MULATAGA STRUCTURE PLAN

LANDSCAPE STRATEGY

March 2020

DevelopmentWA

urbis
NEW IDEAS THROUGH SHARED DESIGN-THINKING

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ACKNOWLEDGEMENTS

This report acknowledges the Ngarluma People as the Traditional Custodians for the Mulataga, Karratha area. We pay our respects to Elders past and present and recognise their continued spiritual relationship and responsibilities for Country.

The report also acknowledges and pays respect to Australian Indigenous Peoples who were separated from Clan and Country and also reside in Karratha and surrounding townships and communities. Traditional Peoples family, Elders and leaders. May these journeys of healing be acknowledged, respected, supported and become mutual objectives for all Australians.

*The cultural stories, quotes and images provided within this report are the Indigenous Cultural and Intellectual Property (ICIP) of Ngarluma People represented by the Ngarluma Aboriginal Corporation (NAC).

Mulataga landscape strategy plan

EXECUTIVE SUMMARY

ACKNOWLEDGEMENT

The Landscape Strategy firstly acknowledges that Mulataga is located within Ngarluma Country. Ngarluma are the local Traditional Owners whose lands extend East from Whim Creek to Maitland River in the West, Millstream Chichester National Park to the South and Nickol Bay to the North. Many Ngarluma People live in Karratha, Roebourne, and surrounding Pilbara towns. Ngarluma people maintain a strong and close association to their Traditional Country. The landscape reveals a story of continuing Aboriginal inhabitation that is considerable for its cultural heritage value, a significance that is able to drive a truly local 'sense of place' narrative.

PURPOSE

The Mulataga Landscape Strategy intent is to provide a design and management framework for protecting and enhancing the future development area and adjacent foreshore for its unique cultural and entwined Pilbara landscape qualities.

The key landscape features include the Mulataga foreshore and Mulataga Creek, which will be retained and managed within this development strategy. The foreshore area is located outside of the DevelopmentWA development site however has been considered within the design and management strategy.

MULUTAGA DEVELOPMENT PLAN

Mulataga is a 171.5ha site. Excluding open space conserved for cultural heritage sites of significance, creek lines and foreshore setback, the developable area is approximately 132.25ha. The future town site extends the eastern urban edge of Karratha township with the opportunity of connecting this regional City to the coast. Karratha is situated within the Pilbara region northwest Western Australia, approximately 1550km North of Perth.

The Mulataga residential project is a West Australian Government backed initiative in partnership with the City of Karratha. Mulataga is anticipated to provide home and respite for up to 1400 dwellings (approximately 3900 occupants)[1]. Understanding the local Pilbara cultural and environmental context will ensure informed, sensitive and sustainable design responses are able to guide the landscape strategic direction. Weaving development requirements sensitively within this existing environment provides future residents and visitors with the opportunity to value and connect to this unique cultural landscape.

1 Mulataga Structure Plan, Roberts Day & Development WA, 2020

LANDSCAPE CONTEXT

The landscape approach and treatments proposed have been informed by DevelopmentWA's increasing experience in the north-west region understanding and responding to the local social, cultural and environmental context and conditions with the opportunity to create meaningful, practical and pleasant spaces that have personal scale and high value recreational amenity.

'Hills to the sea' is a locational descriptive that considers this landscape that is nestled between the Karratha Hills to the south and Nickol Bay to the north. The 'hills to the sea' landscape descriptive is strengthened by a Pilbara context that includes Spinifex covered foothills and the White Gums that trace a rocky creek line down to the mangrove dotted coastline.

The key environmental and topographical features of the site include the (1) Mulataga Creek and associated drainage lines, the nearby (2) rocky outcrops, the (3) coastal foreshore and dunes, (4) Nickol Bay and mangal environment (located immediately north of the development site), and the (5) Karratha Hills that are located south of the development site.

The landscape strategy includes a foreshore management plan that considers the focused management of the immediate Mulataga Foreshore Area, however there is recognition that a holistic Nickol Bay Foreshore Management Plan is required to address the broader cultural, environmental, developmental and recreational requirements. This broad strategy shall provide a context whereby the Mulataga foreshore design and management can be considered and situated.

The large foreshore dune system is divided by Mulataga Creek which discharges overland and subterranean flows into a protected mangal area that is part of Nickol bay. The western large primary dune protects the low-lying areas immediately adjacent the coast, especially the western section of the site from exposed coastal activity. Higher ground to the east allows views across the bay towards the rocky hills of the Burrup (Murujuga) and the Dampier Archipelago. The eastern dune system has a rock substrate that provides a stabilised coastal location for future urban connection to the coast.

LANDSCAPE MASTERPLAN OBJECTIVES

The landscape strategy design response or objectives specifically focus on the provision of alternate types of public open space for Karratha that reflects the Mulataga social cultural and community landscape context. The key aspects guiding the landscape strategy design response include:

1. Aboriginal (Ngarluma) cultural knowledge to guide a local landscape design response - Design that informs a social, cultural and community connection to landscape (Country) including protecting significant landform, cultural sites, site drainage, plant diversity and ongoing site and foreshore management;

2. Implementation of local water sensitive urban design (WSUD) - better urban water management that responds to the north-western Pilbara local condition;

3. The provision high quality passive / active recreation nodes that considers 24hr seasonal use; i.e. shade through the day and lighted recreation areas after dark - providing opportunities for; informal sports, walking, bushwalking, running, biking, fitness stations, swimming, fishing, and nature boardwalks. This includes the provision of passive areas of rest and reflection that include viewing areas and interpretive signage to celebrate contextual sites of cultural and landscape significance; and,

4. The provision of improved public access and connection for Karratha's community; the provision of community universal access to Mulataga beach and the broader Mulataga Creek recreation circuit, including the provision of universal pedestrian access, lookout decks and parking near the Mulataga coastal Hub.

5. Ongoing design discussion with stakeholders to improve maintenance and management issues / opportunities as the development works staging continues.

The development site masterplan does not just look at the green infrastructure and space amenity in isolation, but rather attempts to considers all the layers of the "landscape" to provide design responses that not only provide for an attractive place to live, but also encourages building local sustainable outcomes. The opportunity to build the capacity of the local community and create a sense of pride with this potential lengthy project is exciting. The Mulataga development project is an opportunity to turn a developing town into a strong Pilbara City, supporting a thriving hub with local community industry, pride and ownership. The strategy demonstrates that a sustainable and site-specific landscape amenity for the future Mulataga community can be achieved through jointly understanding the unique ecological condition and acknowledging the existing 'lifestyle' and the Traditional Owners cultural relationship to the site and associated lands.

'These creek lines protect Kangaroos, snakes and lizards and you can find them resting there through the day'. Pansy Hicks, Ngarluma Elder 2012.

FORESHORE MANAGEMENT OBJECTIVES

The landscape strategy management objectives are similar to the design response that requires an alignment with local cultural knowledge and land management systems. The management objective will encourage the development of a healthy and diverse landscape which has been depleted through recent Karratha Station grazing practices. The key aspects guiding the landscape strategy management include:

6. Working alongside Ngarluma Traditional Owners to protect and manage sites of cultural significance;

7. Protecting and maintaining the integrity of the foreshore ecology by minimising erosion affecting loss of land and marine habitat. Enhancing the foreshore ecology through restoration and rehabilitation treatments and ongoing maintenance;

8. Manage and monitor vehicle and pedestrian access to mitigate off road traffic across sites of significance, across creek lines and over dune systems, including vehicles driving onto the beach. Protecting the foreshore ecology through controlled traffic, pedestrian access, and the provision of improved public access and connection for Karratha's community;

9. Promote local landscape value by retaining, supplementing and introducing species diversity to offset a modified grazing (Karratha Station) landscape, including riparian and foreshore diversity to stabilise the dune and marine environs. Work alongside Ngarluma Traditional Owners to develop a diverse planting pallet to supplement the existing degraded landscape condition for both foreshore and creek line and as required.;

10. Support and develop Karratha's landscape/environment management capacity by supporting local land management, construction, landscape & nursery industries (e.g. Friends of Mulataga Creek/Foreshore and con- sider using Indigenous Rangers).

A major Mulataga foreshore environmental management consideration includes stabilising eroded dunes, development soils and monitoring weed control and mimicking existing overland drainage conditions. This is

exemplified in understanding what is best practice local Water Sensitive Urban Design (WSUD). Much of this can be achieved by maintaining and managing the integrity of the dunes, natural creek lines and overland drainage lines.

The Mulataga Strategic Foreshore Management Plan provides a robust framework for development staging of works to be continually revised and improved. The ultimate aim is to provide the general community and visitors of Karratha with a positive and culturally rich Mulataga foreshore experience.

SUMMARY

The strategic design and management objectives for the Mulataga landscape is to firstly consider its significance from a Ngarluma Traditional Owners perspective. The cultural heritage and ecological values are already intertwined and therefore provide strong design and management direction to deliver a sustainable and diverse local landscape experience for future residents and visitors alike.

While moving through this landscape the design objectives will provide a range of recreational opportunities that connect the greater Karratha community with this unique Pilbara landscape context, including the Nickol Bay foreshore, ephemeral tree lined creeks lines and aligned recreational passive and active space amenity.

The key landscape features include the Mulataga foreshore and Mulataga Creek, which will be retained and managed within this development strategy.

While being outside of DevelopmentWA's development area this landscape strategy considers the design and management of the Mulataga foreshore area due to its intrinsic community value, including local cultural heritage, community and future visitor values. A foreshore hub will introduce a unique opportunity for Karratha people and visitors to connect with the ocean in a locally unique way providing opportunity for recreational, commercial and cultural experiences.

The landscape strategy ultimately responds to and is informed by its unique 'hills to the sea' landscape context. DevelopmentWA's developing knowledge and experience for providing 'sense of place' open space in the north-west region has included gaining a deeper understanding of a local social, cultural and environmental condition. Understanding and aligning with the local context provides opportunity to foster meaningful, practical and pleasant spaces to work, live and play.

Mulataga Creek

PART A: CONTEXT

View towards the Karratha Town Centre, across the Mulataga Foreshore and Nickol Bay.

1.0 INTRODUCTION

The landscape strategy firstly acknowledges that Mulataga is located within Ngarluma Country. Ngarluma are the local Traditional Owners whose lands extend East from Whim Creek to Maitland River in the West, Millstream Chichester National Park to the South and Nickol Bay to the North. Many Ngarluma People live in Karratha, Roebourne, and surrounding Pilbara towns. Ngarluma people maintain a strong and close association to their Traditional Country.

The Pilbara Region has a unique and rugged beauty. From a striking red stony soil and contrasting golden Spinifex covered desert landscape to the turquoise waters of the Indian Ocean, this north western Australian region is uniquely recognisable. This Landscape Strategy intent is to provide a design and management framework that protects and enhances DevelopmentWA's Mulataga development sites unique Pilbara landscape and entwined cultural qualities for the lifestyle amenity of both the existing community, future resident and visitor alike.

The key landscape features associated with the Mulataga site include the (1) Mulataga Creek, (2) rocky outcrops which are part of the development site. The (3) foreshore including coastal dune, (4) Nickol Bay and mangrove environment and (5) Karratha Hills are located north and south respectively beyond the development site however form part of the areas key landscape features. The foreshore area is included within the landscape strategy as part of a specific foreshore management approach.

This Landscape Strategy includes the following:

(1) A development site landscape masterplan; and,

(2) A foreshore management plan.

The landscape masterplan includes the provision of new public open space within the Mulataga development area through the creation of unique streetscapes, parklands and multiple-use corridors that sensitively deal with the local landscape condition. The strategy focuses on retention and supplementation of existing vegetation for cultural, fauna and water quality purposes and provides guidance to the types, distribution and size of open spaces and landscape treatments.

The landscape approach and treatments proposed have been informed by DevelopmentWA's developing experience in the north-west region understanding and responding to the local social, cultural and environmental context with the opportunity to create meaningful, practical and pleasant spaces that have personal scale and high value recreational amenity.

The Landscape Strategy includes a Foreshore Management Plan to ensure ongoing enhancement, protection and rehabilitation of the foreshore area. It is important to note; that the location of the foreshore area is outside the development plan area.

In order to build the community with a strong emphasis on connection to country, the open space planning objective is to consider and enhance the strong biophysical and cultural issues that are closely interlinked in the Pilbara landscape. Understanding the local environment provides the future development with a sustainable way forward, a landscape reflective of the local sense of place,

2.0 BACKGROUND

The Mulataga Structure Plan Area was instigated as part of the 2012 Karratha City of the North Vision, which was informed by the State Government's Pilbara Cities Vision. The vision aimed to transform Karratha into a Regional City, whilst strengthening Karratha's economy, sense of place, environment, infrastructure and resources to reflect the growing community and providing a built environment that is aligned with the intrinsic qualities of the local context. This was and is an exciting and progressive vision for Karratha, however, came with a rapid increase in urbanisation and pressures on environmental systems. Hence, it was essential to understand the possible future relationships between Mulataga its landscape qualities, including the adjacent Mulataga Foreshore to ensure the rich array of cultural and entangled environmental features are valued and enhanced. The foreshore area is outside of the DevelopmentWA development site however design and management are considered within this strategy.

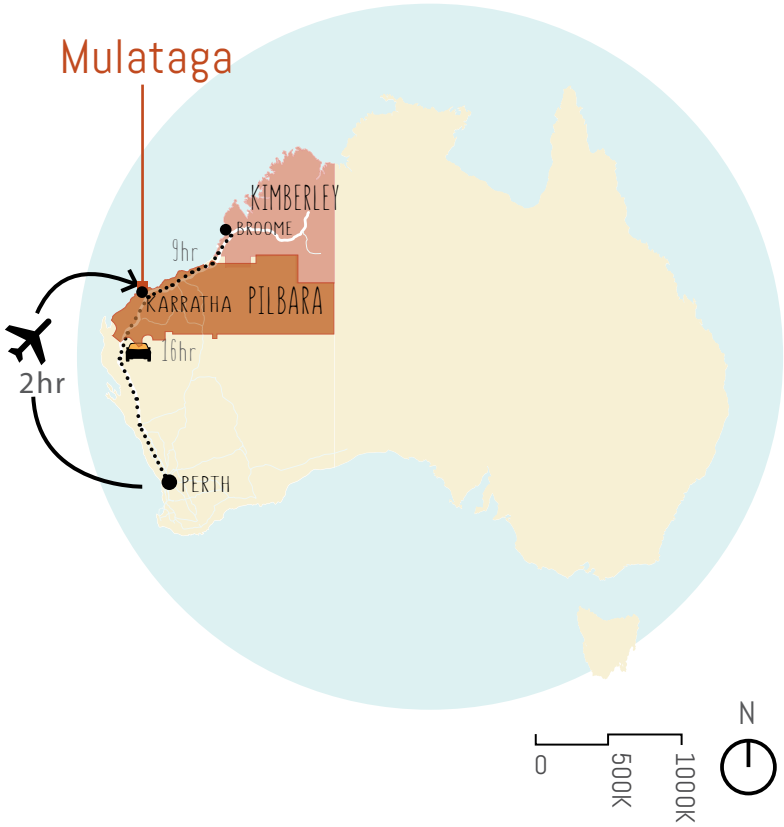
View from the top of the primary dune looking across the mangrove vegetation.

ACRONYM	IN FULL
SoR	Shire of Roebourne
DEC	Department of Environment and Conservation
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
FMP	Foreshore Management Plan
POS	Public Open Space
TO	Traditional Owners
ASS	Acid Sulfate Soil
mAHD	metres Australian Height Datum
ha	Hectare
Km	Kilometer
m	Meter
mm	Millimeter

Table 1: Definitions of Acronyms used in this Document

3.0 LOCATION

Mulataga is a 151ha site when you exclude open space conserved for sites of significance, creek lines and foreshore setback, the developable area is less than half at approximately 70.2ha. The future town site extends the eastern urban edge of Karratha township with the opportunity of connecting this regional City to the coast. Karratha is situated within the Pilbara region northwest Western Australia, approximately 1550km North of Perth.



Mulataga landscape strategy plan

4.0 ACCESS

The site has currently minimal community use except for access through the site via the Northern Mystery Road (access to town boat ramp facility) and Southern bound Millstream Road that leads onto Karratha's busy arterial, Dampier Road.

A myriad of informal dirt tracks lead from both of these sealed roads across the site and over dunes onto the foreshore areas.

Four wheel drive and motorbikes traverse the foreshore dunes

5.0 SITE FEATURES

The key environmental and topographical features of the site include the (1) Mulataga Creek and associated drainage lines, the nearby (2) rocky outcrops, the (3) coastal dunes, (4) Nickol Bay and associated mangal environment (located immediately north of the development site), and the (5) Karratha Hills that are located south of the development site. All of the above-mentioned site features are to be protected and managed.

The Mulataga development site grades back like a natural amphitheatre that rise gently towards the Karratha Hills located to the south. This amphitheatre effect allows raised stepped viewing opportunities towards Nickol Bay and the Burrup peninsula beyond (Murujuga).

'Hills to the sea' is a locational descriptive that considers this landscape nestled between the Karratha Hills to the south and Nickol Bay to the north. The 'hills to the sea' landscape descriptive is strengthened by a Pilbara context that includes Spinifex covered foothills and the White Gums that trace a rocky creek line down to the mangrove dotted coastline.

A foreshore dune system is divided by Mulataga Creek which discharges overland and subterranean flows into a protected mangal bay. The eastern large primary dune protects the low-lying areas immediately adjacent the coast, especially the western section of the site from exposed coastal activity. Higher ground to the east allows views across the bay towards the rocky hills of the Burrup (Murujuga) and the Dampier Archipelago. The eastern dune system has a rock substrate that provides a stabilised coastal location for future urban connection to the coast.

Rocky Mulataga Foreshore

6.0 FORESHORE

The Mulataga Foreshore is located just north of the Mulataga development site, East of Karratha township. The Mulataga Foreshore is part of the wider area known as Nickol Bay and is not part of the Mulataga development site.

The coastal landscape in the region is dominated by the presence of barrier dunes along the western and eastern frontages of the site. The dunes are out of the development site and are to be retained. It is acknowledged that possibly over time the primary dunes may be lost due to coastal erosion effects and this has to be considered within the landscape strategy, particularly within the 100-year foreshore reserve setback and overall structure plan strategy.

Between the prominent barrier dunes, along the centre of the coastal frontage, the foreshore has a lower elevation. This area lends itself to the creation of a more prominent foreshore reserve to take advantage of the views and opportunities for interaction with the coastline that can occur as a result. The concept plans therefore aim to deliver the majority of the foreshore amenity in this area.

Karratha central is setback behind low lying tidal flats and has limited connection to Nickol Bay. Views to the bay are provided as a backdrop to the town centre from the Karratha Hills accessed by the Yaburara Heritage Trail and lookout.

The Mulataga foreshore within a regional coastal environment context is of significant value. Surrounding significant includes the Dampier Archipelago a string of 45 islands that are located off the coast of Dampier, all within a 45km radius. This Marine Park is home to a diverse array of marine biota, which is supported by a wide range of marine habitats. Marine biota includes more than 736 fish species and 230 scleractinian coral species, making Dampier Archipelago the second most diverse site in Western Australia for hard corals.

This marine environment has significant regional value, for both its ecological and social conservation significance.

Mangrove vegetation on the Mulataga foreshore

7.0 FACILITIES

Within the site management area there are no formal recreation areas or facilities. Informally people are using the site for four-wheel driving, recreational trail bike riding including access to Nickol Bay. This is uncontrolled and causing significant site damage, dune and general land erosion. Passive recreation currently includes foreshore fishing, swimming, mangrove crabbing and walking adjacent the beautiful Nickol Bay.

Nearby to the East of the subject site a town recreational boat ramp provides small boat access to the Bay and appropriate tidal opportunities. The site includes very robust low amenity picnic table and shelter. Driving along the sandy foreshore in this area is not actively discouraged.

Within the surrounding context, a range of hotel, motel and B&B is available for visitors. Accommodation has been expensive and hard to obtain through previous extractive industry infrastructure booms, with tourism capability low. There is recognised a strong opportunity for Karratha to be a hub for environmental tourism with regard to the offshore historic archipelago and associated unique marine activities coupled with the inland picturesque Pilbara landscape consisting of world-renowned ranges, waterways, plains and associated national parks.

The town has acquired recently state-of-the-art art/theatre centre and a recreation precinct. It has new restaurants, taverns, hotels, night clubs, café's and a developing main street. It also has a large regional shopping complex, an eight-story apartment and retail complex (Pelago).

Education is provided through four public primary schools and one private primary school, one public and one private high school, a TAFE centre with remote university facilities, and a library.

As well as its professional medical services, the district is served by the Nickol Bay Hospital, which provides a comprehensive array of services, facilities and training.

Fishing at the mouth of Mulataga Creek

Boat launching site north-east of the Mulataga project site

8.0 RECENT HISTORY

The name "Karratha" originated from a pastoral station from which the land was resumed. The station was named by the first owners of the property between 1866 and 1879 from an Aboriginal word meaning 'Karratha' translating as the 'good country' or 'soft earth'.

First sheep grazing began at Karratha Station in 1866 and operated until 1879. Grazing has continued to dominate the local economy for the next 100 years.

The mining industry and offshore oil rigs caused an influx of population to the area in the 1960's sparking town stabilising and residential development. The planning design nature of Karratha has seen to be pragmatic in nature with broad heavy kerbed road pavements, wide verges, stark drainage corridors and spread town facilities. Due to development being in the 1960's the planning design seems to be vehicle driven, decentralised and little to no pedestrian amenity. This type of development approach has continued until the present day.

9.0 TEMPERATURE

Summer temperatures average 32°C to 36°C with the cooler season June to August average temperatures ranging from 26°C to 29°C. Extremes can range from 0°C (at night) to 45°C plus. Representative of a hot, semi-arid climate.

10.0 WIND

Winds in Karratha are characterised by dominant westerly winds occurring throughout summer and prevailing easterly winds in the winter. The West Pilbara is frequented by cyclonic winds. Summer wind patterns consist of mild to strong easterly winds in the morning, changing to a strong westerly breeze in the afternoon. The Breezes over the hot often humid 'wet' season period are considered not to be cool breezes. Air movement can advantage cooling within shaded and protected areas.

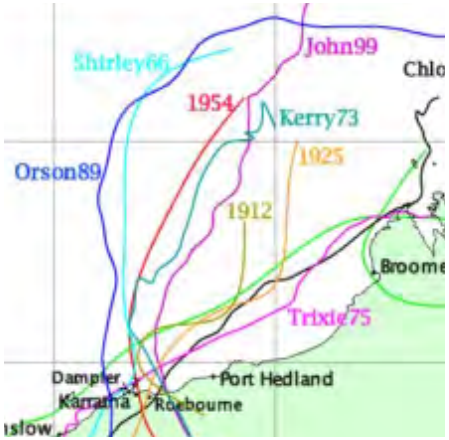


Figure 1: Tracks of notable cyclones that have impacted Karratha (Source: BoM 2012b)

11.0 RAINFALL

Average annual rainfall is approximately 289.9mm the majority of which falls during the summer period, between January and March, from scattered thunderstorms and occasional tropical cyclones. A secondary peak in the rainfall occurs in June as a result of rainfall from tropical cloud bands (Figure 2). Semi-tropical to arid climate with major rainfall events during cyclonic activity in summer or 'wet' season months.

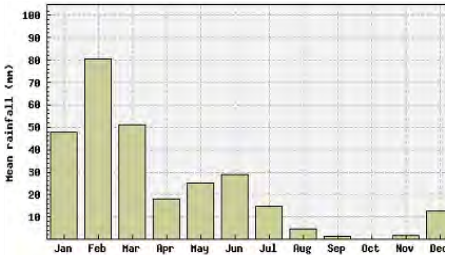
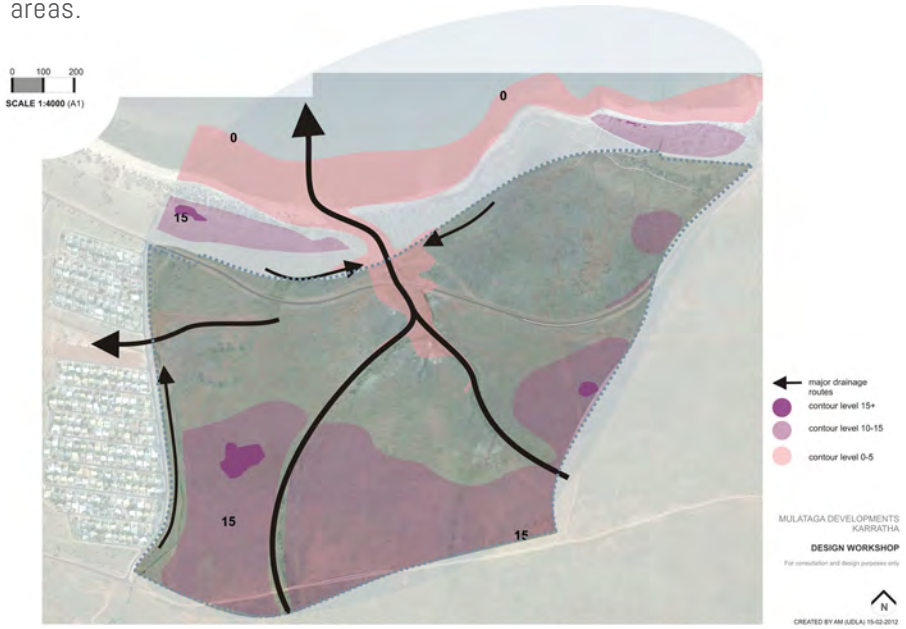


Figure 2: Mean Rainfall for Karratha (Source: BoM 2012a)

12.0 TOPOGRAPHY

The site has clear high and low points that affect drainage and help to define soil type within the subject area. Culturally, high and low points served different purposes for the Traditional Owners, meaning many significant sites are located in low protected areas such as within shaded creek lines or along the back of dunes. Certain high points within the Mulataga development area were used as vantage point or cultural use areas.



TOPOGRAPHY MAPPING

13.0 GEOLOGY

The area is located on the Cleaverville Formation Comprised of granite domes, lateralised caps, volcanic/sedimentary rocks.[1]

The landform features of site, including the coastal dunes and the Mulataga Creek are proposed for retention and management in the current design.

1 Source: Department of Agriculture (2004) in RPS (2012) and RPS (2019) accompanying Structure Plan – Environmental development reports following site visits 2011 and 2012.

14.0 SOIL TYPE

The inland local soil type is mostly made up of Pindan which is a fine red clayish loam. Pindan is the basis of most soils in the North West with the area around Karratha, Dampier, Roebourne, Wickham and Point Samson having an added gravely stone texture.

The soil as a whole has a collapsible structure however can be extremely hard to work when dry.

From past experience in the north west it has been understood (from soil testing UDLA) that fine clay particles within the Pindan soils are believed to have qualities that bind or smother nutrient rich marine environments. Therefore, Pindan soils are exposed and left free to move along water ways hefty silting of downstream marine ecosystems can occur. In addition, downstream drainage infrastructure, pipes, open drains can also become considerably impacted by sediment that when dries becomes a hard clay crust.

Naturally ground covering vegetation such as Spinifex & Kangaroo grasses keep these soils in place preventing surface erosion or dramatic overland sediment flows during short sharp and often large rain events that can occur in the summer cyclonic season.

View from the Karratha Hills over the town. This image illustrates the limited connection between the town and foreshore.

15.0 FLORA & FAUNA

The Mulataga Landscape Strategy aims to protect and enhance the existing environment through the retention of the existing endemic flora and enhance biodiversity to provide healthy areas for fauna habitat.

The overall site is located within the Abydos Plain, which is part of the Fortescue Botanical District, within the Eremaean Botanical Province.[1] The Abydos Plain extends east from Cape Preston to Pardoo Creek, east of the de Grey delta.[2]

The main vegetation in the region is a general cover of hummock grasses interspersed with widely spaced shrubs. A shrub steppe of Acacia pyrifolia and Triodia pungens (Spinifex) dominates. Large shrubs, up to 3 m in height, also include the fire-resistant species Grevillea wickhamii and Hakea suberea, and trees of E. diachromophloia and E. papuana are occasionally found along drainage lines, although they are rare. Along major creeks and rivers are trees of E. camaldulensis and Melaleuca leucadendron.[3]

Quaternary alluvial and older colluvial coastal and sub-coastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of Acacia translucens or A. pyrifolia and A. inequilatera. Uplands are dominated by Triodia Sp.hummock grasslands. Ephemeral drainage lines support Eucalyptus victrix or Corymbia hamersley woodlands. Samphire (succulent coastal plant), Sporobulus and mangal (mangroves) occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains. Islands are Quaternary sand accumulations, basalt and/or limestone.[4]

Associated with the subject site there are five broad vegetation types including:

1. Offshore marine aquatic and reef environments (Including colourful sponge gardens, trumpet shells, cockerels etc.)
2. Mangroves (2 species present)
3. Foreshore dune system
4. Creek line riparian zones
5. Open shrubland and Hummock Grassland

The Mulataga site was previously a pastoral station and has been significantly impacted by grazing, with local grasses Triodia sp. replaced with exotic Buffel Grass. The foreshore flora and vegetation has been surveyed and mapped as degraded condition and is widespread.

Fauna present within the Mulataga Site includes 4 reptiles and 11 bird species. In addition to this, five species of marine turtles could potentially utilise the coastal environment for habitat, which is located directly north of the Mulataga site. However, there are presently no known beaches for turtle nesting on in close proximity to the Mulataga Site.

The endemic flora and fauna communities all serve an environmental purpose. Likewise, they have long term significance for the traditional owners (i.e. food sources, stories, cultural uses, weapons, medicinal, tools etc.).

The accompanying RPS Environmental report notes that there is no flora and fauna on the development site or foreshore of any local or regional conservation significance. The mangrove community is removed from the main project area and is located in the marine environment.[5] Refer to the accompanying Mulataga Structure Plan – Environmental Assessment Report by RPS for more detailed information and mapping of fauna, flora and vegetation types across the Mulataga subject site.

1 Beard 1975: p8.
2 Beard 1975: p50
3 Beard 1975: 50-55
4 (Thackway & Cresswell, 1995).
5 Coffey Environments 2010, 2011, RPS 2012, RPS 2019. RPS site inspection 2011, 2012. UDLA Landscape Masterplan and Foreshore Management Plan (2012)

Detail image of existing mangroves

Foreshore dune environment stabilised by Spinifex and Buffel grass

Mangrove community fringing Nickol Bay

16.0 WATER & DRAINAGE

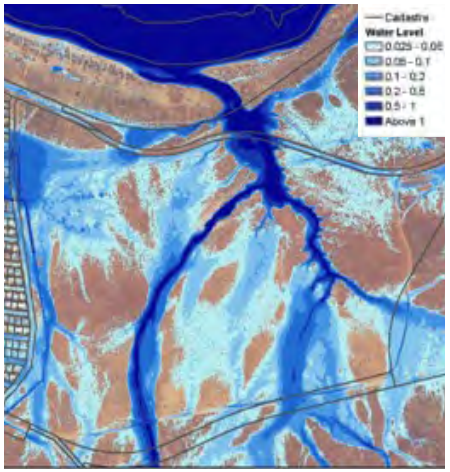
A major environmental management consideration includes stabilising development soils (silts), monitoring weed control and mimicking existing overland drainage conditions. This is exemplified in understanding what is best practice local Water Sensitive Urban Design (WSUD). Much of this can be achieved by maintaining and managing the integrity of the natural creek lines and overland drainage lines.

The northwest Western Australia is at a contrast to the southwest condition with regard to managing high volume storm events and impervious clay type fine particle (Pindan) soils. As a result, a major part of the landscape strategy is to maintain existing water catchment areas, including drainage line topography and soil stabilising existing vegetation where possible. In addition to this, drainage management is to be designed to mimic the existing tributary condition that conveys overland water in a controlled method of volume retardation. Multiuse open space corridors that include linear swale systems utilise various hard and soft engineering and landscaping devices to retard storm velocities, slow and impede potential contaminates, silts, and weeds to pre-development levels.

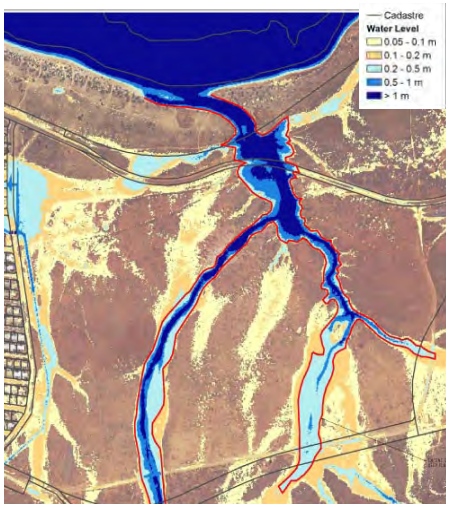
Due to the impervious nature of Pindan overland drainage is naturally broad and sheet flow in nature. In the Pilbara the slow-moving sheet flows are either directed to large sandy depressions (behind dunes) within the landscape to infiltrate over time, or eventually into the ocean via rocky tree lined (E. victrix dominate) ephemeral creeks. The overland water quality predevelopment would transport limited Pindan silts due to a mostly closed natural vegetation cover. Vegetation cover binds the pindan topsoil limiting the opportunity for this material to deposit directly into creek lines or fresh/saltwater marine environs.

Overland water flow is a major consideration in the design and development of the Mulataga site. While rain events occur infrequently these events often distribute large volumes of water over a short period of time. Therefore bio-filtration of nutrients or contaminates that rely on slow moving volumes of water (often past slow-moving ephemeral wetlands that require strappy type vegetation with large surface area) is almost nil. Water quality in the North West relies on the overland sheet flow being stabilised Spinifex or Kangaroo grasses that contain these overland sediments or contaminates. It is understood that the nutrient stripping capacity of this environment is minimal.

Locally responsive urban water management in Mulataga will aid to balance sediment and nutrient levels within the immediate downstream mangrove marine environment. Mulataga's foreshore, which is part of Nickol Bay, has large areas of nutrient rich Mangrove ecosystems that are marine nursery's that include stocks of fish, shellfish and mud crabs.



Flood Mapping



Extent of 1: 100 Yr 0.2M Deep Flooding Shown in Red

17.0 ABORIGINAL HERITAGE

For thousands of years the ancestors of Indigenous people have lived and travelled along the foreshores of the Karratha and surrounding area, across the Pindan plains and along the fringes of the desert. It is understood that the Mulataga development is an important part of a broader cultural landscape, which in this context alone requires understanding and respect.

The whole of the Mulataga site, from the foreshore and creek waterways leading up to the Karratha Hills provides a descriptive picture of a living local ethnographic practice where the landscape setting could be understood as a large open-air kitchen and camp site. A place for shelling and eating seafood (mittens), preparing and cooking bread and meat (stone cutting tools), a place of abundance. The Mulataga Creek foreshore has remnant gnamma holes where over millennia flour was grinded from local endemic grass seed and mixed with creek water to make a local bread. The ocean and creek foreshores still contain artefact scatters, shell mittens, gnamma holes and stands of medicine and bush food. The rocky outcrops that are located south of the foreshore reserve include petroglyphs that have strong local and international cultural heritage significance.

Respecting and retaining the Traditional Owners strong connection and relationship to 'Country' is therefore an essential consideration of the public open space design. Through initial and ongoing design dialogue with local Ngarluma People, initiatives to maintain an unbroken traditional 'lifestyle' that includes restoring environmental health, respecting significant sites and proving continual access to the land is to be respected and continued.

There are a number of areas of significance within the Mulataga region. Significant cultural areas are located and mapped throughout Mulataga with nominated cultural areas within the central foreshore reserve and where the creek meets the coastal foreshore.

Aboriginal sites of recognition in this area include: *Artefact scatter sites, Burial sites, Camp sites, Ceremonial sites, Gnamma holes, a water source site, Grinding patches - seed grinding patches, Modified trees, Mythological sites, Quarry sites, Reduction area (or knapping floor) refers to a cluster of stone artefacts, Rock art sites, Stone arrangement sites and Structures/cairns.* [1]

The dunes are also included as part of these significant sites. Development of these sites will be avoided. With specific reference to the foreshore reserve, the dunes will be left untouched as part of the development, though it is acknowledged that they may be lost by the action of coastal erosion in the future. If and when this occurs, cultural management practices could include repatriation and reburial and / or artefact safe keeping as deemed appropriate by the local Traditional Custodians.

Local Aboriginal Groups indicate that any artefacts that may be present within the foreshore reserve should not be disturbed by contemporary

1 Anthropos Australis Pty Ltd and Context Anthropology Pty Ltd– June 2010.

or development intervention. If artefacts or burial areas are uncovered through changing ecological processes (erosion), or within the coastal node, cultural management practice would include repatriation and reburial and / or artefact safe keeping as deemed appropriate by the local Traditional Custodians, through the development of an Aboriginal Heritage Management Plan.

...Senior female Ngarluma Consultants advised that the Survey Area is situated within an area where the old Ngarluma people camped, hunted and gathered food. The Senior female Ngarluma Consultants explained that the landscape features within the Survey Area such as the coastal sand dunes, creeks, rock holes, and flat areas were habitation areas that provided access to terrestrial and marine resources, and in relation to the sand dunes, were places where Ngarluma people were buried. Further, the Aboriginal sites located during the Survey illustrates that the area was likely to have been substantially occupied, as evidenced by the large size and quantity of shell middens, as well as the presence of artefact scatters, engravings, stone arrangements, and grinding surfaces within the Survey Area. The Senior female Ngarluma Consultants also noted the historical significance of the Survey Area as a place where some male Ngarluma people camped and spent time when they worked in the employment of Karratha Station. The Senior Ngarluma Consultants stated their concern that traditional Ngarluma burials and artefacts that occur in the coastal sand dunes of the Mulataga Survey Area could be disturbed. This concern is supported by the fact that traditional Ngarluma burials have been previously disturbed within the coastal sand dunes to the northeast of the Mulataga Survey Area. The Ngarluma Consultants, therefore, advised that DevelopmentWA should not undertake any ground disturbing activity within the coastal sand dunes that occur on the northern boundary of the Mulataga Survey Area. The Senior Ngarluma Consultants also advised that the ongoing protection and management of the coastal sand dunes be addressed in the proposed Cultural Heritage Management Plan between DevelopmentWA and the NAC. [2]

Hon Peter Collier MLC April 2012 'conditions of consent' referring to DevelopmentWA Section 18 dated 8 February 2012 as part of this condition of consent noted

- *... to provide a written report to the Registrar of Aboriginal Sites (the Registrar) within 60 days of the completion of the Purpose, advising whether and to what extent the Purpose has impacted on all or any Sites located on the Land. The final report should include a detailed description of: a. what extent the Purpose has impacted any Aboriginal Site on the Land; b. where any Aboriginal Site has been impacted, whether such Site has been partially or wholly impacted by the Purpose, and the level, effect and type of any such impact - preferably by the provision of photographs taken before and after the impact; c. where any Aboriginal Site has been subject to archaeological or cultural salvage, when and how such salvage took place, who was present at the salvage and where the material was re-located, results of the salvage and any subsequent analysis conducted; and d. the results and findings of any monitoring of ground disturbing works associated with the Purpose.*[3]

The Mulataga development site will continue to require local Aboriginal (Ngarluma) observers for site works to proceed, including ground disturbance activities and areas nominated for land clearing within and beyond the coastal reserve. DIA noted Areas of Aboriginal Significance within the coastal foreshore reserve are to be fenced off with clear signage. Significant cultural areas are located and mapped throughout Mulataga with nominated cultural areas within the central foreshore reserve and where the creek meets the coastal foreshore. All these areas are to be kept undisturbed by development or unwanted human

2 Anthropos Australis Pty Ltd and Context Anthropology Pty Ltd – June 2010

3 Anthropos Australis Aboriginal Heritage Survey of Mulataga (AA: 2010); UDLA Landscape Masterplan and Foreshore Management Plan (2012); Hon Peter Collier MLC April 2012 consent referring to DevelopmentWA (WALA) Section 18 notice dated 8 February 2012 (s18: 2012)

18.0 EUROPEAN HERITAGE

access. Disturbance through coastal erosion will require action through an Aboriginal Heritage Management Plan. Local groups will repatriate artefacts and protect areas of significance within the foreshore areas as/if coastal erosion occurs – and would not welcome contemporary human or development intervention.

...Senior Ngarluma Consultants also advised that the ongoing protection, including fencing and signage, of the Aboriginal archaeological sites be addressed via a Cultural Heritage Management [4]. Plan to be developed co-operatively by DevelopmentWA and the NAC for the Project Area. Local Aboriginal Observers are to assure correct protection procedures are carried out by site contractors and visitors. Stage 1 works undertaken 2013/14 is a positive precedent to cultural site avoidance procedures being undertaken correctly.[5]

Within the Mulataga site and foreshore area there are significant cultural sites, which have been recorded to Site Identification Standard. The Heritage Surveys are being carried out in accordance with the Aboriginal Heritage Act to define the sites and their significance and seek permission for use under Section 18 approvals.

These sites are located primarily along the creek lines, foreshore and on two possible high points within the subject area as indicated by the plan below. (See following section 'Cultural Context' for more detail). It is notable to point out that a proposed environmental foreshore creek buffer shall retain most of these sites.

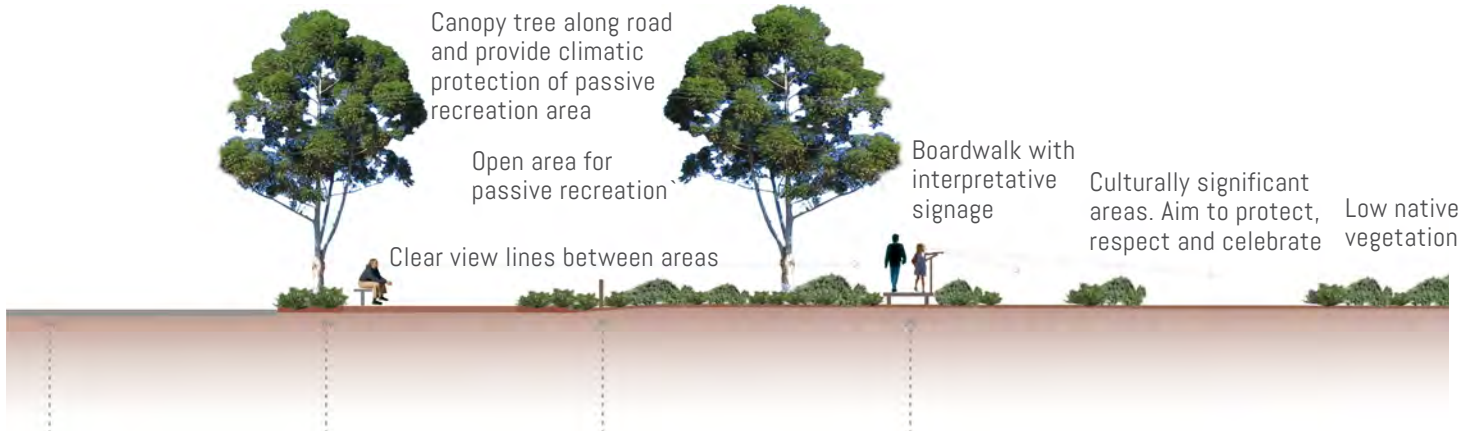
Ongoing consultation and design engagement with the local Ngarluma Traditional Owners (TO's) in regard to the treatment of these sites is to continue with possible edge treatments discussed to discourage site intrusion and promote general respect of this age-old custodial relationship with the Pilbara landscape.

Photograph of site walks with the Traditional Owners and learnings about the foreshore area

There is no European archaeological significance associated with the Mulataga site.

There is a locally used informal pet cemetery located on the Eastern large dune and not within the development footprint. Handmade crosses and stacked rocks have been erected over recent decades in memory of passed companions. This action embodies a local contemporary idea of a 'special place' (i.e. close to town, top of the dune looking out to sea).

4 Anthropos Australis Pty Ltd and Context Anthropology Pty Ltd – June 2010
5 Anthropos Australis Pty Ltd and Context Anthropology Pty Ltd – June 2010; UDLA Landscape Masterplan and Foreshore Management Plan (2012)



ROAD

Red asphalt and concrete edging

MULCH AND GRAVEL

Incorporate various types of pebbles and rocks into the passive recreation areas to ensure areas are low maintenance and add textural interest and patterns.

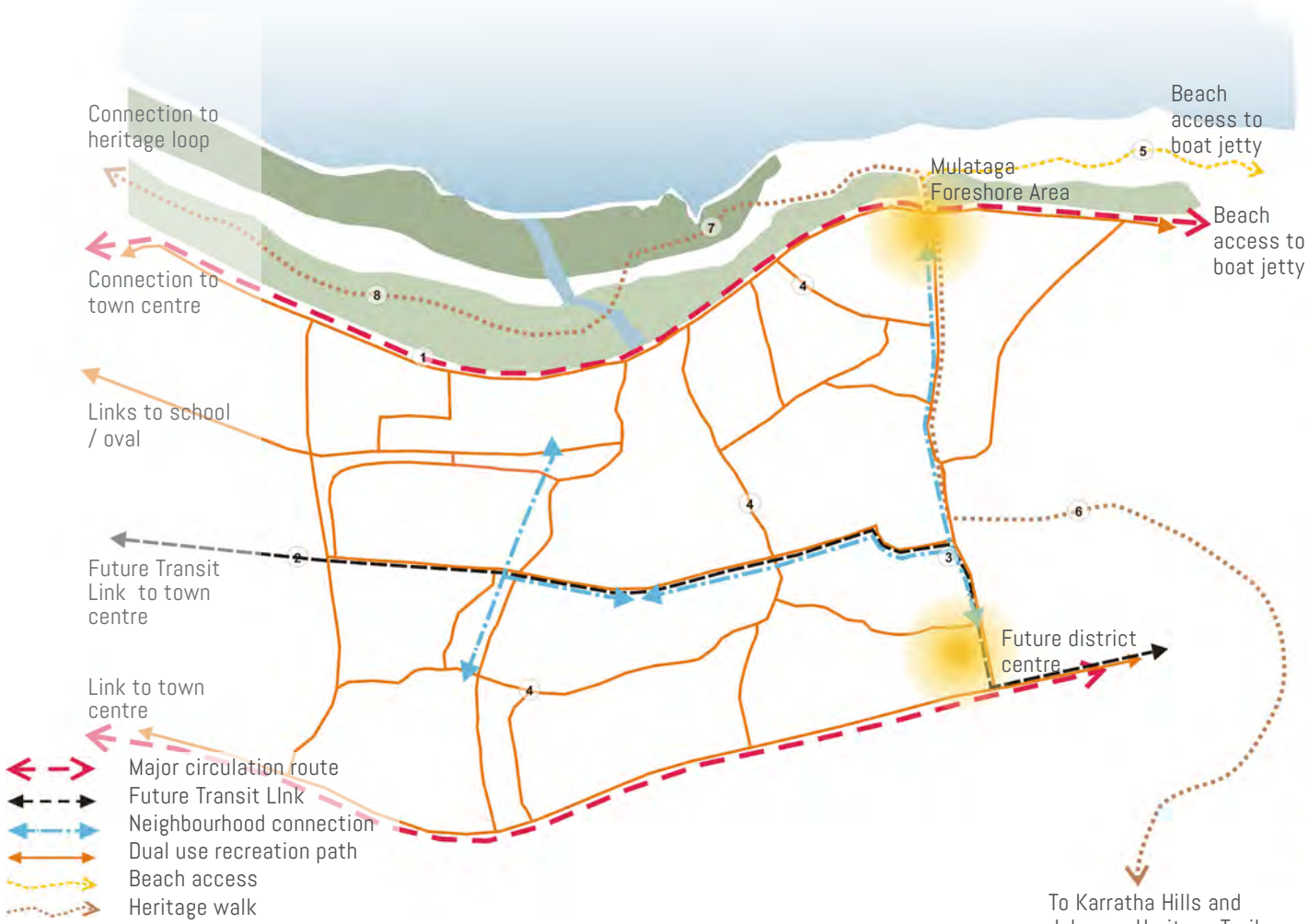
FENCE STYLE

Fences are to be low, maximum 1m and using a construction technique that allows clear visibility.

BOARDWALK AND INTERPRETIVE SIGNAGE

Incorporate board walks and interpretative signage at significant points.

PART B: LANDSCAPE MASTERPLAN




1. Major Circulation


2. Future Transit Link


3. Neighbourhood Connections


4. Dual use recreation paths


5. Beach Access


6. Connection to Jaburara Heritage Trail


7. Mangrove boardwalk


8. Foreshore dune walk

PLAN : DISTRICT CONTEXT CIRCULATION AND LINKAGES

The District Context Circulation and Linkages plan shown above illustrates the Mulataga Development and connection to surrounding areas; including the Jaburara Heritage Trail, Karratha Town Centre, District Sporting Precinct, Boat Jetty etc.

1.0 PLANNING DIRECTION

The district planning direction proposes a coastal node and primary school located within the Mulataga development site. The landscape strategy and amenity is to support these district community and visitor facilities.

CIRCULATION AND LINKAGES

The District Context Circulation and Linkages Plan (pg32) illustrates proposed connection to surrounding areas, including Yaburara Heritage Trail, foreshore, boat jetty, a future district centre and a central transit link back into Karratha City Centre.

PLAN : DISTRICT CONTEXT (Source: Courtesy of Roberts Day, 2012)


Saltwater Pool
'Iconic food/beverage facility'
Boardwalk through mangroves
Lookout
Path network
Natural creekbed
Entry statement
Primary School / Neighbourhood Park/Education & Community Node
Culturally significant area to remain as remenant vegetation
Entry statement
DP1
LC2
LP6
CS2
LP1
LP4
NP1
LP7
CS1
LC1
LP5
LP3
LP2
MAITLAND ROAD
MILLSTREAM ROAD
MYSTERY ROAD
LANDSCAPE MASTERPLAN
1:10,000 AT A4

2.0 LANDSCAPE MASTERPLAN

The landscape masterplan responds to Mulataga's richly layered landscape context and provides a framework for the following key strategy elements:

1. Cultural Context
2. Mulataga Creek | Multi-use Corridors - Better Urban Water Management
3. Streetscapes
4. Public Open Space Strategy
5. Typologies
6. Walkable catchments
7. Planting Strategy
8. Vegetation management
9. Watering
10. Weed Control
11. Plant Pallete
12. Developing Local Capacity

CULTURAL CONTEXT

As illustrated in the development plan, best efforts have been to taken, to align culturally significant areas with retained vegetation, retained creek lines areas, open space typologies and multi-use corridors. This careful alignment aims to avoid culturally significant areas with development areas as best practicable.

In areas where sites cannot be retained and the site is subject to salvage and relocation, this will be completed as stipulated within a separate Cultural Management Plan, to be closely undertaken with the Traditional Owners and as per conditions of the Aboriginal Heritage Act 1972.

It is envisaged there will be ongoing communication with the Traditional Owners, during all planning phases of the development, construction and post construction. E.g. Preparing and implementing a Cultural Management Plan, input and advice on landscape and environmental management, cultural heritage, public art and interpretation opportunities, edge treatments against creek line and significant areas etc.

Consultation and communication with the Traditional Owners will play a pivotal during all salvage and/or relocation procedures of culturally significant sites.

The map of cultrally significant areas on the adjacent page indicates the Aboriginal Sites recorded to a level of Site Identification Standards.

BETTER URBAN WATER MANAGEMENT

The Mulataga development area is susceptible to flooding. It has been noted that different elements of the existing landscape play an important role in slowing and redirecting overland sheet flow of water during high storm events. These include the creek line, the vegetated pindan plains and the front dunal system.

It is suggested that the streetscape and public open spaces will form a network of additional drainage systems that form an integral part of the water management strategy for the Mulataga development. As much as possible, residents will be encouraged to allow infiltration through the landscaping of the lots. However, in broad terms, the excess urban water run-off is directed from housing lot frontages directly onto the road easements where it is then transferred into endemically vegetated swales within multiple-use open space corridors that also consider active and passive urban open space amenity and uses.

BETTER URBAN WATER MANAGEMENT OBJECTIVES

Mulataga better urban water management objectives include:

- The provision of multi-use functionality considering the large area of land taken due to drainage constraints and opportunity to provide green infrastructure amenity;
- The opportunity for open space nodes and lineal connections and linkages throughout and beyond the development; and,
- Provide an urban water treatment train that contains volume, slows water and filters sediments and contaminates along its entirety.

The specialised north west designed swale system's main purpose is to transport water across the site and deliver downstream run-off water at a similar quality, velocity and volume as per pre-development. A vegetated retarding swale system reduces the amount of nutrient binding sedimentation leaving the site and the transportation of contaminates

CULTURALLY SIGNIFICANT AREAS

LEGEND

Anthropos sites recorded to site identification standard

Remnant vegetation

such as invasive weeds.

Standard urban development acknowledges that urban water flow velocity and volume increases, and the water quality decreases (containing more nutrients, silts and contaminants) and the volume will increase as areas available for bio-infiltration reduce. For this reason, greater pressure will be placed on Mulataga Creek. A series of in-line urban water drainage transfer and retention typologies will aid to balance this altered drainage system. Built structures are utilised to retard and slow water volumes within these swales and include concrete drop structures to maintain 1:700 - 1:1000 positive swale floor gradients. To retain areas of stored volume there is an opportunity to utilise weir structures that feature positive low flow devices such as V notches or low-flow apertures (average 300mm dia.). These weirs structures can be designed to contain up to 1:10 events with increasing flows until 1:100 events are allowed to overflow the structures and prevent upstream flooding.

Built weirs and rock pitching help prevent scouring and slow velocity to pre-development flows. Revegetation of these swales also aids these outcomes and provides a more aesthetically pleasing environment for residents as well as provided important habitat for native fauna.

Each typology of drainage opportunities and design responses will essentially mimic elements found with natural drainage systems. i.e. curvilinear design, vegetation to filter nutrients, and rocks/ debris to act as natural or formed weir systems slowing the velocity (reduces erosion and pressure on significant aboriginal sites)

Re-vegetation of the swale systems is a critical factor for Northwest drainage conveyance.

Vegetated swales provide the following better urban water management attributes:

- Stabilises swale bases and batters;
- Filters nutrient captive silts such as Karratha's pindan soils, which can starve downstream marine ecologies;
- Filters fine silts which if otherwise transported can clog up downstream drainage conveyances and waterways;
- Aids in providing natural drainage 'roughness' which reduces the velocity of overland flows; and,
- Reduces the distribution of potential contaminates and exotic weeds.

Vital to water quality, revegetation and protection of the drainage swale system, is the use of the local site mulch and topsoil collected prior to site bulk earthworks. Use of local site mulch and topsoil includes an endemic seed bank. This, along with appropriate supplemental planting, is fundamental to maintaining local biodiversity within the development area.

MULATAGA CREEK

The natural creek line serves an important water management role

and similarly contains a number of significant cultural sites that require preservation. For this reason, a 30m buffer from the edge of the creek bank is to be maintained to retain the existing creek line and preserver culturally significant areas.

The creek line runs predominantly south-north and is the point at which the inland fresh and saltwa ter meet. Essentially the creek line is a unique tract of naturally vegetated land, set aside to be retained without development.

The creek lines connecting the hills to the ocean are extremely important in directing and slowing water towards the ocean as well as filtering out the sediments that in large quantities can choke the nutrient balance and be detrimental to the mangrove and associated marine ecosystem.

Creek line considerations include:

- Maintaining existing creek line hydrology including topography and associated vegetation;
- Providing a creek line buffer that is defined by the 100-year ARI flood extent or alternatively a min 30m buffer from the creek centre line has been applied. In turn, preserve aligned culturally significant areas;
- Maintaining an important cultural and community connection to 'country'. The retention of a substantial portion of lineal local bushland that traverses across the development providing a mostly unhindered connection from the significant foreshore to the hills. This link provides Traditional Owners with the opportunity to continue a 'lifestyle' passing on cultural education and traditional practices as historically and presently practiced on this land;
- Incorporating areas of cultural and environmental interpretation within this preserved creek line corridor;

- Providing a lineal corridor habitat for flora and fauna and an opportunity to support biodiversity and natural drainage networks;
- Separating the urban fabric with informal passive areas and cultural significant areas through a variety of edge treatments and pedestrian pathways; and,
- Providing a strong sense of place for the development by maintaining this important open Pilbara creek line environment.

The area shall be further developed on the back of Traditional Owner design facilitated discussions however following preliminary talks it may comprise of a simple dual use path lineal edge treatment with a network of low maintenance desire line pats to enable appropriate and managed access.

A possible rural style low key perimeter fence around the creek lines will also discourage trail bikes and vehicles from entering; also, this fence treatment shall provide a respectful National Park type treatment.

Areas that have been degraded through earlier land uses and weed infestation are to be re-habilitated to an appropriate agreed standard.

URBAN WATER MANAGEMNET PLAN
1:10,000 AT A4

During and post development flows will differ. The water flow velocity will increase, the water quality will decrease (containing more nutrients and contaminants) and the volume will increase as areas avavilable for bio-infiltration are reduced. For this reason, greater presssure will be placed on the creeklines and a series of urban water drainage typologies will help deal with the changed system

LEGEND

Urban Water Management

Drainage path

MULTI-USE CORRIDORS

Multi-use corridors are provided throughout the Mulataga urban fabric to provide the future urban fabric with lineal linked green infrastructure programmes. These lineal corridors comprise a combination of retained existing vegetation, drainage swales, vegetated buffers and parks.

They provide a number of functions including:

- The provision of appropriate lineal space for the WSUD conveyance of urban water. This includes providing a North West urban water treatment train delivering pre-development water quality downstream over a similar timeframe, volume and velocity;
- Providing an urban green belt for built form relief and amenity;
- Providing local flora and fauna habitat corridors and linkages;
- Providing passive and active open space nodes with informal (grassed kick-about) areas and formally programmed, playground areas;
- Providing bike and pedestrian linkages through dual use paths suitable for walking, jogging, cycling etc. with rest areas, shade, lighting and water fountains; and,
- Opportunities for cultural and environmental interpretation including intergenerational education and community art projects. Multi use corridors also can link with significant sites.

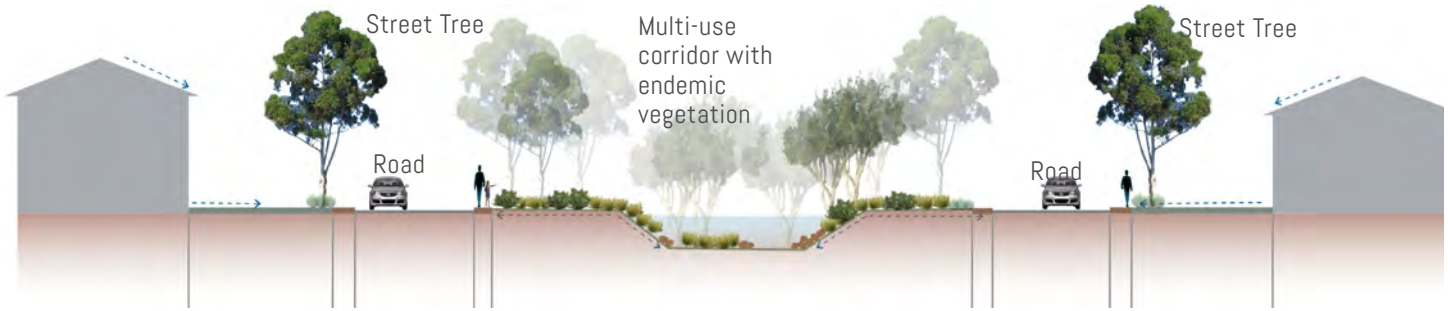
Lineal open space within this development moves past the concept of isolated pocket parks to a strategy of fluid environmental and social corridors recognising the provision of shade amenity and CPTED principles throughout.

A principle purpose of the multiple-use corridors is to retain drainage flow paths and aid in maintaining site flow rates as per pre-development. The design of the multiple-use areas ensures drainage requirements support habitat, cultural and open space uses. For example, during infrequent large storm events, gentle grading within these corridors, normally used for informal recreation, shall become low velocity, low depth conveyance and infiltration areas. Formal recreation areas such as playground equipment and park infrastructure are to be located on higher ground protected from water damage.

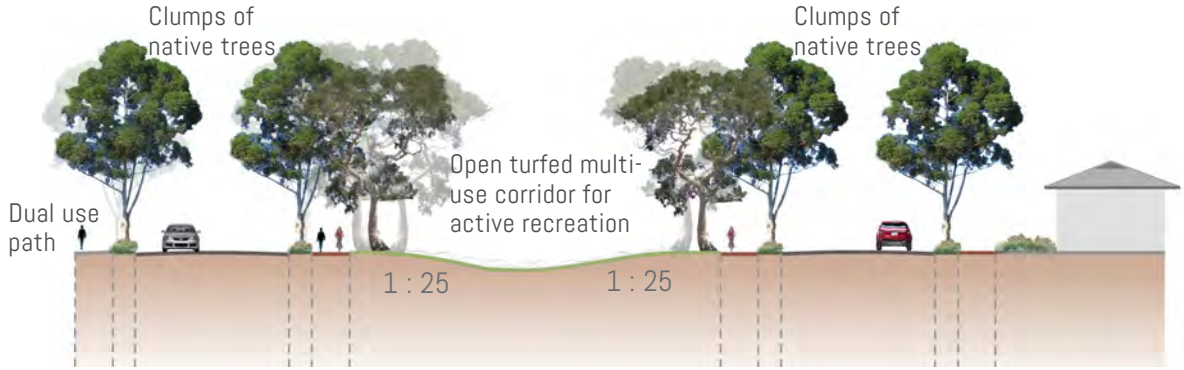
Slight batter grading coupled with retained and supplemented vegetation provides the opportunity to work with topography providing landscape interest and places for shaded seating and slightly elevated passive surveillance.

Multi use corridors offer strong opportunities for the new Karratha fabric to turn what once was considered unsightly drainage areas, to now an amenity or a green infrastructure asset.

Example of multi-use corridor in Broome



INDICATIVE SECTION - VEGETATED MULTI-USE CORRIDOR -
Drainage swale has endemic vegetation



INDICATIVE SECTION - TURFED MULTI-USE CORRIDOR -
Drainage swale has open turf area, which is part of POS and can be used for active recreation

SHADED STREETSCAPES

Within Mulataga there is an opportunity to provide urban relief through shaded streetscapes. While not spatially designed to be used as parkland, they will provide adjacent lot owners, pedestrians and visitors with an urban shaded and aesthetic relief. Trees will be formally planted to provide this amenity with mulch. Robust bollards/guards could be used as a means

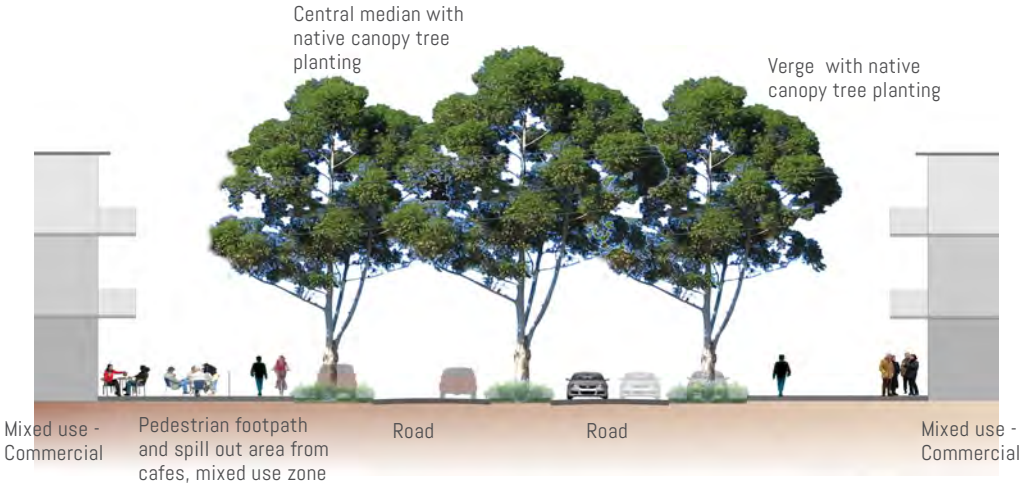
of increasing the perceived value of the trees and protecting them from vandalism and damage from large vehicles (particularly during residential construction).

It is proposed that linkages within the development will allow clear and direct movement through Mulataga, with a hierarchy of pedestrian path networks and clear cycle ways that link back to existing points of interest, Karratha Town Centre or heritage trails in Karratha.

While most public open space areas have been designed to utilise a local planting palette, in certain streetscape linkages it is considered appropriate to incorporate large tree species that are not endemic to the Kimberley region for provision of broader canopy shade amenity.

Locations such as the southern edge of Mystery Road is a prime example of where trees such as a Delonix regia could be used to indicate an important coastal road leading to the coastal node and provide a shaded promenade for pedestrians and cyclists. The seasonality of the orange flower would provide a stunning visual display at certain times of the year.

On lower level street typologies, endemic tree species could be used included Eucalyptus vitrix and Eucalyptus camaldulensis. If pruned and maintained correctly, these trees can become well established as a large shade tree that will add character and a local sense of place to the streetscape.

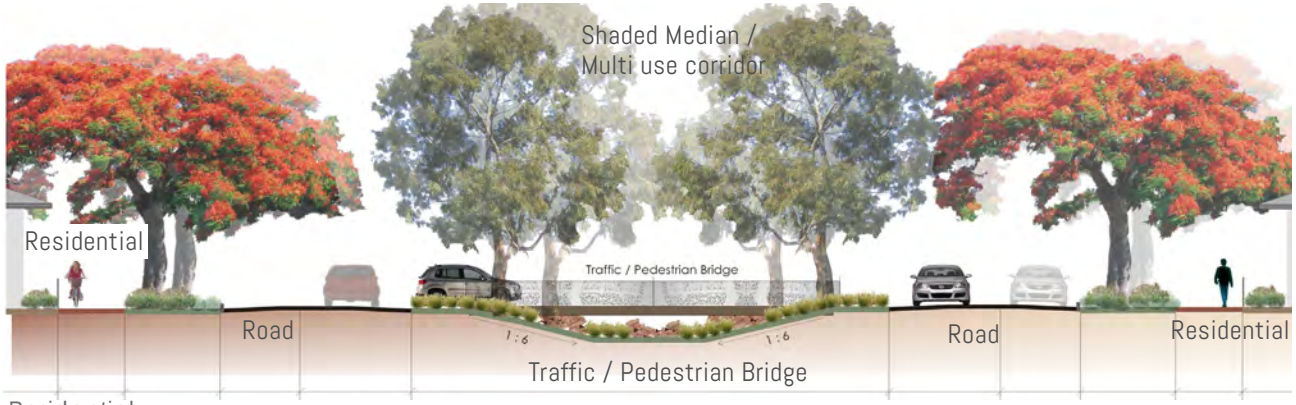


TYPICAL SECTION - COMMERCIAL ZONE
1:100

Location Plan NTS

TYPICAL SECTION - COASTAL PROMENADE - MYSTERY ROAD 1:200

Formal street tree planting along Mystery Road to create coastal promenade. Street tree to provide distinction between natural dune and urban edge, as well as providing significant shade and visual amenity



TYPICAL SECTION - NEIGHBOURHOOD CONNECTOR - BOULEVARD
1:250

Indicative Aerial Perspective of Mulataga Development (Source: Courtesy of Roberts Day, 2012)

PUBLIC OPEN SPACE (POS) STRATEGY

POS typologies are used within the Mulataga landscape strategy to guide types of nodal open space and park function. This is important to understand local/visitor catchments and expected passive/active facilities. The adjacent plan locates these typologies, their size and indicative POS amenity requirements.

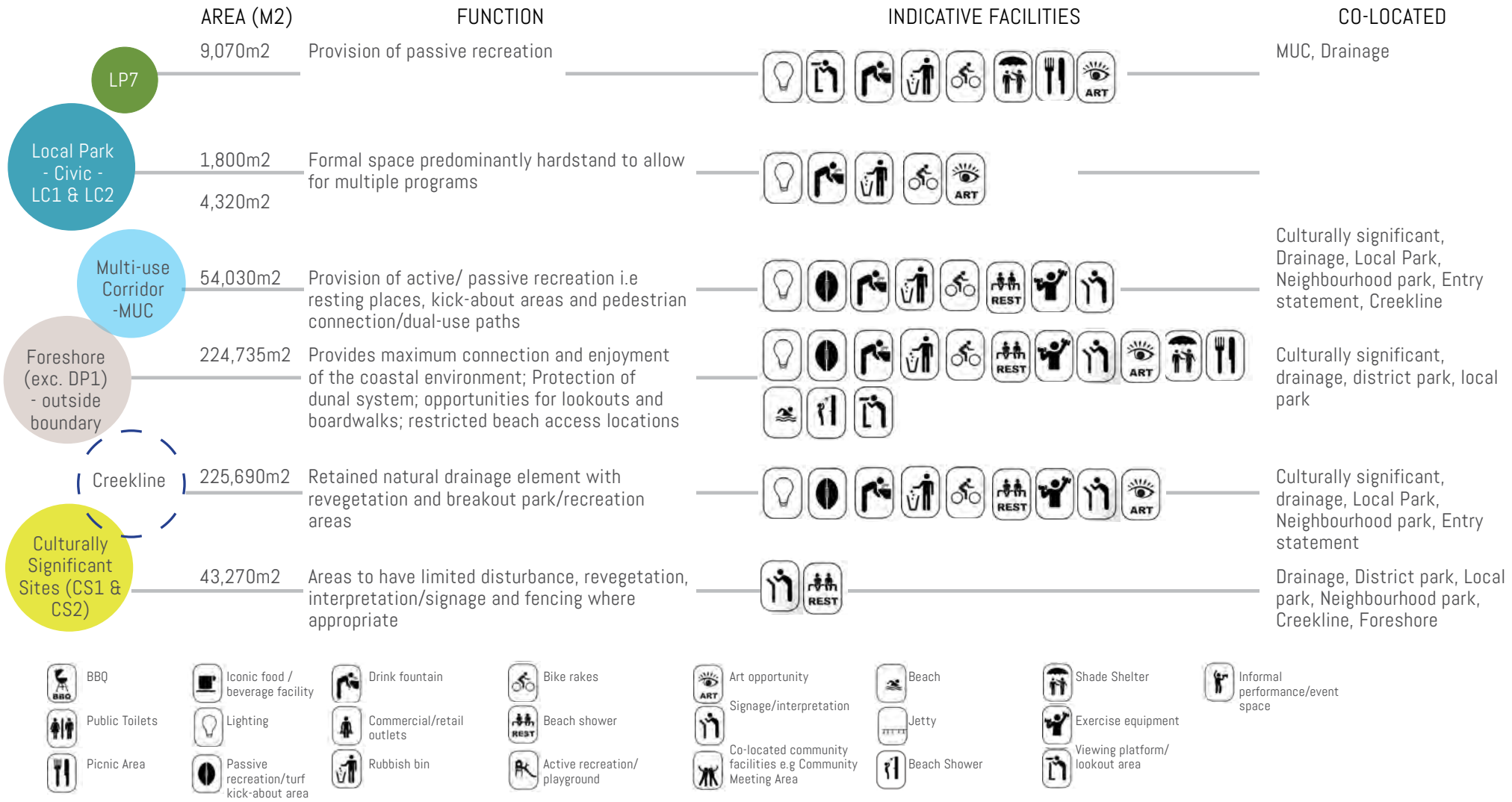
It is important to understand all nodal park typologies are linked as part of a greater Karratha recreational, open space circuit.

LEGEND

- DP1 District Park
- NP1 Primary School / Education & Community Node
- LP1 Local Park
- LC1 Local Park - Civic
- CS1 Culturally significant area
- MUC Multi-use Corridor
- Creekline
- ES1 Mulataga Entry Statement

Schedule of POS Strategy is schematic only and to be used as a guide only

	AREA (M2)	FUNCTION	INDICATIVE FACILITIES	CO-LOCATED
District Park - DP 1 (outside boundary)	15,900m2	Provides maximum connection and enjoyment of the coastal environment. This area would be the central 'hub' with mixed use commercial development, formal & informal landscaped spaces and the provision of passive and active recreation		Foreshore
Primary School/ Education & Community Node - NP1	Co-located with Primary School	Primary School/Education & Community Node. Possible opportunity for co-located facilities including possible Community Garden, Art & Learning Centre, Community Meeting Space, ArtSource etc as joint use facilities with the primary school		Culturally Significant, Creekline, Drainage
Local Parks				
LP1	4,145m2	Provision of active / passive recreation		Culturally significant
LP2	4,680m2	Provision of active / passive recreation		MUC, drainage, Cultrually significant
LP3	4,000m2 min	Provision of active / passive recreation		MUC, Drainage, Culturally significant, Creekline
LP4	4,000m2 min	Provision of active / passive recreation		MUC, Drainage, Culturally significant
LP5	6,060m2 min	Provision of passive recreation		MUC, Drainage, Culturally significant, Creekline
LP6	4,000m2 min	Provision of active/ passive recreation		MUC, Drainage, Culturally significant, Creekline


AREA (M2)
FUNCTION
INDICATIVE FACILITIES
CO-LOCATED
LP7
9,070m2
Provision of passive recreation
MUC, Drainage
Local Park - Civic - LC1 & LC2
1,800m2
4,320m2
Formal space predominantly hardstand to allow for multiple programs
Multi-use Corridor -MUC
54,030m2
Provision of active/ passive recreation i.e resting places, kick-about areas and pedestrian connection/dual-use paths
Culturally significant, Drainage, Local Park, Neighbourhood park, Entry statement, Creekline
Foreshore (exc. DP1) - outside boundary
224,735m2
Provides maximum connection and enjoyment of the coastal environment; Protection of dunal system; opportunities for lookouts and boardwalks; restricted beach access locations
Culturally significant, drainage, district park, local park
Creekline
225,690m2
Retained natural drainage element with revegetation and breakout park/recreation areas
Culturally significant, drainage, Local Park, Neighbourhood park, Entry statement
Culturally Significant Sites (CS1 & CS2)
43,270m2
Areas to have limited disturbance, revegetation, interpretation/signage and fencing where appropriate
Drainage, District park, Local park, Neighbourhood park, Creekline, Foreshore
BBQ
Public Toilets
Picnic Area
Iconic food / beverage facility
Lighting
Passive recreation/turf kick-about area
Drink fountain
Commercial/retail outlets
Rubbish bin
Bike rakes
Beach shower
Active recreation/ playground
Art opportunity
Signage/interpretation
Co-located community facilities e.g Community Meeting Area
Beach
Jetty
Beach Shower
Shade Shelter
Exercise equipment
Viewing platform/ lookout area
Informal performance/event space

DP1: DISTRICT PARK - MULATAGA COASTAL NODE PARK

(Schematic Only)

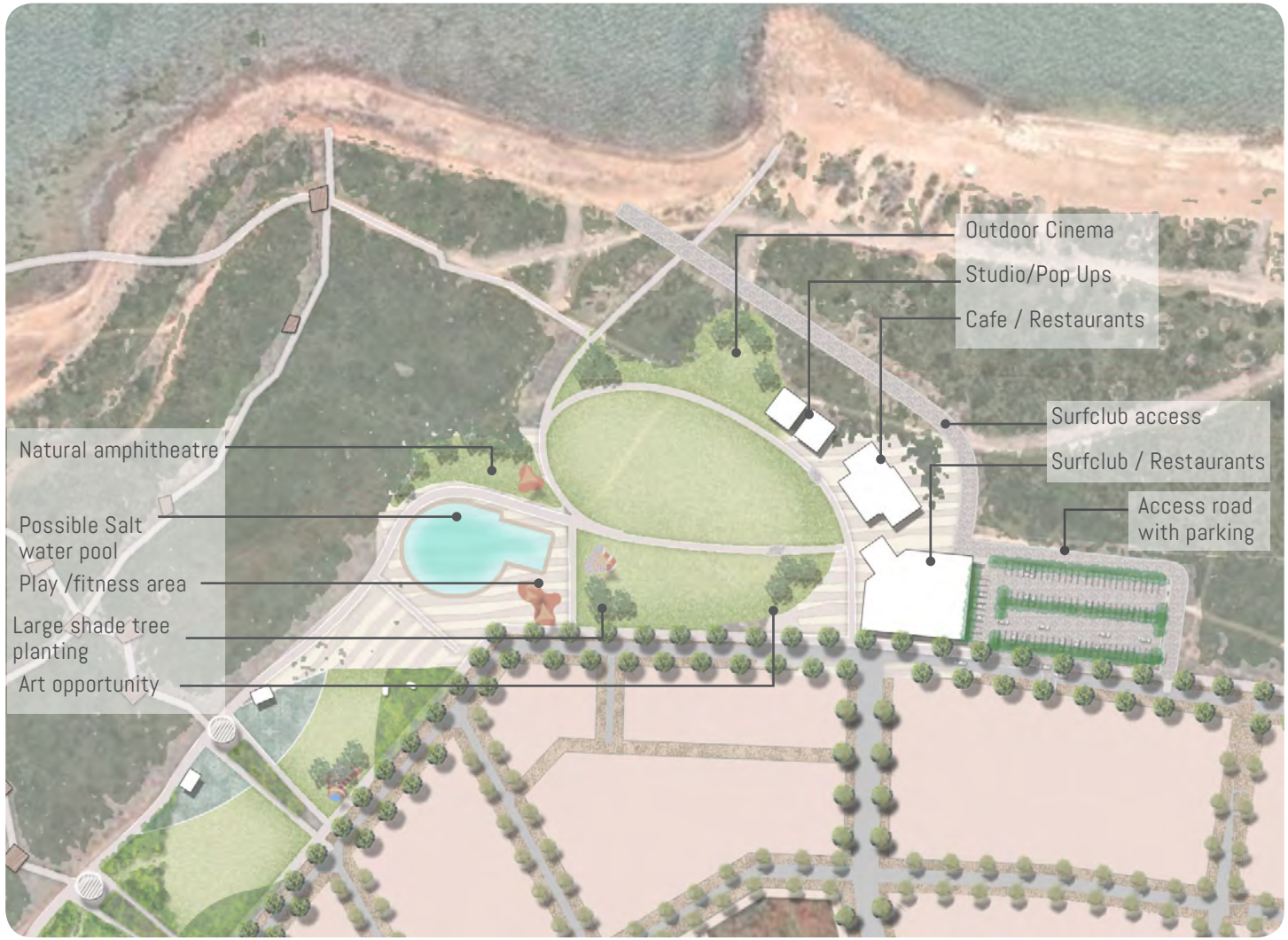
Provides maximum connection and enjoyment of the coastal environment. This area would be the central 'hub' with mixed use commercial development, formal & informal landscaped spaces and the provision of passive and active recreation.

Situated on the high nodal foreshore area, this location provides maximum enjoyment of the coastal environment by Mulataga residents, the greater Karratha community and visitors to the area. It is proposed that this location will have a small provision of mixed-use commercial development which will provide users with low key shopping and dining opportunities. (E.g. fish and chips, art gallery etc) Furthermore, a lease hold site tucked in behind the highest point will make the ideal location for an 'iconic food/beverage facility' style development. The overall response within this location will be the provision of formal and informal landscaped spaces that make the experience of the coast and beach highly accessible, with both passive and active recreational design outcomes.

The proposed activities to occur at the Mulataga Foreshore District Park include:

- Enjoying the water, dunes and mangroves by following the walk trails, board walks and lookouts through the site, reiterating the important connection the locals and the development have with the site's rich ecological features;
- Swimming in the beach and possible pool within foreshore setback;
- Formal play is allowed for by the provision of water play and formal play equipment;
- Informal play such as kicking the footy can occur on the open lawn areas;
- Picnics and BBQs can occur on the open lawn areas and under the shade structures;
- Events and performances can take place in the amphitheatre and stage area;
- Interpretation elements and artworks provide knowledge sharing opportunities;
- Lighting enables the site to be utilised both in the day and night;
- Areas of retained mature existing vegetation (providing existing shade and visual amenity).
- Provision of youth friendly facilities

Please note; the Mulataga Foreshore District Park Plan is schematic only and subject to further consultation / approvals with associated authorities. The foreshore setback pool is indicative and will be subject to future environmental, coastal engineering and planning investigations.



DISTRICT PARK - MULATAGA COASTAL NODE PARK (Schematic Only)

CNP1: COMMUNITY NODE PARK - PRIMARY SCHOOL / EDUCATION AND COMMUNITY NODE

(Schematic Only)

Within the subject site of the Mulataga Development, the primary school has been co-located with facilities to provide an active hub and landscape amenity for residents and students, as well as, having a strong environmental and sustainability focus.

It is proposed the primary school will be approximately 4Ha in size. The Primary School / education and community node is located to the West of the natural creek line. This node will be bounded on three sides by roads to provide easy access and clear 'drop off' zones for parents and teachers.

To the south of the site, and on the main access road, it is suggested community facilities are co-located with the primary school buildings and include possible; library and cafe. It is envisaged these facilities should be aligned with road frontages, to create an active civic hub that can be utilised, not only by people involved with the primary school, by also the wider community. Therefore, engaging with the wider community, and becoming an active hub outside of school hours.

A senior football oval and possible associated school gym / clubhouse are located further north, with associated surrounding landscape area and flexible playscape. Not only will these areas be important facilities for the school curriculum, but also be family friendly and accommodate wider community activities during the weekend.

It is envisaged the primary school / education and community node will offer a high level of usable space and may feature the following amenity:

- Formal recreation areas that cater for varies ages and abilities including younger children with age appropriate play equipment and natural play elements;
- Opportunity to provide co-located community facilities such as; Community Meeting Space, Arts and Learning Centre, Community Garden etc which can be linked into the site;
- Seating, picnic and BBQ facilities would be positioned under shade structures;
- Grassed open space areas for active and passive recreation. Some of these areas have interesting topographical changes;
- Strong path networks that link to the immediate community and beyond via the connected multiple-use corridors;
- Areas of retained mature existing vegetation (providing existing shade and visual amenity);
- Hard-stand areas which use local concrete and aggregates, with further rest areas consisting of local gravels and/or compacted, stabilised pindan;
- Opportunities for lawn irrigation hydro-zoning according to active and passive uses; and,
- Interpretation and art opportunities as developed with the Traditional Owner's, community and within the proposed art strategy. Opportunity to link this in with the school curriculum.

All elements will be subject to further liaison with Department of Education, City of Karratha and other stakeholders allowing for different initiatives to be further considered and their appropriateness determined.

Through the 'joint use' POS development, comprising a primary school, co-located facilities and landscape amenity, there is strong opportunity for this key node to be engaged by the wider community and become an active hub outside of school hours for all Mulataga residents and the wider Karratha community.

Please note; the Plan of the Primary School / Education and Community Node is schematic only. This will be subject to further consultation and approvals with appropriate authorities including the Department of Education and the City of Karratha. Furthermore, the road alignment to the East is indicative only, with the exact location being determined through S18 approvals. This area will require a Detailed Area Plan in accordance with the Part 1 Statutory Provisions.

Multi-use corridor with endemic vegetation and dual use path

4ha boundary

Indicative co-located community facilities. Opportunity to provide facilities including possible Community Meeting Space, Arts & Learning Centre, Community Garden etc as 'Joint Use' facilities with the primary school.

Senior Oval

Junior Oval

Indicative landscape amenity area around oval, including playground, garden bed and feature planting, hardscape areas etc.

Schematic location of school buildings. It is suggested buildings are located close to the street to create an active street edge and civic hub

PRIMARY SCHOOL / EDUCATION AND COMMUNITY NODE (Schematic Only)

Please note; the Plan of the Primary School / Education and Community Node is schematic only. This will be subject to further consultation and approvals with appropriate authorities including the Department of Education and the Shire of Roebourne. This area will required a Detailed Area Plan in accordance with the Part 1 Statutory Provisions.

Plan

1:2000 at A4

LP1-7: LOCAL PARKS

(Schematic Only)

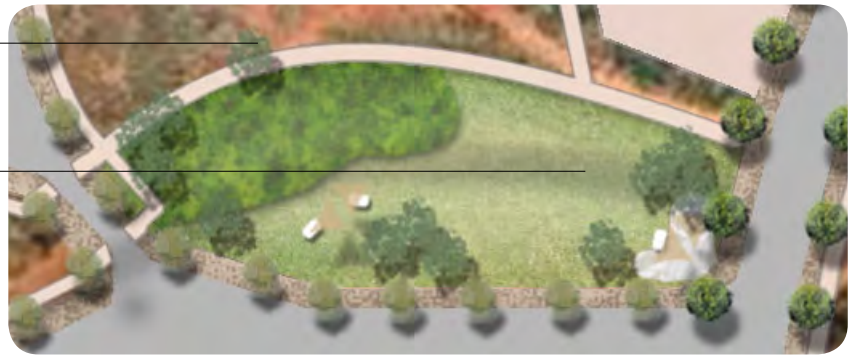
There are 7 local parks have been strategically located across the Mulataga site to ensure all residents are within walking distance from a local park. Generally, these parks are located within the 'multi-use corridor' and provide drainage solutions in the form of a usable grassed area. Aside from the drainage amenity local parks provide essential active and passive recreation and service to local residence including:

- Formal active recreation such as play equipment and exercise equipment;
- Informal active / passive recreation including grass kick-about areas, picnic areas and resting places;
- Strong path networks that link to the immediate community and beyond via the connected multiple-use corridors;
- Areas of retained mature existing vegetation (providing existing shade and visual amenity);
- Hard-stand areas which use local concrete and aggregates, with further rest areas consisting of local gravels and/or compacted, stabilised pindan; Opportunities for lawn irrigation hydro-zoning according to active and passive uses; and,
- Interpretation and art opportunities as developed with the Traditional Owner's, community and within the proposed art strategy. Please note, all local park plans are indicative and schematic only and are subject to further consultation and approval by relevant authorities.

LOCATION PLAN NTS

Clumps of native trees in culturally significant area

Open grass kick about area and multi use corridor



PLAN - LOCAL PARK 2
1:2000 AT A4

Dual use path system

Existing creek

Shade structure and playground

Open lawn area

PLAN - LOCAL PARK 3
1:2000 AT A4

Shade structures and seating areas

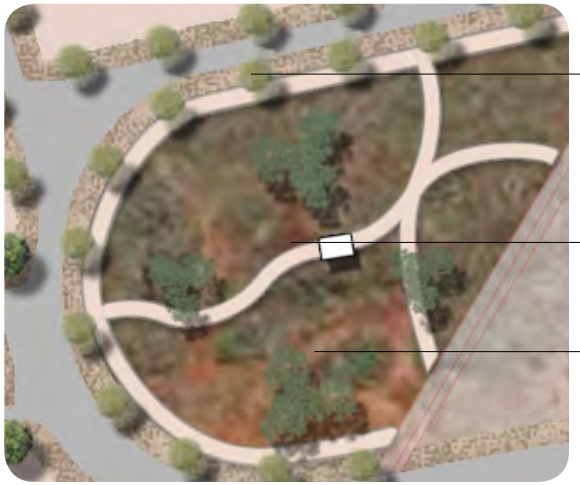
Clumps of native trees

Open grass kick about area and multi use corridor

PLAN - LOCAL PARK 1
1:2000 AT A4

PLAN - LOCAL PARK 4
1:2000 AT A4

PLAN - LOCAL PARK 5
1:2000 at A4



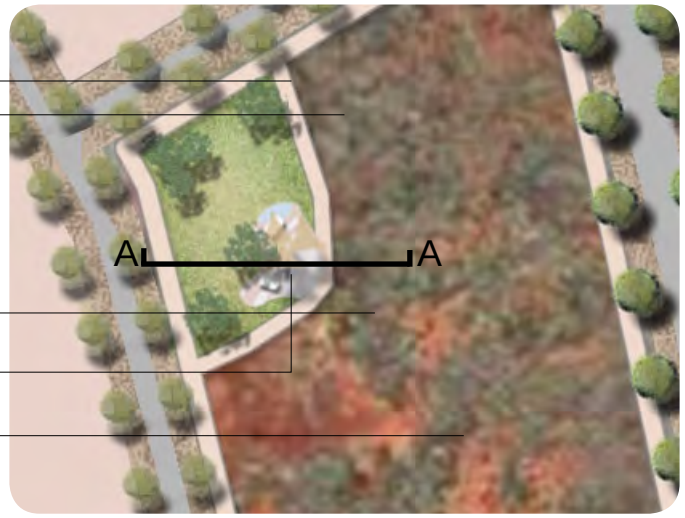
PLAN - LOCAL PARK 7
1:2000 at A4

Dual use path
Low fencing to control access TO Culturally significant area,

Open grass kick about area

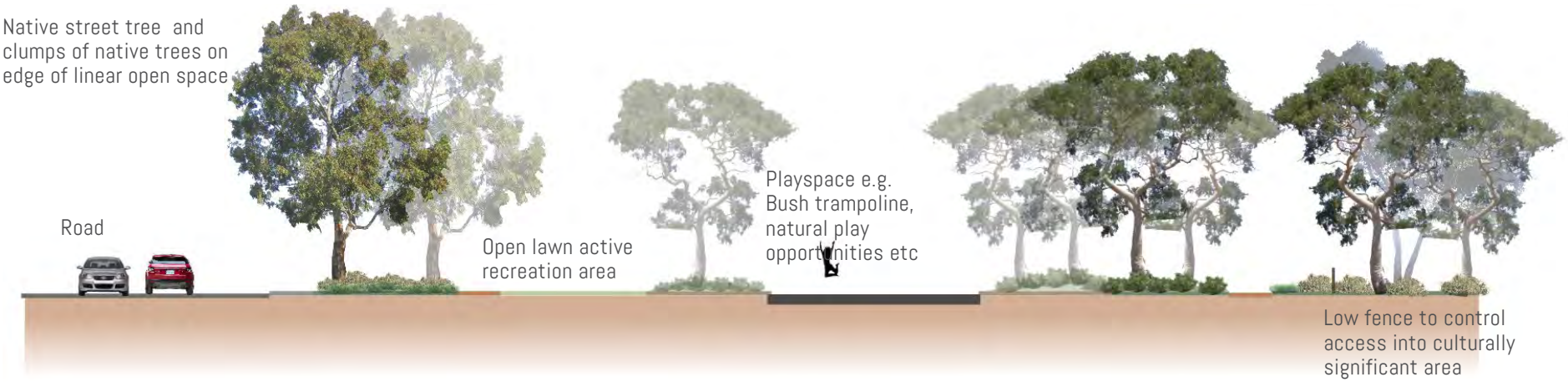
Playspace and shade structure

Culturally significant area with retained vegetation



PLAN - LOCAL PARK 6
1:2000 AT A4

Native street tree and clumps of native trees on edge of linear open space



INDICATIVE SECTION AA- LOCAL PARK 6
NTS

CLP1-2: CIVIC LOCAL PARKS

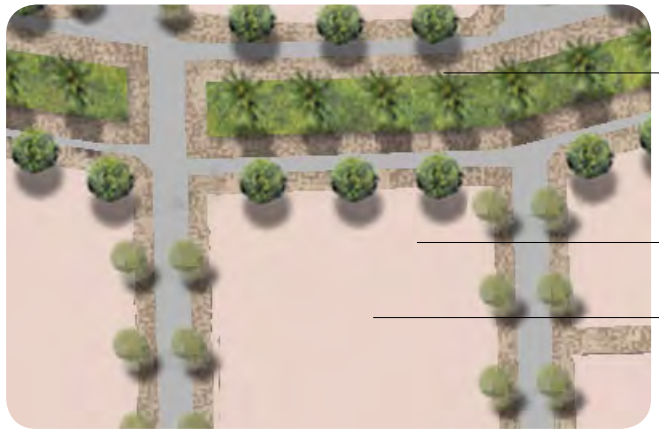
(Schematic Only)

Two civic local parks occur within the Mulataga development and provide a formal space with larger areas of hardstand for multiple programs to take place. They are predominantly located in high density commercial areas or located near the schools and provide the following amenity:

- Hardscape or paving areas for spill out from commercial areas such as cafes and restaurants;
- Formal seating areas;
- Grid like tree planting in local compacted gravels; and,
- Formal raised grass beds for informal meeting and gathering opportunities.

LOCATION PLAN NTS

(Right and above) Indicative style images of Local Park - Civic, including open hardscape paving area, gridded trees to provide shade



Shaded median and drainage treatment area

Hardscape area for flexible activies

Raised planting area with lawn to create informal seating area

PLAN - LOCAL PARK - CIVIC 1
1:2000 at A4

Coastal Promenade

Street trees chosen for shade amenity

Raised planters and lawn areas

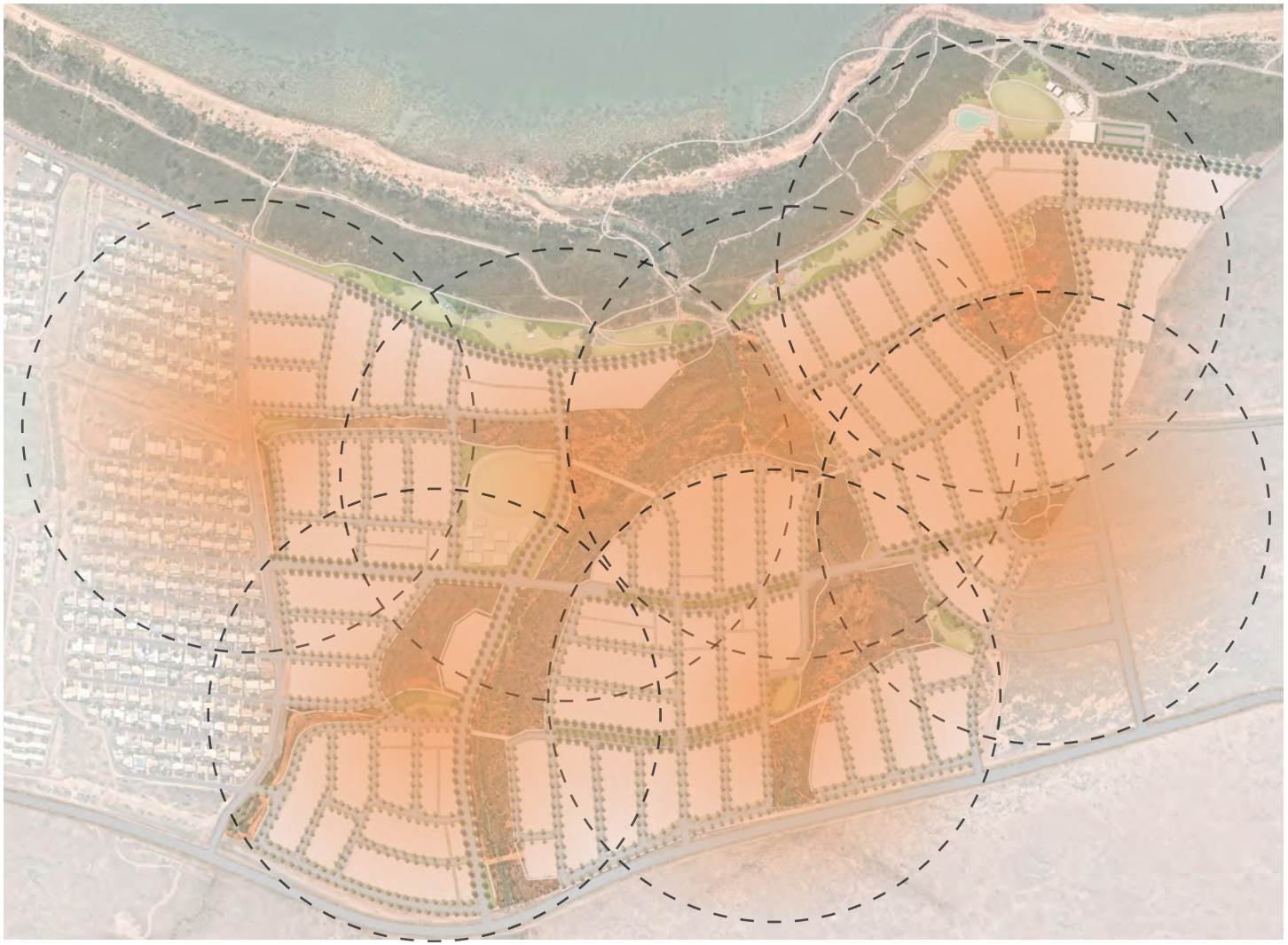
PLAN - LOCAL PARK - CIVIC 2 ALONG COASTAL PROMENADE
1:2000 at A4

WALKABLE CATCHMENTS

The adjacent walkable catchments plans indicates a 400-800m walkable catchment for locating high amenity POS areas.

LEGEND

800m DIA Walkable Catchment Area



800M DIA WALKABLE CATCHMENTS

LEGEND

400m DIA Walkable Catchment Area

400M DIA WALKABLE CATCHMENTS

PLANTING STRATEGY

VEGETATION MANAGEMENT

The Mulataga development site area features existing vegetation typical of a low and open Pindan Woodland plant ecology with scattered trees and dominate Spinifex species grassland. Other vegetation communities found within the development area include creek line environment consisting of taller trees such as the Eucalyptus camaldulensis and Eucalyptus vitrix / papuana, dunal environment consisting of shrubs, grasses and groundcovers including the recognizable Sturt Desert Pea (Swainsona formosa) and local food sources (bush onion) and finally the mangrove environment which provides habitat to a range of local fauna. Retaining as much of this vegetation as possible has many benefits such as:

- Reduced erosion and a reduction in soil run-off into adjacent sites, waterways and the downstream marine ecology;
- Weed control;
- Maintaining flora and fauna biodiversity, including the critical specialised local habitat;
- Immediate site maturity and a local sense of place;
- Shade and visual amenity;
- Cost savings on clearing;
- Respect of Traditional Owners ethno-biological 'connection to country' and continuing 'lifestyle';
- Allowing for the fast creation of multiple-use open space areas for recreation, drainage, flood control, dual use pathways and circuit linkages.

In order to realise these benefits, significant individual trees and vegetation areas within the Mulataga site area will need to be protected and integrated into the design of the public open space areas. The two broad areas that require protection are along the creek lines running through the site and along the foreshore dunal system.

In areas where plants are established in a more formal situation it is important the correct pruning strategies are employed to avoid unsightly or dangerous situations.

Endemic vegetation

WEED CONTROL

Introduced weed species reflect the extent of disturbance as a result of land clearing, vehicle access, rubbish dumping and infiltration from the surrounding exotic gardens. Fortunately, the site is not displaying a large population of weed species currently, despite the evidence of unrestricted access and rubbish on site. However, to reduce the increase and spread of weed species, the following management and control actions should be adopted:

- Minimising clearing where possible (during the construction period);
- Where possible, using existing tracks and roads, preventing uncontrolled access to the site and minimising the number of new tracks required;
- Ensuring cleared vegetation and topsoil (if contaminated with weed seed) is removed and disposed of at Shire approved dumpsites;
- Ensuring all vehicles and

machinery are cleaned of plant material and soil before and after entering the site (in particular when working along the perimeter of the site or in areas noted to have an invasive weed presence);

- Imported soils and materials should be certified weed free;
- All litter and waste materials should be contained and removed off-site regularly.
- General vegetation mitigation for the area would include the following:
- Manual/physical selective removal of weeds;
- Weed spraying using the industry's best practice and appropriate regimes (e.g. use non-residual glysophate based herbicide sprays, limit herbicide overspray, herbicide only applied by a by qualified technician, use of an appropriate herbicide near waterways etc.);
- Regular verge slashing of invasive grasses/low shrubs before seeding occurs; and
- Controlling declared plants under the Agriculture and Related Resources Protection Act, 1976, using recommended methods outlined by the Western Australian Department of Agriculture and Food.

WATERING

Commitment to water conservation is inherent in the design and management of the streetscapes and public open spaces of Mulataga. Landscape Water Management strategies include the following:

- Use of endemic species within the development that require a local climate based low water-use and nutrient use regime;
- 80% percent of planting is mostly re-vegetation with drip irrigation turned off once planting is established (2 years);
- Lawn areas are minimised using arid suitable species.
- The irrigation schedule for most planting is daily during a 13-week establishment period and then reduced to irrigating twice a week or less, as required;
- During the maintenance period the assessment of water needs of the plants will be amended on a regular basis and the watering adjusted accordingly
- Irrigation to residential street trees is to be established as part of a residential rebate package and will be the responsibility of the residence for watering and establishment
- The irrigation systems will be designed in accordance with City of Karratha standards and specifications.

Swainsona formosa - Sturts Desert Pea

PLANT PALETTE

A plant palette consisting of local, endemic species has been largely adopted for the development area. Endemic species are adapted to Karratha's environmental conditions, require less ongoing maintenance and provide habitat for fauna.
The requirements of a local plant palette will also support the growing Northwest landscape industry, by further establishing local plant awareness and stocks.

These can be used for supplementation and for establishment within the creek lines, urban drainage swales, multi-use corridors and pocket parks. Local vegetation within the multiple-use corridors and parkland

is environmentally crucial for maintaining local habitat and biodiversity. Retaining and supplementing local endemic vegetation supports Traditional Owners cultural practices and the opportunity to maintain a 'sense of place' and 'lifestyle'.

Exotic Shade Tree species may include the following:

EXOTIC SHADE TREES

Delonix reginae	-Royal Delonix
Peltophorum pterocarpum	-Yellow Flametree / Yellow Poinciana
Tipuana tipu	-Tipuana / Pride of Bolivia

Endemic species may include the following:

TREES

Acacia aneura	-Mulga
Acacia coriacea	-Desert Oak/Dogwood
Brachychiton australie	-Rock Kurrajong
Brachychiton gregorii	-Dessert Kurrajong
Corymbia aspera	-Brittle Bloodwood
Corymbia deserticola	-Desert Bloodwood
Corymbia terminalis	-Bloodwood
Eucalyptus alba	-White Gum
Eucalyptus camandulensis	-River Gum
Eucalyptus dichromophloia	-Variable Barked Bloodwood
Eucalyptus leucophloia	-Snappy Gum
Eucalyptus papuana	-Ghost Gum
Eucalyptus pattellaris	-Weeping Box
Eucalyptus victrix	-Coolibah
Lyslphyllum cunninghamii	-Native Bauhinia
Melaleuca leucadendron	-Cadjeput

LOW SHRUB & GROUNDCOVER

Acacia adoxa Pedley var. Adoxa	-
Acaci adoxa var. Subglabra	-
Acacia ancistrocarpa	-Fitzroy Wattle
Acacia arids	-Arid Wattle
Acacia bivenosa	-Dune Wattle
Acacia gregorii	-Gregory's Wattle
Acacia hilliana	-Tabletop Acacia
Acacia sclerosperma	-Limestone Wattle
Acacia translucens	-Poverty Bush
Acacia wanyu	-Wanyu
Acacia xiphophylla	-Snakewood
Alyogyne hakeifolia	-
Capparis spinosa	-Caper Bush
Cymbopogon ambiguous	-Scent (Lemon) Grass
Eremophila glabra	-
Eremophila macdonnellii	-
Enchylaena tomentosa	-Barrier Salt Bush
Eremophila maculata	-Spotted Emu Bush
Eremophila pterocarpa	-Silver Poverty Bush
Grevillea wickhamii	-Wickham's Grevillea
Gomphrena canescens	-Batchelors Buttons
Halgania sp.	-Halganias
Ipomoea muelleri	-Native Morning Glory
Maireana georgei	-Satiny Bluebush
Myoporum parvifolium	-Creeping Boobialla

Delonix regia is a suggested tree species for statement tree planting and shaded promenades such as along Mystery Road. The juxta position of this seasonal promenade on the southern edge of Mystery Road, with the low natural dunal vegetation planting palette on the northern edge would be visually stunning for people using the coastal road.

Delonix regia, a great shade tree which preforms well in the Pilbara

DEVELOPING LOCAL CAPACITY

Due to the longevity of the Mulataga development (10-15 years) this project offers an exciting opportunity to build local community and industry capacity. It is proposed that Karratha key industry development is a high priority for the Shire of Roebourne, Partner Developer and associated consultants. This capacity building objective can be achieved through early support and ongoing engagement with the local construction and landscape industries, including cultural and artist opportunities.

Landscape Architects in their broad consultant role have a unique opportunity to develop industry and community capacity as they tend to be with the project from planning to well after construction and ongoing maintenance periods. In their place making role LA's tend to develop strong local relationships and able to link key tasks with local opportunities. The opportunity to support existing local industry or incubate new industries through finding local champions is rewarding, leaves behind a positive legacy and will be a key indicator as to how successful this development process was.

Key industry and community capacity building opportunities within the Mulataga project include developing construction/landscape material resource industries including:

- Building materials
- Nursery stock
- Landscape materials
- Irrigation suppliers
- Paving, concrete and aggregate suppliers
- Fence suppliers
- Etc.

Broader industries include:

- Land Management
- Foreshore Management
- Cultural Management
- Marine Management
- Public Artists
- Etc.

Off the back of suppliers comes a local industry opportunity including:

- Nurseries
- Structural Landscapers;
- Maintenance Landscapers
- Concreters
- Pavers
- Fencing
- Etc.

Sustainable development of local capacity requires seeking local business outcomes by supporting key industry 'champions' with special attention on local indigenous empowerment and employment.

Learning about the site from Traditional Owners

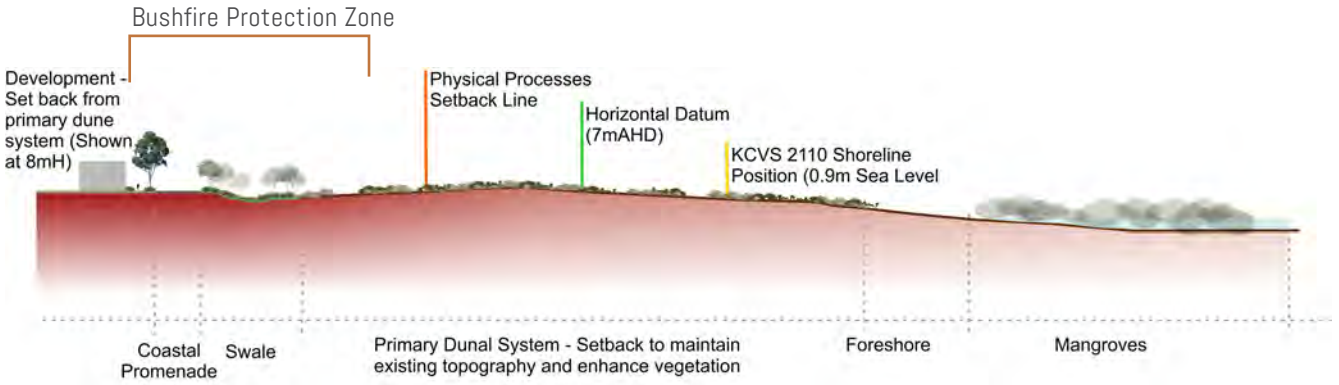
3.0 BUSHFIRE MANAGEMENT

Developing in bushfire prone areas can unfavourably affect the retention of indigenous vegetation through clearing associated with Asset Protection Zones (APZ's). The Landscape Strategy understands that these endemic vegetated corridors may join offsite vegetation and provide a conduit for fire to enter the site in proximity to proposed development areas.

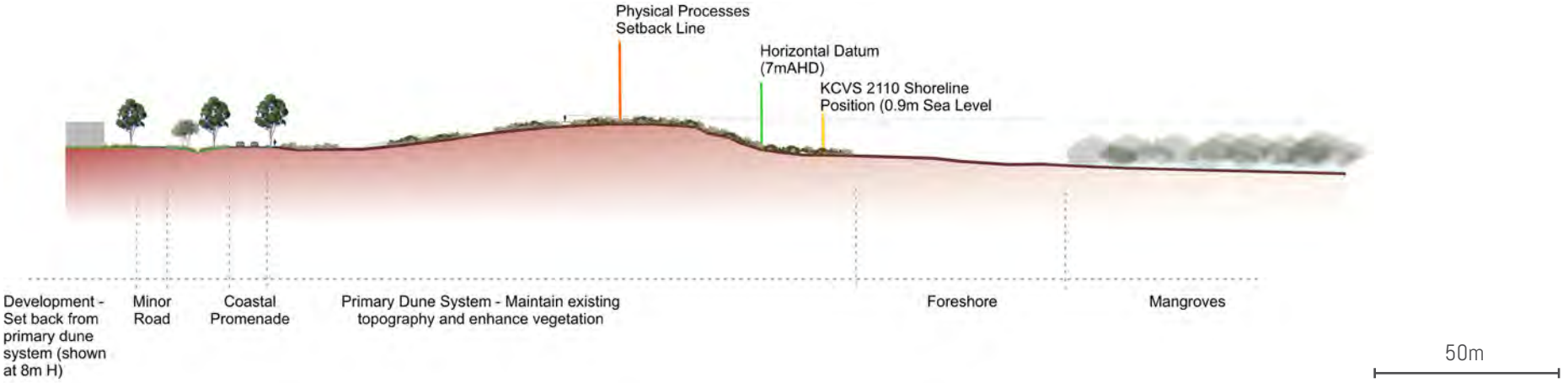
The Mulataga development site requires culturally significant areas, creek and ocean foreshore riparian buffers to be retained and regenerated. This will require appropriate APZ setbacks to be applied through use of cleared and managed road easements with edges identified or demarcated by constructed pedestrian paths.

Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available design options to minimise the removal of native vegetation. Where applicable, any such areas will be identified in the Bushfire Management Plan and their impact on the assessment and future management accounted for through management setbacks or the construction of building being undertaken to a standards corresponding to a higher Bushfire Attack Level (BAL) rating as per BCA (AS 3959-2009 and/or NASH Standard).

Endemic vegetation



SECTION AA HIGH WESTERN DUNE



SECTION BB LOW CENTRAL DUNE

PART C: FORESHORE MANAGEMENT PLAN

1.0 INTRODUCTION

PURPOSE

The purpose of the Strategic Foreshore Management Plan is to provide a framework for the ongoing use and management of the Mulataga foreshore.

The Strategic Foreshore Management Plan is founded on the following components:

- A vision (a clear statement of overall intent);
- A set of management objectives that guide the vision;
- A clearly defined implementation methodology Coastal management guidelines that once implemented will work towards the achievement of the objectives; and,
- A clearly defined implementation methodology.

VISION

To manage the Mulataga foreshore in a sustainable manner, recognising the significance of the foreshore and coast to the Ngarluma Traditional Owners, the high conservation and asset value of the coast, (in particular the mangroves areas) and the need to provide for a range of compatible recreational opportunities so the foreshore is integrated with the Mulataga residential project but also future generations to enjoy the coast and its values.

MANAGEMENT OBJECTIVES

The objectives underpinning the vision are:

Protect coastal landform and vegetation of high conservation (in particular mangrove system) and as necessary undertake remedial measures to repair any damage;

- Protect places of cultural significance;
- Provide a range of passive and active recreational experiences within the foreshore appropriate to the coast without compromising the conservation or cultural values of the foreshore;
- Plan and facilitate development that is compatible with the environment; and,
- Provide the opportunity for public comment on the management of the foreshore and public involvement in its management.

IMPLEMENTATION METHODOLOGY

In regard to the Mulataga foreshore area, the increased demand for beach usage associated with urban development and improved access to the foreshore requires a specific management plan to address the social and recreational needs of both local and regional beach users, whilst respecting and safeguarding the cultural and environmental integrity of the foreshore.

The guidelines defined in this Strategic Foreshore Management Plan will be implemented through detailed foreshore management plan(s) and a specific coastal node management plan. These plans will be triggered by subdivision of the Mulataga residential development immediately adjacent to the foreshore or in the case of the coastal node the submission of a Development Application.

GOVERNANCE

At present the management of the Mulataga foreshore is vested with the Shire of Roebourne.

In regard to the proposed Coastal Node the Shire of Roebourne would be responsible for the establishment and approval of

any proposed development within the foreshore reserve. The community / commercial recreation area would likely be developed under an agreed lease arrangement with the Shire

of Roebourne and is a similar arrangement with other established coastal nodes in the Perth metropolitan area.

As interest is shown there is a future possibility to share or hand over foreshore management to a Coastal Management Body possibly made up of DEC, Ngarluma Traditional Owners (Rangers), or CoastCare, with the opportunity to potentially provide a stronger ownership and specialised management service for Mulataga and the greater foreshore area.

PLANNING FRAMEWORK AND RELEVANT GUIDELINE DOCUMENTS

The foreshore environment is comprised of the following land parcels;

- Part of Lot 4932 on Plan 38691; and,
- Part of Lot 7900 on Plan 71098

Under the City of Karratha's Town Planning Scheme No. 8 Amendment No. 26, the foreshore environment is currently reserved for the purposes of 'Conservation Recreation and Natural Landscapes'

MULATAGA DEVELOPMENT PLAN

The Mulataga residential project is a West Australian Government backed initiative in partnership with City of Karratha and DevelopmentWA, to transform a former sheep station on the eastern edge of the Karratha town site into a new beachside residential community of approximately 1,600 dwellings. The project is part of the State Government's "Pilbara Cities" initiative.

The project site is approximately 168 ha and extends between Maitland Road and Mystery Road, with Nickol Bay forming a coastal backdrop to the north.

STATE COASTAL PLANNING POLICY
(Statement of Planning Policy 2.6)

The policy requires strategic plans to guide local planning, development setbacks for protection against coastal processes such as erosion and storms, and the provision of coastal foreshore reserves.

Guidance is provided on determining setbacks. The preparation of coastal planning strategies or coastal foreshore management plans in partnership with the broader community is also strongly advocated.

The policy provides high order guidance for decision making on coastal planning matters and applies statewide. Implementation will be through local government town planning schemes, and regional and local strategies.

The objectives of this policy are to:

Protect, conserve and enhance coastal values, particularly in areas of landscape, nature conservation, indigenous and cultural significance;

Provide for public foreshore areas and access to these on the coast;

Ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities; and,

Ensure that the location of coastal facilities and development takes into account coastal processes including erosion, accretion, storm surge, tides, wave conditions, sea level change and biophysical criteria.

2.0 MULATAGA FORESHORE CONTEXT

SITE DESCRIPTION

Mulataga's foreshore is a part of the Nickol Bay marine environment. The foreshore consists mostly of a large dunal system that contains a mangal ecosystem which is understood to provide habitat for shellfish, mud crabs and coastal fisheries.

The implementation of the proposed Mulataga residential development will involve the development of the area directly adjacent to the foreshore reserve and will increase the pressures on the area as new residents of the Mulataga and surrounding residents of Karratha seek to access the beach. The area covered by the Mulataga Strategic Foreshore Management Plan is approximately 52ha in size and has a 2.06Km stretch of foreshore environment that lies directly adjacent to the north of the Mulataga Development Plan area.

The foreshore environment is bounded to the north by the Indian Ocean and continues to the west and east of the area that is the subject of this plan. For the purpose of this Mulataga Strategic Foreshore Management Plan area includes;

- Beach and foreshore dune system;
- Creek inlet and associated riparian vegetation;
- Mangroves (2 species present);
- Intertidal areas and mud flats; and,
- Immediate aquatic marine environment.

In planning for the Mulataga foreshore area it is important to understand the nature of the beach and its potential to be a focus for people both locally and regionally. Three distinct areas of foreshore have been identified, characterised by the nature of the existing environment, type of beach setting and the opportunity to offer a range of beach experiences (see adjacent plan).

AREA 1: NORTH WEST LOOKOUT & AREA 2: CREEK MEETS THE OCEAN

Areas 1 and 2 are immediately adjacent to the mangrove system and the creek environment. To sympathetically manage and provide a close experience with this unique environment

a national park design response, such as; low key fencing to delineate the protected coastal area, boardwalks to ensure controlled circulation along the dunal and within the mangal systems, managed access to and from the coast and passive recreation nodes to encourage sensitive recreation and cultural / ecological education has been promoted.

AREA 3: COASTAL NODE

A low stable rocky outcrop at the north east of the development area includes a proposal for a major community and visitor recreation district park, referred to as the foreshore Coastal Node (pg 49), that celebrates Karratha's coastal 'playground', an opportunity for the town's people to 'touch the water'. This node has the potential to provide protected water play areas, improve accessibility to beach foreshore areas and provide formal/ informal large open space recreation areas, creation of a distinct tourism amenity and throughout all areas underpinning opportunity for the community to enjoy and value their connection to this unique coastal amenity.

INDICATIVE MULATAGA FORESHORE PRECINCT CHARACTER PLAN

ENVIRONMENTAL CONTEXT

LANDFORM, TYPOGRAPHY AND SOILS

The shoreline adjacent to the Mulataga development area is defined by a steep reflective high tide beach with an expansive, near horizontal, sub tidal terrace that is approximately 1 km wide at low tide. Fringing mangroves also occupy the landward edge of the subtidal terrace, though the density of the mangrove coverage is more significant along the western half of the site. Conversely, the eastern half of the site is defined by the presence of wave cut rock platforms and sections of exposed Archaean ironstone landward of the typical high-water mark (Short 2005).

Beyond the beach, a large primary dune (up to around 15mAHD) exists between the western site boundary and the Mulataga Creek. This dune is a dominant feature of the coastal landscape and represents a significant protective barrier against inundation as a result of elevated ocean levels. Similarly, a large barrier dune is also present adjacent to the section of shoreline at the eastern end of the site that has a northerly aspect. This feature also provides resistance to ocean inundation.

The central portion of the site, which has a north westerly aspect, lacks a prominent barrier dune, with the primary dune system having an elevation in the order of around 8mAHD. This low dune area provides a view corridor from the Mulataga development area out over Nickol Bay, also provides a less significant barrier to ocean inundation.

The geological associations that underlie the foreshore environment are:

- Miaree Granite is characterised by monzogranites and syenogranites; and,
- Cleaverville Formation is comprised of chert and iron banded formations (Department of Mines and Petroleum 2011).

CLIMATE

Climatic conditions influencing the foreshore environment are representative of a hot, semi-arid climate. Average annual rainfall is approximately 289.9mm the majority of which falls during the summer period, between January and March, from scattered thunderstorms and occasional tropical cyclones. A secondary peak in the rainfall occurs in June as a result of rainfall from tropical cloud bands. Winds in Karratha are characterised by dominant westerly winds occurring throughout summer and prevailing easterly winds in the winter.

OCEANOGRAPHY

Tides are the natural rising and falling of sea levels, influenced by the gravitational interaction of the movement of the sun, the moon and the earth. Other factors such as the shape and depth of oceans and the weather can also influence tidal ranges. Karratha experiences a “semi-diurnal’ tidal system, characterised by two high tides and two low tides occurring over an approximate two-week period. The variation between low tide and high tide is relatively high compared to the southern regions and can range from between 04m and 4.7m (DEC 2000).

HYDROLOGY

The Mulataga Creek, an ephemeral local watercourse which remains dry for most of the year. The creek line drains and dissects the Mulataga Development Plan area and flows in a south to north direction from Karratha Hills towards Nickol Bay. Mulataga Creek seasonally flows through the foreshore environment of Lot 4932 on Plan 38691, the creek’s mouth traversing the sandy beach prior passing through the intertidal mangrove communities and into Nickol Bay.

ACID SULFATE SOILS

The Department of Environment and

Conservation Acid Sulphate Soil (ASS) risk mapping indicates that the majority of the foreshore environment is mapped as moderate to low risk of ASS occurring at depths of greater than 3 metres. Sections of the foreshore environment in the north-west and north-east, which is inclusive of the intertidal mangrove communities, has been mapped as high to moderate risk of ASS occurring at depths of greater than 3 metres.

ENVIRONMENTAL VALUE

Flora

The vegetation condition within the foreshore environment ranged from 'Excellent' to 'Very Poor - Degraded'.

Excluding the mangrove communities, the majority of vegetation within the foreshore environment was considered to be in 'Very Poor - Degraded' condition. This was predominantly due to physical anthropogenic impacts, erosion, and weed infestation. The condition of the mangroves communities is considered to be 'Excellent'. It should be noted the traditional owners have concerns over the steady decline of the mangrove habit in relations to increasing development pressures.

RPS undertook an onsite assessment of the flora and vegetation of the foreshore environment on 26 March 2012. Seven vegetation types were identified and can be described as:

1. AbApOS - Acacia bivenosa and Acacia pyrifolia Open Shrubland over Triodia wiseana and Triodia angusta Mid-dense Hummock Grassland over *Cenchrus ciliaris and Chrysopogon fallax Open Tussock Grassland.
2. AcAsSTS – Scattered Tall Shrubs of Acacia coriacea subsp. coriacea and Acacia sclerosperma over Scatter Low Shrubs of *Aerva javanica over Hummock grassland of Triodia epactia and Triodia angusta with Tussock Grassland of *Cenchrus ciliaris, Eulalia aurea and Eragrostis eriopoda with Scattered Herbs of Rhynchosia minima, Evolvulus alsinoides var. villosicalyx and Cassytha capillaris on less degraded sites.
3. AcAsTOS – Tall Open Shrubland of Acacia coriacea subsp. coriacea and Acacia sclerosperma over Low Open Shrubland of *Aerva javanica and Santalum lanceolatum over Tussock Grassland of *Cenchrus ciliaris.
4. AhAcTS - Atalaya hemiglauca, Acacia coriacea subsp coriacea and Acacia bivenosa Tall Shrubland over Aerva javanica, Corchorus sp. and Indigofera monophylla (Burrup Form) Low Shrubland over Triodia angusta and Triodia epactia Hummock Grassland over Cenchrus ciliaris and Chrysopogon fallax Tussock Grassland.
5. AvAcSTS - Scattered Tall Shrubs of Avicennia marina and Acacia coriacea subsp. coriacea over Scattered Low Shrubs of Cleome viscosa, *Aerva javanica and Salsola tragus with Scattered Tussock Grasses of Spinifex longifolius.
6. AvTOS – Tall Open Scrub to Scattered Tall Shrubs of Avicennia marina.
7. TLSTGSv – Scattered Tall Shrubs of Avicennia marina and or Low Shrubland of Tecticornia spp. and Trianthema turgidifolia over Scattered Hummock Grassland of Triodia angusta with Tussock Grassland of Sporabolus virginicus, *Cenchrus ciliaris and Eragrostis falcata.

FAUNA

The EPBC Protected Matters Search Tool identified a range of migratory birds and other fauna that may be present in the foreshore area (Appendix 1). The EPBC Act Protected Matters Search Tool is designed to only provide an indication of species that may be present in an area.

The key fauna habitats of ecological significance that could potentially be considered likely to sustain conservation significant fauna in the foreshore environment are the:

- mangrove communities; and,
- coastal dunes.

Mangrove habitats form a highly productive part of the coastal foreshore ecosystem. Potentially the mangrove habitats and intertidal areas within the foreshore environment provide foraging and feeding habitat for a range of conservation significant fauna species, including species of bat, migratory bird species, sea snakes and other reptiles, marine associated crustaceans and fish species.

The mangrove habitat is specifically protected by Environmental Protection Authority (EPA) Guidance Statement No. 1: Protection of Tropical Arid Zone Mangroves along the Pilbara coastline (EPA 2001) addresses the protection of tropical arid zone mangroves, habitats and dependent habitats along the Pilbara coastline from Cape Keraudren at the southern end of the Eighty Mile Beach to Exmouth Gulf.

The majority of the mangrove community located in the of the foreshore environment falls into the 'Industrial Areas and Associated Port Areas'. A portion of mangroves in the north-east of the foreshore environment are outside of the 'Industrial Areas and Associated Port Areas'.

EPA (2001) identifies that the Pilbara mangroves inside the 'Industrial Areas and Associated Port Areas' are considered to be a mangrove area of high conservation value which are inside a designated industrial and associated port area and, therefore, are subject to Guideline 4.

All other mangrove areas that occur inside areas that have been designated as industrial areas, associated ports or other development and not covered by Guideline 3 [1] above. (EPA 2001)

The EPA's operational objective for Guideline 4 areas is that the impacts of development on mangrove habitat and ecological function of the mangroves in these areas should be reduced to the minimum practical level (EPA 2001). Proposals within areas subject to Guideline 4 will not be subject to a presumption against finding the proposal environmentally acceptable provided that;

- A high priority is placed on protecting tropical arid zone mangroves, habitat and dependant habitats; and,
- Any development being planned and designed to keep impacts on mangroves, habitats and dependant habitats to a minimum practical level.

EPA (2001) identifies that the mangroves outside the 'Industrial Areas and Associated Port Areas' are considered to be a mangrove area of high conservation value which are outside designated industrial and associated port area and, therefore, are subject to Guideline 2.

All other mangrove areas that occur outside areas that have been designated as industrial areas, associated ports or related development and not covered by Guideline 1 above. (EPA 2001)

The EPA's operational objective for Guideline 2 areas is that no development impacts should take place which would cause unacceptable impacts on the mangrove habitat, the ecological function of these areas and the maintenance of ecological processes which sustain the mangrove habitats (EPA 2001).

1 Guideline 3 relates to areas that contain regionally significant mangroves that occur inside areas that have been designated as industrial areas, associated ports or related development. These areas are indicated in Table 1 in EPA (2001) . Proponents will need to include justification for site location of proposed development in these areas. Guideline 1 relates to areas that contain regionally significant mangroves that occur outside areas that have been designated for industrial areas, associated ports or related development. These areas are indicated in Table 1 in EPA (2001)

A small portion of the mangrove community adjacent to the foreshore environment in the north-east is subject to Guideline 2. The majority of the mangrove environment within the foreshore environment to the north and north-west is subject to Guideline 4.

TURTLES

Four species of marine turtles, Green turtles (Chelonia mydas), Flatback turtles (Natator depressus), Hawksbill turtles (Eretmochelys imbricata) and Loggerhead turtles (Caretta caretta) are known to use the coastal environment of Western Australia as nesting habitat. However, there are no known beaches used by marine turtles for nesting on the Pilbara mainland in close proximity to Karratha, which includes the foreshore environment which is the subject of this Foreshore Management Plan.

CULTURAL HERITAGE VALUE

As mentioned earlier within the landscape strategy, the Mulataga Foreshore Area including the dune system and foreshore areas are known to be rich sites of Aboriginal cultural significance. Heritage Surveys have been carried out in accordance with the Aboriginal Heritage Act and surveyed to a Site Identification Level.

The local Traditional Owners (Ngarluma) have a strong connection and custodian lifestyle, which is highly intertwined with the Mulataga coastal environment. This strong connection and custodian lifestyle offer the TO's an depth knowledge of the holistic foreshore ecosystem as well as, site specific detailed knowledge e.g. endemic plants and their associated characteristics.

Ongoing consultation and design engagement with the local TO's in regard to the treatment of the foreshore site is to continue with possible edge treatments, access and interpretation areas to be discussed. This conversation and consultation process will be used to develop design responses that aim to discourage site intrusion and promote general respect of this age-old custodial relationship with the Pilbara landscape.

RECREATIONAL VALUE | LANDUSE

Despite a hot arid Pilbara climate, locals of Karratha have a highly outdoor and coastal lifestyle. Popular activities in the foreshore area include fishing and mud crabbing within the mangroves and intertidal flats, as well as, collecting cockerels and trumpet shells. Activities such as swimming, boating and passive recreation are also regularly undertaken especially in higher use zones; near the point, and further east towards to boat jetty. Also, off road driving and motor biking are also evident within the Mulataga Foreshore.

The aquatic marine environment also supports a unique flora of sponge gardens, which can only be observed during specific times of the year. Viewing these sponge gardens has been reported is a unique and special recreational activity for the locals.

The natural features of this unique landscape including the panoramic views around the foreshore and Nickol Bay, as well as, back towards the Karratha Town Centre and the Karratha Hills, make this a remarkable setting for passive recreation. It is intended that with careful planning and thoughtful design responses, which align access, lookouts and viewing platforms, key site features can showcase and further enhance this site opportunity.

Currently within the Mulataga Strategic Foreshore Management Plan area there are no formal recreation areas or facilities. There is also, limited control over pedestrian and vehicular access throughout the foreshore area and foreshore driving is not actively discouraged. As a result, the foreshore environment is dissected by informal four-wheel drive tracks which appear to be used to provide access to the beach

in order to undertake a variety of recreational pursuits such as swimming, fishing, off-road driving / motor biking and boating. There are a number of tracks, predominantly through the dune area and as a result of the uncontrolled access the random tracks that meander throughout areas. This is causing significant detriment to the dune system, vegetation and increasing the effects of land erosion.

It is important to note, popular activities undertaken by the local community have a significant detrimental influence on the foreshore areas and associated management requirements. Therefore, the activities and ongoing use of areas, together with engagement and consultation with the TO's and local community are important considerations within this management plan.

Photo of people using the rocky stable area on the point as an opportunity for recreational activities such as fishing.

3.0 FORESHORE MANAGEMENT STRATEGY

STRATEGY APPROACH

In simple terms, the Mulataga foreshore, the coastline and beaches may be divided into locations of district significance and those of local significance. District beaches are those which are likely to be the focus of use by residents of the surrounding region, rather than local coastal residents. Local beaches are used more by people within walking or cycling distance of the beach.

District beaches require increased facilities and a physical environment suitable for a wide range of activities. They also require appropriate levels of road access connecting to the primary road network and development planned adjacent to them should be commensurate with their significance. Local beaches will have fewer amenities and are often suited to a more specific activity such as walking, dog exercise or fishing.

In order to plan for recreational activities, it is necessary to determine which activities are likely to occur and the associated facilities needed to support these activities. Determination of these activities and programs shall be realised following detailed design of the foreshore areas.

WATER FOCUSED	BEACH FOCUSED	FORESHORE RESERVE
Swimming	Dog Exercise	Swimming / Pool
Wading	Walking	Walking
Fishing	Sunbathing	Cycling
Snorkelling	Viewing	Picnicking
Watercraft/Paddling	Picnicking	Exercise

Table 1 : Expected activities along the Mulataga coastline and foreshore

Key recreational activities can be categorised according to where they are performed. That is water-focused, beach-focused or those activities occurring within the foreshore reserve.

Many of these activities do not require provision of support facilities beyond amenities for human comfort.

Activities which will require facilities include:

- cycling – dual use paths, bike racks, water facilities at stopping points and toilet facilities;
- fishing – water facilities and fish cleaning tables;
- picnicking – tables, seats, shelters, café, toilets, barbeques, water supplies and bins;
- dog and horse exercise – water facilities and bins; and
- themed playgrounds – foreshore reserve
- foreshore swimming – foreshore reserve pool

To allow any of these activities, access roads and paths will be necessary. Associated facilities include car parking, dual use paths and bicycle racks. Designated areas in the coastal reserve expected to attract large numbers of people will also require toilets, a possible café / restaurant facility.

CULTURAL MANAGEMENT STRATEGY

The Ngarluma Traditional Owners are concerned about access and management of this vital marine asset. The local TO's ongoing custodian 'lifestyle' relies on the health of this ecosystem and the Nickol Bays capacity to continue to provide a cultural opportunity and sustenance. The health of the local ecosystem often strongly aligns with cultural values and needs.

FORESHORE RESTORATION

The proposed Mulataga landscape responses are mindful of the foreshores context and aim to ensure best practices that aim to retain, enhance and restore this significant coastal environment. Therefore, as part of the development and management of this valuable coastal location, the following section explores design proposals in relation to the foreshore.

The proposed foreshore response is to retain, protect and rehabilitate the primary dune system (particularly west of the creek line), allow the creek, mangroves and marine environment to continue to function as a natural system and utilize the stable rocky outcrop as an opportunity for residents and visitors to formally reconnect and value the coastal location, which is the first and potentially only opportunity for this outcome within Karratha.

Dune Protection

Protection and enhancement of the primary dune shall be enabled through 'national park' type low key treatments. It is suggested that this will include; controlled access fencing (1200mm transparent post and wire), minimum of three clearly defined access points together with low key car parks and pedestrian rest areas.

Controlled Access

Robust lineal and cross dune access paths made up of possibly asphalt / concrete dual use paths and raised

Indicative perspective illustrating open viewing area at the top of the primary dune system.

steel boardwalks shall link desire lines to the foreshore and across the fragile dunal system allowing the opportunity for walking, running tracks and interpretative stories to be incorporated.

Together with weed control and endemic vegetation supplementation the provision of access paths shall allow the entire dunal system an opportunity to stabilise and rehabilitate. The supplementation of endemic vegetation (e.g. gradually replacing Buffel Grasses)shall also aid in building local biodiversity, providing natural habitat and assist in retaining the TO's cultural 'lifestyle' in regard to education, local plant use and food sources.

Different experiences within this path network may include:

- Top of dune with views and vistas;
- Informal beach routes;
- Mangrove boardwalk(s);
- Shaded dual use promenade along Mystery road; and,
- Formalized passive and recreation areas within the key coastal node.

Each of the recreational access nodes shall have designated parking areas at the base of the dune and access steps/ramp/raised boardwalk/constructed asphalt / concrete path to the location. All areas will also allow visitors to access the beach with a different level of experience and use for the visitor.

The Mulataga Foreshore Management objectives, together with local TO's understanding and implementing cultural management objectives include:

- Protect and maintain the integrity of the foreshore by minimising shoreline erosion affecting loss of land and marine habitat;
- Protect and enhance primary foreshore dunal vegetation allowing formal / informal access to residents and visitors to respect, observe and learn about this unique environment;
- Provide robust traffic and pedestrian edge treatments, which mitigate random circulation patterns over dune systems and vehicles driving onto the beach;
- Improve public access and linkages to Mulataga and the broader area to the water's edge and foreshore where appropriate;
- Provide a nodal connection between the foreshore and the Karratha urban fabric through access to passive recreation opportunities such as; swimming, fishing, walking, boardwalk, jetty, pontoon and parking off Mystery Lane at the rear of dune; and,
- Provide passive areas of rest and reflection, which include viewing areas and interpretive signage to celebrate contextual sites of cultural significance.

Mangrove system

ENVIRONMENTAL MANAGEMENT STRATEGY

FLORA MANAGEMENT

As noted, in the Environmental Value and Vegetation Types Section, the Mulataga Foreshore Area features an array of existing vegetation types.

Retaining existing vegetation has many benefits including;

- Reduced erosion of the foreshore dunal system;
- Weed control;
- Rehabilitation of foreshore vegetation to stabilize slopes using endemic vegetation supplementation;
- Maintaining flora and fauna biodiversity;
- Immediate site maturity and develop a local sense of place;
- Shade and visual amenity;
- Cost savings on clearing;
- Respect of Traditional Owners ethno-biological 'connection to country' and continuing 'lifestyle'; and,
- Allowing for the fast creation of multiple-use open space areas for recreation, passive viewing and interpretation, dual use pathways and linkages to the Mulataga Development and Karratha Town Centre.

WEED CONTROL

Introduced weed species reflect the extent of disturbance as a result of land clearing, vehicle access, rubbish dumping and infiltration from the surrounding exotic gardens. Despite the evidence of unrestricted access and small amount of rubbish on site, the Mulataga Foreshore Area is not displaying a large population of weed species.

To reduce the increase and spread of weed species, the following management and control actions should be adopted;

- Minimizing clearing where possible (during the construction period);
- Preventing uncontrolled access to the site and minimizing the number of new tracks required;
- Supplementation of endemic vegetation (e.g. gradually replacing Buffel Grasses);
- Ensuring cleared vegetation and topsoil (if contaminated with weed seed) is removed and disposed of at Shire approved dump sites;
- Ensuring all vehicles and machinery are cleaned of plant material and soil before and after entering the site (in particular when working along the perimeter of the site or in areas noted to have an invasive weed presence);
- Imported soils/sands and materials should be certified weed free;
- All litter and waste materials should be contained and removed off-site regularly.
- General vegetation mitigation for the area would include the following:
- Manual/physical selective removal of weeds;
- Weed spraying using the industry's best practice and appropriate regimes (e.g. use non-residual glyphosate-based herbicide sprays, limit herbicide overspray, herbicide only applied by a by qualified technician, use of an appropriate herbicide near waterways etc.);
- Regular verge slashing of invasive grasses/low shrubs before seeding occurs; and,
- Controlling declared plants under the Agriculture and Related Resources Protection Act, 1976, using recommended methods outlined by the Western Australian Department of Agriculture and Food.

FAUNA MANAGEMENT

The Mulataga Strategic Foreshore Management fauna objectives are to maintain abundance, diversity and

geographic distribution of fauna and associated ecosystems through the avoidance or management of adverse impacts. The proposed management objectives will mitigate potential impacts;

- Habitat fragmentation and disturbance and impacts due to loss and degradation of habitat through clearing;
- Physical Injury or fatality; and,
- Indirect effects on adjacent habitats.

A number of management strategies will be implemented to address the potential impacts to fauna within the foreshore environment during the different phases of the development of the Mulataga Foreshore Plan area. These include;

Pre-Construction

Clearly marking up areas that are not to be cleared on the plans and on site; and, clearly delineating the foreshore conservation areas, from other passive recreation and landscaped areas within the foreshore environment.

During Construction

Induction of machinery operators involved in the clearing process for the Mulataga Foreshore Plan area. Operators to be advised to be alert for fauna when clearing the vegetation, and to take steps to avoid impacts, where practical.

Post-Construction

Rehabilitation of the foreshore environment. Refer the Implementation Table in Section 6, of the Foreshore Management Plan.

Detailed images of existing vegetation

Detailed image of recommended raised steel board walks to control and define access at key node points within the foreshore area

COASTAL / HAZARDS FORESHORE SETBACK

The Mulataga development plan and allowed for a planned retreat of infrastructure that may be impacted by inundation and erosion. The design avoids and /or accommodate 1 in 100-year ARI overland flood and the 500-year ARI ocean inundation in terms of public safety and water conveyance. Conceptual plans have been developed for Mulataga to identify how the additional foreshore reserve could be structured to achieve an outcome that befits the uniqueness and importance of this development to the future identity of Karratha. Preparation of the proposed plans has considered ecological, landscape, indigenous and cultural heritage values associated with the site, together with the requirements for the provision of public access both now and into the future.

The landscape concepts prepared for the Mulataga foreshore incorporate a range of items to enhance public access and use of the foreshore. The level of public infrastructure that is provided on the plans is considered to be generous, but may be realised over the fullness of time, depending on the population growth of the City.

The objective is to provide the majority of the public infrastructure in an area that is landward of the 100-year coastal erosion hazard line – therefore avoiding any risk of coastal erosion. However, in the present day, it is proposed that there may be elements of public infrastructure that extend closer to the coastline to help establish the relationship with the coastal environment. As the shoreline retreats, these infrastructure items would also be retreated to eliminate the risk of coastal erosion impacts. Public infrastructure that is seaward of the 100-year coastal erosion hazard line could include some publicly held commercially leased buildings that would be retreated or removed over time in response to coastal hazard risk.

There is adequate space provided for continued social enjoyment and recreation space beyond the 100-year planning horizon. Any proposed structures anticipated to be impacted will be held in Government ownership (likely Council managed, leased to private entities). Coastal erosion risks will be avoided and there will be no impact on private land.

As / if coastal erosion occurs local TO's will repatriate cultural artefacts and protect areas of significance within the foreshore areas Disturbance through coastal erosion will require action through an Aboriginal Heritage Management Plan.

'...in relation to the sand dunes, were places where Ngarluma people were buried. Further, the Aboriginal sites located during the Survey illustrates that the area was likely to have been substantially occupied, as evidenced by the large size and quantity of shell middens, as well as the presence of artefact scatters, engravings, stone arrangements, and grinding surfaces within the Survey Area. The Senior female Ngarluma Consultants also noted the historical significance of the Survey Area as a place where some male Ngarluma people camped and spent time when they worked in the employment of Karratha Station. The Senior Ngarluma Consultants stated their concern that traditional Ngarluma burials and artefacts that occur in the coastal sand dunes of the Mulataga Survey Area could be disturbed. This concern is supported by the fact that traditional Ngarluma burials have been previously disturbed within the coastal sand dunes to the northeast of the Mulataga Survey Area. The Ngarluma Consultants, therefore, advised that DevelopmentWA should not undertake any ground disturbing activity within the coastal sand dunes that occur on the northern boundary of the Mulataga Survey Area. The Senior Ngarluma Consultants also advised that the ongoing protection and management of the coastal sand dunes be addressed in the proposed Cultural Heritage Management Plan between DevelopmentWA and the NAC.'[1]

1 Anthropos Australis Aboriginal Heritage Survey of Mulataga (AA: 2010)

STORM SURGE PROTECTION MEASURES

Storm surge occurs when a system with high winds and low pressures, such as a tropical cyclone, approaches the coastline. The combination of onshore winds and low barometric pressure act to create an elevated water level, which is known as the storm surge.

The onshore wind and associated wave action push water against the coastline (wind and wave setup). If these winds and waves are accompanied by a low barometric pressure this will result in an additional localised increase in ocean level.

Storm surges at Karratha are likely to be dominated by cyclonic activity. Cyclones and low-pressure storms close to the Karratha coastline will also create increased water levels due to the barometric pressure difference. The magnitude of this water level rise is dependent on the central pressure of the cyclone and the proximity to the cyclone's eye.

Whilst the duration of the peak water level associated with the passage of a cyclone is specific to each event with regard to the strength, proximity and speed of the cyclone, the general trend will be consistent with only short durations, in the order of a few hours, for the peak water level.

A 100-year planning horizon, incorporating a 100-year average recurrence interval event is used to guide development levels within Western Australia. Modelling work by JDA (2011) determined the storm surge and inundation levels for various return period events. In accordance with current requirements, the modelling also incorporated the potential effects of climate change on the sea level together with a potential increase in cyclone frequency and intensity.

Whilst a number of different return period events were considered in the JDA (2011) work, the 100-year event has been used to guide the Mulataga development based on current policy requirements. Along the Mulataga foreshore a 100-year recurrence interval water level of around 6.3 mAHD is predicted for current day sea levels, with a level of 7.0 mAHD predicted for 2110 (which includes a 0.9 m rise in sea level). On this basis it is proposed that all development will be located above a level of 7.0 mAHD to avoid storm surge inundation during the 100-year event. Noting that this level also includes a 0.9 m allowance for sea level rise that is not predicted to possibly occur until the end of the century, this provides an even higher level of protection to development with regard to the storm surge in the short to medium term.

The large barrier dunes present along sections of the foreshore provide protection against ocean inundation and are assessed to contain sufficient volume to be able to withstand any erosive pressures over the planning horizon. The lower intermediate section of the shoreline does not offer the same level of protection and may be subject to breaching if a significant event were to occur. In this regard it is proposed to fill sections of the swale behind the low dune to a level of at least 7 mAHD to eliminate the potential for breaching and subsequent inundation of low-lying areas during very severe cyclonic events. No other coastal protective works are currently proposed.

ACCESS MANAGEMENT

The following management objectives are employed to prevent unauthorized third-party access to the Mulataga foreshore environment.

These management objectives aim to prevent third party access to areas of native vegetation, which can result in localised disturbance and the spread of weeds, vandalism of vegetation, loss of species diversity and changes in fire regimes.

The Proposed Management Objectives are as follows;

Post-Construction

- Installation of appropriate fencing between the Mulataga Development Plan Area and the foreshore environment interspersed with beach access pathways. Bollards or other obstructions such as wheel stops; will be used to prevent unauthorised vehicular access to the beach; and,
- Appropriate signage will be positioned at strategic locations along access paths to the beach, to provide residents and the general public with information on the local environment and native flora and fauna.

FIRE PREVENTION MANAGEMENT

The Management Objectives have been developed to avoid/reduce/ mitigate the potential ignition of fires during development of the Mulataga Development Plan area.

Potential wildfire ignition sources, associated with the development of the Mulataga Development Plan area, that may impact upon the foreshore environment potentially include;

- Construction equipment and machinery;
- Stockpiles of cleared vegetation; and
- Litter (particularly cigarette butts).

Changes in fire regimes may result in loss of biodiversity through changes in species abundance (particularly the spread of weeds), damage to equipment, and loss of fauna and fauna habitat.

Proposed Management Objectives;

During Construction

Fire prevention during development of the Mulataga Development Plan Area will include the following management measures;

- Clearing all flammable materials from around potential ignition sources;
- Maintenance of all machinery so as to comply with relevant fire safety standards; and,
- Machinery and vehicles not in use shall be parked in areas free of flammable material and vegetation

Illustrative perspective of Mulataga Coastal Foreshore

4.0 FORESHORE MANAGEMENT IMPLEMENTATION

FORESHORE LANDSCAPE DESIGN RESPONSE

Foreshore Area 1 – 'Look out and viewing platform'

Located near the western edge of the Mulataga Development Area this location takes advantage of the vistas both toward the ocean an also back toward the hills. A low-key design intervention, it may consist of a deck platform affording 360degree views and seating. This location provides users with a chance to walk down to the beach and take a more informal route or enjoy a defined walkway east across the top of the dune. Future linkages west along the dune system back to the Town Centre are available at this location with an opportunity to link back into a greater system of heritage trails.

Foreshore Area 2 – 'Land meets the sea connection'

Foreshore area 2 is located at the point where the 'land connects with the sea.' This location is the intersection where the creek meets the ocean, providing views east across the bay and over the mangroves, as well as back towards the subject site, with views to the proposed bridge at Mystery road, and into the natural creek lines.

This is an ideal location for seating and picnic areas, with a backdrop of local trees for shade and semi-enclosure. A small portion of lawn area may allow space for informal picnic and viewing area throughout the day and into the evening. At this location users have the option to walk west back along the top of the dune, explore the mangroves along a boardwalk that links to the coastal node, walk along the beach or connect back to the dual use shaded promenade along Mystery Road.

Foreshore Area 3 - Coastal Node (District Park)

This location provides maximum enjoyment of the coastal environment by Mulataga residents, the greater Karratha community and visitors to the area. It is proposed that this location will have a small provision of mixed-use commercial development which will provide users with low key shopping and dining opportunities. (E.g. fish and chips, art gallery etc.) Furthermore, a lease hold site tucked in behind the highest point will make the ideal location for an icon food/beverage facility development. The overall response within this location however will be the provision of formal and informal landscaped spaces that make the experience of the coast and beach highly accessible with both passive and active recreational design outcomes.

The proposed landscape responses at this location include:

- Lighting and artwork will heighten the experience day and night;
- Formal play areas that may include water play;
- Open lawn spaces for picnic and play;
- Amphitheatre style spaces with views out to Nickol bay with associated stage areas for events/performance;
- Infrastructure (such as seating, water fountains, BBQ's) within shaded areas (trees and built shade structures);
- Educational and Interpretative signage;
- Natural beach areas with associated beach showers;
- Viewing/lookout locations;
- Public toilet facilities; and,
- Co-located community facilities such as possible community gardens and community shed that could be linked to this site.

IMPLEMENTATION

To implement the Mulataga Foreshore Management Strategies outlined in this document, it is recommended that local Foreshore Management Teams are set up to achieve these strategic goals. This could involve the Department of Conservation, Biodiversity and Attractions (DCBA), the Ngarluma Traditional Owners and

members of the local community.

Through the consultation process, it is evident the Ngarluma Traditional Owners have a strong connection to the foreshore area and thorough understanding of the specific Mulataga Foreshore ecology. This knowledge will be invaluable in driving the direction and focus of Foreshore Management Teams to achieve outlined strategy goals. This presents an excellent opportunity to link key tasks with local capability. This can only be achieved through early support and ongoing engagement.

Mulataga Management Framework

This section aims to provide specific direction to guide environmental management of the foreshore at subsequent stages of planning.

In summary, the following reports will be required to be prepared to direct the detailed planning of the foreshore area:

- Foreshore Management Plans (FMPs) are required by at subdivision stage for those subdivisions adjacent to the foreshore reserve including cultural management requirements; and,
- Coastal Node Management Plan will be required upon submission of a Development Application.

As stated earlier, the Mulataga Strategic Foreshore Management Plan is a broad document that provides a management framework to be considered once future design and implementation of the adjacent foreshore area(s) proceed.

The Mulataga Strategic Foreshore Management Plan falls under the Coastal Processes section and shall be progressed by more Detailed Foreshore Management Plan(s) within a suitable timeframe, possibly when staged works are adjacent to these areas and when designs are concurrently prepared and approved.

One of these foreshore areas, the coastal node includes the potential for high community activity. The Coastal Node Management Plan has the potential to include management of community foreshore infrastructure.

DETAILED FORESHORE MANAGEMENT PLAN

Following approved design of the general foreshore area and in coordination with Ngarluma, Shire of Roebourne and associated stakeholders , the Detailed Foreshore Management Plan(s) shall focus on infrastructure upkeep and environmental improvements such as dunal and associated foreshore vegetation rehabilitation, including beach access controls. Proposed foreshore embellishments within the foreshore reserve are to be designed in accordance with the Physical Processes Setback (PPS) line noted in the MP Rogers and Associates, Mulataga Coastal Setback and Storm Surge Report.

The proposed coastal node position was chosen due to a prominent headland that included a low rocky stable foundation.

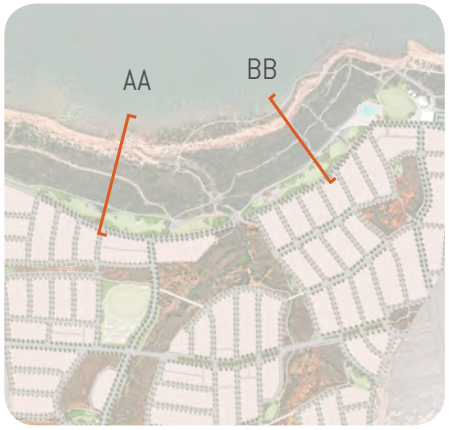
Foreshore embellishments located seaward of the PPS are to be designed with an appropriate lifespan, to a sufficient standard to withstand climatic conditions and in accordance with the City of Karratha, Ngarluma and associated stakeholders.

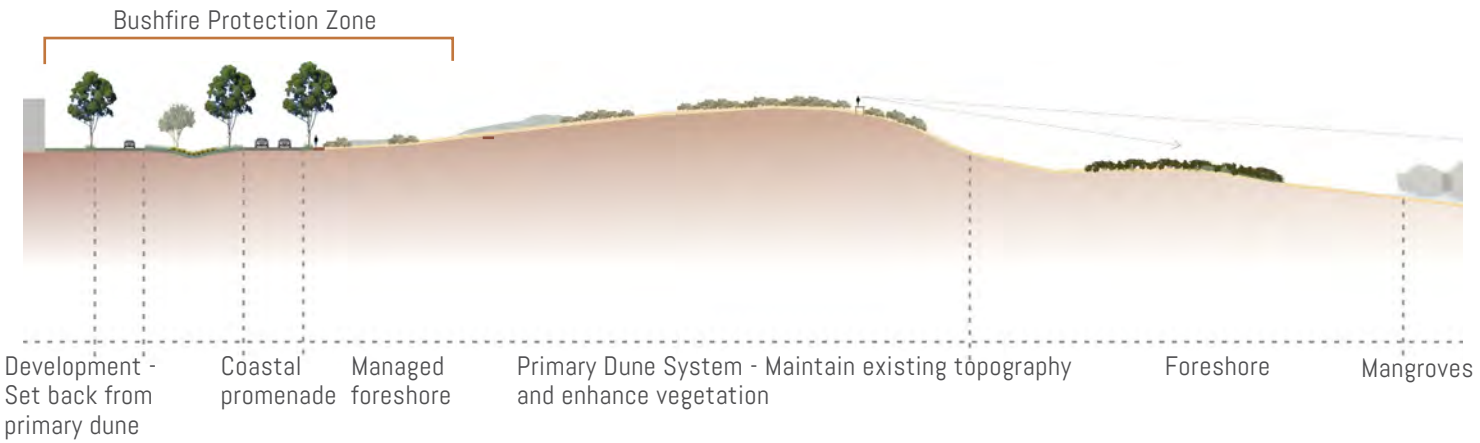
Ongoing strategies shall include further understanding cultural aspects of the site including managing areas of sensitivity and heritage importance.

COASTAL NODE MANAGEMENT PLAN

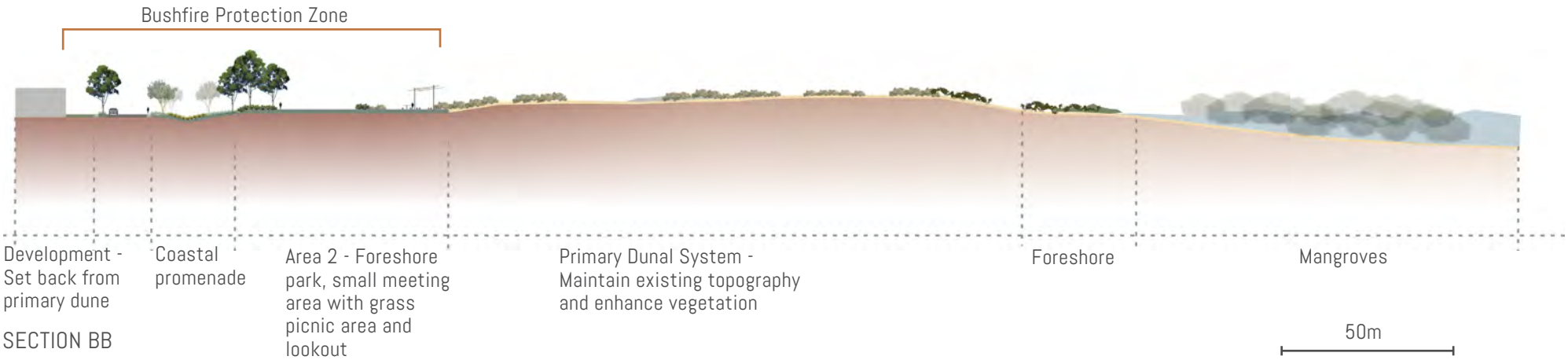
The idea of the proposed coastal node emanated from the Mulataga Public Design Forum (PDF) where there was a wish to provide Karratha township and broader community to have a stronger relationship/ connection to the ocean. The proposed coastal node position was chosen due to a prominent headland that included a low rocky stable foundation.

This foreshore node area boasts community amenity such as:





SECTION AA



SECTION BB

- A natural viewing area from its prominent high dune across Nickol Bay, back to Karratha Township and surrounding Karratha Hills. Views also extend West, North West along the fringing mangal environment to the Burrup;
- The provision of a natural fishing ledge from the low rocky headland;
- A popular swimming and walking beach immediately east of the rocky headland; and,
- A walkable destination point that is close to the existing town boat ramp.

Management plan guidelines for this node may include:

- Strongly delineated and controlled pedestrian access path(s) to and from the shoreline;
- Vehicle parking behind the foreshore dune;
- Litter controls;
- Restricted vehicle access from the dune and beach area;
- Restricted pedestrian access and controls to the adjacent dunal and mangal environment; etc.

IMPLEMENTATION TABLE

Following is a broad foreshore management implementation table that provides potential management requirements from pre to post construction including areas of responsibility. These management requirements are to be set once detailed design is achieved for individual foreshore areas/stages.

The management issues include, however not be limited to the following:

- Cultural / Heritage
- Access, Protection & General Rehabilitation (Fill Management) 1.2 Biota - Flora & Fauna
- Weed Management
- Fire Management
- Sea Level Rise & Storm Surge
- Supporting Local Capacity
- Approvals

Indicative images of low treatment fencing to control and define access through foreshore areas. Fencing also acts to clearly define rehabilitation and conservation areas.

Endemic vegetation

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION PLANNING & DESIGN	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
1.0 Cultural Management	- Respect, protect and enhance Traditional Owners ethno-biological and cultural / heritage relationship with the Mulataga Foreshore area, maintaining the cultural 'connection to country'	High Priority - Preparation of a Cultural Management Plan CMP in coordination with Ngarluma (Traditional Owners) the development stakeholders and the Shire of Roebourne	Cultural construction management to be implemented as part of the Mulataga CMP. May include, however not limited to the following management requirements: High Priority • On site cultural monitoring for areas disturbed by construction to a level suggested within the CMP • Cultural education and awareness for construction contractors • Robustly fence off and sign construction site prohibiting general public access • Stop work procedures upon signs of cultural disturbance / exhumation • Robust fencing, buffers and signage surrounding significant areas within the construction site Medium Priority • Define vegetation retention areas and limit clearing / land defoliage • Retain removed topsoil for rehabilitation purposes • Retain removed vegetation for mulching and rehabilitation purposes • Rehabilitate / stabilise cleared areas ASAP • Site weed management	Cultural post construction management to be implemented as part of the Mulataga CMP. May include, however not limited to the following management requirements: Medium Priority • Ongoing foreshore weed monitoring and management • Ongoing foreshore vegetation rehabilitation • Regular inspection of permanent access control and rehabilitation fencing • Implement long term management governance and monitoring of coastal infrastructure conditions (part of CMP). • Support local capacity building schemes including local foreshore management teams that may include; DEC, NAC and members of the local community • Consider ongoing foreshore interpretation and art opportunities	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders and Traditional Owners Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsiblity to DEC, Ngarluma (Traditional Owners) and members of the local community ('Friends of the Mulataga Foreshore', Rangers, etc.)

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION PLANNING & DESIGN	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
1.1 Access, Protection & General Rehabilitation (Fill Management)	- Management options to protect the integrity of Mulataga foreshore, including vegetation and dunal systems As part of the Detailed Foreshore Plans and associated Detailed Landscape Management Plan(s) rehabilitation strategies would include: 1. Track defining, removal & restoration 2. Vegetation rehabilitation 3. Dune restoration 5. Soil management (attend to additional fill requirements) 6. Determine fencing requirements for construction and long term protection / rehabilitation of foreshore / heritage areas	High Priority - Prepare a Detailed Foreshore Design and Management Plan for specific area. May include, however not limited to the following management requirements: - As part of detail design liaison with the DEC, Ngarluma Traditional Owners and SoR to determine appropriate locations for cultural infrastructure, interpretation, art, etc. Determine beach access paths, minimise further disturbance to existing vegetation cover - Determine vehicular and pedestrian tracks not required and plan for rehabilitation and associated methodologies - Delineate boundaries around areas of native vegetation to be retained - Determine seed provenance collection and storage - Provide soil management strategy for fill requirements	High Priority - Fence foreshore boundary areas through the use of permanent or temporary construction fencing - Fencing off construction and rehabilitation areas to prevent unauthorized access - Protect areas within the construction site that require heritage or significant vegetation protection. Buffer zones for these areas are to be a minimum of 30m - Provide bold signage on temporary construction fences to clearly note protection/conservation zones - Use fauna permeable fencing along permanent beach perimeter and access paths - Place more low key appropriate signage (designed and approved)on permanent fences, indicating the conservation areas - Rehabilitate existing unwanted tracks through a number of trialed methods - (i.e. Replacing topsoil, endemic seeding, raking material adjacent onto track and placing grass mulch that includes an endemic seed pool, tubestock planting, etc.) - Manage soil following fill being used within foreshore	May include, however not limited to the following management requirements: Medium Priority - Continue monitoring and evaluate the success of: 1. Formalised access 2. Track restoration 3. Fencing types and uses 4. Signage types and uses - i.e. foreshore respect through environmental and cultural education 5. Areas of soil fill - Determine reporting procedures including monitoring and maintenance programs for items mentioned above	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders and Traditional Owners Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsibility to DEC, Ngarluma (Traditional Owners) and members of the local community ('Friends of the Mulataga Foreshore', Rangers, etc.)

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION PLANNING & DESIGN	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
1.2 Biota - Flora & Fauna	To manage the effects of all living things within the Mulataga foreshore region In liaison with the local DEC wildlife officer / NAC Rangers. The proposed management objectives will mitigate potential impacts of: 1. Minimise habitat loss, fragmentation and disturbance through clearing activities. 2. Maintain/create ecological corridors through site - fauna permeable fencing 3. Loss of bio-diversity 4. Limit fauna and flora loss 5. Limit stress or injury	High Priority Prepare a Detailed Foreshore Management Plan where implementation may include, however not be limited to the following pre construction management requirements: - Obtain or have detailed flora & fauna survey for specific foreshore area in question - Prepare plans indicating areas to be protected or not to be cleared. Therefore the specific detailed designs and associated management plan are to clearly delineate the foreshore conservation areas, from other passive recreation and landscaped areas with the intention to fence and clearly sign - Determine indirect effects on adjacent habitats, including maintaining existing water channels and overland flowpaths	High Priority Implement Detailed Foreshore Management Plan. May include, however not limited to the following construction management requirements: - Ensure that the foreshore reserve area and restricted significant flora/ fauna areas are appropriately fenced and sign posted/flagged, including restrictions to third party access - During the construction phase regular monitoring of clearing areas with over clearing reported as an environmental incident - Inform site workers about the fauna expected to be on site and no handling without a permit. Provide site workers with the DEC WILDCARE phone number for injured/distressed fauna and induct machinery operators involved in the clearing process to avoid and be aware of all biota impacts, where practical - Stockpile materials including site topsoil, mulch and gravels in already cleared areas	High Priority From Detailed Foreshore Management Plan post construction implementation may include, however not be limited to the following management requirements: - Monitor and maintain healthy condition of foreshore reserve including: 1. Habitat access 2. Weed control 3. Fire management 4. Introduced species Medium Priority - Ongoing reporting, monitoring and maintenance should be undertaken in accordance with the jointly prepared Detailed Foreshore Management Plan	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders and Traditional Owners Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsibility to DEC, Ngarluma (Traditional Owners) and members of the local community ('Friends of the Mulataga Foreshore', Rangers, etc.)

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION PLANNING & DESIGN	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
1.3 Weed Management	- To successfully monitor and control weeds within the foreshore reserve	High Priority Prepare a Detailed Foreshore Management Plan where implementation may include, however not be limited to the following pre construction management requirements: - Conduct a detailed flora survey accurately mapping weed species and distribution - Prepare a weed management strategy to monitor and control foreshore weeds. Controlling declared plants under the Agriculture and Related Resources Protection Act, 1976, using recommended methods outlined by the Western Australian Department of Agriculture and Food. - The strategy shall include; 1. Monitoring and management processes including cleaning of machinery, handling and certifying imported materials (weed free) and appropriate removal of waste material off-site 2. Weed removal techniques including certified spraying, mechanical weeding, slashing 3. Rehabilitation process including replacing infested areas with provenance species	High Priority Implement Detailed Foreshore Management Plan and associated weed management strategy that may include, however not be limited to the following construction management requirements: - Manual/physical selective removal of weeds - Selective slashing of invasive grasses, low shrubs prior seeding occurs - Ensure litter, waste materials, cleared vegetation and topsoil (if contaminated with weed seed) is removed and disposed of at Shire approved dump sites - Weed spraying using the industry's best practice and appropriate regimes (e.g. use non-residual glyphosate based herbicide sprays, limit herbicide over spray, herbicide only applied by a by qualified technician, use of an appropriate herbicide near waterways etc.) Medium Priority - Supplementation of endemic vegetation (e.g. gradually replacing Buffell Grasses)	High Priority Undertake ongoing weed management in accordance with the Detailed Foreshore Management Plan and associated weed management strategy for particular site area. Post construction implementation may include, however not be limited to the following management requirements: - Medium term (2 years) ongoing monitoring and reporting of recently rehabilitated areas Medium Priority Ongoing (long term) monitoring and maintenance should be undertaken to prevent the spread of weeds, particularly during phases when construction has occurred close to conservation/heritage areas	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders and Traditional Owners Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsibility to DEC, Ngarluma (Traditional Owners) and members of the local community ('Friends of the Mulataga Foreshore', Rangers, etc.)

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION PLANNING & DESIGN	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
14 Fire Management	- Mitigate impacts of sustainable fire regimes in the foreshore endemic bushland areas	High Priority Prepare a Detailed Foreshore Management Plan prepare a sustainable fire regime in coordination with FESA and Ngarluma Tradtional Owners where implementation may include, however not be limited to the following pre construction management requirements: - Planned location of fire breaks and to utilise already degraded areas where possible - Planned mosaic or cool burning, if required - Design roads, tracks or paths that can separate infrastructure or development - Design designated parking areas to allow public access to the foreshore reserve	High Priority Implement Detailed Foreshore Management Plan and associated fire regime that may include, however not be limited to the following construction management requirements: - Provide / signage stating emergency FESA fire numbers to all workers and include information about the impacts of changes to fire regimes and key ways to prevent this in the contractors induction information i. This should include, but not be limited to: 1. No smoking near bushland 2. No littering and bins provided for staff 3. Workers parking in designated areas away from bushland - Clear and construct fire breaks as set out within the Detailed Landscape Management Plan and associated fire regime - Construct designated parking areas to allow public access to the foreshore reserve	High Priority From Detailed Foreshore Management Plan and associated fire regime post construction implementation may include, however not be limited to the following management requirements: - Monitor and maintain firebreaks during all stages of the development - Restrict fires within the foreshore reserve area (place signs indicating that fires are not permitted around the foreshore reserve boundary) This advice may be further clarified following cultural discussions	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders, Traditional Owners and FESA Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsibility to DEC, Ngarluma (Traditional Owners) and FESA Shire of Roebourne in coordination with Development Stakeholders and Traditional Owners

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION PLANNING & DESIGN	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
1.5 Sea Level Rise & Storm Surge	- Mitigate against sea level rise and storm surge inundation to ensure adequate protection measures for foreshore infrastructure both for the present and anticipated future	High Priority Prepare a Detailed Foreshore Management Plan allow adequate measures for sea level rise and storm surge where implementation may include, however not be limited to the following pre construction management requirements: - Liaise with Ngarluma (Traditional Owners), SoR, DEC to determine appropriate setbacks - Ensure that all development infrastructure is located above a level of 7.0 m AHD to avoid storm surge inundation during the 100 year event. Noting that this level also includes a 0.9 m allowance for sea level rise that is not predicted to possibly occur until the end of the century, this provides an even higher level of protection to development with regard to the storm surge in the short to medium term. Therefore determine appropriate locations for: 1. Dual use paths 2. Beach access paths 3. Car parks, showers, grassed/picnic areas and other facilities - Set up fixed photo-point monitoring locations - Prepare and implement an EMP in accordance with Ministerial Statement 722 prior to the commencement of any ground disturbing works	High Priority Implement Detailed Foreshore Management Plan and including, however not being limited to the following construction management requirements: - Ensure all foreshore coastal infrastructure is developed at an appropriate setback as detailed within the management plan - All construction to be of sustainable robust material to withstand coastal environmental conditions (wind, coastal storms, inundation, cyclonic conditions etc.) - If damage occurs infrastructure is of a low maintenance material and readily available	Medium Priority From Detailed Foreshore Management Plan and associated EMP foreshore post construction implementation shall include, however not be limited to the following management requirements: - Implement ongoing monitoring of fixed photo point locations to determine coastal setback or land changes - Implement long term management and monitoring of coastal infrastructure condition - Regularly inspect fencing that is exposed and around areas of vegetation being rehabilitated or retained - Replace fencing around remnant vegetation and along access paths with fauna permeable fencing that will remain for the long term	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders and Traditional Owners Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsibility to DEC, Ngarluma (Traditional Owners) and members of the local community ('Friends of the Mulataga Foreshore', Rangers, etc.)

ISSUE / PARAMETER	DESCRIPTION / LOCATION	PRE-CONSTRUCTION IMPLEMENTATION	CONSTRUCTION IMPLEMENTATION	POST CONSTRUCTION IMPLEMENTATION	RESPONSIBILITY
1.6 Supporting Local Capacity	Foster building of local skills and capacity with regards to the associated foreshore development, interpretation, public art and environmental works	High Priority • Prepare a Foreshore Local Capacity Skills Building Management Plan implementation may include, however not be limited to the following pre construction management requirements: • Engagement with Ngarluma (Traditional Owners) SoR, Community Groups, Art Coordinators and local Employment Agencies to provide input into the direction and focus of the capacity building process • Prepare information brochures to be distributed to new land owners. Information should include, but not be limited to: 1. Cultural heritage 2. Native fauna 3. Native flora If possible provide information about Community Groups including, how to form them, where funding can be obtained and what other community projects they can be involved	High Priority Implement the Foreshore Local Capacity Skills Building Management Plan that may include, however not be limited to the following construction management requirements: • Foreshore Environmental management teams • Public Art Teams • Encourage the involvement of the community in the management implementation of foreshore assets • Environmental education and training including: 1. Landscape contracting 2. Nursery(s) 3. Land management 4. Maintenance / management implementation teams	High Priority From implementation, foster the development of the Foreshore Local Capacity Skills Building Management Plan post construction may include, however not be limited to the following opportunities: • Extend ranger or foreshore management programs beyond Mulataga • Continue education and skills learnt with ongoing development works including public art, parkland, residential and land care opportunities • Encourage the involvement of the community with regard to the future management of foreshore assets	Pre Construction and Construction Shire of Roebourne in coordination with Development Stakeholders, Traditional Owners, Community Groups, Art Coordinators and Local Employment Agencies Post Construction Shire of Roebourne with opportunity to consider sharing or vesting governance responsibility to DEC, Ngarluma (Traditional Owners), Community Groups, Art Coordinators and Local Employment Agencies

ISSUE / PARAMETER	STATUTORY APPROVAL	REFERRAL AGENCIES	STAGE OF DEVELOPMENT	SUPPORTING INFORMATION	LIKELY MANAGEMENT PLAN
1.7 Approvals Environment S.38 Referral to the EPA	EPA	OEPA, DEC and DoP - Department of Transport	Development Application	Environmental report defining and summarising the proposal including identifying the environmental factors and potential impacts and management measures Marine (benthic) survey report Coastal engineering report Detailed engineering design of potential infrastructure Timeframes for implementation	Foreshore Management Plan (amended current version to include potential infrastructure) Construction Environmental Management Plan
1.7 Approvals Planning Development Application	Shire of Roebourne / WAPC	EPA, OEPA, DEC, DoT and DoP	Development Application / Detailed Engineering Design	Environmental report	

Possible approvals pertaining to future foreshore assets:

PART D: LANDSCAPE STRATEGY CONCLUSION

1.0 CONCLUSION

LANDSCAPE MASTERPLAN

The Landscape masterplan demonstrates that a sustainable and site-specific landscape amenity for the future Mulataga community can be achieved through jointly understanding the unique ecological condition and acknowledging the existing 'lifestyle' and the Traditional Owners cultural relationship to the site and associated lands.

The Landscape Development Report doesn't look at the green infrastructure and space amenity in isolation, but rather attempts to considers all the layer of the "landscape" to provide design responses that not only provide for an attractive, safe place to live, but also encourages building long term local sustainable outcomes. The opportunity to build the capacity of the local community and creates a sense of pride with this potential lengthy project is exciting. The Mulataga development project is an opportunity to turn a developing town into a strong Pilbara City, supporting a thriving hub with local community industry, pride and ownership.

Foreshore Management Plan

The Mulataga Strategic Foreshore Management Plan provides a framework for managing the foreshore areas adjacent to the Mulataga residential project by outlining the key values, challenges and strategic management actions for the foreshore.

The Mulataga Foreshore Area is of rich cultural and environmental significance. Located within the area, are known culturally significant sites, as well as, strong cultural connections and intertwined lifestyles that rely heavily on the health of the foreshore ecosystem.

The area covered by the Mulataga Strategic Foreshore Management Plan is approximately 52ha in size and has a 2.06km stretch of foreshore environment that lies directly adjacent to the north of the Mulataga Development Plan area.

Consultations with the Ngarluma Traditional Owners has brought the decline of the mangroves and foreshore area over recent years to attention, and there is significant concern about ongoing, future access and management of this vital marine asset.

The Mulataga Strategic Foreshore Management Plan will include an overview of existing values;

- Heritage and Cultural Significance;
- Existing landform, climate, soil & geology;
- Environmental Value;
- Flora and Vegetation types;
- Foreshore access and recreational value; and
- Storm surge and coastal stability.

Subsequently, this information is used to inform cultural management and best practice foreshore management objectives developed in this document, as well as, a design response for the foreshore area.

The management objectives and design response, aim to provide a range of recreational opportunities that do not conflict with need to protect, enhance and maintain natural features.

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Hon Peter Collier MLC April 2012 consent referring to DevelopmentWA (WALA) Section 18 notice dated 8 February 2012 (s18: 2012)