



TOWN OF PORT HEDLAND TRAILS MASTERPLAN



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prepared for the ToPH by GHD Pty Ltd



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EXECUTIVE SUMMARY

Port Hedland, located in the Pilbara region in the North West of Western Australia, is the major iron ore export port of the Pilbara region, and home to approximately 20,000 permanent residents, with a strong contingent of migratory workers who service the mining and associated service industries. Pilbara Cities, the draft regional planning document which forecasts the expansion and growth of Port Hedland to 2035, has projected a growth in population to 50,000 people by 2035, indicating a strong regional growth in the area, supported by the State government. The State Government, in line with the projected population growth, has highlighted Port Hedland as one of the key regional centres to be developed over the next 25 years, due to the strong export ties to the port and associated service industries which are centred in Port Hedland.

The Town of Port Hedland has commissioned a Trails Masterplan to ascertain the feasibility of creating a network of nature and cultural based recreational trails within three precincts around the township- Port Hedland, South Hedland and Finucane Island. The Trails Masterplan is a complementary passive recreation proposal to the 'Active Open Space Strategy' (2011), which identified, analysed and proposed upgrades of active recreational infrastructure throughout the Town, and is also complementary to the Town of Port Hedland Cycle Plan (2008), which analysed the existing cycle infrastructure of the town and proposed new recreational cycle opportunities within key precincts of the Town.

In line with the projected population growth of Port Hedland, the Town of Port Hedland has commissioned the Trails Masterplan to identify prospective sites within these three precincts, consult with the local community, local and state stakeholders and commence with concept design of the proposed trail network, allowing for future growth of the Town's population and increased requirements for passive recreational opportunities.

The objectives of the Trails Masterplan are to take into account cultural, ecological and historical appreciation of the proposed sites, increase opportunities for social interaction and passive recreation in an informal setting, increase appreciation of the local environment, and allow for growth of tourism based activities in a natural settings.

Whilst Port Hedland is known for it's ties to iron ore mining and exporting, the indigenous and European history is not well known nor fully explored, and the unique environmental aspects of the Pilbara coastal area are not yet appreciated to the degree to which they could be. Active open space for formal play are well analysed and documented within the 'Active Open Space Strategy', and the Port Hedland Trails Master Plan seeks to balance the natural and cultural passive recreational opportunities for users, allowing for unique experiences which interact and provide experiential recreation throughout some of Port Hedland's more unique landscapes.



1.0 INTRODUCTION

1.1 Desktop Literature Analysis

1.1.2 Desktop Literature Analysis

Prior to site investigation in early December 2012, a desktop study was conducted of the following documents for relevance and background.

1. Active Open Space Strategy (CCS Strategic, 2011)
2. Town of Port Hedland Cycle Plan (Transplan 2008)
3. Pilbara Planning and Infrastructure Framework Draft (2011)
4. Port Hedland Land Use Master Plan (2008)
5. Hedland's Future Today (2010)
6. Port Hedland Coastal Vulnerability Study (Cardno, 2011)

Within these documents, the Active Open Space Strategy noted lack of passive recreational facilities and segregated walking/cycling paths within both Port Hedland and South Hedland. This document, which was primarily aimed at structured, organised team and individual sports, highlighted the Department of Sport and Recreation definitions of Recreation and Nature Spaces, and the lack of areas which are suitable within the Town of Port Hedland particularly for nature based recreation. Whilst options are available within 5-15km of the town for nature based recreation such as water sports, beach fishing, water skiing and kayaking, there is not sufficient nature based passive recreational spaces within walking distance of the major residential areas of Port and South Hedland.

The Town of Port Hedland Cycle Plan is an in-depth analysis of current cycling facilities, both on road and segregated, within Port and South Hedland, with the study performing a gap analysis of the current state of facilities for both cyclists and walkers. Within Port Hedland, it was noted that whilst on road and segregated cycle routes were available, significant linkage routes and local destinations of note were not available to both recreational and commuter cyclists alike. This document did highlight two notable 'Priority Projects', the Port Hedland to Pretty Pool Shared Path and the Port Hedland to South Hedland Path.

Pretty Pool is a predominantly residential area in East Port Hedland, located to the North and South of the Pretty Pool Creek and associated recreational park located off Matheson Drive on the South of the creek. This area, separated by the estuary of Pretty Pool, has the Cooke Point Caravan Park adjacent, along with existing horse stables and residential developments, and lacks passive recreation areas and link paths, which could serve as walking trails. Within the Cycle Plan, the authors noted the lack of connection between Cooke Point and Pretty Pool, across the estuary, and the opportunities for development of trails, both walking and cycling, around the area to provide passive recreational opportunities to residents along with commuter links to Port Hedland along the foreshore or south to Gray St, which is the connecting road to Six Mile Beach, a popular fishing and ecological destination South of East Port Hedland. This proposed bridge link across the Pretty Pool estuary would also tie into the current parallel project which the Town of Port Hedland has embarked upon, the Foreshore Masterplan, which will link the foreshore from the West End to Cooke Point. It is the intention of the Trails Masterplan to integrate with this project, and provide a valuable link from Cooke Point to Pretty Pool, and thereby link continuously from the West End to Six Mile Beach at full project fruition.

The Port Hedland to South Hedland Path is a long term project, and has been partially constructed several years ago as part of the Great Northern Highway upgrade from South Hedland to Redbank Bridge. The Northern section of this commuter route has not been constructed, and constraints such as the construction of the Great Northern Highway re-alignment, heavy traffic on Redbank Bridge, land tenure issues and funding has delayed the progress of this project.

The Cycle plan also highlighted the lack of recreational walking trails in South Hedland, which is the home to more than two-thirds of the Town's population. South Hedland is the major residential growth area for Port Hedland, and is seeing rapid change and an increase in community infrastructure due to it's significance as a Pilbara City. Whilst

residential areas have some footpaths and public open space linkages, the lack of recreational walking trails or scenic paths in South Hedland is also highlighted in the Cycle Plan. The Plan recommends a scenic path or trail in the bush land South West of South Hedland, with note given to the low lying nature of the ground and care to be given to the remoteness of the trails.

1.2 Consultation

The Port Hedland Trails Masterplan was initiated in November 2012, with a working group meeting convened by the Town of Port Hedland (ToPH) project team. Other stakeholders joining the working group representing state interests are the Department of Sport and Recreation (DoSR), Department of Environment and Conservation (DEC) and the Pilbara Development Commission (PDC). Local stakeholders representing user groups on the project working group were CARE for Hedland and Atlas Iron. Stakeholders consulted during the Masterplan process were the Port Hedland Historical Society, Hedland Well Women's Centre, Hedland Tri Sports, Port Hedland Port Authority, and representatives of the Karriyarra Native Title Working Group.

Within the ToPH staff, members of the Community Development, Recreation Services, Planning Services and Technical Services departments all form stakeholders on the project working group.

In the course of this masterplan, the following stakeholder groups were consulted-

1.2.1 Town of Port Hedland-

Lorna Secrett	TOPH Community Development, Manager Community Development
Mark Davis	TOPH Community Development, Community Development Officer
Graeme Hall	TOPH Recreation Services, Manager Recreation Services and Facilities
Nicole Roukens	TOPH Recreation Services, Recreation Coordinator
Jenella Voitkevich	TOPH Infrastructure Development, Manager Infrastructure Development
Rob Bailly	TOPH Infrastructure Development, Project Coordinator

Pip Jarkiewicz	TOPH Depot, Coordinator Parks/Reserves
Steve De Meillon	TOPH Planning, Planning Officer
Anup Paudel	TOPH Technical Services, Manager Technical Services
Jennifer Malloy	TOPH Historical Officer South Hedland Library

1.2.2 State Stakeholders

Kane Benson	Department of Sport and Recreation
Steve Bennett	Department of Sport and Recreation
Trish Barron	Pilbara Development Commission
Amber McCallum	Department of Environment & Conservation
Kate Antonas	FORM
Grant Singleton	Landcorp

1.2.3 Local Stakeholders

Arnold Carter	Port Hedland Historical Society
Denise Bevins	Hedland Well Women's Centre
Jacqui Ryker	Hedland Tri Sports
Nicole Wiley	Port Hedland Port Authority
Pip Short	Care for Hedland
Bec Pianta	Atlas Iron
Diane Robertson	Karriyarra Native Title Working Group
Kerry Robertson	Karriyarra Native Title Working Group
Alf Barker	Karriyarra Native Title Working Group
Jenny Snowball	Karriyarra Native Title Working Group
Raelene Stuart	Karriyarra Native Title Working Group
Jessica Mathie	Wangka Maya Centre

During the site trip and following the site visit, individual and group meetings were held with all stakeholders listed above, to ascertain comments on the proposed preliminary alignments of the trails. Comments ranged from tying into

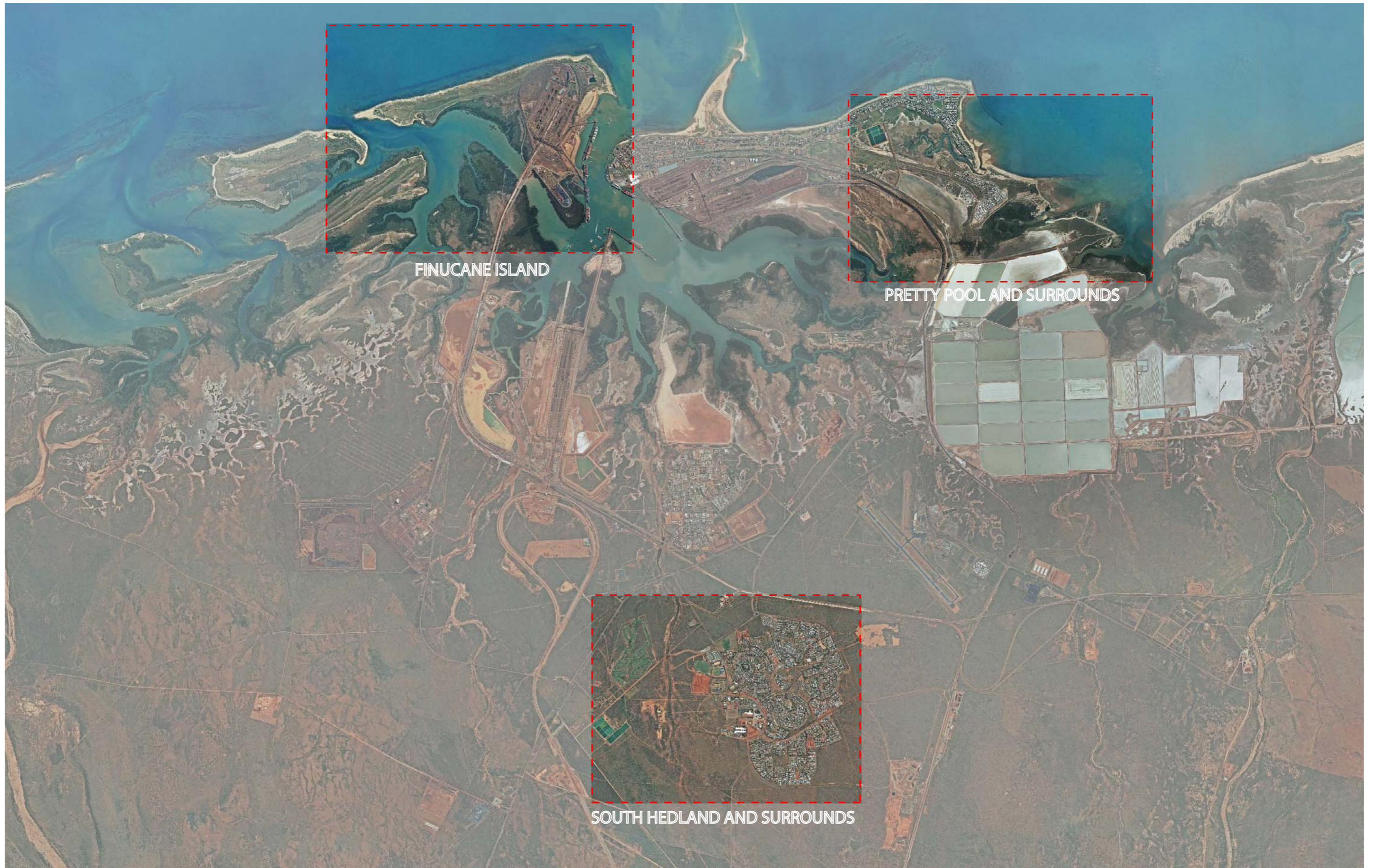


Figure 1: Study Area

1.0 INTRODUCTION

existing trails, such the existing Port Hedland Heritage Trail, to new parallel projects, such as the ToPH Foreshore Masterplan.

1.2.4 Indigenous Stakeholder Consultation

During the initial site investigation in December 2012, and the subsequent second investigative trip in March 2013, GHD met with members of the Karriyarra Native Title Working Group to discuss the alignment of the trails, areas of indigenous significance, and to also discuss opportunities for indigenous interpretation throughout the trails alignment.

The plans were met with interest from the representative groups, and there exists the opportunity to weave indigenous names and uses of the sites throughout the interpretation of the trails. Due to the proximity of the trails in Pretty Pool, East Port Hedland, Six Mile Beach and Finucane Island to the coastal habitat, these areas have more indigenous significance and historical use than the areas around South Hedland, which was previously indelible tracts of bush with little indigenous significance. The areas surrounding the Pretty Pool and East Port Hedland Loops were traditionally used for temporary camp sites, due to the proliferation of food sources and shelter through these areas. Scattered midden sites exist in these areas highlighting traditional usage of the sites, and a strategy for preserving these in situ should be formed in the detailed design stages of the trails development.

Other areas of the trails network also have indigenous significance, but due to the history being of a ceremonial nature, the opportunities for interpretation will require sensitive consultation with the working group to ascertain the level of interpretation, if any, some of the sites will have. One of the existing sites has a checkered historical past, and the indigenous representatives may wish for this to remain within their culture due to the nature of the history. The same site was also one of three ceremonial gathering sites in the greater Port Hedland area, and it may be that this ceremonial history is used in the interpretation more so than the other aspects.

2.0 METHODOLOGY

2.1 Site Investigation

The Consultancy team travelled to Port Hedland on the 7th December 2012 for five days, with preliminary trail alignments created with input from the working group, and based upon the Desktop Literature Analysis. These preliminary route alignments were assessed through consultation with the working group and extended stakeholder group, and assessed on site for viability, location, user access, topography and proximity to residential areas. Three areas were highlighted in the working group initiation meeting for consideration of the potential for trails- Pretty Pool, South Hedland and Finucane Island, a popular passive recreation destination 20km from Port Hedland by road, located to the West of the port. Refer Figure 1 for location plan of the proposed recreational precincts.

These preliminary alignments formed the basis of individual and group consultations during the site investigation, and each proposed area was assessed according to scenic qualities, access, indigenous heritage, topography and location close to adjacent residential, conservation or recreational activities.

The three areas of proposed recreational trails are located on Pretty Pool, in the East of Port Hedland, South Hedland, and Finucane Island.

2.2 Base Information

As part of the preliminary route alignments selection, LiDAR aerial survey information was obtained of the Port Hedland region, showing topography, aerial photos and feature surveys, to a detail of around 1:25000 scale. The survey information was based upon 5m contours, which was then calibrated to 1m contours to allow for more detail in the planning of the trails.

The preliminary alignments are shown in Figures 2-5, and were based upon existing scenic and recreation areas within the three precincts. The preliminary routes were then revised according to comments from the stakeholders, and then revised accordingly, with the addition of new proposed residential lots and subdivisions added to allow for future proofing of the trails network.

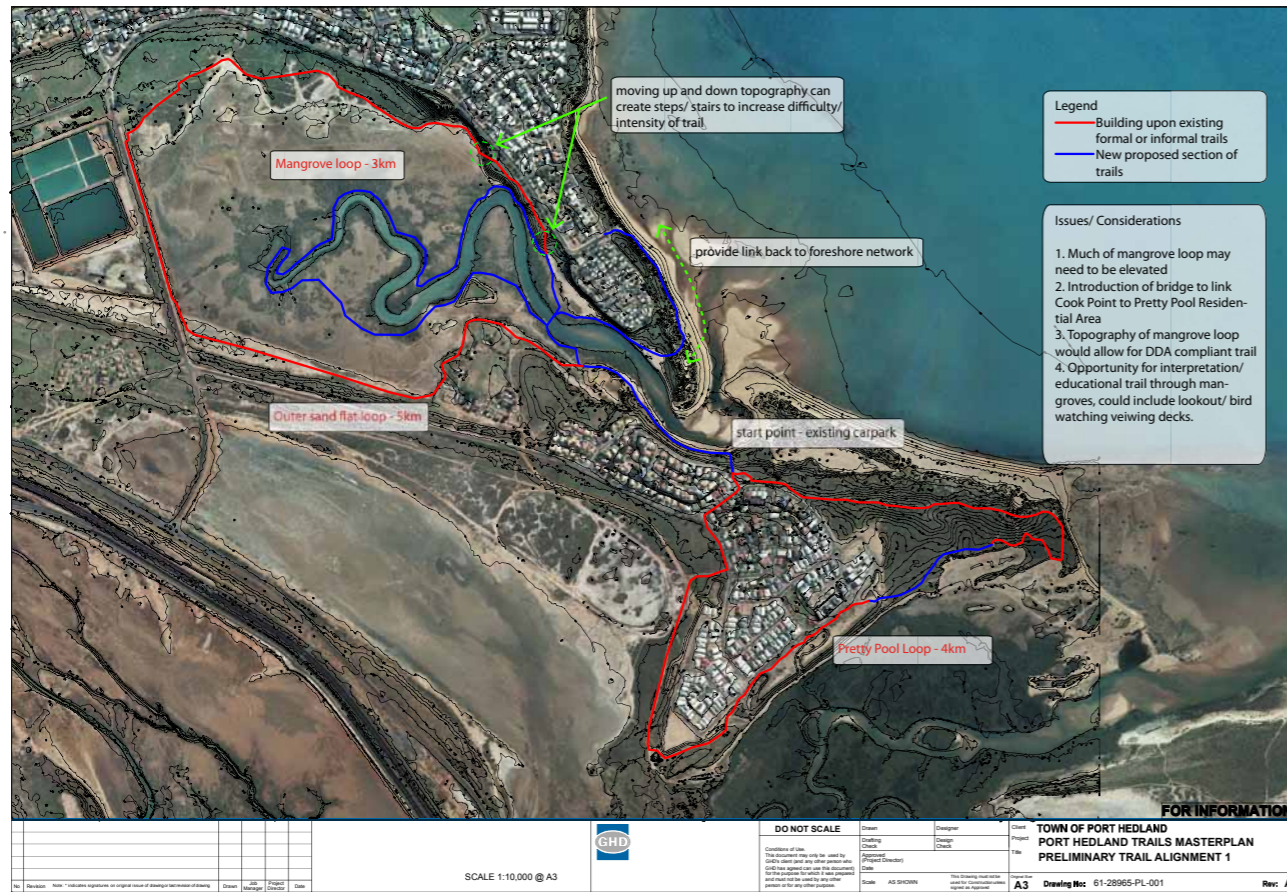


Figure 2: Pretty Pool Loop

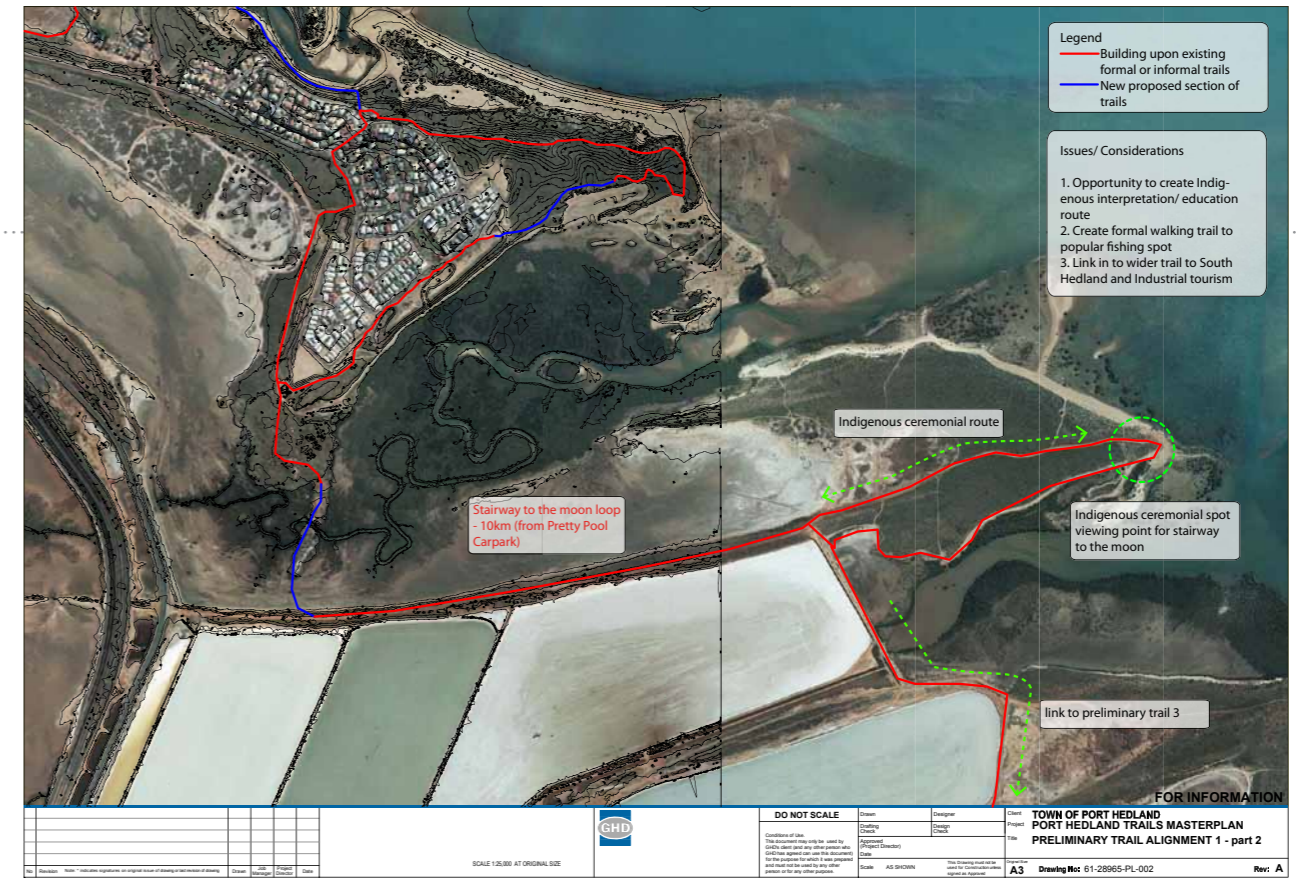


Figure 3: East Port Hedland and Six Mile Loop

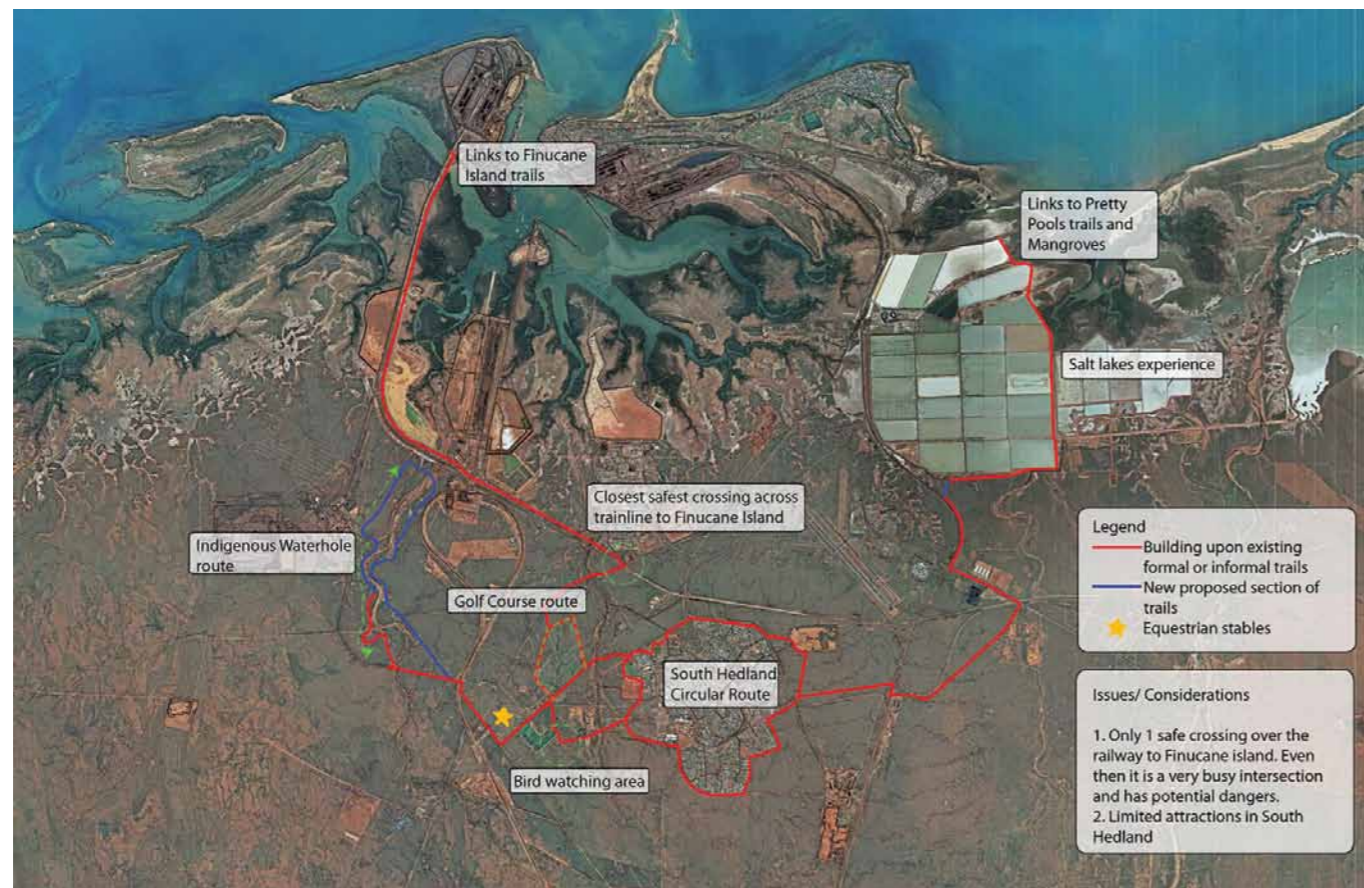


Figure 4: South Hedland Loop

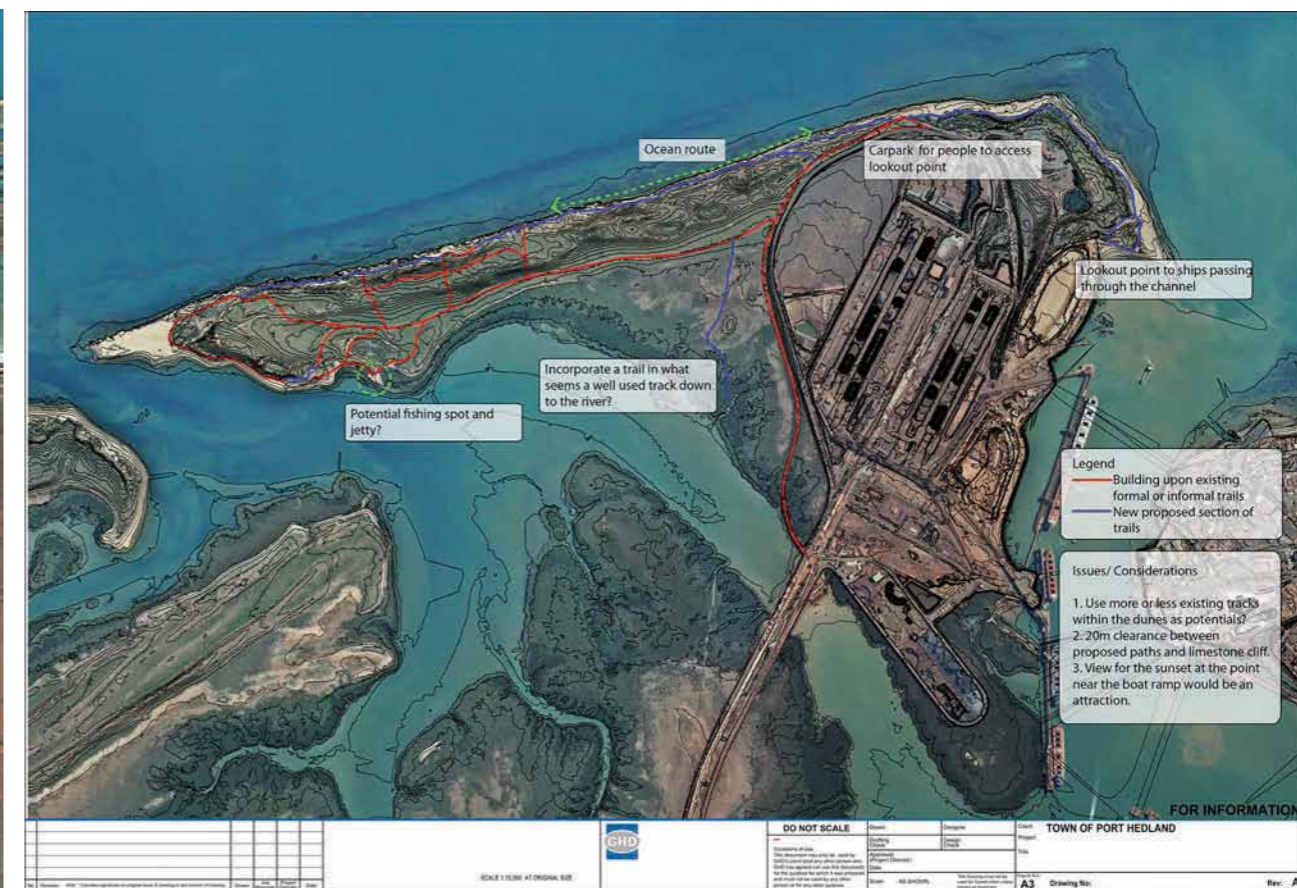


Figure 5: Finucane Island Loop

2.3 General Design Parameters

2.3.1 Preliminary Alignments

Following the revisions to plans, the preliminary trails alignments have been revised to take into account flood and coastal inundation data from the Port Hedland Coastal Vulnerability Study (Cardno, 2011) which highlights flood and design ocean water levels for East Port Hedland (Pretty Pool) and historical tide data for the area. The South Hedland trails have also been cross-referenced with the design levels set by this document. The Finucane Island trail network was not subject to the same analysis as Port and South Hedland due to its more natural state and the absence of proposed adjacent developments.

2.3.2 Foreshore Design Levels

The Cardno Port Hedland Coastal Vulnerability Study (PHCVS) has been completed to analyse the historical and forecast data for 2110, allowing for climate change and rising sea levels. This document sets conservative levels for the development of residential and commercial to allow for 2110 sea levels, major storm events (2 ARI to 500 ARI) and associated tidal surge with major storm events. The data below is extracted from the PHCVS in relation to Pretty Pool (Figure 6), as of the three sites, this site is the most impacted by tidal data, and as Figure 7 shows, will continue to be impacted by sea level rise in the future.

The design parameters for residential developments in Australia are generally specified as set at 100 ARI, plus a free board of +0.5m. This is, however, for residential developments, and infrastructure such as roads (dependent upon road hierarchy) vary accordingly, from major roads being developed at 100 ARI to minor roads design levels at 20-50 ARI. For hospitals and major infrastructure such as evacuation centres/routes, it is common for these to be set at 10 000 ARI.

The 'Port Hedland Area Planning Study' by the Western Australian Planning Commission (2003) cites the following design criteria for South Hedland.

Table 6.7: Summary of Design Peak Total Still Water Level (TSWL) for Eastern Spoil Bank to Pretty Pool - Selected ARI's for present climate scenario.

ARI (years)	East Port Hedland - Eastern Spoil Bank to Pretty Pool		
	Peak TSWL (mAHD)*	Wave Setup - Ocean Coast (m)	Total Design Water Level for Open Coast (mAHD)
2	3.5	0	3.5
10	4.0	0.8	4.8
20	4.1	0.8	4.9
50	4.4	0.8	5.2
100	5.0	0.9	5.9
200	5.1	1.0	6.1
500	5.6	1.2	6.8

* Peak Total Still Water Level based on Published Tidal Constituents (AHO, 2009)

Figure 6: Pretty Pool Present Day Scenario

Table 6.15: Summary of Design Peak Total Still Water Level (TSWL) for East Port Hedland and Spoil Bank Developments - Selected ARI's for 2110 climate scenario.

ARI (years)	Design Peak Total Still Water Level (mAHD)	
	East Port Hedland - Excluding Open Coast Locations	Spoil Bank Area
2	4.4	4.4
10	4.9	5.7
20	5.0	5.8
50	5.3	6.1
100	5.9	6.8
200	6.0	7.0
500	6.6	7.8

Figure 7: Pretty Pool 2110 Scenario

"The Main Roads Department prepared the Town Planning Flood Study for South Hedland in 1975 "...to determine the constraints upon development of South Hedland from flooding of the South and South West Creek systems, and to design town flood protection to increase land use in the flood prone area. The design flood has been taken as the 100-year return interval event. The existing commercial centre of South Hedland is constructed at approximately 13m AHD. For planning purposes, the 1 in 100

year inundation level is used throughout Australia as an acceptable level of risk for property."

The trail network for Area 1 (Pretty Pool), Area 2 (South Hedland) and Finucane Island have been set at 20 ARI generally, and within these areas, some localized trails have been designed at a lower level of 10 ARI. Within each area, the specific design rationale will be explained in further detail.

Within each of these three areas, this report has treated the various loop system levels according to present day scenarios. Typical design life of construction materials for footpath and trail construction would be set at a 20 year design life, so the current day scenario's have been used as the design levels to allow for lower construction levels and cost efficiency's due to this.

2.3.3 Tidal conditions

Based upon documentation from the Port Hedland Port Authority, the Port Hedland area experiences a diverse range of tides, from a lowest astronomical tide of 0.2m to a highest astronomical tide of 7.7m.

The height data for the lowest astronomical tide (LAT) are:

Mean high water spring-	6.8 m
Mean high water neap-	4.7 m
Maximum range-	7.5 m.

Australian National Tide Tables give the following data for Port Hedland tides-

Highest Astronomical Tide-	7.24m
Mean High Water Spring-	7.0m
Mean High Water Neap-	4.9m
Mean Sea Level-	4.2m
Mean Low Water Neap-	3.5m
Mean Low Water Spring-	1.1m
Lowest Astronomical Tide-	0.2m

The above data can be summarized at a lowest tide of 0.2 AHD, and highest tide of 7.24 AHD. The average spring tide is around 7.00 AHD, and the average high tide 4.9 AHD, not counting spring tides. The highest low tide average is 3.50 AHD.

2.3.4 Trail Classification System

The Australian Walking Track Grading System has been used for proposed grading of the trails in this masterplan. Detailed analysis of the final trails should take place as part of the detailed design and construction methodology. The grading system is based upon Australian Standard 2156.1-2001 Walking Tracks - Classification and Signage, and has been endorsed by the Department of Environment and Conservation Western Australia as the prescribed classification system for trails grading for recreational trails.

The classifications are as follows-



Grade 1- No bushwalking experience required. Flat even surface. Suitable for wheelchair users who have someone to assist them. Walks no greater than 5km.



Grade 2- No bushwalking experience required. The track is a hardened or compacted surface and may have a gentle hill section or sections and occasional steps. Walks no greater than 10km.



Grade 3- Suitable for most ages and fitness levels. Some bushwalking experience recommended. Tracks may have short steep hill sections a rough surface and many steps. Walks up to 20km.



Grade 4- Bushwalking experience recommended. Tracks may be long, rough and very steep. Directional signage may be limited.



Grade 5- Very experienced bushwalkers with specialised skills, including navigation and emergency first aid. Tracks are likely to be very rough, very steep and unmarked. Walks may be more than 20km.



3.0 AREA 1- PRETTY POOL LOOP AND EAST PORT HEDLAND LOOP



Pretty Pool Creek looking South East, with Cooke Point Caravan Park on the far left and Pretty Pool residential in the middle background

3.1 Background and Location

Pretty Pool and Cooke Point are located in East Port Hedland, approximately 6km from Wedge Street and the West End, which is the commercial centre of Port Hedland. Figure 8 shows the proposed future development scenario of East Port Hedland, with concept designs currently being designed for Stages 1-6 by Landcorp, with the construction programme as yet determined.

The estuary of Pretty Pool is a small, tidal creek which is surrounded by mangrove habitat and tidal flat. Located off Matheson Drive on the South of the estuary is the Pretty Pool Reserve, which is a passive recreation public open space, and popular with residents and tourists due to its facilities and proximity to the estuary. The creek is navigable by foot at low tide, but is generally separated from Cooke Point, and no cycle nor vehicular access is possible.

Located to the North of the creek is the Cook Point Caravan Park, and Athol Street, which are mainly residential areas. The caravan park population comprised of long term residents and short stay tourists, and is located on the headland overlooking the estuary. There is an newly constructed 'Stairway to the Moon' viewing platform located off Taylor Street adjacent to the caravan park, and good quality dunes and beaches along the headland.

South of the creek is Pretty Pool and East Port Hedland, comprised of residential developments. There is also an area of horse stables and associated housing located at Johnson Lane, on high ground above the tidal flats and to the West of Matheson Drive.

3.2 Heritage

Cooke Point and Pretty Pool are mainly residential areas developed since the upturn in the mining industry and export of mining material from the 1950's. The current population of residents is mining personnel and staff, with an emphasis on executive accommodation. Due to the estuary and distance from Port Hedland, the location is much sought after, and also represents one of the last undeveloped areas within the Town Planning Scheme.

During the 1940's, the area was used a rifle range by local military personal, and a lookout, named Merv's Lookout, is located off Athol Street as part of the Heritage Trail, with a small plaque located in the verge beside the road. During discussions with the Heritage Society, it emerged that Pretty Pool was occasionally used for sheltering yachts and recreational boats during cyclones, due to its protected aspect and deep waters.

As part of the site investigations, evidence of midden sites was discovered in some areas of the inundation zone, showing evidence of historical indigenous use.

3.3 Ecology and Environment

The tidal flat between Athol Street, Styles Road and Pretty Pool Rd are periodically inundated by tidal inflow, and are typified by thick mangrove habitat in the riparian edge of the creek and inundation zone, with spinifex growing on high ground above the tidal mark.

The creek is a deep water creek with permanent water which is of a good quality. The riparian edge is dense and typical of the Pilbara mangrove habitat, representing a diverse aquatic ecosystem.

Currently the area of the tidal flats is used for passive recreation, with fishing, walking and some motorized vehicle use. There are numerous tracks traversing the tidal flats, and quad bike use is present.

3.4 Existing Infrastructure

Currently, there is existing passive recreation at Cooke Point Caravan Park, where a steel framed lookout has been constructed over the sand dunes for the Stairway to the Moon, which is a Pilbara phenomenon where the moon rising over the low tide reef resembles a series of stairs rising to the moon.

Pretty Pool Reserve has public toilets, barbeque facilities and a playground, and is a well used park due to these and the proximity to the estuary. There is also a large car park sufficient for multiple users, and overflow parking on the adjacent street



Merv Stanton, March 2013, Merv's Lookout, Athol St.



Pretty Pool Creek from the South East looking North

3.5 Pretty Pool Loop



Figure 8 shows the proposed Pretty Pool Loop, starting from the Cooke Point Caravan Park on Taylor St. The Loop has two sections which are bounded by Athol St, Pretty Pool Rd and Styles Road, which are centred upon the tidal flats and mangrove habitat, and one which extends from Pretty Pool Reserve to East Port Hedland and around the new development at Counihan Crescent and Dowding Way East Port Hedland, making use of the existing headland and sand dunes to create a coastal dune walk and cycling trail. There is also a short section of dune habitat trail located behind the caravan park at Taylor St, adjacent to the Stairway to the Moon Lookout, which loops around the caravan park through the secondary dune system.

The Pretty Pool/Cooke Point section begins at either the Stairway to the Moon Lookout or the Cooke Point Caravan Park on Athol St, and can be walked either clockwise or counter-clockwise from either location. Both would be located with a location plan and overview board, and create a short loop which extends through the sand dune habitat at the rear of the beach, extending towards the end of the headland and an overview of the Pretty Pool estuary.

This section would have interpretation signs which are more ecologically orientated, and would be an exploration of the unique dune habitat of the site.

The second section of the Pretty Pool Loop also starts from the Cooke Point Caravan Park, and moves in either an anti-clockwise direction around the tidal flat towards the proposed East End Village Stage 1, towards Athol St, or in a clockwise direction towards the estuary and Pretty Pool. It is proposed under this Trails Masterplan to construct a connection across the creek, which could be either a stand alone bridge structure or a lower level causeway which could be located closer to the water level.

The case for constructing a pedestrian bridge or connection over the creek is compelling, and is a keystone to creating a successful section of trails at Pretty Pool. Currently at Pretty Pool, pedestrians and cyclists are required to either drive or travel along Pretty Pool Rd, which is a long and mentally taxing journey due to the exposure and aspect, and the lack of features. This link is also the final section

which would allow for a continuous foreshore link between the West End of Port Hedland and Pretty Pool, and would serve to tie into the proposed Foreshore Masterplan currently under development by the Town of Port Hedland.

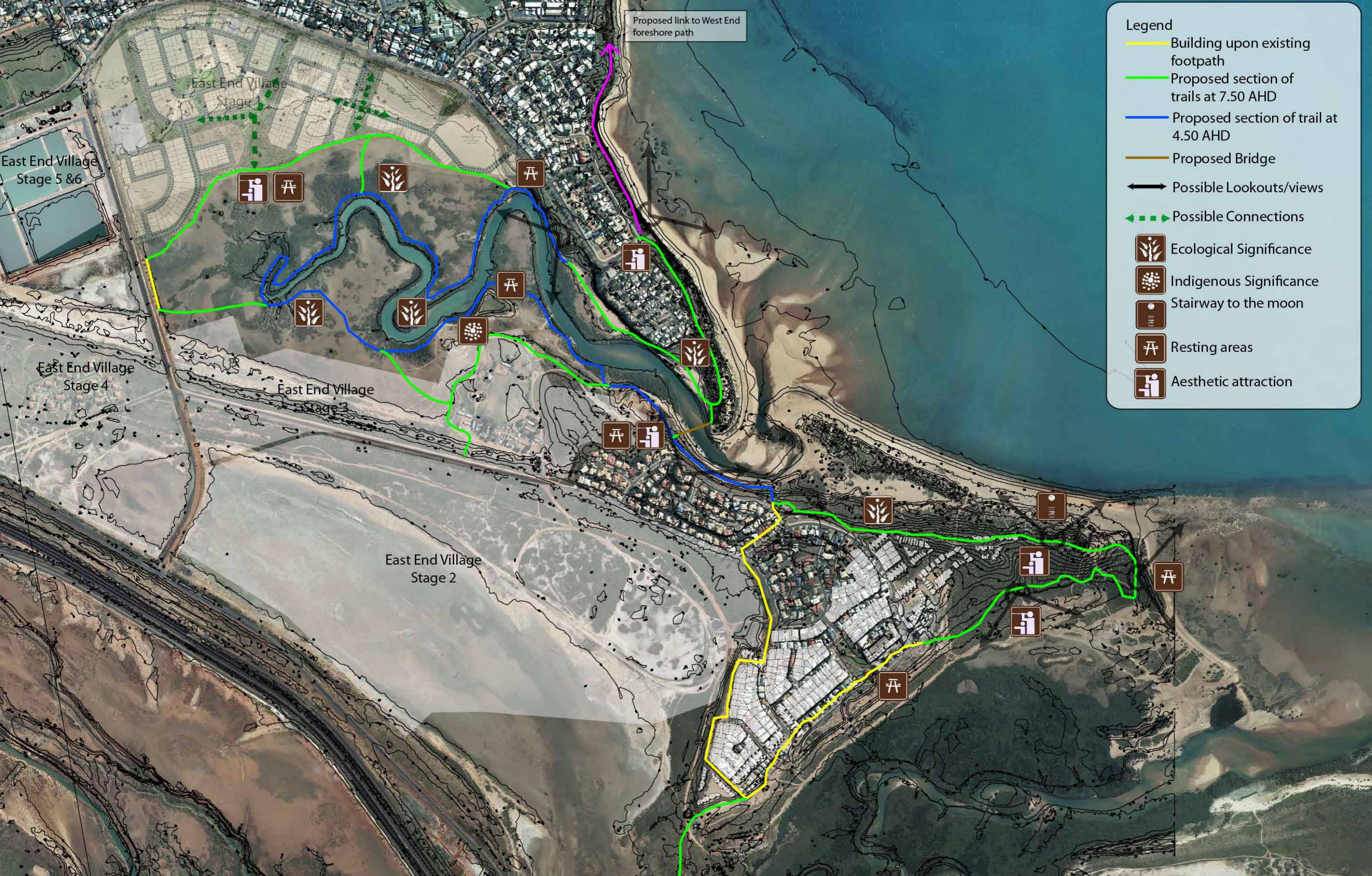
The Pretty Pool Loop would have a mixed interpretation theme, concentrating on the mangrove habitat, the aquatic bio-diversity of the area, and some select historical interpretation using indigenous interpretation of uses of the area.

Crossing the estuary towards Pretty Pool, the track would extend to the Pretty Pool Reserve, where another interpretation and exploratory sign would be located.

3.6 Grading Classification

The Pretty Pool loop is proposed to be graded as Grade 1 for the Outer Loop Section, and Grade 2 for the Inner Mangrove Loop.

The Outer Loop Section, Grade 1, is proposed to be constructed of in-situ concrete, would be a fully accessible track with access for wheelchair users. The Inner Mangrove Loop is proposed to be Grade 2, and would be a more advanced level due to the proposed surfacing material, the grade utilising gentle hill sections and the use of an inundated path which may, on occasions, leave leaf litter or debris on the path.



Legend

- Building upon existing footpath
- Proposed section of trails at 7.50 AHD
- Proposed section of trail at 4.50 AHD
- Proposed Bridge
- ⇨ Possible Lookouts/views
- - - Possible Connections
-  Ecological Significance
-  Indigenous Significance
-  Stairway to the moon
-  Resting areas
-  Aesthetic attraction

Figure 8: Pretty Pool Loop and East Port Hedland Loop



View from Counihan Crescent towards Four Mile Beach

3.7 East Port Hedland Loop



The East Port Hedland Loop joins the Pretty Pool Loop at the Pretty Pool Reserve, and runs along the road verge of Matheson Drive until joining Counihan Crescent, where the off road trail begins by veering off into the ridge of the existing sand dunes, running parallel to the beach, and in an Easterly direction towards the headland of Six Mile Creek. Please refer Figure 8.

This trail allows for informal beach access off the main ridge trail, and runs to the headland where another less formal Stairway to the Moon lookout could be located. The existing informal trails would be formalized through the additional loop, and would eventually join in with the Counihan Crescent off road pathway which has been recently constructed as part of the Landcorp development in this location. The path would traverse coastal dune habitat and then mangrove habitat before reaching the existing path, and would then follow this until it terminates near Dowding Way and Jipurr Street, then following the existing road back along Styles Road to Matheson Street and the Pretty Pool Reserve.

The interpretation theme of this section of the path is to be predominantly ecological, exploring themes of the diverse dune and mangrove habitat, the fauna of the area and the role of salt flats and tidal creeks in the ecosystem.

At the South West corner of Dowding Way, there is the potential to create an additional loop across the tidal flat of Four Mile Creek to Gray Street, which accesses

the Six Mile Beach and the salt farm evaporation ponds. Please refer to Figure 9.

This loop would require traversing Four Mile Creek via an elevated causeway, but has great potential to explore indigenous heritage and the industrial ecology of the salt farms, through the creation of additional lookouts and informal walks in the Six Mile Creek vicinity, which is a popular recreational location currently only accessed by vehicles, not walkers or cyclists. Access through the salt farms in the form of an additional link to South Hedland was initially looked at as part of the preliminary alignments, but has many draw backs due to the current plans by Dampier Salt to expand the scale of the evaporation ponds, various health and safety, along with liability issues, which would also be associated with introducing members of the public to an industrial work site. The Trails Masterplan would recommend allowing access along Gray Street to Six Mile Beach, which is public access, to allow for informal stopping points and lookouts over the evaporation ponds, and terminating the trail at Six Mile Beach, which is an existing recreational destination.

Interpretation of the trails at Six Mile Beach would explore the indigenous heritage of the area, and be done in a manner which does not highlight any specific location so as not to allow for damage to any specific site, and would formalize already existing trails so as not to damage any larger habitat areas.

3.8 Grading Classification

The East Port Hedland Loop is proposed to be graded as Grade 3 due to the surface materials and gradient, which undulates with the dunes and may exceed 5% in some areas.



Figure 9: East Port Hedland Loop and Six Mile Beach Loop

4.0 AREA 2- SOUTH HEDLAND RECREATIONAL LOOPS



Port Hedland Golf Course, with the Wanangkura Stadium on the left in the distance.

4.1 Background and Location

South Hedland is located 20km from Port Hedland, inland and to the south, and joined by the Great Northern Highway to Port Hedland itself. The majority of the residential population of Port Hedland reside in South Hedland, and hence, most new public infrastructure is now located in South Hedland, such as the community centre, sport centre, hospital and indigenous services.

South Hedland is also proposed for the majority of residential and infrastructure growth which is highlighted in Pilbara Cities, and is earmarked for several new, large scale residential sub divisions which will allow for rapid population expansion in the next ten years.

The main entry to South Hedland is via Hamilton Rd and North Circular Rd, which logically leads past the new sports centre and the Matt Dan Cultural Centre, located on Hamilton Rd. The new Wanangkura Stadium, with the Marie Marland Reserve to the rear, is the epicenter of organized sports in South Hedland, and would be the start and finish location for two alternate loops which are proposed in South Hedland, the South Hedland Recreation Loop and the Golf Course Recreation Loop.

4.2 Heritage

Sites of heritage value in South Hedland are infrequent, with no indigenous nor European heritage sites of value or significance located in or around the township itself. An indigenous heritage site is located several kilometers to the West of South Hedland, and is registered as an indigenous water hole route, which follows the creek line of an offshoot of Whim Creek through the Boodarie Estate to the industrial area to the West of Wedgefield. This site was investigated as part of the preliminary route alignments, but was decided to be quite remote, and required crossing the Great Northern Highway and the industrial rail line for access. Due to the safety and remoteness of this site, it was decided to not pursue this alignment. Refer Fig 5 for the preliminary alignment of this option.

4.3 Ecology and Environment

The ecology and environment surrounding South Hedland is typical of the arid bush and flood flats of this area of the Pilbara, with no notable topography nor features which stand out from the greater landscape. It is, however, not without it's unique charms, and the proposed trail alignments would necessitate some articulation of the landscape through the creation of nodal planting to provide some destinations which are worthy of drawing users along the alignments.

4.4 Existing Infrastructure

Existing infrastructure which serve as destinations and departure points for the two loops proposed are the Wanangkura Stadium, the Marie Marland Reserve and the Port Hedland Golf Course, located off Shoata Road. The proposed trails would use these points as departure and destination points, and would also aim to use the Wangka Maya Centre as a focal point for the South Hedland Recreational Loop. Refer Figure 10 for South Hedland Overall Loop Masterplan.

4.5 South Hedland Recreational Loop



Figure 10 shows the proposed South Hedland Recreational Loop, which circumnavigates South Hedland to create a 10km loop, beginning and terminating at the Wanangkura Stadium, designed to be used by local residents and accessed from various points throughout the loop.

Beginning at Wanangkura Stadium, the trail crosses Hamilton Rd and enters the boundary of the South Hedland Senior High School, which is referred to in the Active Open Space Strategy as being earmarked for upgrading to a community event space and higher quality facility. The trail loop then continues around South Hedland in a clockwise fashion, between North Circular Rd and the residential properties and sub-divisions, until reaching Murdoch Road, where the trail would join in with the new Osprey subdivision and proposed Open Space Strategy.

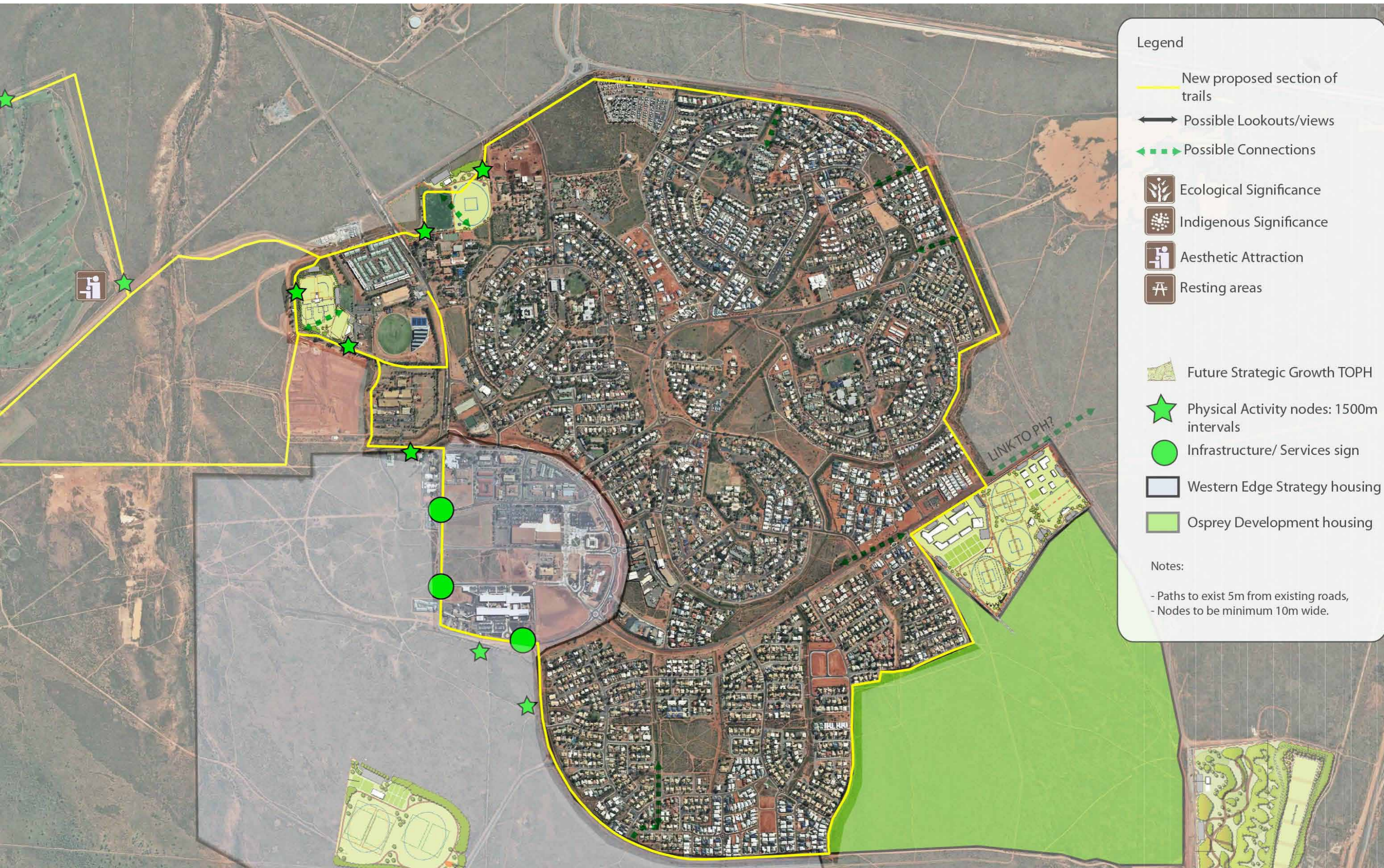
The trail would then continue south along the boundary of the sub division, and then head West and North West back to the outskirts of the proposed Western Edge Landcorp subdivision, before turning back to Collier Drive and Hamilton Drive, heading past the South Hedland Hospital and Wanka Maya Centre to return to Wanangkura Stadium.

The theming of the South Hedland Loop would be as an active exercise theme, to tie into the proposed Active Open Space Strategy, and provide exercise and passive recreation options for local residents who would like other alternatives outside of organized team sports, which are well catered for at the Sports Centre.

The linking of the masterplanned sports precincts also allows for cycle commuting on segregated paths for users in the future, and encourages use of the paths for passive recreation in the interim.

4.6 Grading Classification

The South Hedland Recreational Loop is proposed to be graded as Grade 1 and Grade 2. Short sections of the Loop would be Grade 1, but due to the length of the Loop, a Grade 2 rating should be applied to the overall Loop network.



Legend

— New proposed section of trails

↔ Possible Lookouts/views

↔ Possible Connections

Ecological Significance

Indigenous Significance

Aesthetic Attraction

Resting areas

Future Strategic Growth TOPH

Physical Activity nodes: 1500m intervals

Infrastructure/ Services sign

Western Edge Strategy housing

Osprey Development housing

Notes:

- Paths to exist 5m from existing roads,
- Nodes to be minimum 10m wide.

Figure 10: South Hedland Recreational Loop

4.0 AREA 2- SOUTH HEDLAND RECREATIONAL LOOPS



View from the existing maintenance track across the Port Hedland Golf Course

4.7 Golf Course Recreational Loop



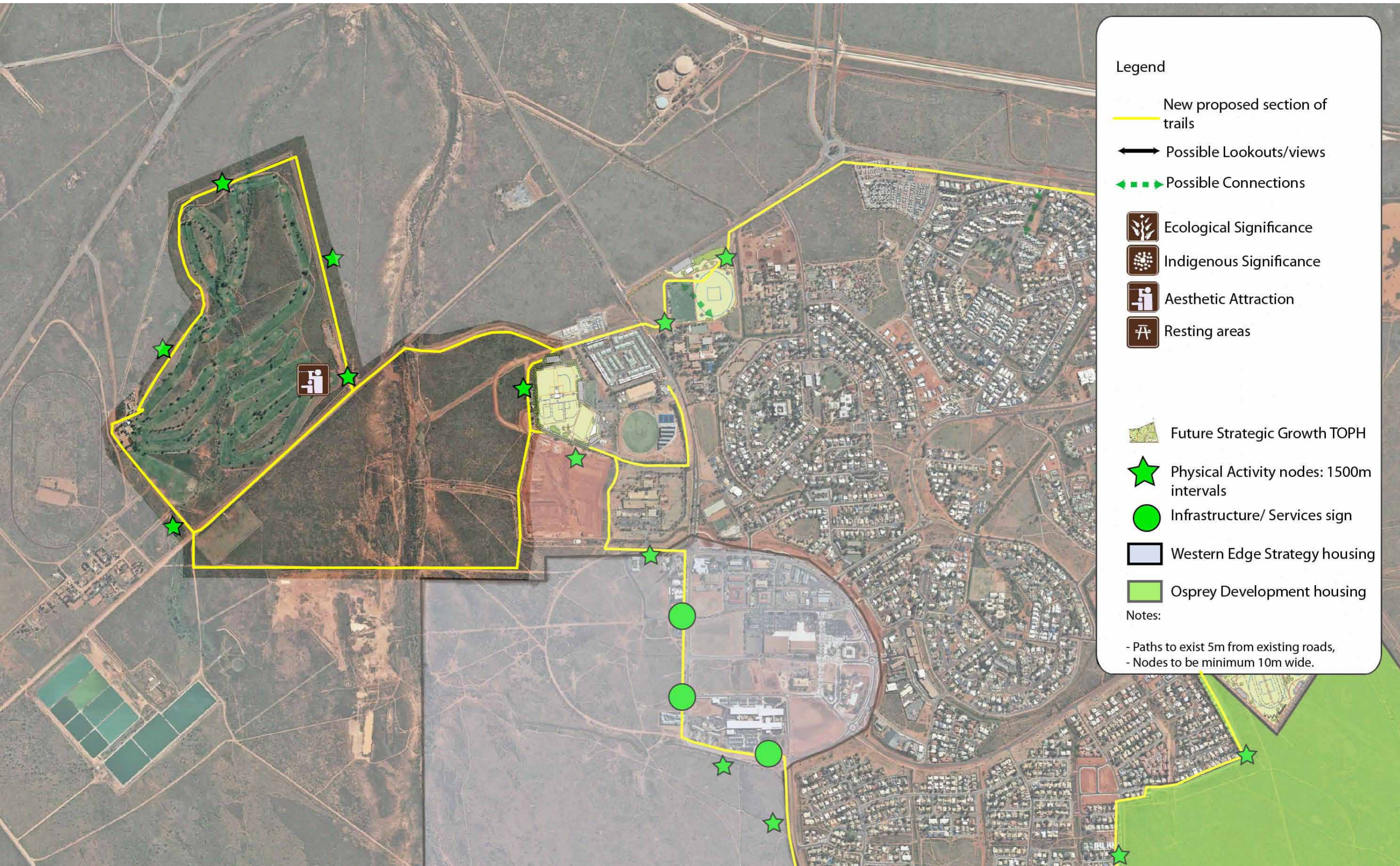
The Golf Course Recreational Loop utilises a similar design philosophy as previously mentioned for the South Hedland loop, and departs from Wanangkura Stadium, but offers diversity of experience by heading North and West from the start point, leading to Shoata Road and then following the existing boundary of the Port Hedland Golf Course, using the borrowed landscape of the golf course to provide a scenic cycle and walk trail with diversity of experience. Refer to Figure 11 for details.

As per the South Hedland Loop, the Golf Course Loop would have nodal destinations created as part of the design, with structural planting and some interpretive signage to encourage use of the facilities around the key nodes.

The theming of the Golf Course Recreation Loop would be one of an active exercise theming, to allow for the use of the loop for team's using the Wanangkura Stadium for training, and also for recreational users of the area.

4.8 Grading Classification

The Golf Course Recreational Loop is proposed to be graded as Grade 1 and Grade 2. Short sections of the Loop would be Grade 1, but due to the length of the Loop and its more isolated nature, a Grade 2 rating should be applied to the overall Loop network.



Legend

- New proposed section of trails
- Possible Lookouts/views
- Possible Connections
- Ecological Significance
- Indigenous Significance
- Aesthetic Attraction
- Resting areas
- Future Strategic Growth TOPH
- Physical Activity nodes: 1500m intervals
- Infrastructure/ Services sign
- Western Edge Strategy housing
- Osprey Development housing

Notes:

- Paths to exist 5m from existing roads,
- Nodes to be minimum 10m wide.

Figure 11: Golf Course Recreational Loop

5.0 AREA 3- FINUCANE ISLAND LOOPS



View over the existing boat ramp facilities at Finucane Island, looking South East

5.1 Background and Location

Finucane Island is a recreational reserve located approximately 20km from South Hedland and around 35km by road from Port Hedland. Geographically, it is on the opposite side of the Port Hedland Harbour, and is the base for mining export activities in the harbour, with BHP based on the Eastern portion of Finucane Island. It is also the proposed location of the landside activities associated with the Multi User Outer Harbour proposal, which may restrict public access to some degree to the Western end of the island.

Currently, the island is used by recreational fisherman, water skiers and other recreational day users from both Port and South Hedland. Due to its location, it is one of the few places in Port Hedland with water side access which is easily reached, and is well used by the local community. There is also a heavy use of the area for 4WD and quad bikes, which are eroding the existing dunes in some places.

5.2 Heritage

Indigenous and European heritage of the area is undetermined. Any European heritage which was existing has now been subsumed by mining activities at the Eastern edge of the island, with this area previously being the base for the mining operations from the 1960's.

5.3 Ecology and Environment

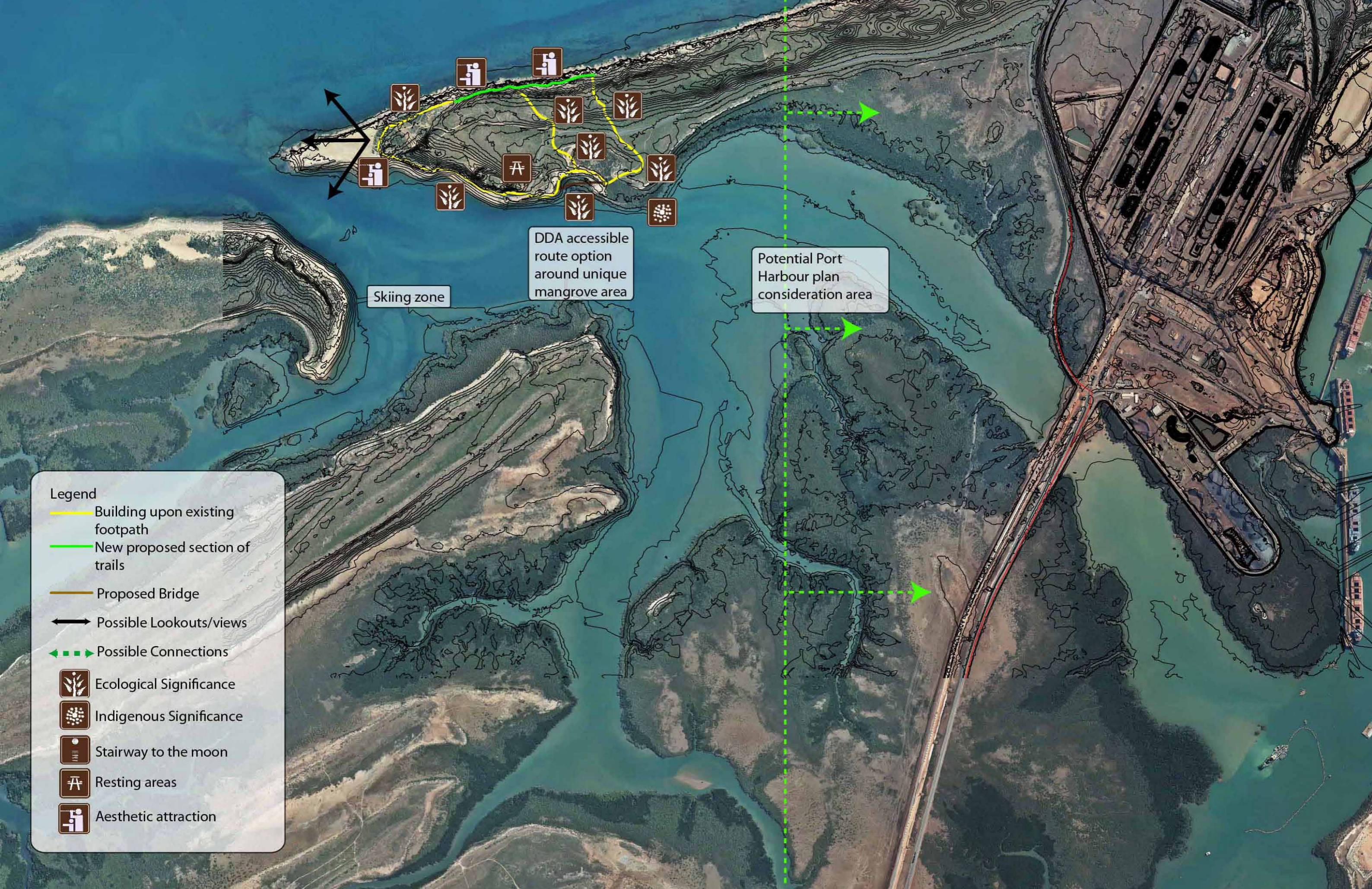
The Western end of the island is typical of Port Hedland coastal reserves, with limestone cliffs, undulating sand dunes in the foreground and mangrove habitat in the more protected Southern facing coastal areas. The mangrove habitat is especially unique adjacent to the boat ramp, having seven different species of mangrove growing in the one area, which is a unique situation. These areas have been largely un-impacted by mining and development, and represent a truly unique snapshot of the diversity once common in the saline estuaries of the areas. The water quality and depth of the estuary are a haven for recreational boat users and the shoreline on the South West edge of the island is pristine.

The onshore habitat has been impacted by the creation of many off-road 4wd and quad bike tracks through the dune system, with varying impacts. Some of the tracks are small, low speed environments which can be managed, whilst some other access tracks are heavily eroded and see high volumes of traffic. Any trails which are proposed for this area would need to be carefully managed, to separate the various vehicular and pedestrian users groups, and to also prevent vehicular use of pedestrian trails.

5.4 Existing Infrastructure

Existing infrastructure on the island is mainly centered around the existing boat ramp. At this location there is a large car park, shade structures, the boat ramp itself and public toilet facilities. The area is well used by local amateur anglers and also local water skiers/wake boarders and jet ski users, who use the adjacent ski area to the South of Downes Island, due to its proximity and good quality of water.

Access to Finucane Island is along Finucane Island Road, which is a shared public access with the industrial users of the harbour. Recreational user groups of Finucane Island also include quad bikers and four wheel drive enthusiasts, along with day trip family's who see Finucane Island as a good destination for nature play within an easy commute of South or Port Hedland.



Legend






- Building upon existing footpath
- New proposed section of trails
- Proposed Bridge
- ↔ Possible Lookouts/views
- - - Possible Connections
-  Ecological Significance
-  Indigenous Significance
-  Stairway to the moon
-  Resting areas
-  Aesthetic attraction

Figure 12: Finucane Island Loop

5.0 AREA 3- FINUCANE ISLAND LOOPS



View from the Finucane Island boat ramp towards the Headland and Cliff Loop

5.5 Finucane Island Headland and Cliff Loop



The first of the Loop trails on Finucane Island is the Headland and Beach loop, which is a low impact, ecological walk which makes use of the existing beach and cliffs. Leaving the car park's Western end, the walk traverses the back of beach trail above the tide line, and heads for the most Western headland of the island. Along these areas, the path is marked with a series of bollards, which are marked with a distinctive way finding insignia, to lead the walkers through the hind dunes to the point.

Upon reaching the point, the trail then rises onto the small limestone foreshore cliffs, and follows these in an Easterly direction, using the cliffs and rough limestone as the trail surface. The path is marked by bollards at approximately 100m intervals, and at junctions of the trails. There are two loops which can be completed by the user, both utilizing existing 4wd tracks, which would have anti-vehicular measures built to prevent vehicles using the trails.

The Headland and Beach Loop would focus upon ecological interpretation, with three informal ocean lookouts utilizing the existing limestone cliffs, to showcase the unique aspects of the area. Following completion of the cliff section of the walk, the loop has two traverses back to the start point via the Mangrove Loop. Each of these loop sections meanders across the dunes system, and crosses the boat ramp access road, and then traverses the beach at the mangrove habitat, East of the boat ramp. At this point, the user can decide whether or not to include the Mangrove Loop within the walk, or proceed back to the carpark.

5.6 Grading Classification

The Headland and Cliff Loop is proposed to be graded as Grade 3. The Loop is quite isolated, has sharp sections of unmade track, and relies upon wayfinding devices of a simple nature to follow the track through a natural environment.

Legend






- Building upon existing footpath
- New proposed section of trails
- Proposed Boardwalk
- Possible Lookouts/views
- - - Possible Connections
-  Ecological Significance
-  Indigenous Significance
-  Stairway to the moon
-  Resting areas
-  Aesthetic attraction



Figure 13: Headland and Cliffs Loop

5.0 AREA 3- FINUCANE ISLAND LOOPS



View of the proposed Mangrove Loop area, with Port Hedland infrastructure in the background

5.7 Finucane Island Mangrove Loop



The Mangrove Loop is proposed to be a fully accessible ecological short distance loop which begins at the boat ramp carpark's Eastern boundary. From this position, a concrete or asphalt path, at a maximum grade of 1V:14H will traverse the dune, across to the mangrove inlet, where a raised boardwalk will continue through the mangroves on a concrete or steel substructure, with recycled plastic decking surface. The elevated structure will showcase the unique mangrove habitat in this location, and take users through the habitat on an elevated structure for approximately 100m before reaching the beach, where a hard surfaced path will be created to loop back to the carpark.

This loop will require full disability access, and will require detailed design of the substructure, surface materials, handrails and lead in paths to ensure compliance. Due to the sensitive nature of the habitat, it is recommended a full arboricultural survey be undertaken of the proposed area, and liaison with the Department of Environment and Conservation take

place prior to detailed design of the area. Stakeholders on the working group have intimate knowledge of this area, and should be utilised for expert advice in the detailed design stage.

5.8 Grading Classification

The Mangrove Loop is proposed to be graded as Grade 1, with a fully accessible path which can introduce all ages and fitness levels to the mangrove habitat, at a short distance from the existing carpark.



Legend

- Building upon existing footpath
- New proposed section of trails
- Proposed Boardwalk
- Possible Lookouts/views
- - - Possible Connections
-  Ecological Significance
-  Indigenous Significance
-  Stairway to the moon
-  Resting areas
-  Aesthetic attraction
-  Bird Watching

Figure 14: Mangrove Loop

6.0 DESIGN AND CONSTRUCTION



View of the proposed Pretty Pool Loop at Spring high tide, March 2013, tide level of 7.20

6.1 Area 1-Pretty Pool Loops

6.1.1 Design Levels

The Pretty Pool Loop, being located on a tidal flat which undergoes periodic tidal inundation, has two base levels which define the height from Australian Height Datum level.

The inner mangrove loop is designed to be inundated at a level of 4.50 AHD, which allows the trail and user to maintain a level of interaction with the mangrove habitat which located between 2.0-3.0 AHD on the edge of the Pretty Pool Creek. Lifting the level of the trail any higher will require extensive areas of fill being brought to site, and lifting the levels well above the levels which the mangrove's inhabitat. A level of 4.50 AHD will allow for close proximity to the mangroves, and less fill required for the trail.

Designing the lower mangrove loop at 4.50 AHD will require the installation of small box culverts at regular frequencies to allow for free draining of the tide into and out of the tidal flat. This trail has been set a level of 4.50 AHD, which will maintain it above the Mean Low Water Neap level of 3.50 AHD, and in a typical year, will see the trail inundated by low tides less than 5 times, based upon an average year. During high tide, the trail will regularly be inundated by most high tides, and the design of the trail must take this into consideration, and allow for a free flow profile with rock beaching to both sides for erosion control, a hard wearing surface

for grip and sufficient frequency of culverts to allow for drainage. It is considered that the periodic inundation of the lower trail will create a more rugged style trail, and the surfacing material should be a low impact, compacted material which can be maintained easily whilst still allowing for a tactile walking surface. The lower trail should be designed to allow for ease of access, allowing multiply entry and exit points, so that in the case of a high tide, users will have several avenues of retreat prior to the tide inundating the trail. Entry points should have tidal charts attached, and at key locations, flood markers could be used as interpretive and sculptural elements to inform the trail user.

The outer loop levels will be set at around 7.50 AHD, designed to tie into the new East End Village Stage 1 and 2 levels. Currently, the design levels for the development are being analysed, and will be factored into the estimated levels from the Cardno PHCVS, at around 5.90 AHD or higher. The outer loop path is designed to provide a link to the East End Village development's public open space, and will require some flexibility of the levels to allow for the subdivision levels. During the design process, using higher levels were considered, but due to the amount of fill required, and the detachment which this 'causeway' scenario would create, it was decided to maintain the levels at 7.50 AHD to allow for less fill, and closer interaction with the existing con-

tours and environment. The proposed trail at this level would also experience periodic inundation during high tide scenarios, but during low tides would be totally clear of inundation.

The proposed pedestrian connection between Cooke Point and Pretty Pool will require being designed as a causeway or bridge which can be trafficked during all tidal ranges. This will require the bridge deck being set at a 1:100 ARI levels, similar to the residential developments of the East End Village, but will also require taking into account storm surge and wave action, due to it's location near the mouth of the estuary, leaving a developable level of around 7.50 AHD or higher . Due to Port Hedland's location, the construction of the bridge shall be suitable for Category 2 Building Code Provisions, which ensures all structures are compliant with Region D construction methodology, suitable for cyclone rated winds.

6.1.2 Trail Materials

Both of the Pretty Pool Loops shall be constructed of hard wearing and easily constructable material, either of crushed and compacted limestone or rock beaching, as in the lower level path (4.50 AHD), or in-situ concrete, of around 2400mm width, on a minimum of 100mm compacted fine crushed rock for the 7.50 AHD

path. Each path shall have a 600mm soft shoulder, and shall be constructed of compacted fill over the existing site soil. Due to the reactive nature of the ground in these areas, geotechnical information should be ascertained prior to any detailed design taking place.

Due to the tidal flats and probable inundation of the paths during high tide events, it is recommended that the fill slopes be constructed at 1V:3H to minimize fill amounts, and that each batter be treated with rock beaching with 200mm minimum diameter rocks for erosion control. Along with the requisite geotechnical information, it is also recommended that the detailed design take into account hydraulic modeling of the tidal flats and inundation models, to allow for the tidal flows over and through the paths, and the correct detailing of box culverts and wing walls to prevent scouring and erosion at localized areas, due to higher velocity water flows.

6.1.3 Furniture Palette

Interpretation and directional signage shall be constructed from materials suitable for use in a marine and coastal environment. Due to inundation of the loop, the interpretive signage is recommended to be constructed of marine grade materials. Signage materials, such as the directional signage and information boards, should be waterproof and ultra-violet stable, and should be easily replaceable and repairable.



6.2 Area 1- East Port Hedland Loops

6.2.1 Design Levels

The East Port Hedland Loop is based upon existing informal trails which are in the fore dune areas adjoining Counihan Crescent. The levels of the trails are well above tidal levels, and will vary between 7.50 AHD and 9.00 AHD.

6.2.2 Trail Materials

Due to the trail being constructed over reasonably well vegetated dunes, the construction could be of in-situ concrete, of around 2400mm width, on a minimum of 100mm compacted fine crushed rock. This would allow for sufficient width for both cyclists and pedestrians.

The proposed lookout above Four Mile Creek would be an on-ground structure, with pedestrian seats and a low stone wall for seating. The area required could be similar proportion to the Stairway to the Moon Lookout at Cooke Point Caravan Park, which is around 20m².

6.2.3 Furniture Palette

Interpretation and directional signage shall be constructed from materials suitable for use in a marine and coastal environment. Due to exposure to salt and sand spray from the wind, the interpretive signage is recommended to be constructed of marine grade aluminium. Signage materials, such as the directional signage and information boards, should be waterproof and ultra-violet stable, and should be easily replaceable and low maintenance. Benches or seating elements should be either in-situ stone benches, or off-the-shelf street furniture which is fit for purpose. Anodized aluminium is a recommended material for any stand along seating or benches which are proposed as part of the detailed design.

Pretty Pool Loops- Mangrove Loop 4.50 AHD							\$533,998
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
Pretty Pool A-4.50 AHD Fill	3692	4.4	16,245	m ³	\$20	\$324,896	
Pretty Pool A-4.50 AHD FCR	3692	0.21	775	m ³	\$50	\$38,766	
Pretty Pool A-4.50 AHD Compacted Limestone Surfacing	3692	0.3	1,108	m ²	\$110	\$121,836	
Pretty Pool A-Interpretive Signage			7	Unit	\$1,500	\$10,500	
Pretty Pool A-Directional Signage			4	Unit	\$2,000	\$8,000	
Pretty Pool A-Concrete Box Culverts with Rock Beaching			12	Unit	\$2,500	\$30,000	

Pretty Pool Loops- Pedestrian Bridge							\$2,250,000
Pretty Pool A-Abutments and Pedestrian Links to Bridge			1	Unit	\$250,000	\$250,000	
Pretty Pool A-Pedestrian Bridge link to Pretty Pool Reserve			1	Unit	\$2,000,000	\$2,000,000	

Pretty Pool Loops- Outer Ring Loop 7.50 AHD							\$1,150,943
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
Pretty Pool B- 7.50 AHD Fill	2857	3.3	9,428	m ³	\$20	\$188,562	
Pretty Pool B- 7.50 AHD FCR	2857	0.36	1,029	m ³	\$50	\$51,426	
Pretty Pool B- 7.50 AHD In Situ Concrete	2857	1.8	5,143	m ²	\$175	\$899,955	
Pretty Pool B-Interpretive Signage			6	Unit	\$1,500	\$9,000	
Pretty Pool B-Directional Signage			1	Unit	\$2,000	\$2,000	

East Pt Hedland Loops							\$848,084
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
East Pt Hedland On Ground FCR	1918	0.36	690	m ³	\$50	\$34,524	
East Pt Hedland On Ground In Situ Concrete	1918	2.4	4,603	m ²	\$175	\$805,560	
East Pt Hedland-Interpretive Signage			4	Unit	\$1,500	\$6,000	
East Pt Hedland-Directional Signage			1	Unit	\$2,000	\$2,000	

East Pt Hedland Four Mile Creek Causeway							\$764,250
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
Four Mile Causeway- 7.50 AHD Fill	1375	4.8	6,600	m ³	\$20	\$132,000	
Four Mile Causeway- FCR	1375	0.36	495	m ³	\$50	\$24,750	
Four Mile Causeway- In Situ Concrete	1375	2.4	3,300	m ²	\$175	\$577,500	
Four Mile Causeway-Concrete Box Culverts with Rock Beaching			12	Unit	\$2,500	\$30,000	

Gray St/Six Mile Beach							\$969,813
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
Gray St- 4.75 AHD Fill	2763	4.4	12,157	m ³	\$20	\$243,144	
Gray St- FCR	2763	0.36	995	m ³	\$50	\$49,734	
Gray St- In Situ Concrete	2763	1.4	3,868	m ²	\$175	\$676,935	

Six Mile Beach							\$872,300
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
Six Mile Beach- 450mm Fill	2475	4.25	10,519	m ³	\$20	\$210,375	
Six Mile Beach- FCR	2475	0.36	891	m ³	\$50	\$44,550	
Six Mile Beach-In Situ Concrete	2475	1.4	3,465	m ²	\$175	\$606,375	
Six Mile Beach-Interpretive Signage			6	Unit	\$1,500	\$9,000	
Six Mile Beach-Directional Signage			1	Unit	\$2,000	\$2,000	



6.3 Area 2- South Hedland Recreational Loop

6.3.1 Design Levels

The recommended design levels for the South Hedland Recreational Loop are intended to tie into the adjacent existing and proposed subdivision levels, which vary between 10.00-11.00 AHD around the Marie Marland Reserve and Wanangkura Stadium Precinct, through to 13.00-14.00 AHD adjacent to the Western Edge and Osprey subdivisions. The existing North Circular Rd has been constructed between 10.00 & 11.00 AHD, and the proposed trail would tie into this level closely. Fill calculations for the construction of the trail in these location have been based upon these levels.

6.3.2 Trail Materials

Due to the urban nature of the South Hedland Recreational Loop, a similar construction methodology of using in-situ concrete, 2400mm width, on a minimum of 100mm compacted fine crushed rock would be proposed.

6.3.3 Furniture Palette

Interpretation and directional signage shall be constructed from materials suitable for use in a marine and coastal environment. Due to exposure to the environment, the interpretive signage is recommended to be constructed of marine grade aluminium. Signage materials, such as the directional signage and information boards, should be waterproof and ultra-violet stable, and should be easily replaceable and low maintenance.

Benches or seating elements should be either in-situ stone benches, or off-the-shelf street furniture which is fit for purpose. Anodized aluminium is a recommended material for any stand alone seating or benches which are proposed as part of the detailed design.

Exercise equipment is recommended to be constructed of off the shelf galvanized and painted mild steel, with concrete footings. The exercise equipment and nodal seating should be located at high points of the trails, with falls away from the equipment.

Sth Hedland Recreational Trail						\$6,571,227
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total
Sth Hedland - 450mm Fill	12249	4.25	52,058	m ³	\$20	\$1,041,165
Sth Hedland - FCR	12249	0.36	4,410	m ³	\$50	\$220,482
Sth Hedland -In Situ Concrete	12249	2.4	29,398	m ²	\$175	\$5,144,580
Sth Hedland-Interpretive Signage			6	Unit	\$1,000	\$6,000
Sth Hedland-Directional Signage			6	Unit	\$1,500	\$9,000
Sth Hedland Exercise Equipment			12	Unit	\$2,500	\$30,000
Sth Hedland Nodal Planting			12	Unit	\$5,000	\$60,000
Sth Hedland Nodal Landscape Treatments			12	Unit	\$5,000	\$60,000



6.4 Area 2- Golf Course Recreational Loop

6.4.1 Design Levels

The recommended design levels for the recreational loop around the Port Hedland Golf Course are 11.00 AHD, which closely ties into the constructed levels of adjacent roads and the golf course itself. This is inline with the WAPC recommendations for the area, and would be sufficient elevation to prevent flooding under a 20 ARI.

6.4.2 Trail Materials

Due to the more open nature of the Golf Course Recreational Loop, a construction methodology of using asphalt paths with pre-cast concrete shoulders, 2400mm width, on a minimum of 100mm compacted fine crushed rock would be proposed, with a 600mm soft shoulder.

6.4.3 Furniture Palette

Interpretation and directional signage shall be constructed from materials suitable for use in a marine and coastal environment. Due to exposure to the environment, the interpretive signage is recommended to be constructed of marine grade aluminium. Signage materials, such as the

directional signage and information boards, should be waterproof and ultra-violet stable, and should be easily replaceable and low maintenance.

Benches or seating elements should be either in-situ stone benches, or off-the-shelf street furniture which is fit for purpose. Anodized aluminium is a recommended material for any stand along seating or benches which are proposed as part of the detailed design.

Sth Hedland Golf Course Trail						\$828,313
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total
Sth Hedland Golf Course- 450mm Fill	6026	2	12,052	m ³	\$20	\$241,040
Sth Hedland Golf Course - FCR	6026	0.21	1,265	m ³	\$50	\$63,273
Sth Hedland Golf Course- In Situ Concrete	1500	1.8	2,700	m ²	\$175	\$472,500
Sth Hedland Golf Course-Interpretive Signage			0	Unit	\$1,000	\$0
Sth Hedland Golf Course-Directional Signage			1	Unit	\$1,500	\$1,500
Sth Hedland Golf Course Exercise Equipment			4	Unit	\$2,500	\$10,000
Sth Hedland Golf Course Nodal Planting			4	Unit	\$5,000	\$20,000
Sth Hedland Golf Course Nodal Landscape Treatments			4	Unit	\$5,000	\$20,000



6.5 Area 3- Finucane Island Headland and Cliff Loop

6.5.1 Design Levels

The recommended design levels for the Headland and Cliff Loop vary. Section 1 from the carpark heading North West to the headland are on beach, and vary from 4.00 AHD to around 6.00AHD at the headland. The cliff walk varies across the topography between 6.00 AHD to 8.00 AHD. As the two spurs of the cliff walk terminate and head South, they rise over the dunal system to around 15.00AHD, then fall heading South to around 5.00 AHD at the crossing of the access road.

6.5.2 Trail Materials

The Headland and Cliff Loop does not have a constructed trail surface, but uses bollards/wayfinding markers set at 100m intervals to determine the route. The wayfinding bollards will allow users to walk between and along the trail alignment from point to point. Each bollard is proposed to be constructed of recycled plastic, 800mm high, with a 450mm square and 600mm deep concrete footing. These will be located adjacent to the path, and allow the existing vehicular traffic to pass along the trails without damaging the bollards.

6.5.3 Furniture Palette

Interpretation and directional signage shall be constructed from materials suitable for use in a marine and coastal environment. Due to exposure to the environment, the interpretive signage is recommended to be constructed of marine grade aluminium. Signage materials, such as the directional signage and information boards, should be waterproof and ultra-violet stable, and should be easily replaceable and low maintenance.

Headland and Cliff Loops							\$51,000
Description	lm	m ² /lm	Quantity	Unit	Rate	Sub Total	
Headland and Cliff Loop-Directional Signage			3	Unit	\$2,000	\$6,000	
Headland and Cliff Loop-Interpretive Signage			10	Unit	\$1,500	\$15,000	
Headland and Cliff Loop- Wayfinding Markers			30	Unit	\$1,000	\$30,000	



6.6 Area 3- Finucane Island Mangrove Loop

6.6.1 Design Levels

The Mangrove Loop begins at the Eastern edge of the existing carpark, at a level of around 5.00 AHD. The path descends to around 3.00 AHD for the rest of its length, and would be raised above the existing mangrove habitat by around 1m. The existing mangrove habitat is within the 0.00 AHD to 2.00 AHD range.

6.6.2 Trail Materials

The access path to the mangrove loop would be in-situ concrete, and shall comply with Australian Standard 1428- Design for Access and Mobility. The path is recommended to be 1800mm wide, and shall have a shoulder of around 600mm wide on the down slope side of the path. As the concrete path reaches the beach level of 3.00 AHD, it should transition to a boardwalk structure, with galvanized steel sub-structure, and recycled plastic deck. Due to the height of the boardwalk, it should also have handrails and balustrade, dependent upon the specific area. As the boardwalk transitions out of the mangroves back to the beach at level 3.00 AHD, the con-

struction material should transition back to an in-situ concrete path, which then returns along the back of the beach to the main access track. All concrete paths should be maintained above the high tide level.

6.6.3 Furniture Palette

Interpretation and directional signage shall be constructed from materials suitable for use in a marine and coastal environment. Due to exposure to the environment, the interpretive signage is recommended to be constructed of marine grade aluminium. Signage materials, such as the directional signage and information boards, should be waterproof and ultra-violet stable, and should be easily replaceable and low maintenance.

Materials for the boardwalk shall be suitable for use in a marine environment, and shall be galvanized mild or structural steel, with low maintenance fixings and handrails. The decking material shall be recycled plastic, ultra violet stable and fit for purpose in a marine environment.

Mangrove Loop							\$687,754
Description	lm	m ³ /lm	Quantity	Unit	Rate	Sub Total	
Mangrove Loop- 450mm Fill	298	4.25	1,267	m ³	\$20	\$25,330	
Mangrove Loop- 100mm FCR	298	0.36	107	m ³	\$50	\$5,364	
Mangrove Loop- 100mm In Situ Concrete Path	298	2.4	715	m ²	\$175	\$125,160	
Mangrove Loop- Recycled Plastic Boardwalk with handrails	180	1.6	288	m ²	\$1,800	\$518,400	
Mangrove Loop-Directional Signage			1	Unit	\$1,500	\$1,500	
Mangrove Loop-Interpretive Signage			8	Unit	\$1,000	\$8,000	
Mangrove Loop-Wayfinding Markers			8	Unit	\$500	\$4,000	

7.0 PROPOSED STAGING OF TRAILS DEVELOPMENT



Proposed location of the Pretty Pool Pedestrian Bridge, linking Cooke Point and Pretty Pool

7.1 Project Staging

7.1.1 Overall Project Staging

From tidal inundation zones in Pretty Pool, to arid bushland and spinifex habitat in South Hedland, and finally dunal and coastal estuarine landscape in Finucane Island, the Trails Masterplan enjoys a broad spectrum of experiences and landscapes, of which users can enjoy many unique aspects. Staging of the projects should take into account several factors, which are listed below-

1. Opportunity for development
2. Community gain
3. Buildability within the adjacent developments

Following consultation with the Project Working Group, it is proposed that the following sequence of staging be explored.

1. Area 1- Pretty Pool Loop- Inner Mangrove Section
2. Area 3- Finucane Island- Headland and Cliff Loop
3. Area 1- Pedestrian Link Bridge to Pretty Pool Reserve
4. Area 2- South Hedland- Recreational Loop (North East Section Adjacent to North Circular Rd)

5. Area 2- South Hedland- Recreational Loop (Marie Marlie Reserve to North Circular Rd)
6. Area 2- South Hedland- Golf Course Loop
7. Area 1- East Port Hedland- Dune Lookout Loop
8. Area 1- East Point Hedland- Six Mile Beach Loop
9. Area 1- Pretty Pool Loop- Outer Ring Loop
10. Area 2- South Hedland Recreational Loop (Osprey and Western Edge Sections)

7.2 Area 1-Pretty Pool Loop- Inner Mangrove Section

Due to the proximity to the residential areas and its net community gain through interpretation and diversity of experience, the Inner Mangrove Loop could be developed in a short period of time, in isolation of the remaining trails loop. As part of the trail, this would still necessitate link paths tying back to Athol Street, Cooke Point Road and Styles Road to allow for access.

Detailed design of the area would be required due to the tidal flats and geotechnical conditions of the area, but could be accomplished with minimal cost and design due to the natural nature of the paths proposed.

7.3 Area 3-Finucane Island- Headland and Cliff Loop

The Headland and Cliff Loop at Finucane Island could be developed within a short period of time, due to its low construction footprint and net community gain. As a popular day trip destination for existing residents, and a potential tourism draw, the Headland and Cliff Loop should rate highly for priority projects. Funding bodies such as the Department of Sport and Recreation would view the natural trail network as a high priority for funding, and due to the low impact of this trail, could be easily attained within the next two financial years, following detailed design.

The ecological diversity and quality of experience at Finucane Island is also a strong reason for priority development of this trail. Traversing estuarine beach, limestone cliffs, spinifex dunes and mangrove tidal flats, the Headland and Cliff Loop provides a strong ecological link to the Port Hedland area which is currently not represented.

7.4 Area 1-Pretty Pool- Pedestrian Link Bridge to Pretty Pool Reserve

The development of the Pedestrian Bridge link to Pretty Pool could be done in isolation as a much needed linkage between the two residential areas; due to the required funding potentially coming from multiple sources, detailed design of the pedestrian bridge should commence as a priority to allow a business case and funding options to be sort at an early juncture.

7.5 Area 2- South Hedland- Recreational Loop (North East Section Adjacent to North Circular Rd)

The North East section of North Circular Road is a vital link currently used by recreational cyclists and joggers, and should be formalized to allow for integration with the Hedland Senior High School upgrade as part of the Active Open Space Strategy, and to provide a vital residential link across the already developed Northern section of South Hedland.



7.6 Area 2-South Hedland-Recreational Loop

(Marie Marlie Reserve to North Circular Rd)

Following development of the North East section of trails, a link from Marie Marlie Reserve to the Hedland Senior High School should be constructed, to allow for continuity of the trails and links to the public open space of the Wanangkura Stadium. This would also aid organized sporting groups, in allowing for a short loop for warm up and warm down routines, along with linking the adjacent trails through the main sporting precinct of South Hedland.

7.7 Area 2-South Hedland-Golf Course Loop

With minimal design and construction costs, the Golf Course Loop could be design and constructed with the aid of local and state funding, due to the natural nature of the loop. The net community benefits for organized sporting groups and individual nature users would be high, and due to the minimal level of construction proposed through these areas, this loop should be high on the staging priority list.

The benefits of using the borrowed landscape from the golf course, the existing maintenance track access and proximity to the Wanangkura Stadium are all strong factors in prioritizing this loop section in the first 2-3 years of funding.

7.8 Area 1-East Port Hedland-Dune Lookout Loop

The Dune Lookout Loop in East Port Hedland is also another loop which would greatly benefit the residential and tourism communities in Port Hedland. Due to the diversity of the landscape, traversing coastal dune, estuary and mangrove tidal flats, this loop section should be prioritized for construction in the next 2-3 years.

As part of the Area 1 loops, this section would provide a strong ecological link for tourism, and also provides vital diversity to the Port Hedland landscape/nature experience.

7.9 Area 1-East Port Hedland-Six Mile Beach Loop

The Six Mile Beach Loop presents an existing and diverse experience to users, and would provide an interpretative loop which allows for recreational and cultural representations, whilst also allowing for 'industrial ecology' experience due to the close proximity of the Dampier Salt evaporation ponds. As part of the Area 1 loops, this link to Six Mile Beach would provide diverse coastal experiences, as part of the greater overall loop system in Area 1, allowing for a 15km round trip by cycle from Port Hedland West End along the foreshore, or a short drive along Gray St for ease of access.

7.10 Area 1-Pretty Pool Loop-Outer Ring Loop

The Outer Ring Loop at Pretty Pool will require tying into proposed residential and commercial developments, and will require close liaison with adjacent developers to ensure seamless interfaces with these. As such, the Outer Ring Loop at Pretty Pool should only be developed when the adjacent land uses and detailed design of such has been commenced, to take opportunity of the strong linkages which will be required for these developments to tie into the trail network.

7.11 Area 2-South Hedland Recreational Loop

(Osprey and Western Edge Sections)

Due to the proposed large scale residential developments occurring in the South East and South West of South Hedland, the staging for this area will require tying into the development staging of the residential subdivisions, and close liaison with the developers to ensure a consistent integration of the trails through the public open space of the subdivisions.

REFERENCES

- + The Town of Port Hedland (2007) Port Hedland Land Use Master Plan. Prepared by Urban Design Centre of Australia, Sustainable Consulting, and EPCAD Consultants for The Town of Port Hedland.
- + The Town of Port Hedland Town Planning Scheme NO 5 (District Scheme). Western Australian Planning Commission, Perth WA
- + The Town of Port Hedland Draft Pilbara Port City Growth Plan 2012. Prepared by RPS (Primary Consultant) for the Town of Port Hedland & Pilbara Cities.
- + Western Australian Planning Commission (2011) Port Hedland: Regional HotSpots Land Supply Update. Western Australian Planning Commission, Perth WA
- + Western Australian Planning Commission (2003) Port Hedland: Area Planning Study. Western Australian Planning Commission, Perth WA
- + Active Open Space Strategy (CCS Strategic, 2011)
- + Town of Port Hedland Cycle Plan (Transplan 2008)
- + Pilbara Planning and Infrastructure Framework Draft (2011)
- + Port Hedland Land Use Master Plan (2008)
- + Hedland's Future Today (2010)
- + Port Hedland Coastal Vulnerability Study (Cardno, 2011)



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