 2 m wide concrete separated path	No	Maintained	Moderate-good – separated from road, minimum width, power poles immediately adjacent to path
d. 2-2.2 m wide concrete separated path, relocate power poles closer to road	Yes	Maintained	Moderate-good – separated from road, less than recommended width, power poles close to path

Recommended design

- 2.0 m wide concrete separated path with chicanes. Refer drawing numbers 1818/210 and 218; and
- Ch 6340 align crossing of Sandstone Crescent minimum of 4.0 m east of intersection with North Creek Road. Alignment shown based on minimum curve radii of 5.0 m.

Construction considerations

- The extent of path construction work is unlikely to be more than 2.5 m either side of the centre line of the proposed alignment;
- Turfing of disturbed areas will be required to stabilise and restore the nature strips; and
- The works are likely to require significant traffic management measures, most likely including temporary local closures of the southbound traffic lane.

3.14 Ch 6350-6558 – North Creek Road, Sandstone Crescent to Amber Drive

Specific design considerations

- Residential area;
- Distributor road; and
- Ch 6360-6490 retaining wall immediately adjacent to existing kerb and gutter.

Design options

The recommended design was the primary option considered.

Recommended design

- Ch 6350-6360 2.0 m wide concrete separated path;
- Ch 6360-6490 install suitable kerb ramp and transfer to roadside path at grade on existing road surface. Refer "North Creek Road Typical Section E" drawing number 1818/218;
- Ch 6490-6520 install suitable kerb ramp transfer to 2.5 m wide concrete separated path; and

- Ch 6520-6558 taper concrete path to a minimum width of 2.0 m and reduce offset from existing kerb and gutter as necessary to navigate embankment and power pole near Ch 6540 (not shown on survey). Indicative alignment shown.



References

- Austrroads (2009), *Guide to Road Design Part 6A: Pedestrian and Cyclist Paths*, Austrroads
- Standards Australia (2009), *Australian Standard 1428.1-2009 Design for access and mobility Part 1: General requirements for access – New building work*, Standards Australia International
- Standards Australia (2009), *Australian Standard 1742.2-2009 Manual of uniform traffic control devices Part 2: Traffic control devices for general use (AS 1742)*, Standards Australia International
- Standards Australia (2001), *Australian Standard 2156.2-2001 Walking tracks Part 1: Classification and signage*, Standards Australia International
- Standards Australia (2001), *Australian Standard 2156.2-2001 Walking tracks Part 2: Infrastructure design*, Standards Australia International
- Blackwood Ecological Services (2011), *Ecological Assessment Ballina to Lennox Head Shared Path – Skennars Head SEPP 14 section*, prepared for Ballina Shire Council, Blackwood Ecological Services
- Gorrell S. (1985), *Walking Track Construction Guidelines*, NSW National Parks and Wildlife Service
- NSW Roads and Traffic Authority (2000), *Road Design Guide Section 3 – Cross Section (Issue 1.1)*, NSW Roads and Traffic Authority



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Amend to suit your report

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