

THE WATERFRONT
TOWNSVILLE CITY WATERFRONT
PRIORITY DEVELOPMENT AREA
DRAFT DESIGN GUIDELINE
MAY 2018





THE WATERFRONT

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1 Purpose

The purpose of this guideline is to support the delivery of key outcomes within the Townsville City Waterfront Priority Development Area (PDA) Development Scheme for development in Area A (Townsville City Council)¹. The outcomes facilitated through this document will aid in the delivery of priority projects identified in the Townsville Master Planning Strategic Analysis Report prepared by Pure Projects.

The primary objective of this guideline is to provide additional information and direction for all stakeholders to deliver consistent development outcomes within the PDA. This guideline anticipates high level development outcomes and the delivery of a consistent public realm that optimizes pedestrian connectivity and refocuses the City toward The Waterfront. The guidelines include design requirements and consideration of urban design for the public realm, public art, green engineering and marine plant management. The design guideline is intended to allow for flexibility and creativity in design, while also providing for consistency throughout the PDA.

This guideline should be read as a whole and in conjunction with the PDA Development Scheme and other relevant PDA guidelines, practice notes and material referenced in this guideline.

This guideline is intended to be used as a tool to assist in simplifying the development assessment process in accordance with the PDA Development Scheme, by articulating desired outcomes up front to help inform early design, pre-lodgment discussion and the assessment process. Following consultation with Townsville City Council and other relevant parties, an applicant for a development approval may propose alternative, innovative solutions which do not comply with the following requirements, but meet the PDA-wide criteria.

¹ Refer to Townsville City Waterfront Priority Development Area Development Scheme Schedule 5 available at www.townsville.qld.gov.au or www.dsdmip.gov.au



1.1 RELATIONSHIP OF GUIDELINE COMPONENTS



2 Guiding Principles

The guideline establishes the following guiding principles to support the vision of the PDA Development Scheme.

Each guiding principle is supported by the design principles identified in Part 3 of this guideline.



2.1 CHARACTER

Within the PDA there are a number of identifiable areas with distinct yet connected character. The character is informed by cultural and natural history, development patterns, natural areas and envisioned development. When moving along Ross Creek the area transitions from the upstream natural riparian character through to a more public, active and urban place, and finally toward the mouth a distinct wharf and port character.

Figure 1 provides the location and intent of each of the emerging character areas to inform and provide inspiration for future works and design across the PDA.



Figure 1: PDA character areas

Rail

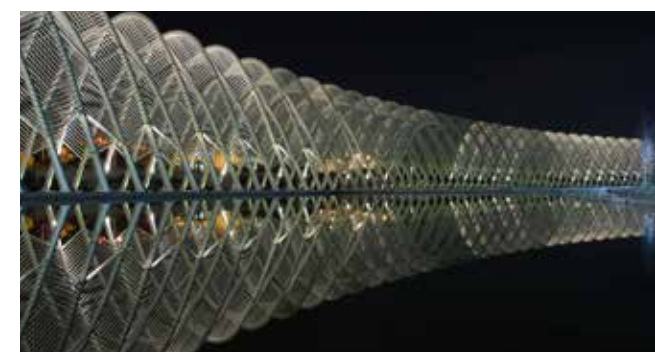
Located at the southerly most orientation of the PDA, the Rail character area forms a significant gateway connection from the suburbs to The Waterfront. The Rail character area celebrates its historical, as well as literal, connections to Townsville's Railway Transport Network.

The area will incorporate a contemporary re-interpretation of the site's past heritage uses. Future design outcomes are encouraged to take cues from the historic elements of the area, including a number of listed heritage buildings, historic rail lines and intact rail elements. Modern buildings and civic spaces are to complement the existing heritage characteristics.



Entertainment

The Entertainment character area is prominently positioned to accommodate significant community infrastructure, with the centrepiece being the North Queensland Stadium. Elements of design pay homage to Townsville's sporting history and incorporate features such as shared pedestrian trails, interpretive public art murals as well as sculptures to illustrate the significance of Townsville's sporting and cultural identity.



Natural

The Natural area provides a unique opportunity to experience a natural environment in the heart of the city. Infused into the layers of the marine riparian interface, the Natural area promotes the ideals of a light footprint, via an elevated boardwalk network and pathways, interfacing with and exploring the mangroves' unique microclimate, whilst promoting physical interaction with the water's edge.

The Natural area also provides a buffer for development to contribute to the protection of environmental values, while providing opportunities for recreation, active transport, connectivity, education and enjoyment of the place.

Development which integrates with the Natural area leverages on this asset, providing soft interfaces and low impact infrastructure design to enhance the natural environment and improve the ecology of the creek.



Community

The Community area permeates the entire PDA, culminating in the centre of The Waterfront. The community area is made up of a series of inclusive community spaces and is an essential public attraction to activate the PDA and wider CBD.

Vibrant, interpretive wayfinding markers and public art encourage exploration of pedestrian-friendly spaces and spaces where the community comes for recreational activities targeted at all the demographics within the Townsville community.

Enhanced public infrastructure and alterations to marine plants connect people to the water's edge and provide visual connection creating a stronger sense of physical connection between the east and west banks.

Maritime

Ross Creek is the city's most significant maritime entrance. It contains Townsville's key marine infrastructure, the cornerstone being the Port of Townsville, alongside complementary maritime services, including tourist, passenger and recreation boat facilities.

The on-water activity creates a sense of vibrancy, with development overlooking and harnessing Ross Creek and interaction with the water.

The Waterfront Promenade, pontoons, landings and public spaces will enhance overall integration and connectivity with the water. Future development will reinforce the maritime experiences on offer and design reflects the area's maritime and industrial heritage function.



2.2 URBAN

Development within the PDA is exemplar, providing the highest quality architecture and best practice built form outcomes for the city, complementing the wider CBD. Design and built form harnesses the prime locality of the PDA and draws inspiration from the dry tropical environment and natural and cultural history of the area. Design provides for ingenuity, flexibility, sustainability, liveability and meets the following objectives:

- establishes a strong sense of place;
- enhances human interaction;
- optimises the potential of land and buildings;
- creates comfortable and attractive places;
- minimises impacts on the environment and maximises environmental processes in the urban context;
- values natural landscapes, waterways and landmarks and ensures their setting is protected;
- responds to locality and identity;
- finds creative uses that enliven historic places and precincts and provide a sense of historic continuity; and
- creates accessible places that are safe and secure.





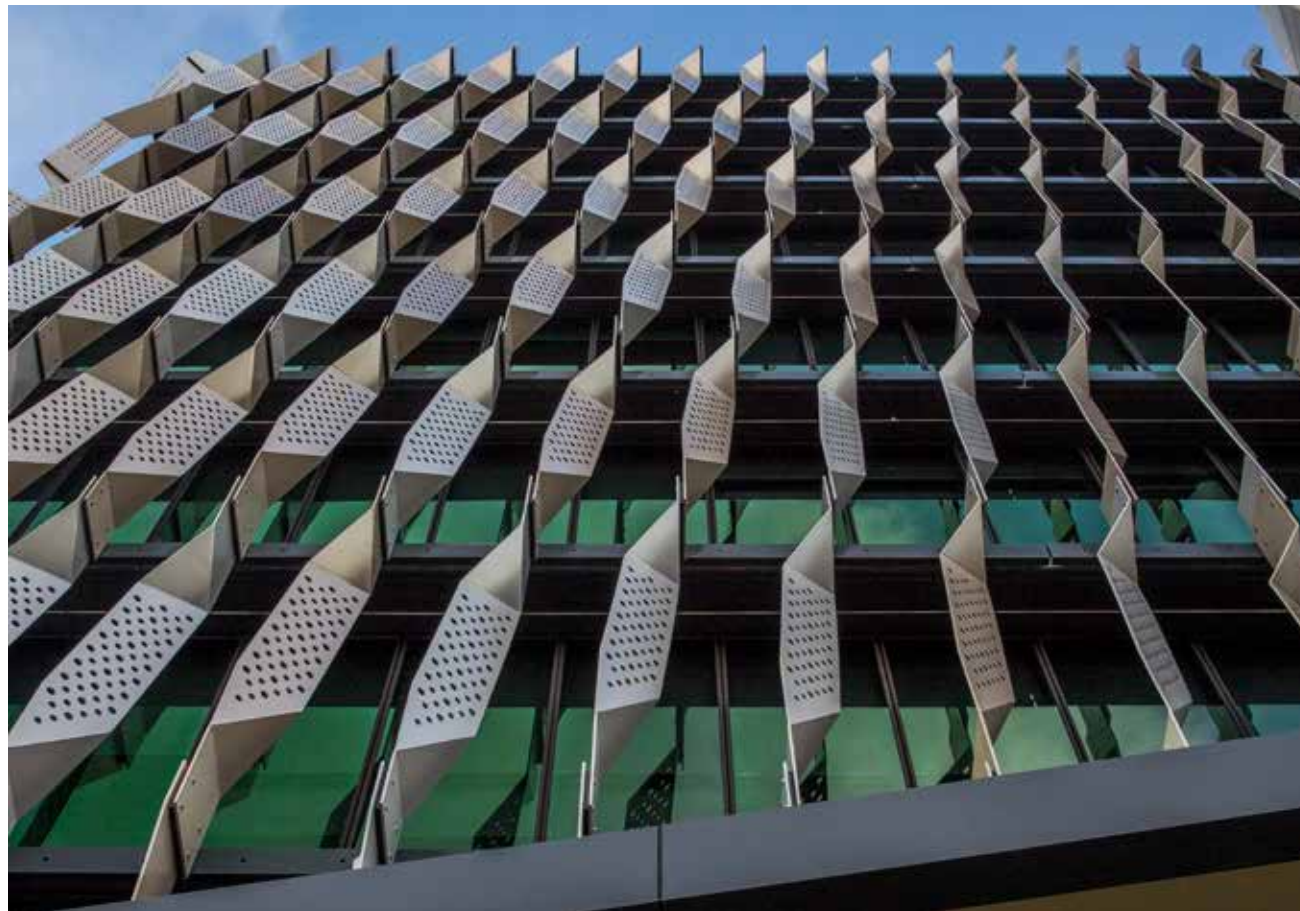
Ross Creek is Townsville's birth place

2.3 CLIMATE

Townsville is a city in a coastal, dry-tropical environment. To Townsville's north and south are wet tropical environments. However, the east/west layout of the coast of Townsville results in less rainfall than neighbouring coastal regions. Consequently, the Townsville region is classified as the 'Dry Tropics'.

Indicative of dry tropical climates, dry warm winters and hot humid summers are experienced in Townsville. The majority of rain falls as short torrential bursts, with most rainfall occurring in January and February. Unlike temperate Australia, Townsville does not experience four seasons. Instead it experiences a short/inconsistent 'wet season' and a long 'dry season'. Sustainable design outcomes for the Dry Tropics climate should consider the following:

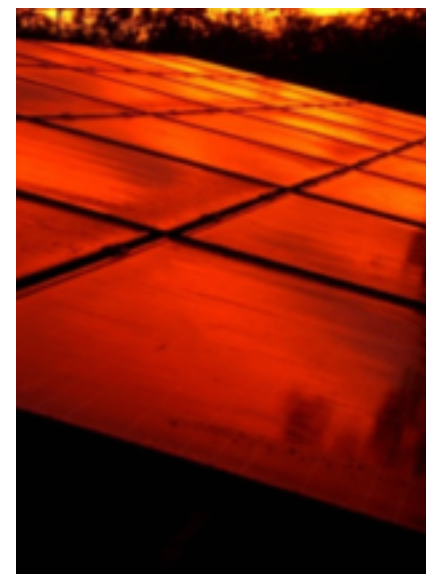
- Sun – heat and glare;
- Temperature and humidity;
- Rain – infrequent but intense;
- Breezes – reduction of humidity; and
- Extreme events – flood, cyclone and storm tide.



2.4 HERITAGE

Ross Creek has played a pivotal role in the history, development and rise of Townsville and is rich in cultural and natural heritage. Development in the PDA will retain and enhance cultural and natural heritage elements to enrich the community and reinforce the importance of Ross Creek. Design considers the history of cornerstone events, physical, social and spiritual elements such as:

- indigenous history – traditional owners, historical/traditional knowledge of the cultural landscape;
- Ross Creek a port – gold, pastoral and port development;
- a rail centre – the Great Northern Railway;
- borders and crossings, bridges and the impact on development of Townsville;
- shaping Ross Creek – human interference and natural processes;
- Ross Creek as a gateway to the Islands;
- the PDA as a front door to North Queensland;
- places of cultural heritage significance;
- sites of archaeological potential;
- natural habitat and ecological features – mangroves, mudflats and salt-marsh;
- natural life – mangrove fauna, birds, fish, sharks; and
- danger – Bull Sharks and the history of attacks.





2.5 PEOPLE

The PDA will enable the creation of great places for the value they bring to their community. The PDA will provide a variety of public places enabled through best practice urban design principles, opportunity for activities and interaction and multi-use flexible spaces which are highly connected. To achieve great places local conditions are also considered, such as climate. The PDA will provide places for people, these places will:

- feel comfortable and welcoming;
- provide for equitable public access;
- be vibrant, where people can interact;
- feel safe and secure;
- be walkable and connected;
- be diverse, with variety of experience; and
- provide atmosphere and enjoyment.

"What attracts people most, it would appear, is other people." (Whyte, 1980, p. 19)



2.6 SUSTAINABLE

The PDA employs sustainable design, not only for the environmental and social benefits but also the associated economic benefits, moving toward a blue economy model. The PDA will enhance sustainable design and consider the following in design:

- reduced capital and lifecycle costs of development;
- use of sustainability rating tools in development;
- incorporation of systems-based and passive building design;
- creating a low-energy environment;
- encouraging the use of locally supplied and recycled materials;
- designing for climate change impacts;
- end-of-trip and cyclist facilities;
- use of locally generated renewable energy;
- incorporation of water sensitive urban design;
- increased water quality of Ross Creek;
- increased native vegetation and biodiversity;
- rehabilitation and decontamination of land;
- enhanced accessibility to public transport; and
- initiation of active research programs.

Initiatives such as this will create more local business opportunities and jobs, regenerate the local environment and increase biodiversity and create a stronger and healthier community.





3 Design Principles

This part provides detail to support the guiding principles and outcomes of the PDA Development Scheme, including:

- built form;
- public realm and streetscape;
- stormwater management;
- wayfinding strategy;
- lighting strategy;
- public art;
- green engineering; and
- marine plant management strategy.

3.1 BUILT FORM

This part provides details regarding the following built form elements to support the PDA Development Scheme:

- interesting and attractive form;
- awnings;
- active frontages;
- car parking; and
- sustainable building practices.





3.1.1 Interesting and attractive form

Development within the PDA ensures an interesting and attractive presentation to streetscapes, Ross Creek and public realm, including the Waterfront Promenade, and considers the following design elements:

- the expression of architectural, cultural, historic, scenic, natural, social or spiritual qualities in design;
- utilisation of materials that respond to Townsville's climate and character;
- articulation of building entrances and openings (Figure 2);
- variations in material, elevation treatments and building form (Figure 3);
- sun control that provides generous protected indoor/outdoor areas;
- continuity of façades along the street (Figure 4);
- projections and recesses in the façade to create interest and articulation of form (Figure 5);
- textural patterns and colours that provokes movement and playfulness to provides interest;
- at lower levels creates human/pedestrian scale experiences;
- elements which assist in wayfinding and legibility (3.4 Wayfinding Strategy);
- elements which relate to the context and theme area including surrounding buildings, parks, streets and open spaces;
- build to boundary walls which do not impact on the amenity and privacy of adjoining premises;
- attractive building caps and rooftops, which incorporate recreational spaces and green roofs;
- transition to and design compatibility with lower-scale heritage places and precincts (Figure 6);
- strong visual and physical connections between internal and external spaces (Figure 7);
- buildings are oriented to the primary entrance and the Waterfront Promenade (where adjacent Ross Creek);
- waste disposal and servicing areas are screened from public view and do not have adverse amenity impacts on adjoining properties; and
- air conditioning units are insulated so that adjoining properties are not affected by the noise source, and are not significantly visible from the street or from the Waterfront Promenade.



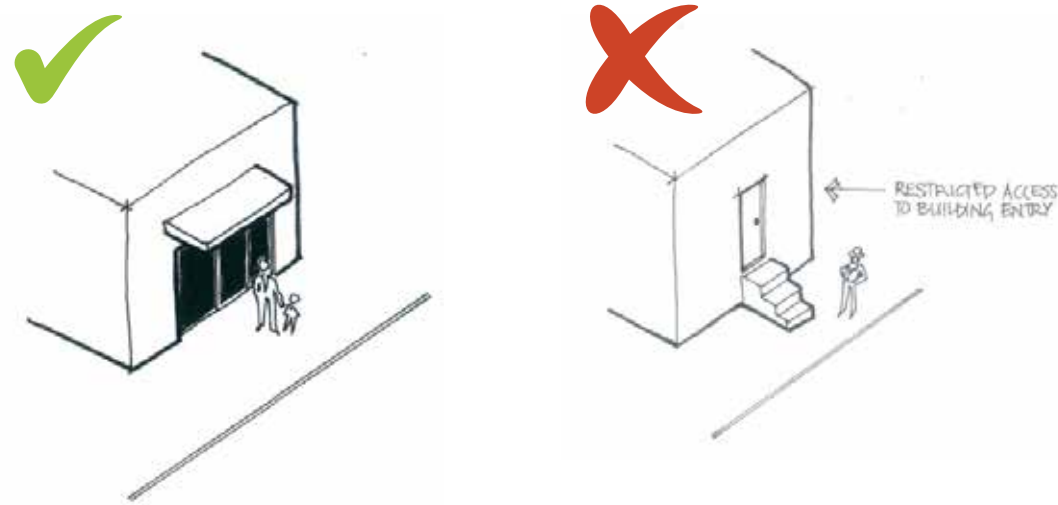


Figure 2: The entry to a building is easily accessed by pedestrians

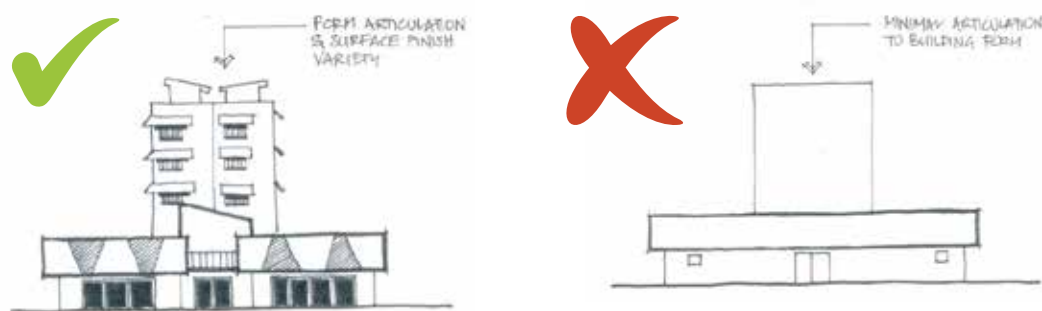


Figure 3: Richness and variety is provided in the building's form. Buildings incorporate design elements and detailing to minimise the bulk of large buildings

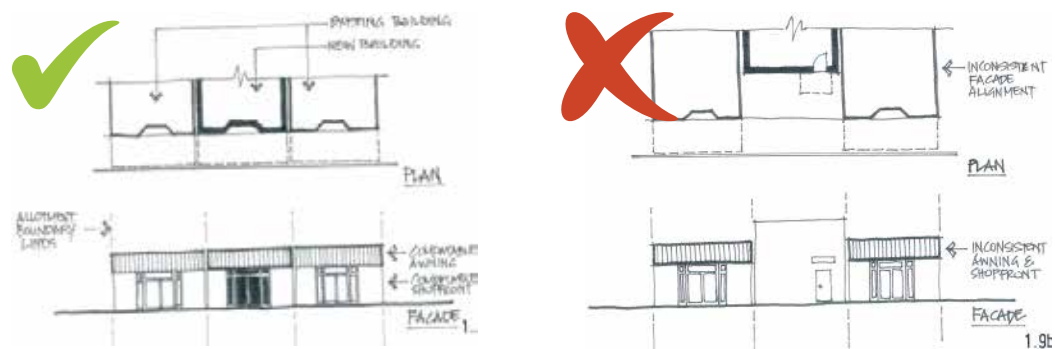


Figure 4: Continuous building line

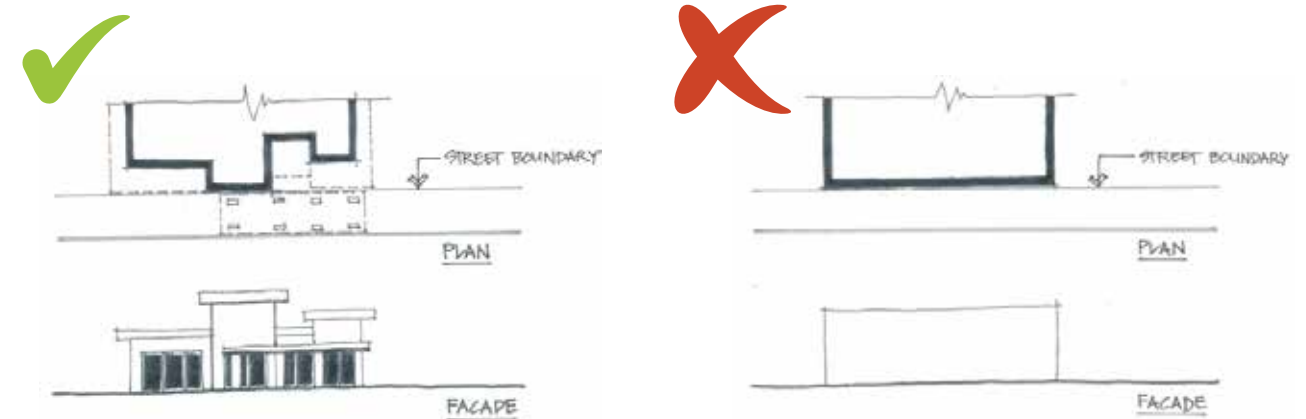


Figure 5: Long blank walls facing the street are avoided and form is articulated

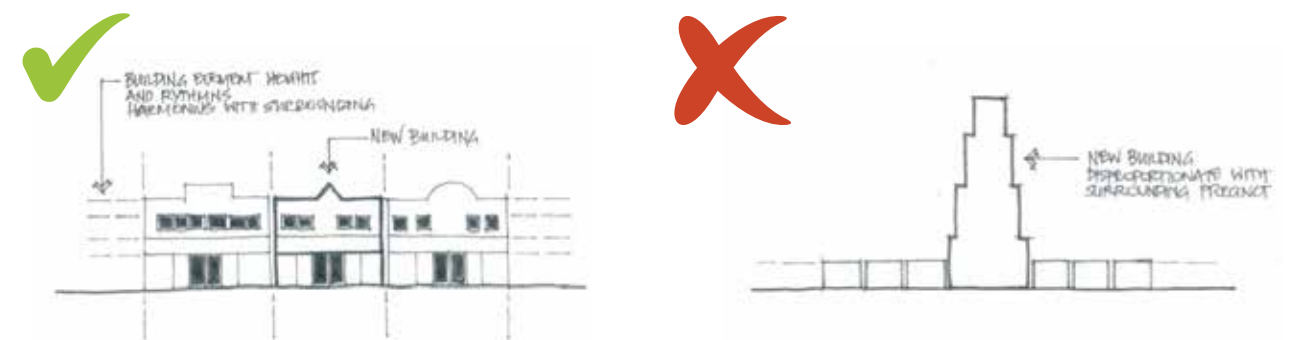


Figure 6: Buildings are harmonious in proportion and scale to buildings in the rest of the street or immediate precinct

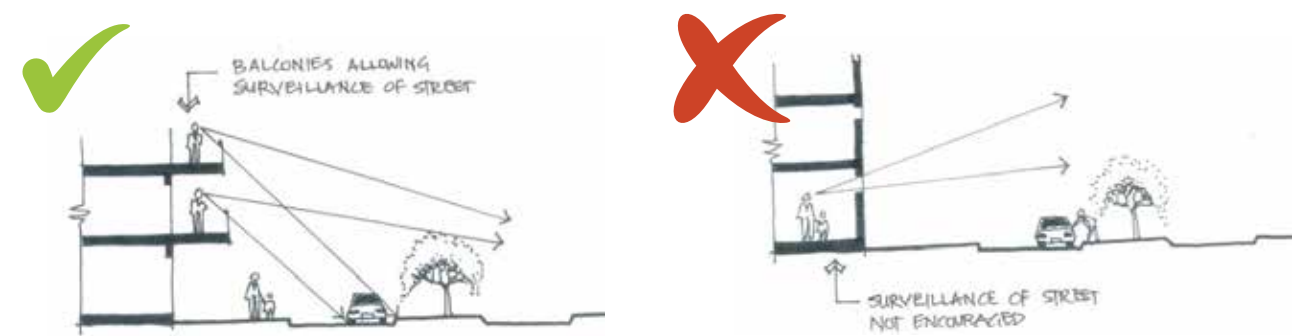


Figure 7: Balconies, windows and openings open onto the street or public open space and provide passive street surveillance

3.1.2 Parking

The design and location of parking contributes to attractive and inviting streetscapes and:

- parking entrances do not dominate the street frontage or Waterfront Promenade frontage (street example see Figure 8);
- parking areas and facilities are located to be concealed from public view to ensure an attractive streetscape via:
 - parking areas which are sleeved by buildings along primary frontages and the Waterfront Promenade (Figure 9, Figure 10); or
 - basement and semi-basement car parking (Figure 11); or
 - parking above the ground level (Figure 12).

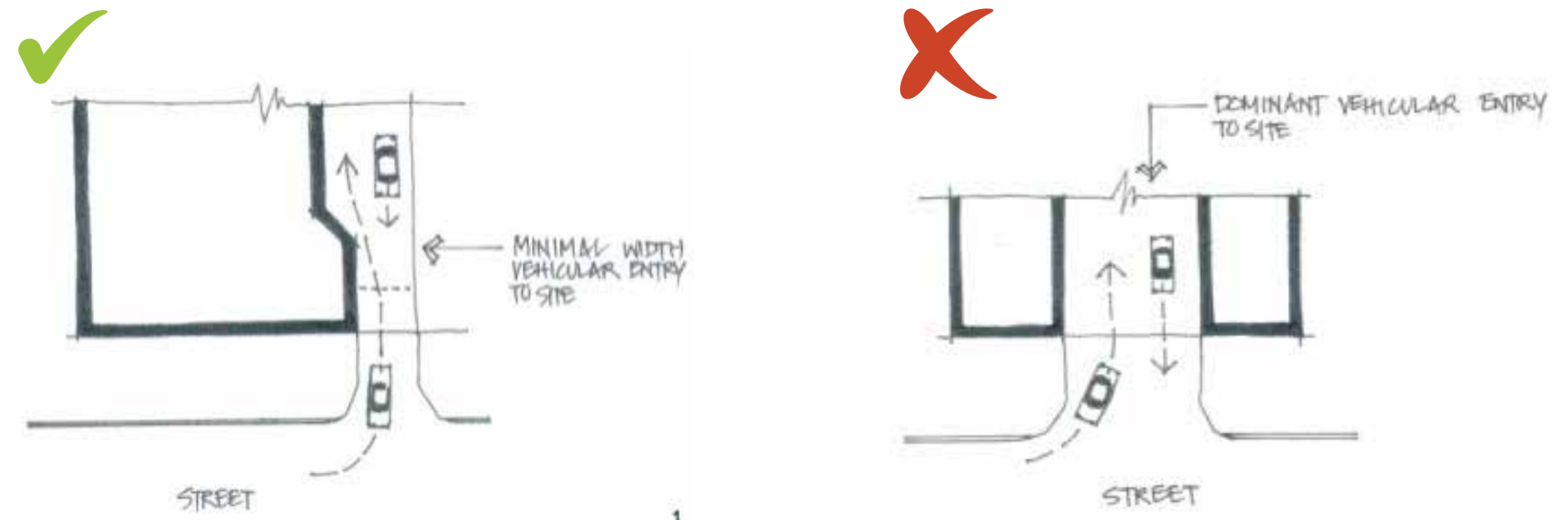


Figure 8: Vehicular entry to the car park is minimized and subservient to other façade activities

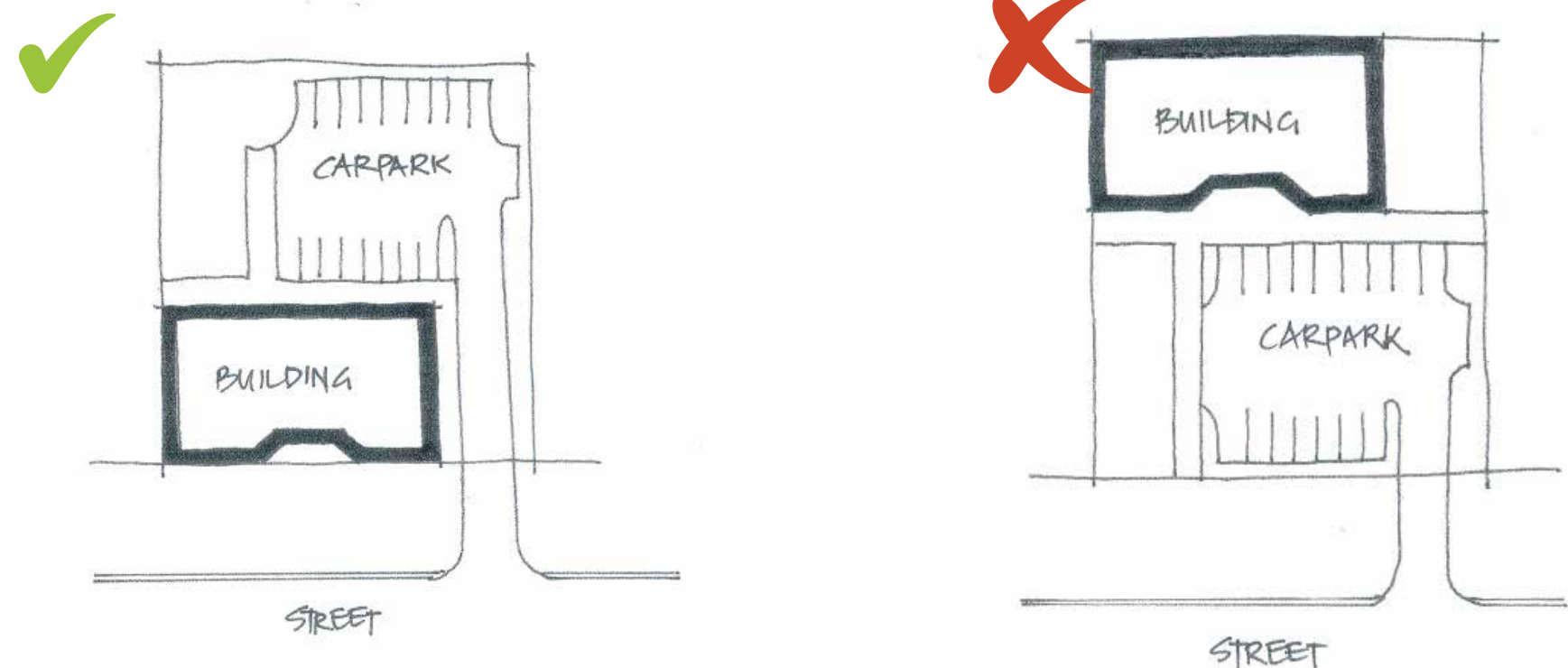


Figure 9: Car parking is sleeved by building from the primary frontage

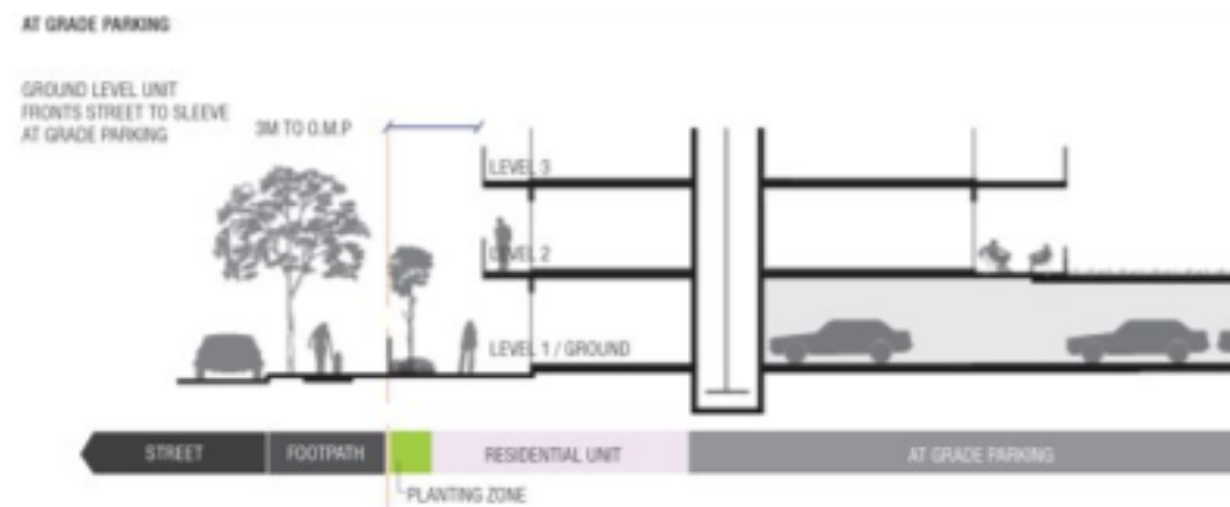


Figure 10: Car parking is sleeved by buildings

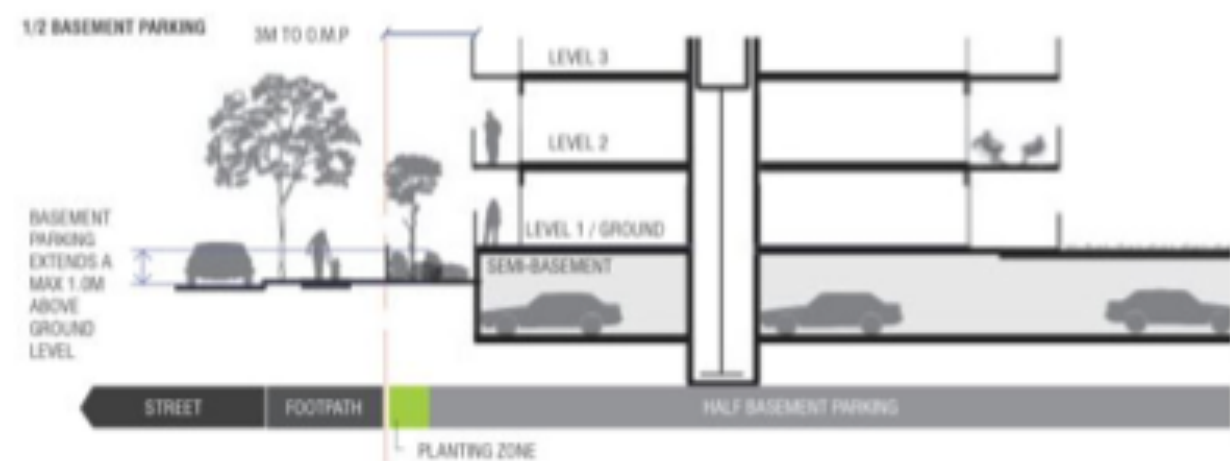


Figure 11: Car parking is basement or semi-basement



Figure 12: Car parking is above the active frontage

3.1.3 Awnings

Awnings make an important contribution to achieving high levels of shade and are designed to provide footpaths and pathways with all-weather protection within a safe, unobstructed and attractive environment which:

- are continuous and compatible with existing awnings;
- allow for street trees and landscaping;
- are visually safe and amenable;
- are located along key pedestrian routes and connect key destinations;
- contribute to legibility and wayfinding;
- do not impede the normal flow of pedestrians; and
- are constructed of materials that reflect the tropical climate and character of Townsville.

Awnings are:

- located above ground floor and are a minimum of 3.2m and generally not more than 4.2m above pavement height;
- extended from the face of the building and are set back from the back of the kerb line: 1.5m;
- continuous across all frontages of the site;
- contiguous with adjoining buildings and awnings;
- cantilevered from the building and does not include posts within the footpath (except within the Flinders Street East precinct);
- required to provide under awning lighting (also see 3.5 Lighting Strategy); and
- constructed of durable lightweight materials.



3.1.4 Active frontages

Development supports active streets and active public realm interfaces, including pedestrian laneways, via active lower level uses and built form which supports activity. Where supported by the PDA Development Scheme, ground floors and lower level floors relate positively to streets, the Waterfront Promenade, public spaces and pedestrian laneways, and activate the public domain by incorporating:

- corner treatments to address both street frontages for a premises on a corner (Figure 13);
- operable elements within the building facade such as large window openings, sliding doors, window seating (Figure 14);
- a gradual transition between the public domain and private outdoor or building spaces (Figure 15);
- usable outdoor/semi-outdoor spaces that support outdoor lifestyles and engage with the public realm (Figure 16);
- minimal blank inactive walls or frontages (Figure 16); and
- protection for pedestrians.



Figure 15:
Uninterrupted
access/vistas to
public open space

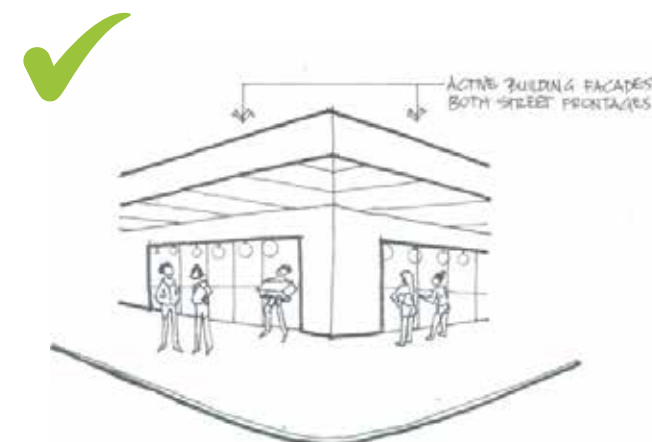
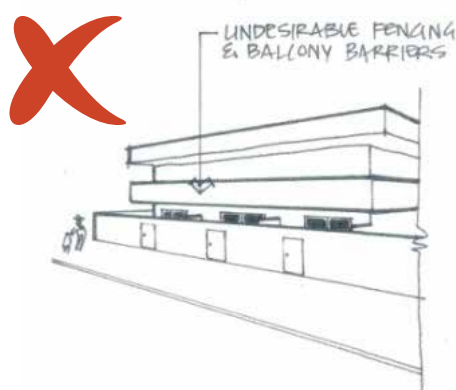


Figure 13: Corner buildings address both streets with active frontages and facades

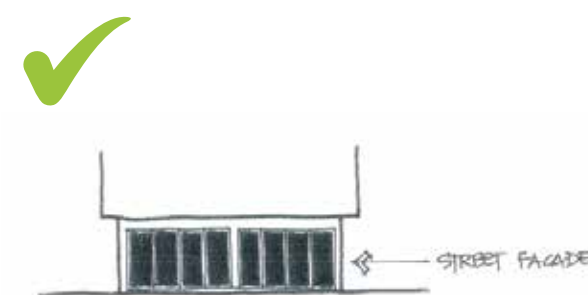
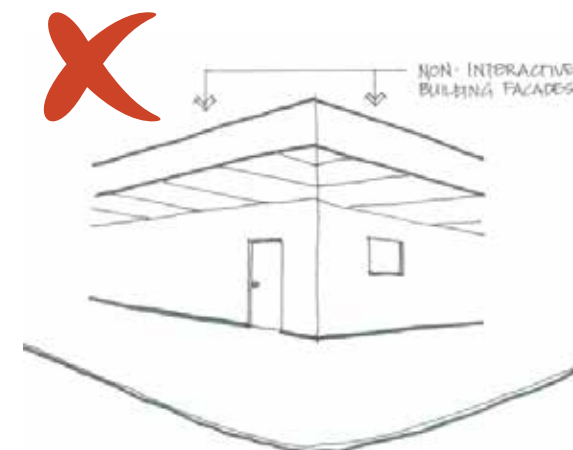


Figure 14: Maximise building's openings to the street

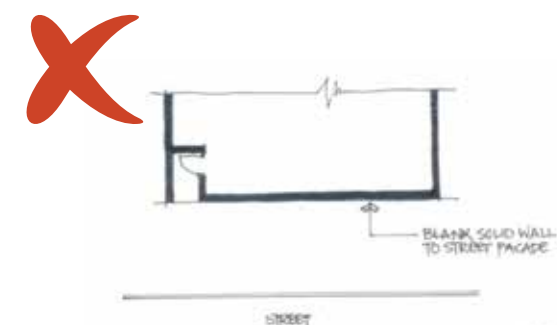
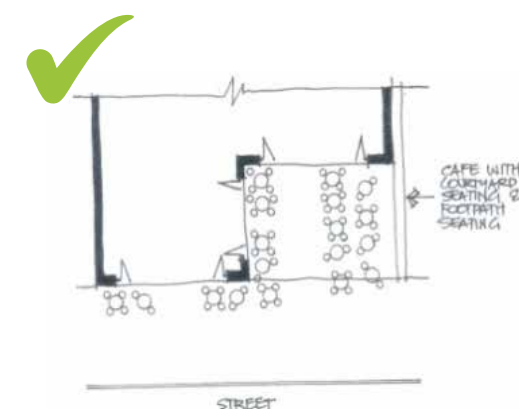
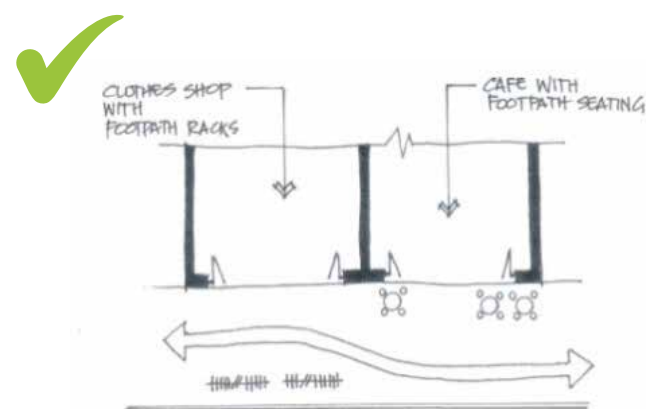
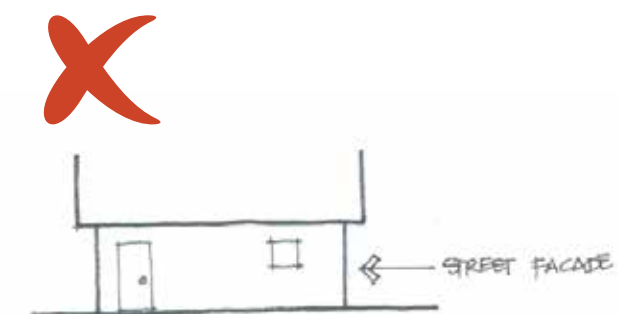


Figure 16: Promote opportunities for active uses to 'spill out' onto the public realm

THE WATERFRONT



3.1.5 Sustainable building practices

A key priority for the PDA is to incorporate best practice sustainability throughout. The following provides additional detail to be considered in design regarding:

- passive design;
- green star for buildings; and
- green roofs and walls.

3.1.5.1 Passive design

Lot reconfiguration:

- and lot orientation which facilitates the conservation of non-renewable energy sources and the siting of buildings that is appropriate for the local climatic conditions;
- which optimises a generally north-south orientation for the long axis of street blocks, or where east-west orientation is unavoidable, proportioning lots to allow for appropriate building orientation;
- which creates lots that are generally rectangular in shape; and
- which facilitates road, street, lot orientation and lot size which are responsive to north-east prevailing winds and facilitates air permeability.

Buildings:

- are oriented to minimise exposure to the harsh sun, in particular the western sun; and
- are oriented to capture prevailing north easterly breezes.

Building elements:

- allows for glazed surfaces to be protected by shade and deep shade structures that protect the internal building spaces (Figure 17);
- provide for overhead shade to the north and south facades (Figure 18);
- provide vertical shade on the east and west facades to protect from low sun (Figure 18);
- incorporate fenestration and sun control elements;
- incorporate materials with light-coloured finishes, to minimize heat gain; and
- incorporate moveable elements to capture prevailing breezes and provide heat protection.

Due to the number of sunny days a year, the hot temperatures and the harsh glare, it is important to ensure as much of a building is shaded as possible, especially any windows or glazing. This shading will minimise heat gain by the building and make it more comfortable to occupy, whilst reducing ongoing running costs.



Figure 17: Examples of the use of deep shade for protection from Townsville's climate. Extensive shade protection is provided to all glazed surfaces

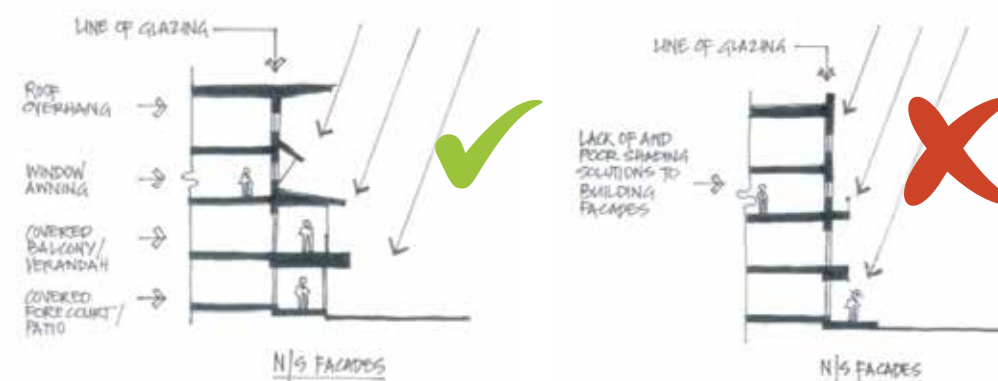


Figure 18: Buildings are protected from the sun

3.1.5.2 Green Star for buildings

The built environment is the world's single largest contributor to greenhouse gas emissions. Buildings and built environments also consume around a third of our water supply, and generate 40% of our waste. A Green Star rating provides an independent verification that a building or community project is sustainable.

A building with a green star rating can help save money, create a healthy place for people, minimise the environmental footprint and build a better future for the Townsville community. Green Star rating:

- reduce operating costs and increase asset value;
- consume up to 66% less electricity than average Australian city buildings;
- consume up to 51% less potable water than minimum industry requirements;
- boost employee productivity by up to 15%;
- produce up to 62% fewer greenhouse gas emissions than an average Australian city building;
- improve the overall health and wellbeing of occupants;
- increase student learning and engagement;
- speed up recovery times of hospital patients;
- reduce risk and 'future proof' investments;
- deliver a competitive edge in the marketplace; and
- attract additional corporations or organisations that desire to occupy higher quality spaces.

Green Star was developed to assist the property industry in order to:

- establish a common language;
- set a standard of measurement for built environment sustainability;
- promote integrated, holistic design;
- recognise environmental leadership;
- identify and improve life cycle impacts; and
- raise awareness of the benefits of sustainable design, construction and urban planning.

The Green Star rating tools assess building projects against a number of categories. These categories allow for a determination to be made on the environmental impact of a project's site selection, design, construction, maintenance, etc.

The nine categories included within the various Green Star rating tools are:

Management – Indoor Environment Quality – Energy – Transport – Water – Materials – Land Use & Ecology – Emissions – Innovation

All applications are to target a minimum 5 Green Star 'as designed' rating. To ensure an efficient design process and avoid costly rework, design teams are encouraged to engage with a Green Star Accredited Professional (GSAP) early to discuss the Green Star certification process and receive guidance on costs and benefits of various design options.



Figure 19: End-of-trip facilities (Oregon Department of Transportation, 2012)

3.1.5.3 Green roofs and walls

The PDA encourages the use of green roofs, green walls and facades. Integrating plants into building design is essential to improve our resilience to increasing population pressures and a changing climate. Green roofs and walls provide many benefits to building owners and our city including:

- improved air quality;
- beautifying buildings and the cityscape;
- supporting local biodiversity;
- supporting our physical and mental health;
- insulating buildings from heat and noise;
- creating new open space for recreation and food growing;
- extending roof life by protecting the waterproofing layer from weather and temperature changes;
- improving solar panel efficiency;
- cooling city temperatures and reducing the urban heat island effect; and
- slowing and cleaning storm water runoff from buildings.

Design considerations

Access

Ensure access to the roof or wall for installation and maintenance purposes is an important consideration. Soil can be pumped from ground level up to a roof, via crane, scissor lift or through an internal stairwell or lift. The easier the access, the cheaper it is to install and maintain.

Accessibility

If a green roof or wall is to be accessible, consider pathway widths and planter box depths. This will ensure the design is free of trip hazards and can be readily accessible to people in wheelchairs or with mobility or visual problems.

Biodiversity

Biodiversity is essential to human and environmental health. Any green roof or green wall can be designed to support biodiversity and incorporate native species. Include ponds or water features to encourage bird and invertebrates to use the space. Insect hotels, rockeries and designs that provide hiding spaces for invertebrates will also support local biodiversity.

Privacy

While supporting green roofs, be mindful not to impinge on others' privacy. Roof tops that overlook other private spaces may require privacy screens or setbacks.

Food

Growing your own food can reduce food travel, it also provides a source of fresh food and personal satisfaction for the grower or community. The minimum soil depth should be 300-400mm to ensure good growth, and an integrated irrigation system is important in our climate. Native food plants and plants with shallow rooting systems can do well on green roofs and walls.



(La Citta Vita, 2012)

Safety

If the green roof is to be used as open space, adequate safety measures will need to be in place. A continuous balustrade or other barrier must be provided along the side of any roof to which public access is provided. If the green roof is not trafficable, you may still require a safety harness system to allow for the safe maintenance of the green roof.

Noise

Green roofs and walls reduce noise impacts on a building. However if the green roofs will be used regularly as outdoor space, the space should be designed to minimise potential noise impact on neighbours.

Slope

A green roof requires a minimum slope to ensure proper drainage. If the roof is completely flat, layers can be added to improve drainage on the roof. Green roofs can be installed on roofs of pitches up to 45°; however, green roofs over 10-15° may require added support to keep soil and plants evenly distributed on the roof.

Soil

Soil for green roofs and walls is specially engineered to be lightweight and provide sufficient support for plants to grow and drain water effectively. Once planted, a thick layer of mulch should be added to prevent soil blowing away and to reduce irrigation requirements. Over time, soil and fertilisers will need to be added to keep your garden healthy.

Sun and wind access

For green roof or wall to flourish site aspect needs to be considered. Select plants that thrive in the particular sun and wind conditions of your site. The higher the roof or wall, the greater the potential wind and sun impact. If you are intending to grow food on your green roof or wall, maximising daily sun exposure is important.

Solar panels

Solar panels can be integrated with green roofs. Green roofs keep ambient temperatures at an optimal level for maximum solar panel efficiency. Select low growing plants that will not overshadow the panels.



(Psijas, 2013)

(Metro Centric, 2013)



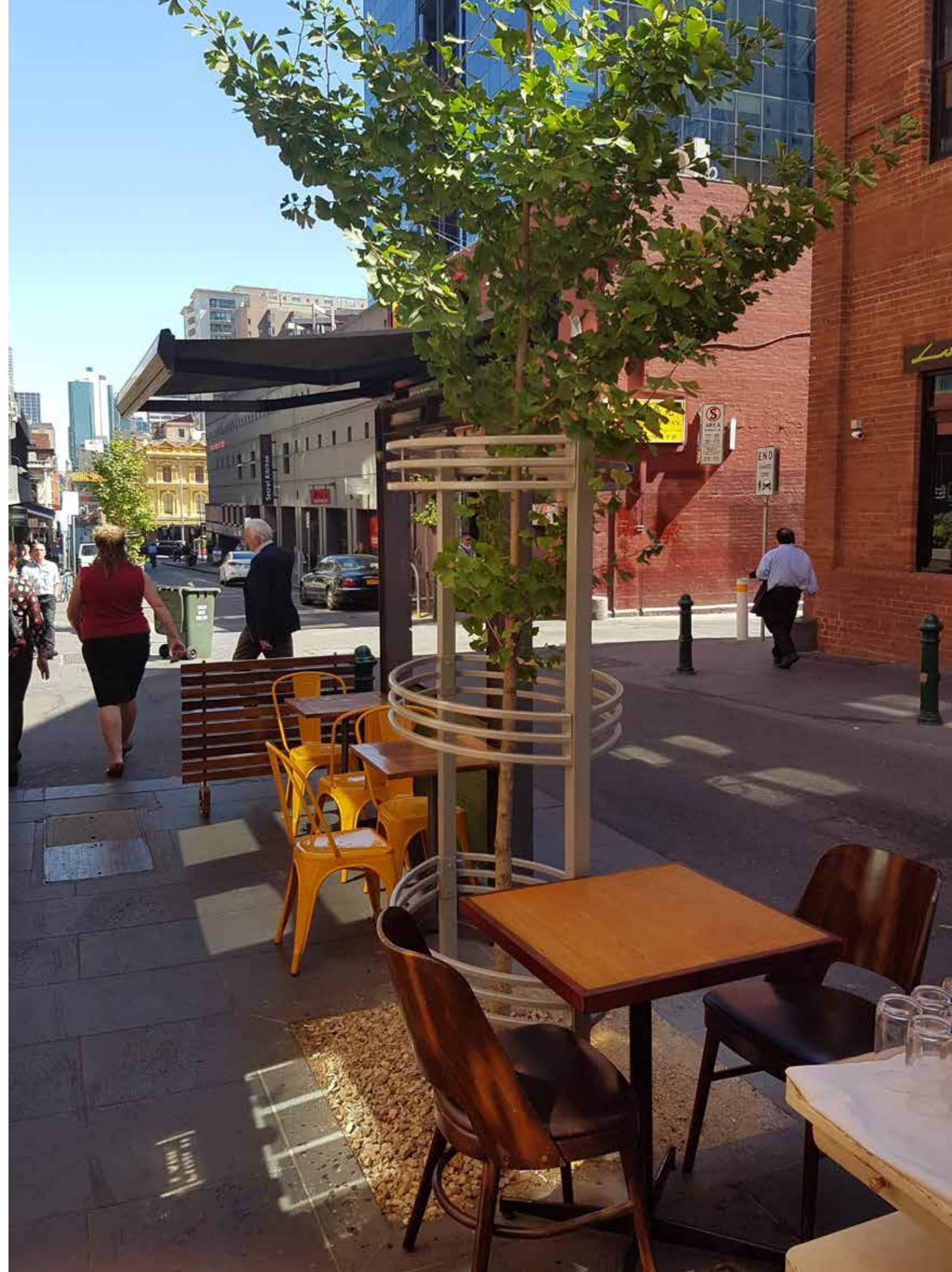
(Padriac, 2010)

3.2 PUBLIC REALM AND STREETSCAPE

This part provides detail regarding the following elements to support the PDA Development Scheme:

- streetscape;
- interface and defined user zones;
- street trees;
- recreation;
- footpath treatments;
- built structures; and
- placemaking.

Great public places make cities and towns great places to live...



3.2.1 Streetscape

The pedestrian realm streetscape serves as a multi-functional space, providing for the use and comfort of pedestrians and users, but also providing for core community needs including infrastructure and access to this infrastructure, essential services and stormwater management.

Streets are also places where city life is expressed in ways including on-street dining, informal meetings, artwork, advertising, performances and other ephemeral activities. Great streets not only foster civic pride and distinction but can serve as cornerstones of economic development.

This part contains additional information regarding the interface design provisions for streetscape types. Conceptual principles and examples are provided to demonstrate the recommended approach for the creation of effective spaces and movement corridors (promenade, links, streets) for pedestrians and people-powered transport within the PDA, and connectivity with the PDA.

Streets are the lifeblood and arteries of the city...



(La Citta Vita, Vastra Hamnen, park space, 2010)



3.2.1.1 Streetscape design

All of the previous concepts are culminated with the overall streetscape design, integrating the built urban design outcomes with the public realm and urban greening concepts. As a guide two typical streetscapes have been identified.

Typical urban connector streetscape

Dual climatic designs respond to the climatic drivers providing protection, comfort as well as protection for the pedestrian in the morning and afternoon.

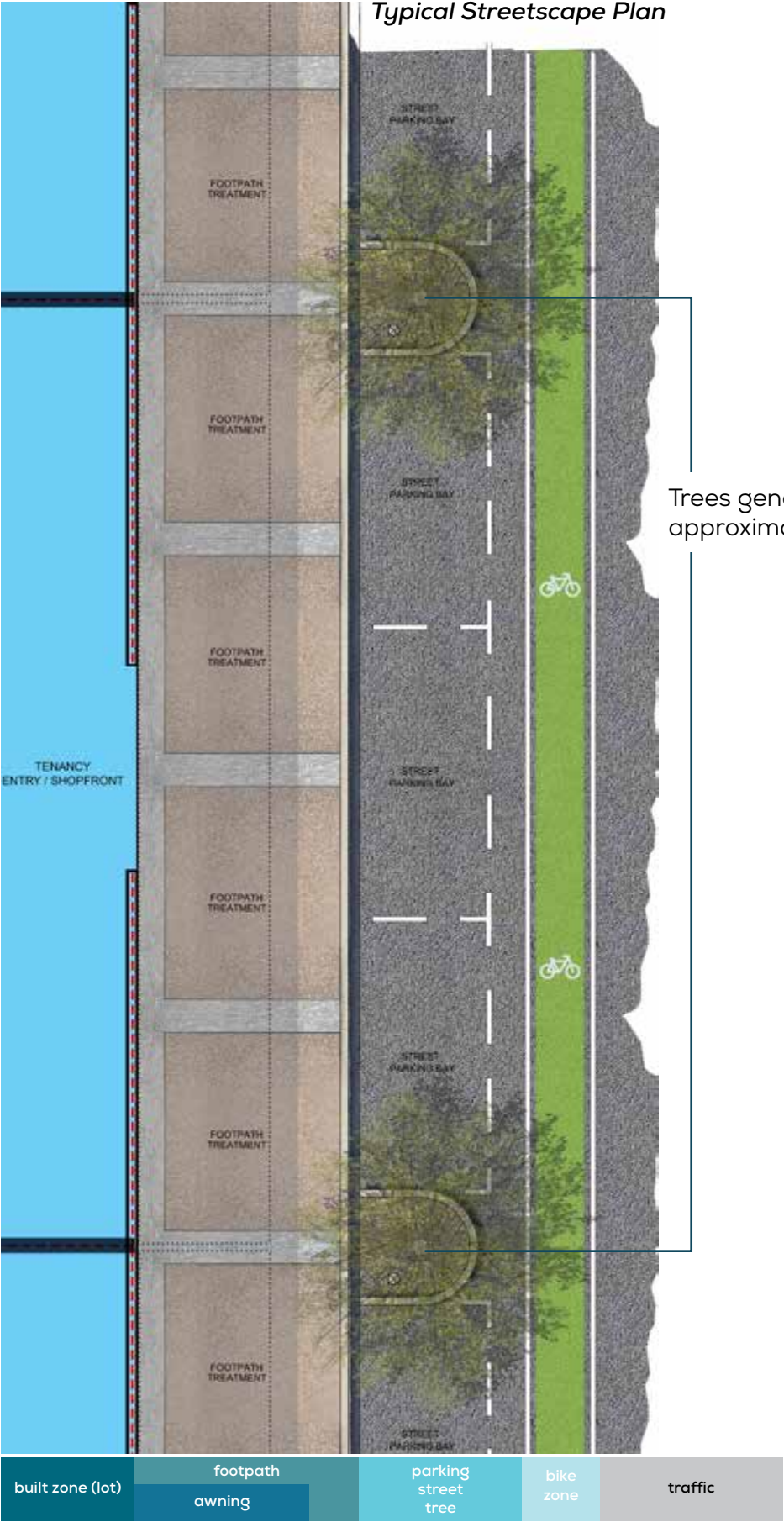


Typical urban intimate streetscape

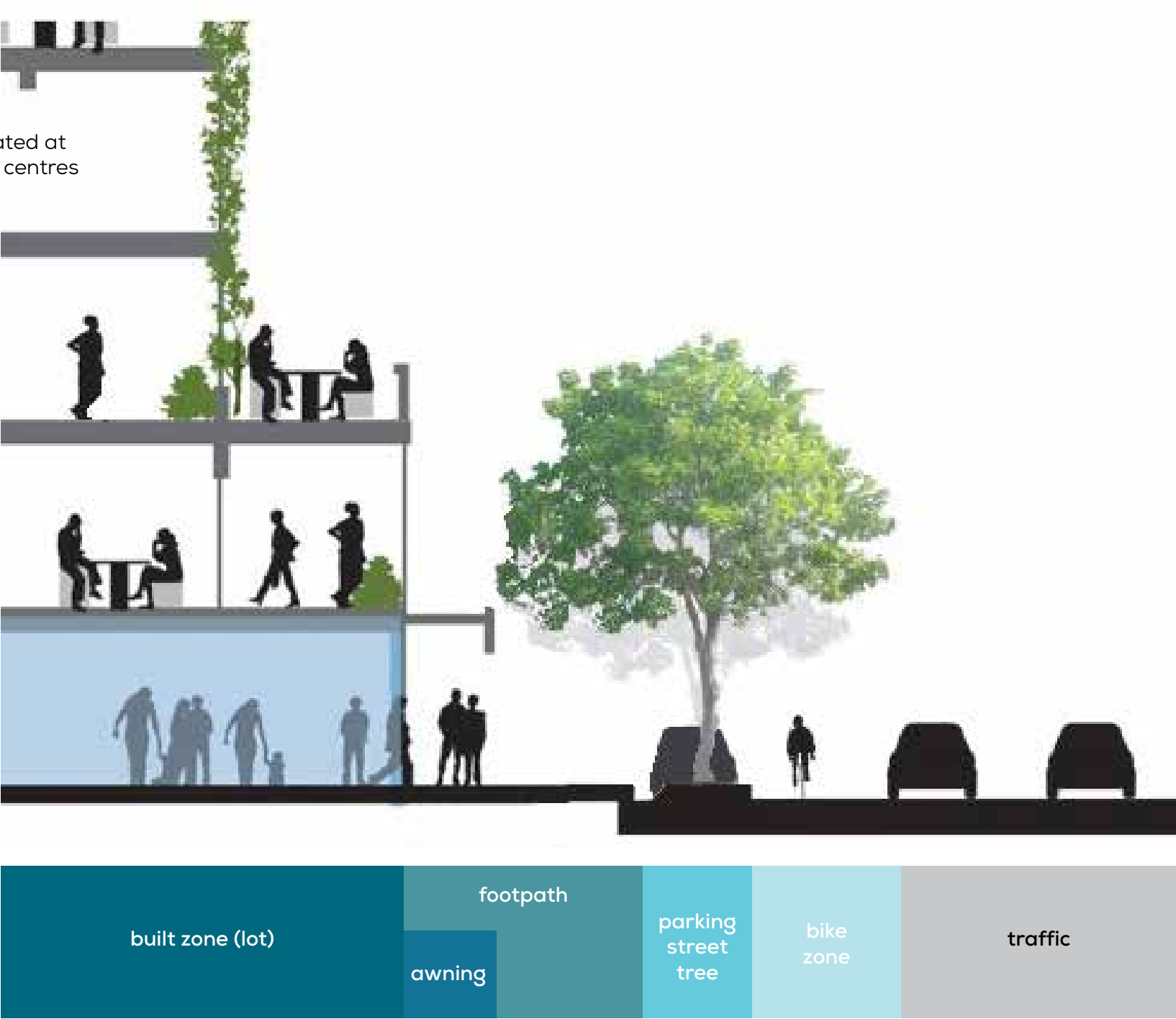
A more intimate streetscape where traffic is slower and is a secondary function. Climate responsive footpath activity nodes dovetail commercial activities, encouraging vibrant movement, sound and colour into the public realm. This streetscape is ideal for an entertainment or residential precinct.



Typical Streetscape Plan

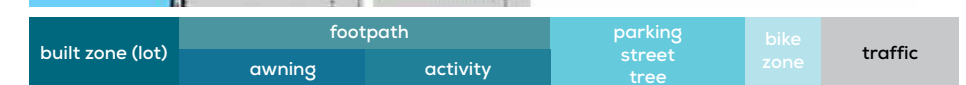
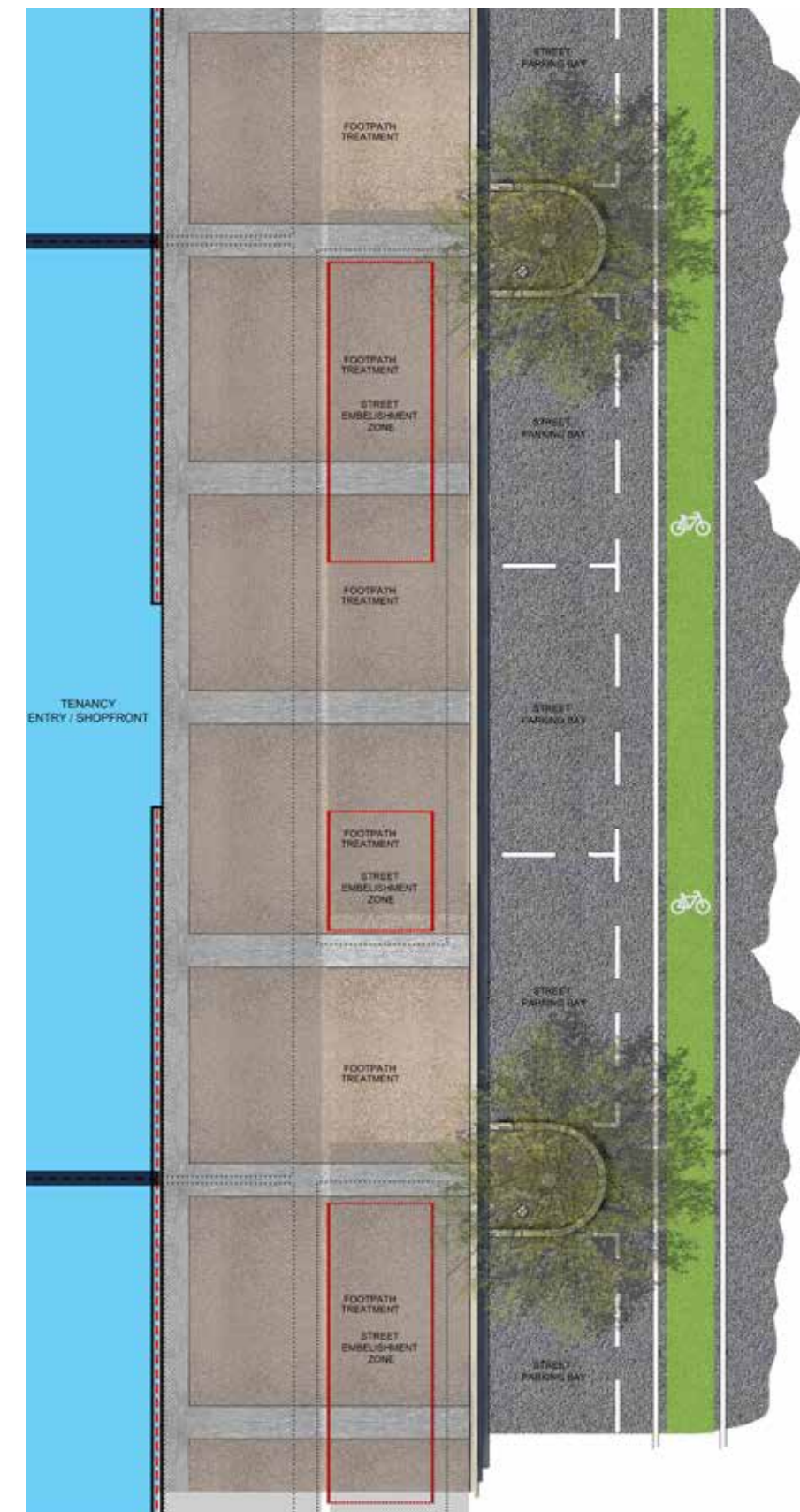


Typical Streetscape Section



Trees generally located at approximately 15m centres

Typical streetscape wide footpath section

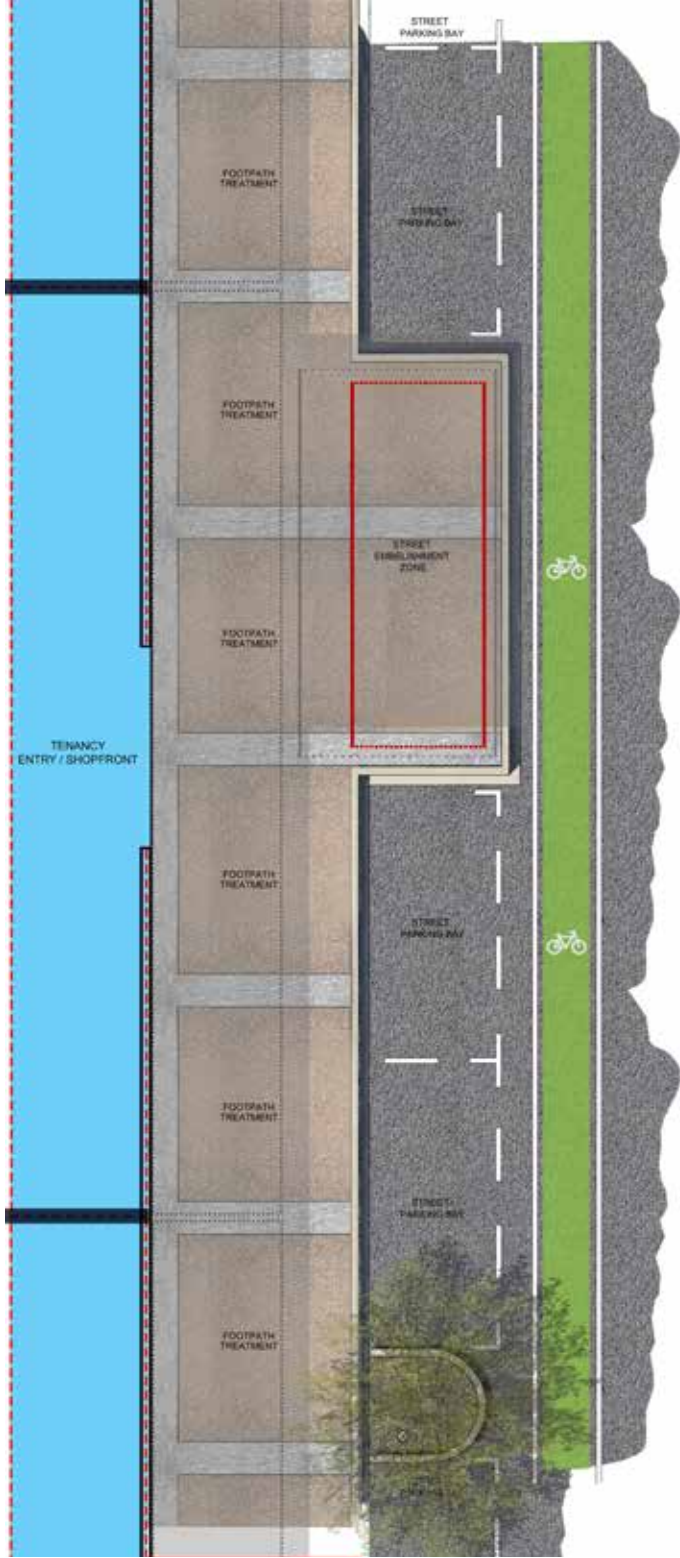


Typical streetscape wide footpath plan

Typical streetscape activity node section

The footpath interrupts the parking zone to provide an activity node. Activity nodes could be a number of different elements inserted in to the street or even a combination with the outcome for pedestrian activity and improved amenity in the streets. These may include elements of, but not be limited to;

- outdoor dining;
- feature landscapes;
- public art (refer art strategy);
- bus stop;
- signage elements including interpretive and wayfinding;
- pedestrian crossings; and
- public furniture – seats, water stops, bins, etc.



built zone (lot)	footpath	parking	bike zone	traffic
	awning	activity		

Typical streetscape activity intervention plan

3.2.2 Interface and defined user zones

Recognisable zoning where pedestrians, motor vehicles and people-powered transport share the same or adjacent areas contributes to the safety and wayfinding of all users.

Ways to identify recognisable zones should be considered in design for the following user groups:

- pedestrian (prams, wheelchairs);
- bikes and other faster forms of people-powered transport;
- motorised personal transport (electric skateboards, segways, etc.); and
- motor vehicles (motorbikes).

Ways to define zones include:

- pavement colour;
- pavement texture;
- pavement levels;
- bollards;
- structures;
- trees; and
- landscaping.



(La Citta Vita, Eco-housing, 2010)

3.2.3 Street trees

Streets are the veins of a city; to make them work properly we need to encourage pedestrian activity. People seek out comfort, accessibility and safety. Trees within streets and the public realm aim to encourage walking by providing these outcomes.

- Trees can increase property values:
 - Street trees can increase the “kerb appeal” of properties in urban areas.
 - Create additional business and development opportunities.
- Trees provide a healthier environment:
 - Two medium-sized, healthy trees can supply the oxygen required for a single person for a year.
 - Trees clean the air by absorbing greenhouse gases that contribute to global warming, by storing carbon dioxide in their stems and leaves.
 - Trees capture airborne particles such as dirt, dust and soot; a mature tree can absorb 50-100 kgs of particulate pollution each year.
 - Street trees provide a natural habitat for native fauna.
 - Researchers have found that more trees in urban neighborhoods correlate with a lower incidence of asthma.
- Trees and sidewalk gardens reduce flooding and water pollution:
 - Storm water can overload the storm-sewer system, resulting in polluted runoff into Ross Creek. This runoff contains chemicals washed from our streets by the rain. Trees reduce this problem by capturing rain; a mature tree can store up to 190 litres of water during large storms, and the concrete removed from our sidewalks for street trees and sidewalk gardens allows rain to soak into the soil, instead of into the storm water system.
- Trees calm traffic:
 - The presence of trees reduces the speed of drivers, and reduces the frequency and severity of crashes.
 - Street trees and sidewalk gardens create a physical and mental barrier between the street and the sidewalk, keeping pedestrians, children and pets out of harm’s way.
 - Street trees absorb traffic noise and increase privacy.
- Trees and sidewalk gardens can increase revenues in shopping districts:
 - Consumers have indicated more willingness to pay for goods and services in retail areas that have streetscape greening.
- Trees and sidewalk gardens may reduce crime and provide a safer environment:
 - The greener a building’s surroundings, the fewer reported crimes.
 - Increase in the use of green spaces by pedestrian’s will increase passive surveillance and deters would-be criminals.
 - Greenery alleviates mental fatigue, a precursor to violent behaviour.
- Trees promote exercise and a healthy lifestyle:
 - People feel distances to be less when walking, and are therefore more likely to travel on foot.
 - Encourage pedestrian movement.
 - Comfort levels for pedestrians are improved by providing shade, reducing traffic noise, reducing heat sink sources and reducing glare.
 - A mature tree canopy can reduce air temperatures from to 3°C - 5°C.



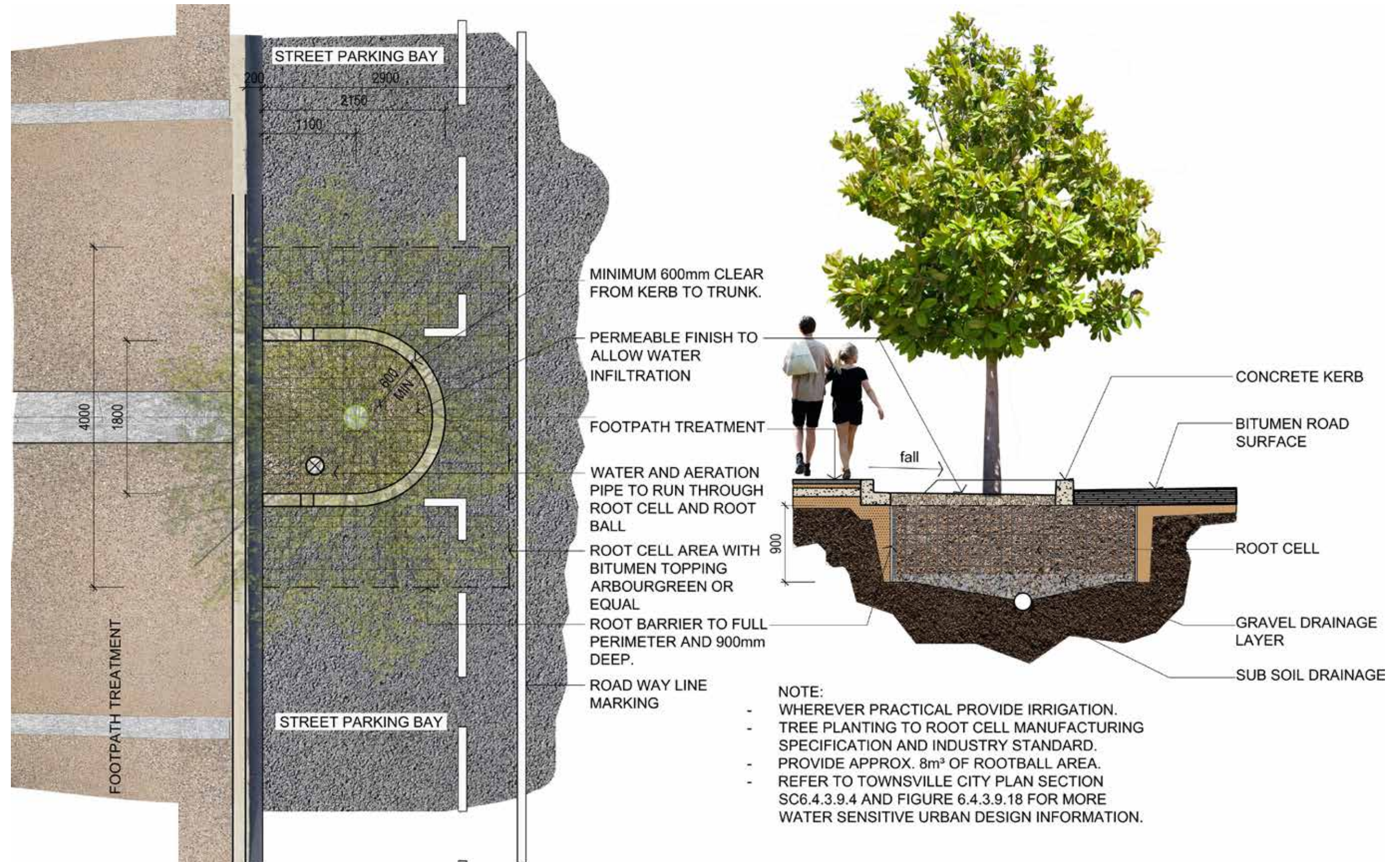
3.2.3.1 Street tree design

A street's primary function is to provide access for cars, however with a focus on encouraging pedestrian traffic and improving their comfort levels we aim to shift the hierarchy. Trees are to occupy the edge of the road interface within the on street parking zone. This aims to:

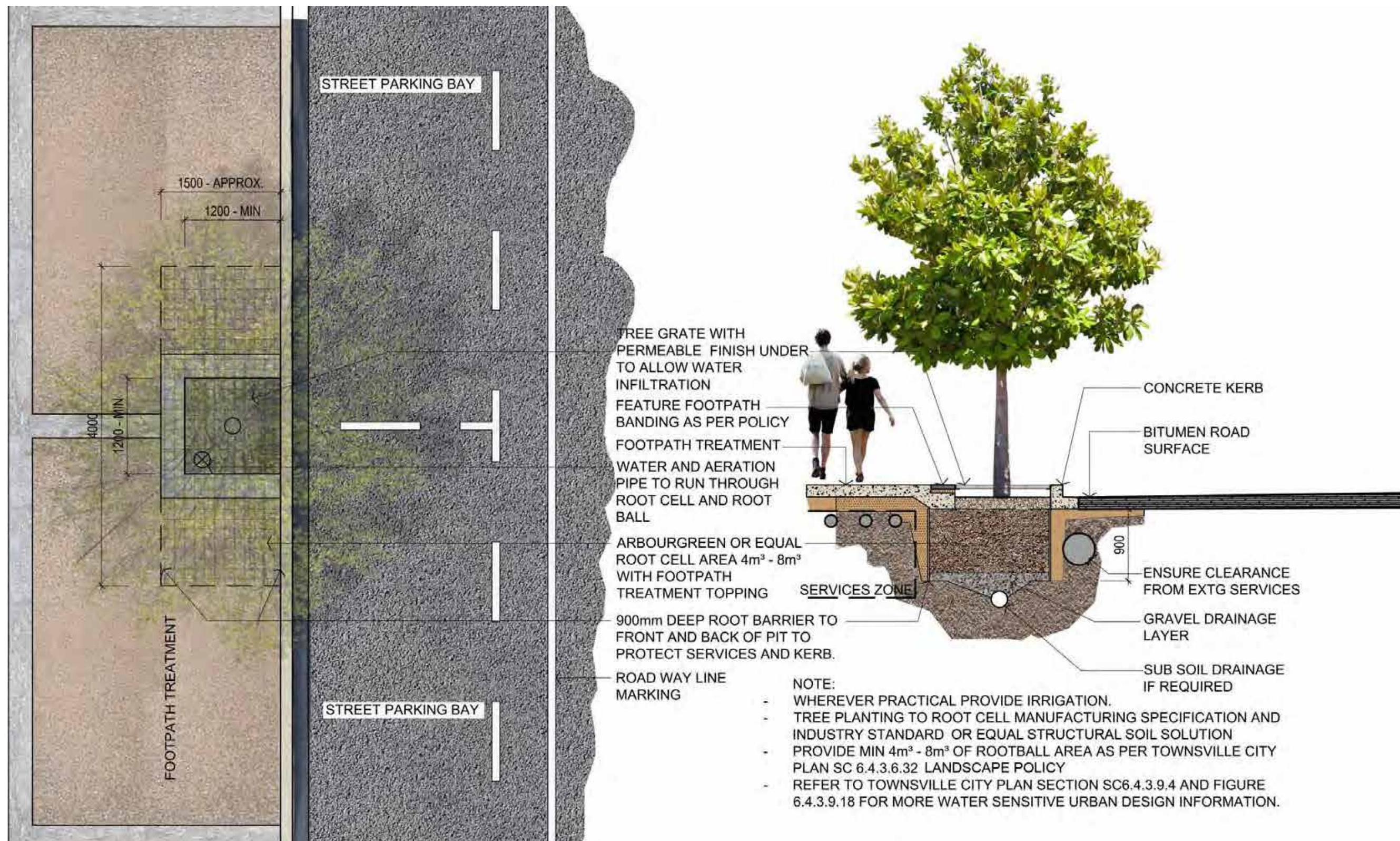
- give more room for pedestrian movement;
- create a 'barrier' to the traffic on the street;
- avoid essential infrastructure within the footpath;
- encourage water sensitive urban design (WSUD) by allowing the trees to filter and capture storm water runoff from the street; and
- make the streets a more comfortable and enjoyable experience for everyone.



Typical Street tree carpark insertion



Alternative Street tree footpath insertion



3.2.4 Recreation

3.2.4.1 Introduction

Recreational space initiatives are widely recognised as playing a critical role in the health and wellbeing of a city's people, economy and natural systems.

The delivery of the recreation spaces intended by the PDA Development Scheme, supported by other public realm and streetscape elements, will create an overarching network of high-quality spaces comparable to elements of The Strand and Riverway, serving a regional catchment.

Recreational spaces in the PDA will provide opportunities for passive and active recreational nodes. Recreational nodes will also strengthen the PDA connectivity network providing enhanced connectivity between nodes and while also providing wider connectivity to the city and surrounds.



(Brisbane City Council, Calamvale District Park, Calamvale, 2013)



(Brisbane City Council, 2014)

3.2.4.2 Key principles

Recreation spaces throughout the PDA will provide a range of functions and provide users with a diverse range of experiences. Key outcomes when designing recreational spaces include:

- integrated urban design;
- connectivity;
- diversity of experience;
- biophilic urbanism and connection with nature;
- active lifestyle; and
- landscaping.

Integrated urban design

Design elements within recreational spaces are integrated and multifunctional and allow for shared use of spaces. Recreational spaces and design elements consider matters such as integration and relationships with adjoining built form, incorporation of natural landscape and interaction and connection with Ross Creek. Recreational spaces integrate with a number of PDA strategies including connectivity, wayfinding, art, lighting and stormwater management to enhance user enjoyment, legibility and creation of multifunctional spaces. The design of recreation spaces allows for multiple and shared-user spaces to enhance opportunity for participation.

Connectivity

Recreation spaces in the PDA provide enhanced connectivity to the variety of recreation nodes. Connectivity is essential for the PDA to enable pedestrians, cyclists, etc. ease of movement to their destination, connecting the city centre with The Strand and the suburbs along Ross River. This connectivity also needs to enable users from the widest possible range of sources and diversity of destinations to access the recreational spaces of the PDA, future residential spaces as well as the many city destinations.



(Brisbane City Council, 2014)

Diversity of experience

Users of recreation spaces seek out these spaces for a variety of reasons including passive leisure, active play, exercise and connection with nature and people.

Design of recreation spaces in the PDA considers opportunities for a range of recreation pursuits that provide for diverse demographics, equitable access, use of spaces for both day-time and night-time activities.

Spaces will provide for active and passive use and leverage Ross Creek providing enhanced access and opportunities for recreational use along Ross Creek such as fishing and on-water activities.

Biophilic urbanism and connection with nature

The term biophilic urbanism, is a practice which focuses on the greater use of natural elements in the design and function of cities. A key outcome and a need which is satisfied via biophilic urbanism practice is enhanced human interaction with nature.

Increased provision of natural elements within the urban setting delivers a range of benefits that enhance community liveability. Benefits include reduced heat island effect, lessen heating loads in buildings, improved air quality and improve stormwater management. Natural elements also provide increased amenity, reduce crime and violence, reduce stress and depression, improved health and wellbeing and encourage greater community connectivity. Key biophilic urbanism outcomes reflect Townsville's dry tropical climate and considers the following patterns of biophilic design (Bronwning, Ryan, & Clancy, 2014):

- visual connection with nature;
- non-visual connection with nature;
- non-rhythmic sensory stimuli;
- thermal and air flow variability;
- presence of water;
- dynamic and diffuse light;
- connection with natural systems;
- biomorphic forms and patterns;
- material connection with nature;
- complexity and order;
- prospect;
- refuge;
- mystery; and
- risk/peril.

Active lifestyle

The PDA provides an environment with a choice of active and passive recreation activities that contribute to community health and wellbeing. Recreational spaces in the PDA encourage engagement in recreation and focus on the creation of a pedestrian-oriented environment. Active public transport nodes and active transport networks are provided to ensure ease of movement throughout the PDA. The pathway network provides for end-of-trip facilities and for a variety of people-powered transport including bicycles, skateboards, prams, wheelchairs, pedestrians, etc. Sufficient path widths and pathway choices should be provided to ensure users feel safe in a multi-user environment, and may require the separation of connectors. The network design shall consider opportunities for higher speed active transit. Within active recreation spaces, fitness nodes shall be placed to encourage a healthy active life style.

Landscaping

Landscaping is required to maintain and enhance the character of the PDA and can be used to soften hard urban areas. Landscape design responds to distinctive natural and man-made characteristics of the local setting. Landscape design presents a legible and attractive 'face' to the user and provides for continuity of landscaping elements to enhance legibility.

All landscape works are of a high-quality in both function and amenity. All such landscape works ensure that they can be easily managed and maintained in the long term. The use of best practice in the design of landscaping works is essential in providing a safe environment for all users.

Landscape and planting selections are climatically responsive to Townsville's dry tropical climate. Appropriate species should be selected for urban and park spaces with consideration given to shade cover, the PDA character area, streets and avenues and entry statements.

Shade in the Dry Tropics is required all year round so the selection of deciduous species is not particularly appropriate. It should be kept in mind too that some local eucalypt species lose their leaves in summer, reducing shade provision when it is most needed.

Selection of any understorey planting is also important, as they can also offer significantly reduced maintenance aspects. All understorey plantings shall provide durable attractive and appropriate flora gardens within the PDA recreational space.

All landscaping is to be installed in accordance with the Townsville City Plan's SC6.4 Development Manual planning scheme policy.



(Brisbane City Council, 2014)



(Brisbane City Council, 2014)





THE WATERFRONT

3.2.4.3 Functions

The hierarchy of recreational spaces in the PDA is as per the Public Open Space Hierarchy as described in the Landscape Policy of the Townsville City Plan's SC6.4 Development Manual planning scheme policy. Within the hierarchy of recreational spaces, these spaces provide for the following functions:

Active recreation unstructured

May provide structured parkland design, offering facilities for flexible usage of organised play, sport and exercise. Amenities that support supervision and spectators and encourage extended use. Provide informal open space parkland design, offering opportunities for different types of play while addressing the need for flexibility e.g. kick and throw areas.

Passive recreation

Provide informal parkland design, generally incorporating pathways and seating surrounded by grass and trees, and often containing active fields and playgrounds. Support wayfinding via integration of wayfinding elements such as accessible Wi-Fi and for places to pause and gather.

Connectors

These refer to pedestrian spaces which provide for users to connect between identifiable parks and civic spaces or plazas supporting the connection of a vibrant activity network. They provide for exploration and passive use such as walking and leisure, however also provide to active users such as jogging and cycling.

Natural space

Naturally formed landscape environment that may include areas of vegetation, habitat, wetlands, forests, etc.

Civic plaza

Provide the heart and soul of public gatherings and interactions, creating point of interest destinations and connections for public consumption. Essential outcomes at public interface include: Human scale, comfortable green soft shaded spaces that provide: Safe, comfortable and inviting open spaces with vibrant, attractive, textile, interactive, hubs. Activities and events of this space should feed and build the CBD identity. Supporting infrastructure to hold events is provided such as service connection points for power, sewer and water.

Urban plaza

Flexible outdoor public space generally located in special places with community activity. Can often be adapted to be utilised for a variety of activities including, gathering, socialising and occasionally for organised events and activations (e.g. markets).

Urban parkland

Public parks utilised for gathering/meeting and occasional organised events. Generally located in proximity to commercial and cultural centres and in areas offering scenic surroundings.



(Forgemind ArchiMedia, 2012)

3.2.4.4 Recreation in the PDA

As identified in Structure Plan and Implementation Strategy of the Development Scheme, the PDA will provide for a series of high-quality recreation spaces. Combined these facilities will service the region and provide unique recreational experiences for the Townsville community and visitors.

Table 1 provides a description of the various recreation spaces throughout the PDA (Figure 20), their role in the public open space hierarchy and the functions they provide for. Embellishments are as per the Landscape policy in the Townsville City Plan's SC6.4 Development manual planning scheme policy, other than those listed below which are in addition² and support the high-quality nature of recreation spaces expected in the PDA. It is noted that additional recreation spaces may occur additional to those listed in Table 1.

Public art, lighting and wayfinding in recreation spaces are also provided in accordance with sections 3.4 Wayfinding Strategy, 3.5 Strategy and 3.6 Public art which may be in addition to the requirements of the Landscape policy in the Townsville City Plan's SC6.4 Development manual planning scheme policy.

Table 1: Recreation spaces

Recreation space	Role in Hierarchy	Function	Embellishment
Waterfront Promenade The Waterfront Promenade is the primary connector and a key attraction within the PDA. The Waterfront Promenade integrates with the natural environment.	Recreation Corridor / Amenity Park	2. Passive Recreation 3. Connector 4. Natural space	
Central Park Central Park is the PDA primary open space area and is key in linking the North Queensland Stadium to Palmer Street and the City Centre. It is intended to be developed to perform a regional function supported and integrated with regional community facilities. It provides access to Ross Creek and links other key activation opportunities.	Regional Recreation Park	1. Active Recreation Unstructured 2. Passive Recreation 3. Connectors 6 Urban Plaza 7. Urban Parkland	<ul style="list-style-type: none"> • Water play • Shade arbour • Platform seating to water's edge • Major bespoke playground • Amphitheatre
Hanran Park Hanran Park provides open space and a plaza for informal recreation and gatherings. This park is a key area of circulation, linking the bus hub to the NQ Stadium. Hanran Park is integrated with public art and provides connectivity to CBD functions including public transport options. The adjacent mangroves provide shading during the day and function as a green linkage.	Local Recreation Park	1. Active Recreation Unstructured 2. Passive Recreation 3. Connectors 6. Urban Plaza 7. Urban Parkland	<ul style="list-style-type: none"> • Activator – such a junior water, nature, imaginative and electronic play • End-of-trip facilities
Waterfront Parklands 3 Waterfront parklands are established to provide passive open space and connectivity function for residents and visitors throughout the PDA including areas adjacent to the Waterfront Promenade.	Pocket Park	2. Passive Recreation 3. Connector 4. Natural space	<ul style="list-style-type: none"> • Educational and interpretive elements
Precinct 2 – Waterfront wetlands area The wetlands area provides for the preservation of high importance natural assets which provides for the connection of the Waterfront Promenade via low impact boardwalks, and for the enjoyment and education of natural assets.	Natural and Bushland Area	2. Passive Recreation 3. Connectors 4. Natural space	<ul style="list-style-type: none"> • Educational and interpretive elements • Observation spaces
SEC forecourts 4 The North Queensland Stadium forecourts provide for more than just game days integrating civic spaces, greens and places for gathering including for the youth throughout the year. The forecourts provide a shady reprieve and facilities for community use and enjoyment including public art.	Civic Space	2. Passive Recreation 3. Connectors 5. Civic Plaza	<ul style="list-style-type: none"> • Urban youth park
Flinders Street East Plaza Flinders Street East plaza provides a pedestrian based area for informal gathering and small-scale event such as community gatherings and markets. The plaza will provide a shady space for leisure and interaction with Ross Creek in an urban wharf setting.	Civic Space	2. Passive Recreation 3. Connectors 6. Urban Plaza	<ul style="list-style-type: none"> • Public toilet
Strand Waterfront Plaza The Strand Waterfront Plaza provides a key connection from the southern end of The Strand to the Waterfront Promenade. The plaza provides for informal gatherings integration public art and wayfinding.	Civic Space	2. Passive Recreation 3. Connectors 6. Urban Plaza	
Blackwood Street Plaza Blackwood Street plaza provides an informal space providing a corner treatment functioning as a gateway connection through to the Waterfront Promenade.	Civic Space	2. Passive Recreation 3. Connectors 6. Urban Plaza	
Wickham Street Plaza Wickham Street connection forms a small plaza providing for pedestrian connectivity and integrated art and wayfinding elements.	Civic Space	2. Passive Recreation 3. Connectors 6. Urban Plaza	
Private urban plazas 5 A number of private urban plazas will be integrated as part of development throughout the built environment providing for gathering, outdoor dining and connectivity.	Civic Space	2. Passive Recreation 3. Connectors 6. Urban Plaza	

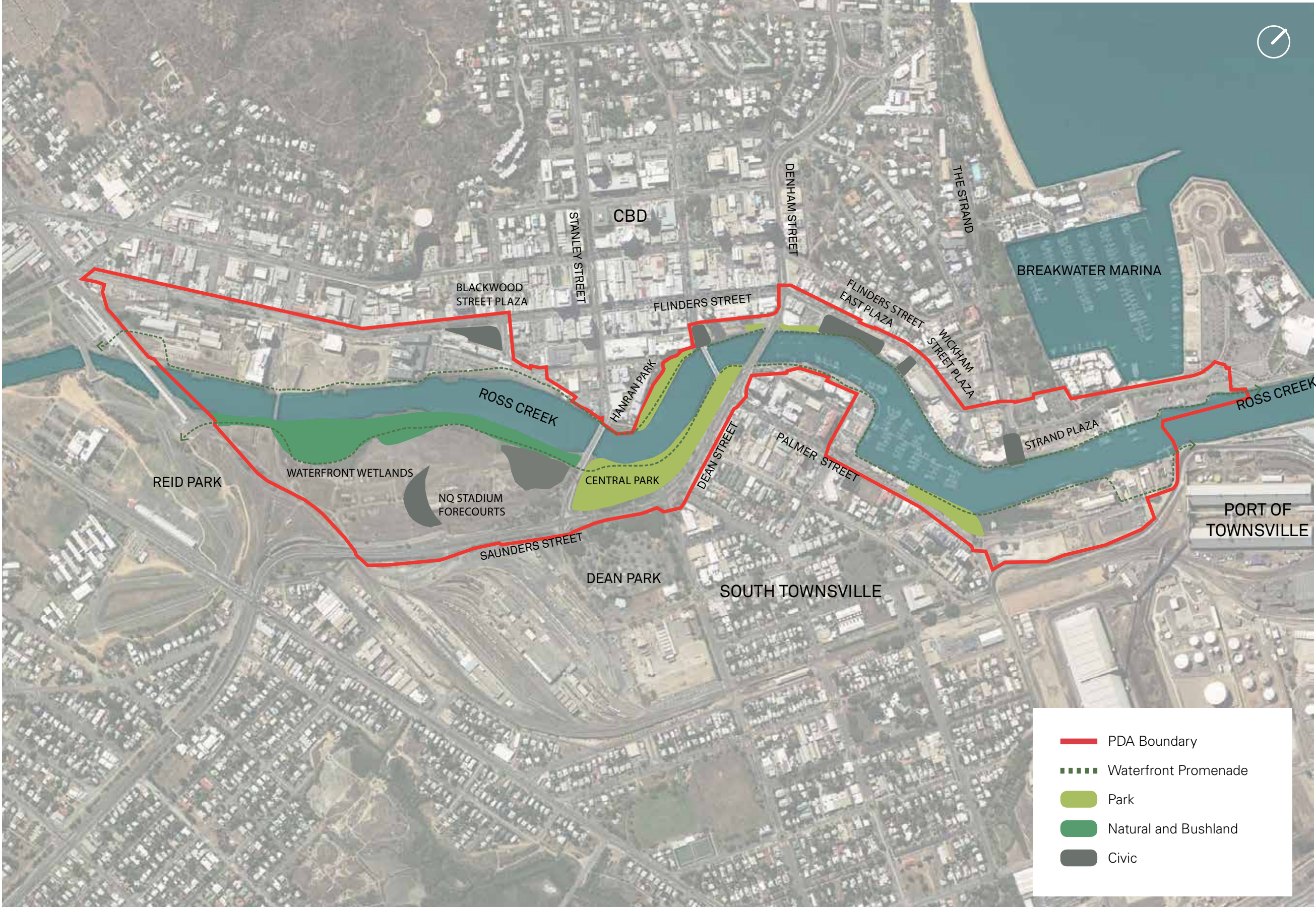
² Refer to the Townsville City Waterfront Priority Development Area Infrastructure Charges Offset Plan available at www.townsville.qld.gov.au

³ Note that Waterfront Parklands (Pocket Parks) are not all represented on Figure 21. Pocket park opportunities will be considered in the development application process

⁴ Note that the design and location of the North Queensland Stadium forecourt recreation areas will be determined through the application and assessment process

⁵ Note that Private urban plazas are not represented on Figure 20

Figure 20: Recreation spaces



3.2.5 Footpath treatments

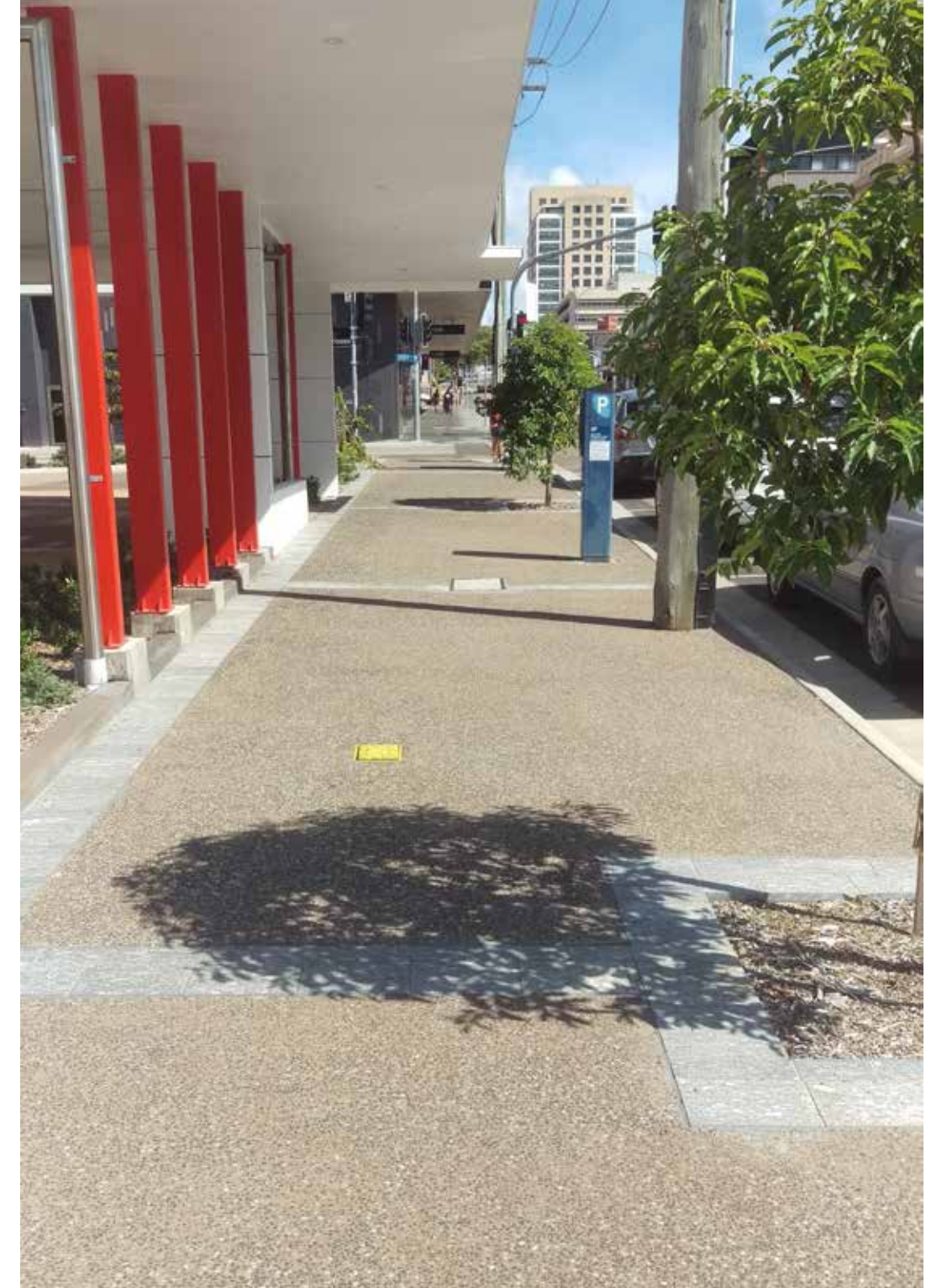
This part provides additional requirements regarding intended footpath treatments to that listed in Townsville City Plan SC6.4 Development manual planning scheme policy. Where no detail is provided the relevant criteria is that of the SC6.4 Development manual planning scheme policy.

3.2.5.1 Footpath treatment standards

The general outcomes for footpath treatment for each PDA precinct is described below and identified on Figure 29. Additional standards for footpath treatment can be found in Townsville City Plan SC6.4.3.3 Footpath treatment policy.

In such instances where no footpath treatment is specified, criteria from SC6.4.3.3 Footpath treatment policy and the following section shall be used to determine the particular treatment to be applied.

Footpath treatment design should consider and integrate with the specific site conditions, theme, built structures, wayfinding, lighting, and public art, and management of marine plants and other relevant criteria of the Development Scheme and Design Guideline⁶.



⁶ Refer to SC6.4.3.3.7 Footpath treatment location maps for locations of proposed treatments outside of the PDA
Townsville City Waterfront Priority Development Area Design Guideline



PRECINCT 1 – CITY WATERFRONT GATEWAY

Footpath treatments in Precinct 1 provide for:

- the continuation of the Footpath Treatment 2 along Flinders Street as per the Townsville City Plan (see SC6.4.3.3 Footpath treatment policy). to provide consistency and continuity of footpath treatments within the broader locality;
- the connection with and continuation of Ceremonial Corridor (Figure 29) as per the design theme of the existing stages;
- the connection of the Waterfront Promenade (Figure 29), which has a direct interface with the riparian corridor (Figure 21) and opportunities for access to the water; and
- integration with existing footpath treatments, the Waterfront Promenade, civic spaces with materials generally comprising of:
 - coloured concrete;
 - exposed aggregate; and
 - feature banding.



Figure 21: Type C – Rock batter with seating height concrete edge restraint to top of batter



PRECINCT 2 – WATERSIDE LIVING

Footpath treatments in Precinct 2 provide for:

- a primary connection of the Waterfront Promenade which interfaces between urban and natural areas;
- a secondary connection of the Waterfront Promenade (Figure 29), through the natural areas which responds to the natural environment. This is generally of a raised boardwalk style to minimise impact (Figure 22, Figure 23); and
- future urban areas, to which Footpath Treatment 2 is applied, as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency and continuity of footpath treatments within the locality.

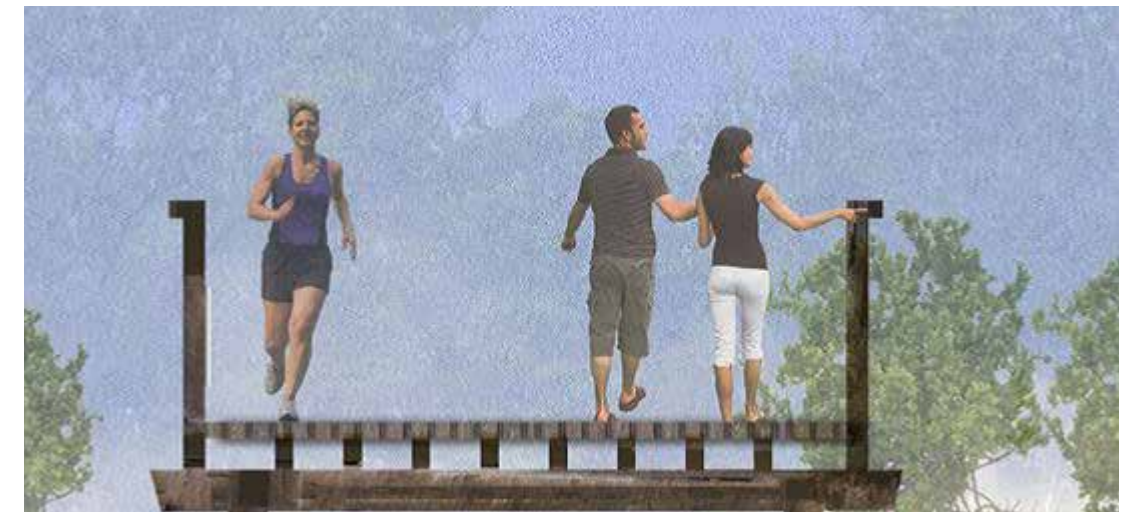


Figure 22: Type A - Habitat soft edge through mangroves



Figure 23: Type B - Habitat soft edge through salt grass

PRECINCT 3 – CULTURE AND ENTERTAINMENT

Footpath treatments in Precinct 3 provide for:

- a primary connection of the Waterfront Promenade which interfaces between urban and natural areas;
- a secondary connection of the Waterfront Promenade (Figure 29), through the natural areas which respond to the natural environment. This is generally of a raised boardwalk style to minimise impact (Figure 22, Figure 23);
- the connection of the Waterfront Promenade along Ross Creek in Central Park which provides for a direct interface with the water and access to the water by users (Figure 24, Figure 25);
- connectivity with urban forms, key nodes and civic spaces within the precinct; and
- the provision of Footpath Treatment 2 along Saunders Street and Dean Street as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency and continuity of footpath treatments within the locality.



Figure 25: Type E & F – Terraced edge / linear concrete terracing



Figure 24: Type G – Wharf edge – vertical wall with concrete pavement interface

PRECINCT 4 – CITY REACH

Footpath treatments in Precinct 4 provide for:

- the connection of the Waterfront Promenade along Ross Creek in Hanran Park which creates connectivity, and a soft interface with the riparian corridor (Figure 26) and opportunities for access to the water;
- the connection of the Waterfront Promenade on both sides of the creek downstream of Victoria bridge, which is of a wharf character, featuring over water boardwalk style footpaths, pontoons and structures, creating a direct interface with the water for users (Figure 27);
- the provision of Footpath Treatment 1 along Flinders Street East as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency and continuity of footpath treatments within the locality;
- the integration of civic plazas, spaces and waterfront links along Flinders Street East, including the Flinders Street pedestrian plaza and waterfront links at Denham Lane/Flinders Street area and Wickham Street, which integrate with adjoining footpath treatment types;
- the provision of Footpath Treatment 2 along Ogden Street and Plume Street as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency and continuity of footpath treatments within the locality; and
- the integration and rationalisation of the Tomlins Street area with the Waterfront Promenade.



Figure 26: Type D - Rock batter with concrete path set back from top of batter with planted strip between





Figure 27: Type H - Wharf edge - vertical wall with concrete pavement behind and flush deck out over water



PRECINCT 5 – RESEARCH AND TOURISM

Footpath treatments in Precinct 5 provide for:

- the connection of the Waterfront Promenade which interfaces with built form and is of a wharf character, featuring over water boardwalk-style footpaths, pontoons and structures, which provide users with a direct interface with the water (Figure 28);
- the provision of Footpath Treatment 2 along Flinders Street and King Street as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency and continuity of footpath treatments within the locality; and
- the integration of civic plazas, spaces and waterfront links including, at Wickham Street, and at the end of The Strand, which integrate with adjoining footpath treatments.

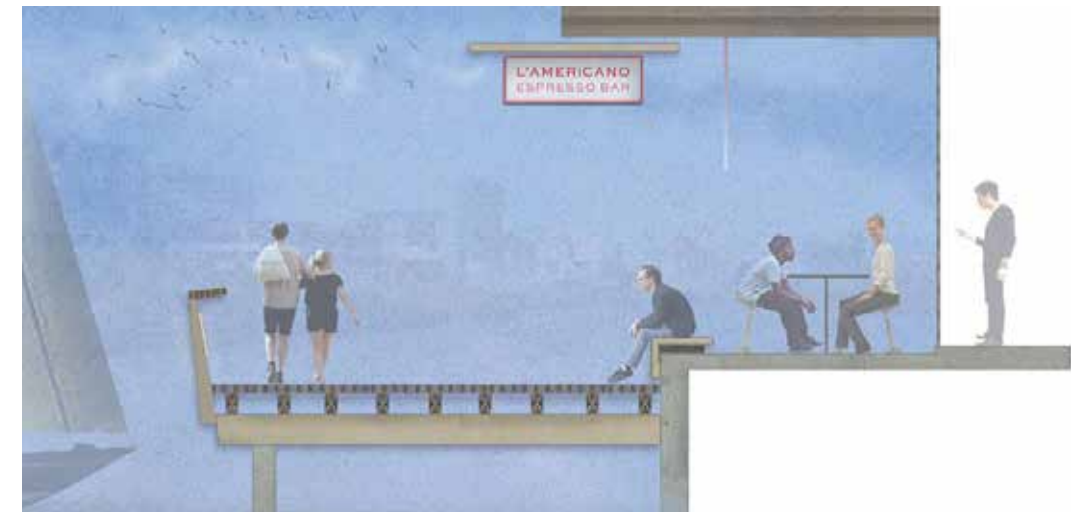


Figure 28: Type I - Wharf edge - vertical wall with concrete pavement with stepped deck out over water





PRECINCT 6 – OCEAN GATEWAY ^{7 8}

Footpath treatments in Precinct 6 provide for:

- the integration of footpath treatments which are complementary or sympathetic to existing Footpath Treatment 7 along Sir Leslie Thies Drive;
- the connection of the Waterfront Promenade which interfaces directly with built form and is of a wharf character, featuring over water boardwalk-style footpaths, pontoons and structures, which provide users with a direct interface with the water (Figure 28); and
- the integration of civic plazas, spaces and waterfront links with the precinct and at the end of The Strand which integrate with adjoining footpath treatments.

PRECINCT 7 – MARITIME MIXED USE ^{7 8}

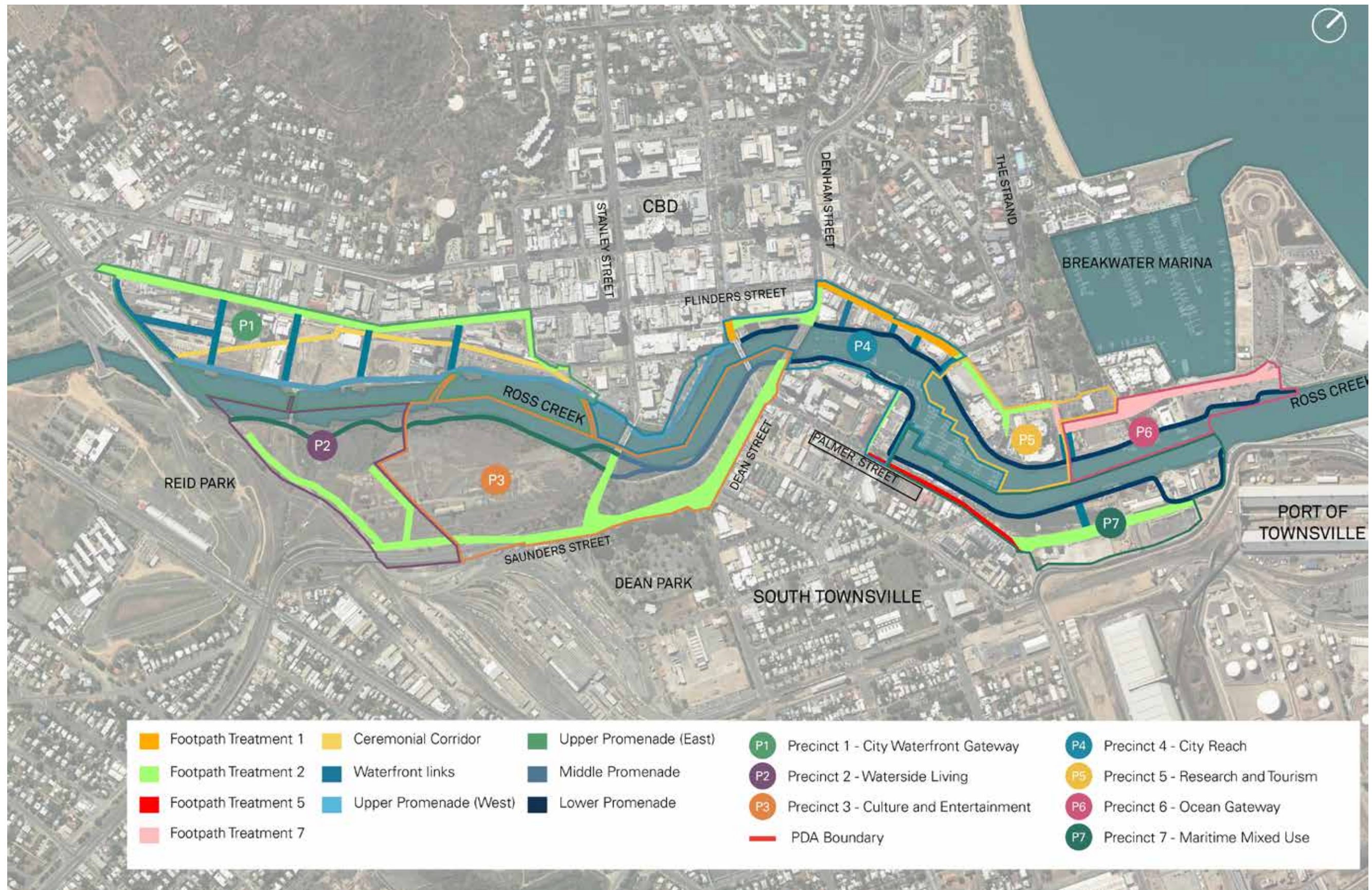
Footpath treatments in Precinct 7 provide for:

- the provision of Footpath Treatment 5 along Palmer Street as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency and continuity of footpath treatments within the locality;
- the integration of footpath treatments along and connecting with Ross Street which is complementary to Footpath Treatment 2 as per the standards set out in Townsville City Plan (see SC6.4.3.3 Footpath treatment policy), to provide consistency of treatment in the locality; and
- the connection of the Waterfront Promenade which is of a wharf character, featuring over water boardwalk style footpaths, pontoons and structures, which provide users with a direct interface with the water (Figure 28).

⁷ Development in Area B (see Schedule 5 of the Development Scheme) is assessed by MEDQ

⁸ Note that the Port of Townsville is a declared priority port subject to a master planning process

Figure 29: Footpath treatment location map⁹



⁹ Note that footpath treatments outside of declared road reserve areas are indicative in terms of location and are provided for information on intended treatment only

3.2.6 Built structures

Built structures within the PDA public realm are essential in responding to Townsville's dry tropical environment. Providing a response to this environment will offer improved amenity for the PDA, and cater for a variety of uses and activities. These will encourage people to stay, enjoy and appreciate the surrounding environment.

The design of built structures in the public realm creates an identifiable sense of place throughout the PDA, and creates a level of uniformity and consistency as you move through the spaces. The design of built structure contributes to making the PDA unique and recognisably different to other places in Townsville.

In particular, the design of built structures within the PDA public realm will:

- create a continuity of design, which reflect the theme of the area (Figure 1);
- only be used where necessary and where they support the outcomes of the development scheme;
- be multi-purpose, integrate wayfinding (3.4 Wayfinding Strategy), signage, art (3.6 Public art), lighting (3.5 Lighting Strategy), amenities, water fountains, seating, and shade;
- work with the natural environment and natural features where possible;
- be integrated with the pathway and promenade network and consider the physical contribution to the network;
- create comfort; not necessarily continuously, but certainly continually; and
- generally provide the opportunity to seek shelter in a downpour and would likely be integrated with formal seating.

3.2.6.1 Materials

Materials and finishes can be selected from an almost limitless array but it is important that the selection be practical. Materials and finishes have a role to fill beyond that of pure aesthetics. Suitability to the task is the most important criteria for materials selection but context too is important. The materials shown here are durable and low maintenance. The materials are close to nature and have their own inherent colour and texture, or substance.

These materials could include, but are not limited to:

- galvanised or stainless steel components bolted together establish the strength of the frame;
- timber battens and decking timbers create shade and pattern the structure. They can be used for seating, roofing, flooring and awnings;
- fibre cement sheet can be used for more solid elements or where more shade or separation is required;
- corrugated iron can be used in a similar way to fibre cement sheet; and
- stone and cement: Castle Hill Granite can be incorporated into rock walls and as aggregate for concrete used in structural walls and columns and low separation walls and seats.



3.2.6.2 Furniture

Street furniture is to be integrated into the fabric of the parks, the Waterfront Promenade, plazas and public realm. Furniture is encouraged to be integrated and can perform multiple purposes. Furniture should integrate with wayfinding (3.4 Wayfinding Strategy), signage, art (3.6 Public art), lighting (3.5 Lighting Strategy) and amenities.

Bubblers

Access to potable water is essential in our tropical climate and should be an integrated component of the PDA. Bubblers should only need to be located in areas which are close to existing services, in high use areas.

Town water is generally available close to roads and other infrastructure, and where pathways intersect or approach these, an opportunity presents to provide a drinking fountain at moderate expense.

As an integrated solution spill water can be used to fill a trough suitable for use by pets as well as native animals. The troughs can slow-drain to prevent stagnation.

Bins

Like all other on route facilities, these should be integrated with other structures and only be located when necessary. They are to be appropriately sized and will required larger bins in open areas and a smaller type where the pathway is not wide enough for full sized bins.

Seating

Recreation commonly goes hand in hand with relaxation. A pleasant environment will encourage a pause and a pause will encourage social interaction. A mix of seating opportunities, formal and informal, upright and relaxed, should be provided at regular intervals and at key locations along the system of pathways.

Seating opportunities should be regular, and should be located with a pleasant or key outlook at a point of interest.

The majority of seating should be shaded by either built or natural means.

Seating must be diverse in style and location in order for users to choose their preferred form of relaxation.

Bollards

Unlike balustrades or fences bollards allow for permeability between uses, but still offer an effective filter to vehicular traffic. They can be permanent or temporary (retractable/removable). It is likely flexible outcomes within the public realm will be sought after, to vary the relationships between traffic and pedestrians on a day-to-day or week-to-week basis. Removable bollards are most effective in this role.

Permanent bollards may be located along street edges negating the need for level changes in paths to distinguish vehicular from pedestrian zones.





3.2.7 Placemaking

Placemaking is both a process and a philosophy and is strongly supported throughout the PDA area. Centered on creating public and semi-public spaces which facilitate social and economic exchanges that are safe and vibrant to strengthen connections between communities and the places they share. A strong idea of activation of public spaces creates a unique point of interest that in turn transforms the amenity, activity and appearance of a place. It also contributes to the desired identity, character and essence of the places we build. It allows building a community by bringing people together and in turn enhances the spirit and character of this unique place.



3.3 STORMWATER MANAGEMENT

This part provides key concepts around achieving appropriate stormwater management to support the PDA Development Scheme and water sensitive urban design outcomes.

Consideration should also be given to the Townsville City Plan SC6.4 Development manual planning scheme policy and other PDA guidelines. A series of guidelines for Water Sensitive Urban Design (WSUD) are also available on council's website¹⁰.

¹⁰Also see <https://www.townsville.qld.gov.au/building-planning-and-projects/town-planning/water-sensitive-urban-design>



3.3.1 Introduction

Increased development can result in greater hard surface area and changes to the volume, velocity and quality of stormwater drainage into natural waterways. Achieving improved stormwater quality is a key objective in reducing the environmental impact of urban development on waterways and receiving water body of Ross Creek.

Incorporating Water Sensitive Urban Design practices via maximising pervious area and improving water quality will help to protect and improve the condition of Ross Creek and the receiving waters beyond. Stormwater management features can be used to passively irrigate urban vegetation and improve water efficiency.

Council will require stormwater treatment measures to be designed by a suitably experienced and qualified engineer.

3.3.2 Assessment of stormwater management options

When considering the design for stormwater management, the following questions should be considered:

- Does the proposal design meet the best practice performance objective and treatment measures?
- Is the proposal designed to incorporate works to maintain, or improve the quality of stormwater within or exiting the site?
- Will the proposal significantly add to the stormwater discharge or adversely affect water quality entering the drainage system?
- Are there opportunities for water conservation and reuse that influence the use of water sensitive urban design?
- Has the presence of any contaminated land been considered and accounted for in the proposal?
- What is the level of ongoing management required to achieve and maintain the desired stormwater quality measures that will be used during the construction phase to prevent a loss of stormwater quality as a result of building activities, such as silt traps?

3.3.3 Management options

When considering stormwater management, the following outcomes should be considered in design.

3.3.3.1 Maximise pervious area

In the urban setting a preferred method for stormwater management, which seeks to avoid and minimises generation of stormwater and stormwater pollutants is to maximise pervious area. Methods to maximise pervious area include:

- reduced site cover, building up not out, and consequential maximised green public space;
- reduction of hard other surfaces, such as at grade car parking;
- inclusion of green building elements; and
- the use of permeable paving.

Green building elements

The use of green roofs is an approach used to maximise pervious area, while also offering other benefits such as enhanced amenity and environmental outcomes.

Development in the PDA is encouraged to incorporate green roofs, walls and facades (3.1.5.3 Green roofs and walls) on buildings where practicable to enhance the role of vegetation on buildings in managing the quality and quantity of stormwater.

Permeable paving

Where appropriate, permeable pavement may be used to maximise pervious area and can reduce the amount of stormwater runoff and pollutants being generated by urban areas. Permeable pavements have potential for use in the PDA, especially in areas with pedestrian traffic and which are subject to direct rainfall only (rather than being subject to runoff from high sediment areas). Suitable applications may include small carparks, driveways, and pedestrian areas. The use of permeable paving seeks to minimise runoff by minimising large areas of impervious material.

3.3.3.2 Improved water quality

Erosion and sediment control

Erosion and sediment control (ESC) is a broad term for the suite of practices used to limit sediment-laden runoff leaving construction sites. Erosion control should always be considered first, so that soil erosion is avoided or minimised, followed by sediment control which seeks to capture any waterborne (or airborne) sediment. Key practices include avoiding earthworks activities during expected high rainfall periods, careful construction scheduling, maintaining soil cover, sediment fences and sediment basins.

Good erosion and sediment control is also one of the most cost-effective ways of improving water quality, being at least an order of magnitude more cost effective than other methods such as rain gardens, bioretention systems, and wetlands.

Watersmart street trees

Watersmart street trees use a simple design to allow runoff from kerb and channel to provide water into the root zone of street trees. There is potential for widespread application, with a large number of trees having a cumulative benefit. There should be appropriate consideration of the species used for Watersmart street trees, particularly with respect to root structure and protection of infrastructure.



(Volkening, 2012)



(Center for Neighborhood Technology, 2013)



Swales and buffer strips

Swales are simple grass or vegetated drainage lines that can be a low-cost way of conveying stormwater and helping provide some reduction in stormwater pollutants. Swales have the potential to provide a high level of amenity and are preferred over hard infrastructure such as pipes. They have low upfront costs, and if installed in open space or parkland, maintenance costs are minimised.

Deep swales should be avoided due to the potential to intersect poor sodic soils and generate significant base flow. Shallow swales also provide for better maintenance access, being easier to mow and less prone to boggy conditions.

Bioretention basins and rain gardens

Bioretention systems are vegetated soil filters that treat stormwater through vertical percolation through a prescribed filter media. Water quality is managed through a combination of evapotranspiration, exfiltration, filtration, sorption, transformation, and biological uptake.

Bioretention systems also assist with maintaining natural hydrological response of urbanised catchments. Bioretention systems are designed to achieve pollutant reduction over time. To manage the risk of failure and promote better urban design integration, individual bioretention systems should be limited in size to less than 500m².

The use of saturated zones underneath bioretention systems is required in the dry tropics to assist in helping plants survive extended dry periods. Bioretention systems that increase infiltration to the surrounding groundwater will need to ensure there is no risk of mobilising pollutants within contaminated land.

Litter control

Design of development should encourage the use of measures to prevent litter being carried off-site in stormwater flows, including:

- appropriately designed waste enclosures and storage bins, and
- the use of litter traps, such as gully baskets, for developments with the potential to generate significant amounts of litter.

Gully baskets

Gully baskets are simple mesh baskets which can be retrofitted into existing stormwater gully (side entry) pits or as part of new infrastructure.

Gully baskets are best suited to litter hot spot areas and therefore are suited for application in the PDA environment.



3.4 WAYFINDING STRATEGY

This part provides detail regarding strategies for wayfinding design to support the PDA Development Scheme¹¹.

¹¹Townsville Waterfront Pedestrian Wayfinding Strategy, Dot Dash, 14 June 2016



3.4.1 Introduction

The Wayfinding Strategy aims to establish core foundations and define key principles for the design and implementation of a high-quality wayfinding system. The wayfinding strategy will help to create a more legible and connected city and improve public information, access and safety¹².

The Waterfront branding is incorporated in wayfinding elements to assist in creating a sense of place. The strategy considers the following elements:

- design principles;
- accessibility standards;
- sign types; and
- sign location.

Key objectives for a successful wayfinding system are:

- identify and connect destinations and places
- build user confidence and trust to walk
- reduce the dependence on vehicular travel
- promote cycle and public transport
- encourage exploration and discovery
- supports landscape and public art strategies
- supports activation of public space

3.4.2 Design principles

Cohesion

At key locations wayfinding elements provide overview information which highlights Townsville's destinations and offerings through a variety of media (maps, posters, digital). Overview information is supported by strategically planned directional signage that provides links between destinations. Both of these elements combine to form a cohesive network of wayfinding information elements.

Creature comfort

Shelter and creature comfort is provided for visitors to allow them to spend time to read, listen, and understand Townsville's destinations and offerings. Visitors become better informed to tailor and maximise their visitor experience.

Communication

Terms and language that is easily understood by all English speaking visitors is used. International standard pictograms to support text messages are incorporated. Specific use of foreign languages (e.g. Chinese and Japanese used in apps) should also be considered.

Accessibility / Safety

All signage and urban elements meet the Australian Standard AS1428, Premises Standard and Building Code of Australia and Crime Prevention Through Environmental Design Guidelines (CPTED).

Flexible / Adaptable


Wayfinding elements are configurable to suit the specific site parameters in terms of available space and existing structures. Wayfinding elements consider ease of manufacture, maintenance and modification. Signage design can be implemented by local industry and is simple and cost effective to maintain, repair and update (messages) as required.

3.4.3 Accessibility standards

Different types of disabilities results in different implications for signage design. The requirements should be confirmed with a project access consultant and certifier and should aim to exceed the standards where possible.

Guidelines and Standards

- AS 1428.1 (2009) Amendment 1 – 2010 General requirements for access – New building work;
- AS 1428.2 (1992) Enhanced and additional requirements – Buildings and facilities;
- AS 1428.5 (2010) Communication for people who are deaf or hearing impaired;
- Building Code of Australia (NCC 2015); and
- *Disability Discrimination Act 1992* (DDA).

	Disability	Proposed Strategies
	Low vision	Good colour contrast, clear signage
	Use of mobility aids	Signage located at an accessible height
	Cognitive difficulties	Use of shapes, symbols and pictograms

¹² For more information about Townsville's wider city trails networks see www.townsville.qld.gov.au

THE WATERFRONT



3.4.4 Sign types

Three sign types are identified to contribute to the wayfinding system and are identified on Figure 35 being:

- refresh stops;
- directional finger signs; and
- precinct markers.

3.4.4.1 Refresh stops – Concept direction

The notion of the Refresh Stops is to provide a nodal point for visitor information in an environment where people can comfortably stop to reorient themselves and make informed decisions on the next part of their journey. The Refresh Stops are urban elements that provide shelter and wayfinding information, consistent with The Waterfront brand. They should be highly visible and easily recognised in the urban landscape. They should be able to accommodate a few different users at one time. They can be modular in their design approach and adapt to the parameters of the specific environments that they are placed in. They can easily be incorporated in the Waterfront Promenade, retrofitted into existing structures incorporating any existing shelter and seating or Refresh Stops can be new freestanding structures (3.2.6 Built structures) that should integrate with key pedestrian routes.

3.4.4.2 Priority function

The Refresh Stops provide a number of functions and capabilities, such as:

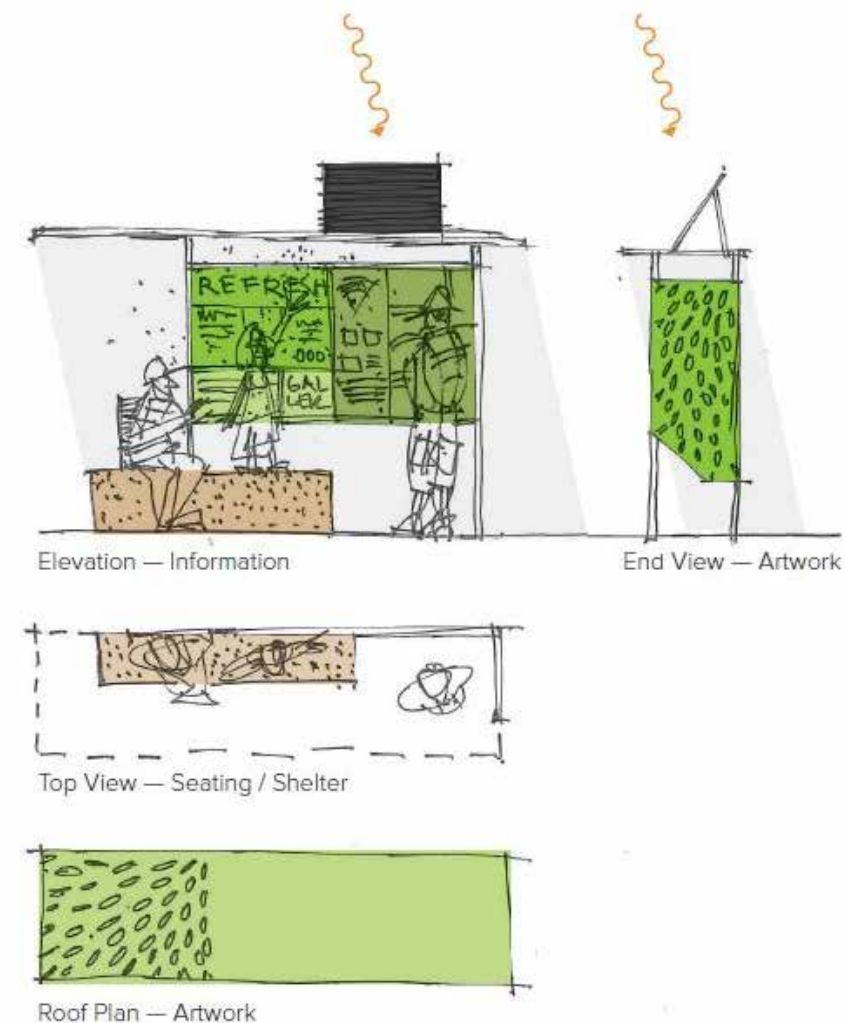
- shelter – rain and sun;
- identification signage;
- printed map(s) showing immediate area and larger city area showing key destinations, pathways, distances etc.;
- events/tourist information poster cabinet;
- Wi-Fi connection;
- access to downloadable apps on Townsville – history, culture, events and wayfinding;
- other support information –e.g. taxi phone or phone number, emergency help/assistance;
- lighting elements (3.5 Lighting Strategy);
- seating;
- water bubbler; and
- sensor activated water mister.

Other desirable capabilities

Other functions that may further support the visitor experience include:

- community notice board;
- solar power – for lighting and power;
- USB – phone charge points;
- 10,000 steps information;
- public artwork elements; and
- digital screen to display local advertising in place of a poster cabinet.

Figure 30: Refresh Stops – Form Reference



3.4.4.3 Refresh stops – Panel draft

The Waterfront context map

- overall map of all precincts (45 minute walk radius);
- icon/"you are here";
- walking radar/s;
- major identifiable features;
- Ross Creek as a geographic landmark;
- major bus, train, ferry nodes; and
- multilingual messaging of key destinations.

Precinct level map

- immediate surrounds and key destinations (5 minute walk radius);
- icon/"you are here";
- walking radar;
- street names;
- transport nodes; and
- show direction to nearby destinations outside of map area.

Connect

Access to downloadable apps about Townsville – history, culture, events and wayfinding, as well as general transport and tourism information should be provided.

Apps should link to The Waterfront brand and social media with access to the Townsville City Council website and include the hashtag or handle to share content and find out more.

What's on

Events/tourist information via a dynamic digital screen, displaying cultural, sporting and special announcements etc. is displayed.

Interpretation

Simple visual stories about the local history, community and environment that references the app's content are displayed.



Figure 31: Example Panel Draft diagram

3.4.4.4 Directional finger signs

Directional Finger Signs are intended to be easily visible in the landscape and relate to the Refresh Stops in design, form and colour, consistent with the Waterfront brand. They direct people to local destinations that are shown on the Refresh Stop maps. The message includes an estimated walking time based on an average walking speed of 5 km/hr. As a guide, generally Directional Finger Signs direct to no more than two destinations in each direction making a maximum of eight destinations on one finger sign. Destination messages on directional signs are determined by proximity of sign to destination and Refresh Stop. In other words, the directional signs form a link between the Refresh Stops and the destinations. The list of destinations should be determined through consultation with council.



Figure 33: Example directional signage

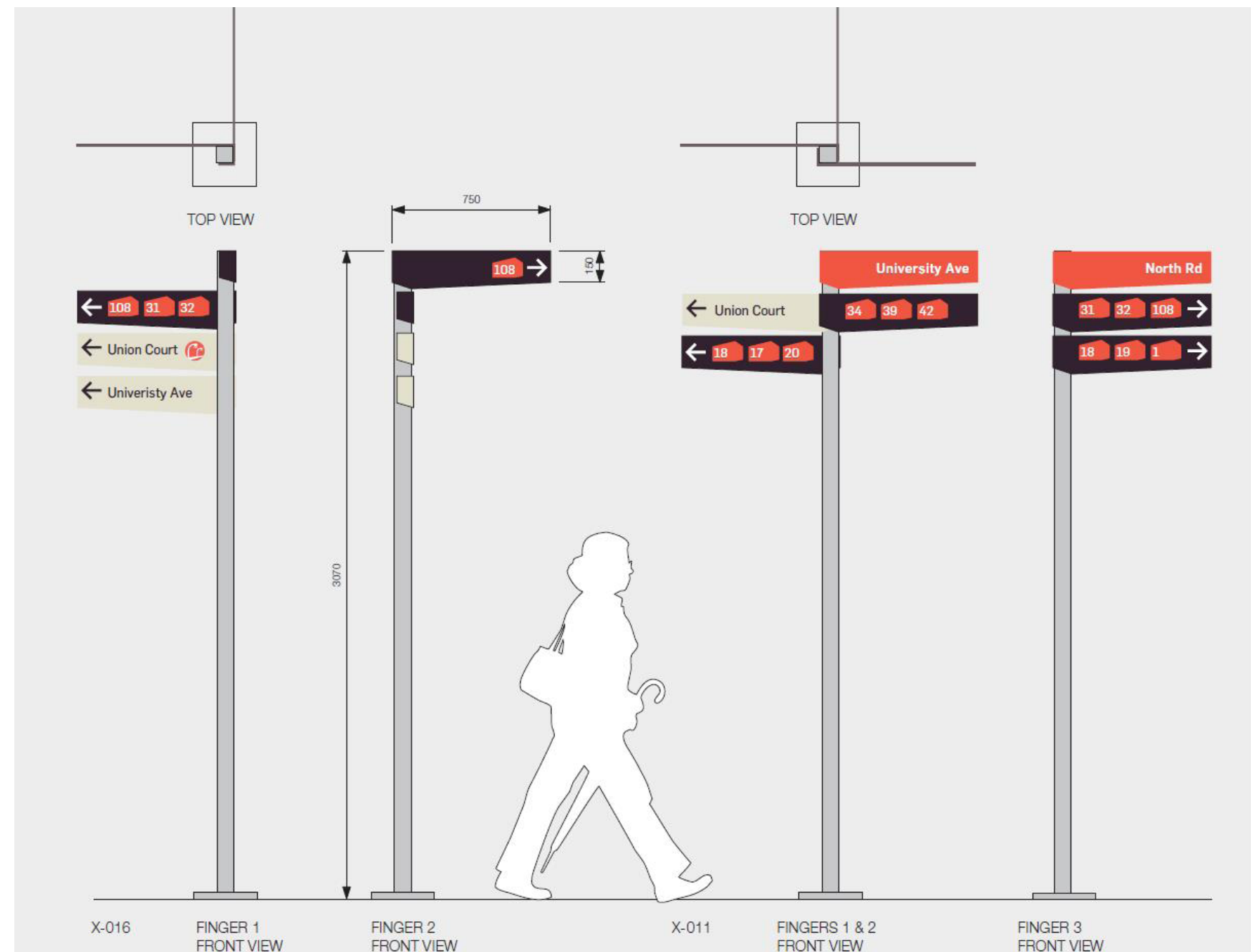


Figure 32: Example directional signage

3.4.4.5 Precinct markers

Precinct Markers provide an identifiable point of recognition for each key destination reached. They will generally appear at precinct boundary intersections such as creek crossings and road-oriented pedestrian linkages. They will appear as high level identifiers, with integrated feature lighting for night-time visibility, along with the opportunity to promote The Waterfront identity/brand. The design of the Precinct Markers should respond to site-specific conditions and be unique character to each precinct. This can be achieved by incorporating specific lighting or public art elements. The precincts will be identified on the overall mapping panel within the Refresh Stops, with the list of precincts and their names to be completed in consultation with council.

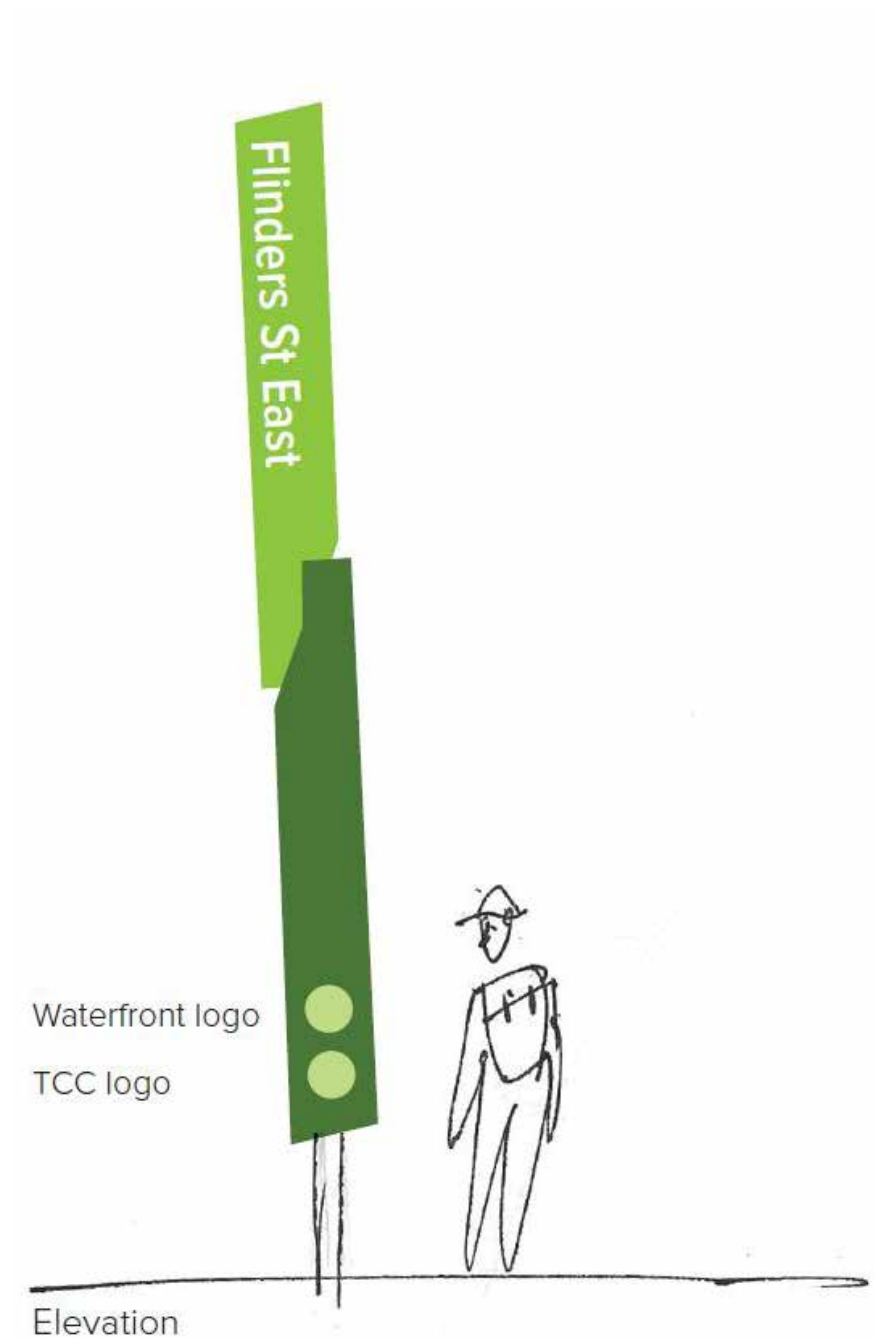
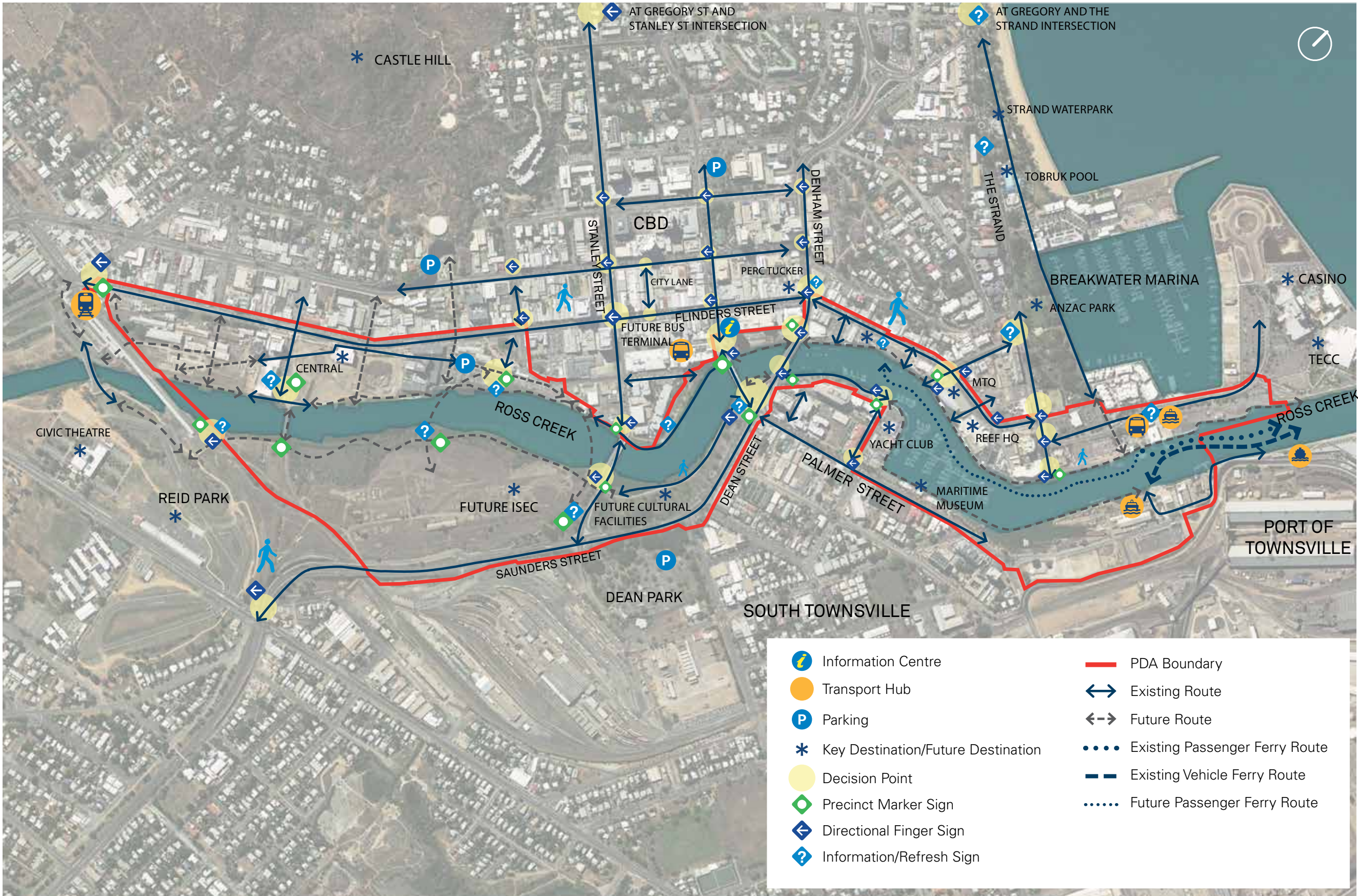


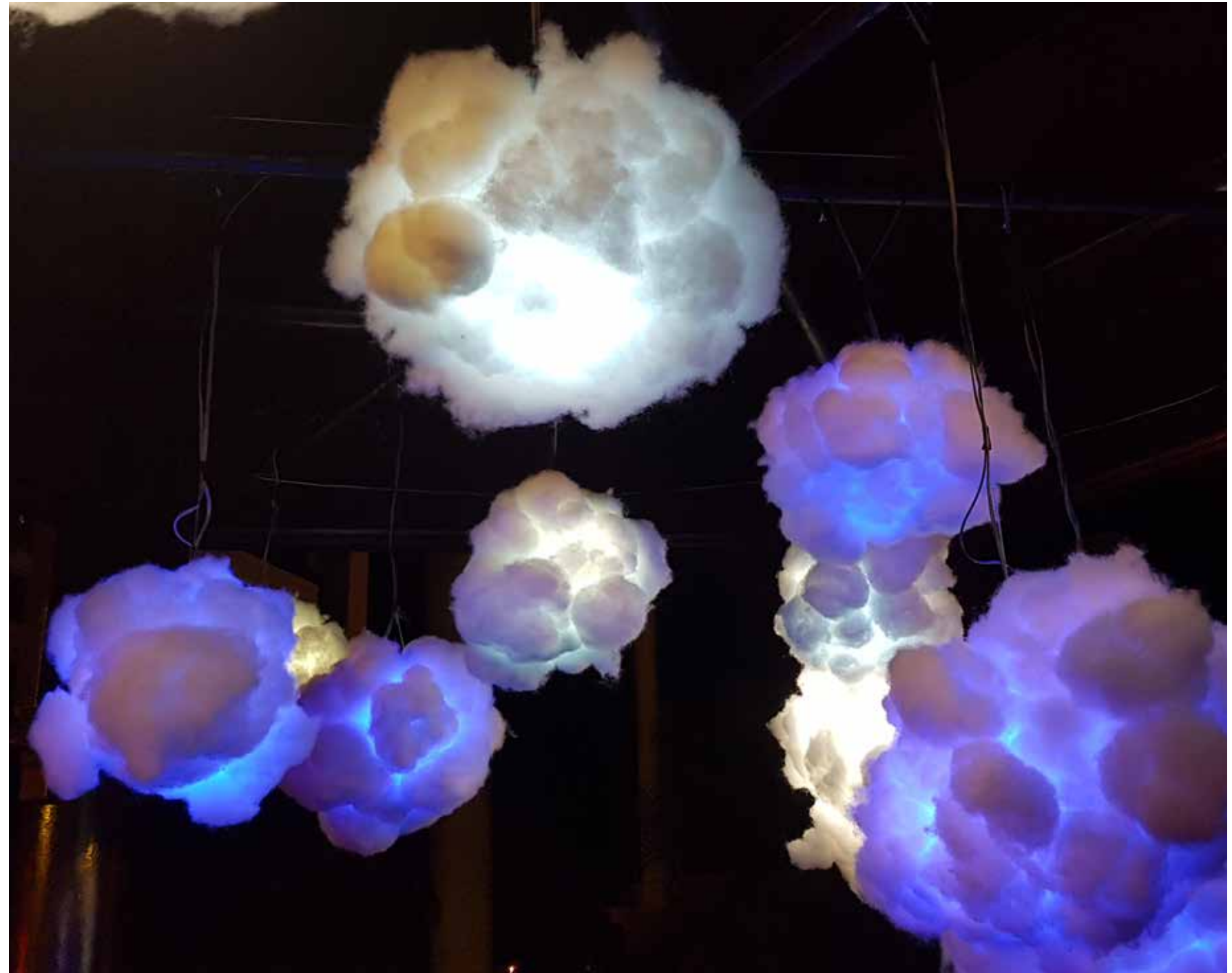
Figure 34: example precinct markers

Figure 35: Sign location plan



3.5 LIGHTING STRATEGY

This part provides detail regarding strategies for lighting design to support the PDA Development Scheme.



3.5.1 Introduction

The purpose of the Lighting Strategy is to facilitate a structured and consistent approach to lighting objectives from both a performance and appearance criterion. The Lighting Strategy presents guidance to ensure the people who use the different precincts, pathways and general open space, will be treated to a visual experience whilst feeling safe and secure doing so.

The Lighting Strategy considers all aspects of what is required to develop a cohesive lighting scheme, such as reference to, (as a minimum), Australian Design standards, a consistent language with regard to the appearance of the light poles, regardless of the eventual differing height(s) for different application, luminaires, light sources and colour temperature.

The Lighting Strategy provides information on the following elements to be considered in design:

- lighting principles;
- amenity lighting;
- architectural lighting; and
- feature lighting.

3.5.1.1 Associated documents

Australian Standards 1158.3.1 Public Lighting of Roads and Spaces - Pedestrian area (Category P) Performance and Design requirements.

Section J BCA - Power Density Tables (internal lighting if applicable).

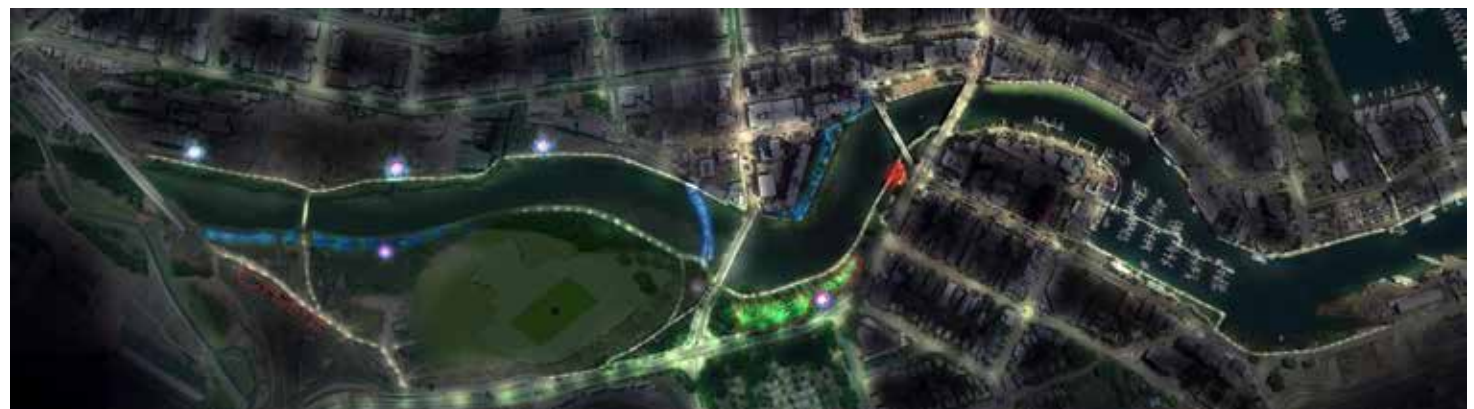


Luxlumin event, Townsville

3.5.2 Lighting principles

Lighting design in urban open space is an important part of overall planning. Significant lighting principles include:

- lighting enhances safety ensuring public realms are utilised particularly in warmer climates such as Townsville where outdoor environments are highly desirable places for public utilisation;
- visual interest is created, revealing and releasing the senses and thought process through the use of appropriately applied lighting design. This can further enhance existing elements while highlighting and directing the use of new space; and
- through well-considered techniques and appropriately located lighting, subliminal and at times outspoken messages of civic pride can be communicated. Giving the community of Townsville the opportunity to engage with a high-quality public space that is enjoyed and frequently visited by the public.



3.5.3 Amenity lighting

Amenity lighting covers the base layer of light, for both pedestrian and general open space lighting.

The reference document used as a guide to determine the suitable minimum target illuminance levels is:

- AS/NZS 1158.3.1:2005 Lighting for roads and public spaces - Part 3.1: Pedestrian area (Category P) lighting - Performance and design requirements.

The fundamental objective is to create an artificial lighting system that has a high level of illuminance and uniformity to not only encourage, but persuade people to want to use the PDA area at night and enhance night-time activity.

- target horizontal, vertical and uniformity values shall be in accordance (as a minimum) with Table 2.7 Values of light technical parameters.
- for Public Activity Areas - Lighting sub category P6.

The general lighting philosophy is to design for higher than recommended illuminance and uniformity levels, to transition from light to dark areas - Figure 36 and Figure 37.

When designing public outdoor areas, it is important to consider the wider use of the space and therefore the safety of patrons using these spaces after dark.

All outdoor luminaires (in-ground, ground and pole mounted) are to fulfil the requirements of outdoor lighting in an urban context. The requirement is to have high-quality products that are corrosion proof and water resistant. This is essential to ensure the quality and longevity of outdoor luminaires in a public space. All LED luminaires are required to have a minimum service life of 50,000 hours.

The reference document used as a guide to determine the suitable minimum target illuminance levels is:

- Australian Standard AS4282 Control of the Obtrusive Effects of Outdoor Lighting.



Figure 36: The overlapping of amenity light shown above will assist in providing the appropriate vertical lighting levels required for passive surveillance and a sense of security to patrons using the Townsville Waterfront



Figure 37: To optimise public safety it is important we aim for a vertical illuminance level and a uniform distribution of lighting and avoid creating dimly lit spaces between each light source. As demonstrated in the image above



3.5.3.1 Poles and luminaires

Poles

To ensure a consistent language / appearance of the luminaires, lighting masts, regardless of the purpose, light poles should:

- be of the same manufacturing source or where not possible visually similar;
- be a 'smart pole' range where add on accessories such as security cameras, banner support arms, etc. can be added as an integral part of the urban furniture;
- be anodized, Silver (RAL 9006) or a neutral colour (high-quality anti-corrosion coating) to reduce the visual impact of the fixtures during the day;
- as a form of infrastructure, consider standardised pole bases to ensure there is sufficient space to locate weatherproof GPOs and data outlets for occasional use; and
- use standard bracket / ladder-type mounting systems within the pole bases to facilitate fixing and access. These would be identified and coordinated with the Electrical Services consultant.

Luminaires

Luminaires should:

- be selected to ensure minimal discomfort glare;
- be LED light sourced, Zhaga compliant, i.e. have the capability for interchange ability, due to either power board failure, end of life failure or updated and improved technology;
- be a minimalist style, understated, comprising a slender plate like shape. The material, finish and connection (with the pole) will be consistent and coordinated with the pole/ mast specification;
- be aligned to the intended lighting condition and performance requirements (i.e. pedestrian pathways, open space, play areas etc.). Lumen output and distribution will be selected based on pole height and spacing, to achieve desired illuminance values as required by the code; and
- consider the use of colour temperature for identifying different 'special' areas and nodes, as a method of attracting people to particular zones and wayfinding;
- where new infrastructure will be required, run new circuitry underground to all lighting points.





Figure 38: Exhibit the light distribution of the smart pole. Demonstrates a flat plate luminaire that will not detract from other features, while expressing a contemporary minimalist design approach



Figure 39: Demonstrates the lighting distribution given by a 10m smart pole, primarily utilised for open space and recreational or parkland areas



Figure 40: Exhibit the light distribution of the smart pole. Represents the light distributed by a 4-5m smart pole used primarily for to provide lighting for pedestrian areas. While Figure 22 displays the lighting provided by a 6-7m smart pole primarily used for lighting bridges, larger pedestrian areas and roadways

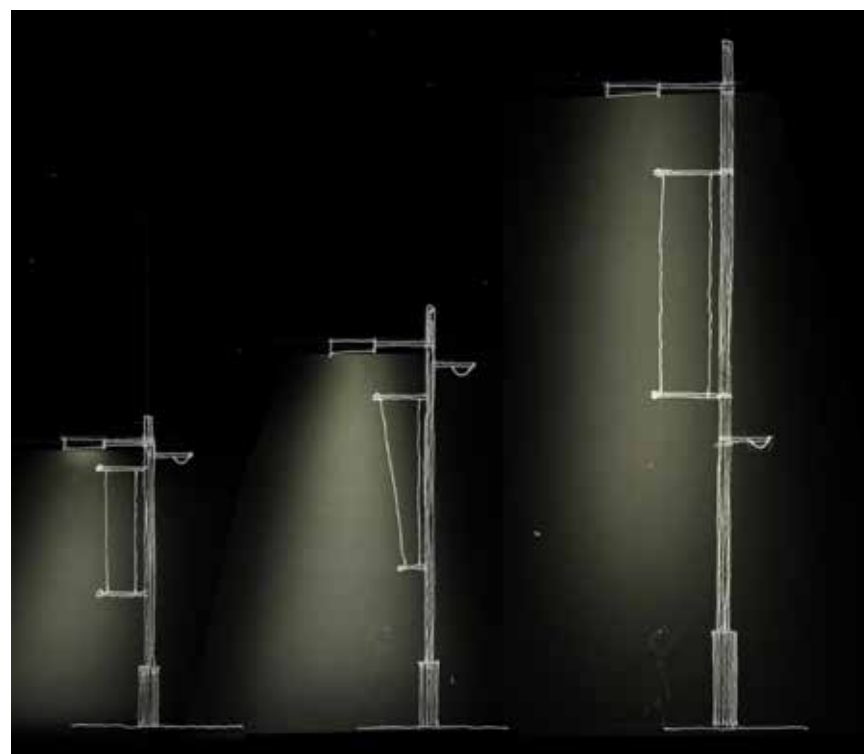


Figure 41: The smart pole lighting with accessories such as banners and / security cameras, must all consider minimal understated 'flat plate' type luminaires

3.5.4 Architectural lighting

Architectural lighting is another layer of lighting contributing to the overall lighting design. Architectural lighting will comprise the more specific systems that:

- are set into the hardscape;
- give definition/location to furniture;
- enable wayfinding through fixture style and placement; and
- enhance selected planting.

Importantly a combination of all these lighting techniques will be anticipated to ensure this level of detail is fulfilled.

It is intended that all luminaires in this category are proprietary fixtures, designed, and chosen for an outdoor environment on the coastline of Australia.

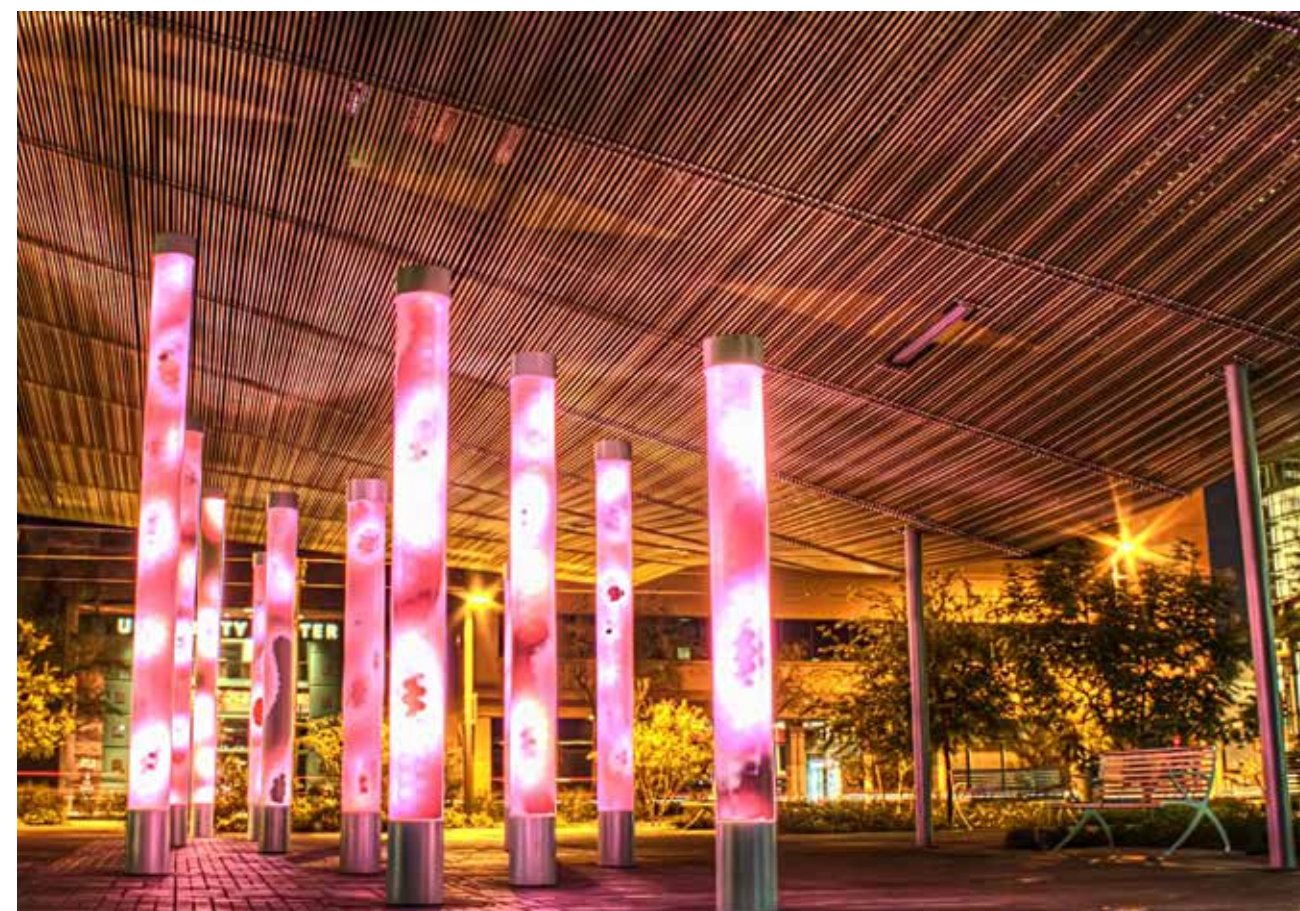
All fixtures will have a minimum protection rating of IP 54 and where they are located at low levels and the possibility that they are, in seasonal events, flooded, the rating will be a minimum of IP 57.

Materials used for the outer shell of all luminaires will have high-performance coatings, in the case of steel and where choices are presented, non-ferrous metals such as aluminium, copper, brass and bronze cast fixtures would be ideal.

Longevity and maintenance of light fixtures in the public realm are to be principal considerations and should be discussed openly with the stakeholders during any proposed implementation of the different stages of development of the PDA. Particular care should be given very early planning stage to ensure all spatial allowances are detailed, clearly documented and included in the working/construction plans where there is a proposal for fixtures to be recessed, surface mount, concealed or exposed.

All architectural lighting sources are to be LED, ideally with integral control gear and:

- where remote control gear is required, a clear strategy is to be developed regarding the housing and accessibility of this equipment. Consideration shall be given to the maximum cable run from control gear to light source(s);
- equipment is to be housed in a dry, well-ventilated enclosure. These could range from a standalone above ground electrical enclosure, suitably located, or a custom-made / adapted space worked into the furniture and / or hardscape;
- if, due to location, there is a possibility these locations are flood prone, the equipment or enclosures will be waterproof IP67 minimum;
- colour temperature is to be considered along with the amenity lighting. Opportunities using colour temperature as a form of contrast for visual interest, or as a wayfinding, reinforcement guiding principle, should be explored;
- throughout the precinct there are many large mature trees of various forms, consideration will be given to developing two or three (only) lighting techniques, for these, to ensure there is a repetitive language (as with the amenity lighting), that is unique to the project. LED festoon lighting is to be avoided, other than for festive occasions to selective trees; and
- consideration is to be given to sight lines and featuring large mature trees using theatrical techniques, such as projected images from pole-mounted luminaires.



Bridges

Bridges and permanent structures may be identified and techniques suggested / recommended to enhance the structures “architecturally” and at the same time provide a point of reference in the district.

Pedestrian

Opportunities exist to utilise the spandrels of either pedestrian or vehicular bridges, to be used as mounting points for a combined continuous water fall / light features utilising linear colour change LED light grazing the falling water.

Catenary

The opportunity may exist in squares or laneways where consideration can be given to the application of overhead catenary lighting systems. This could be in the form of a standalone, bespoke statement or a structural spaced arrangement to provide pedestrian illumination to selected areas of the site.



3.5.5 Feature lighting

The final 'layer' of light, feature lighting, is the point of difference. Given current artificial light technology, in particular projected light, the results can create significant impact. This type of feature lighting, as seen around the world, is something that attracts people and visitors. The lighting opportunities within this category are many. The location of any feature light installations should consider the following to ensure maximum impact:

- reinforcing viewpoints and sight lines;
- being positioned in areas of less light to generate contrast; and
- being appropriate in terms of scale and extent.

Various ideas have been considered; often these ideas have common characteristics with what may be deemed as public art.

By their very nature these techniques are often but not always, a display of new technology and therefore should in many cases be seen as non-permanent, something that is turned around, and renewed from time to time to maintain an active interest in the precinct. Interactive technology using personal handheld devices such as mobiles phones are becoming increasingly popular. It is intended that one or two of these feature installations have this control option.

3.5.5.1 Event lighting

Throughout the PDA there are, and will be, opportunities to hold events that are purely displays of lighting and associated technology.

As it is demonstrated on a regular basis in the major cities in Australia, projected light systems are being increasingly used for a wide range of applications from public light art through to commercialisation.

The extent of detail with these techniques is wide ranging, from projection via gobo / lens methods to finely mapped, detailed projection that is comprehensive in its presentation and in many cases animated. This application would be perfect for selected heritage facades along the edges of the precinct.

Allowing for temporary or staged lighting events, should be considered in the overall urban design with the appropriate infrastructure such as the installation of data points and power to allow event specialists to set up on an as required basis.

3.5.5.2 Technology

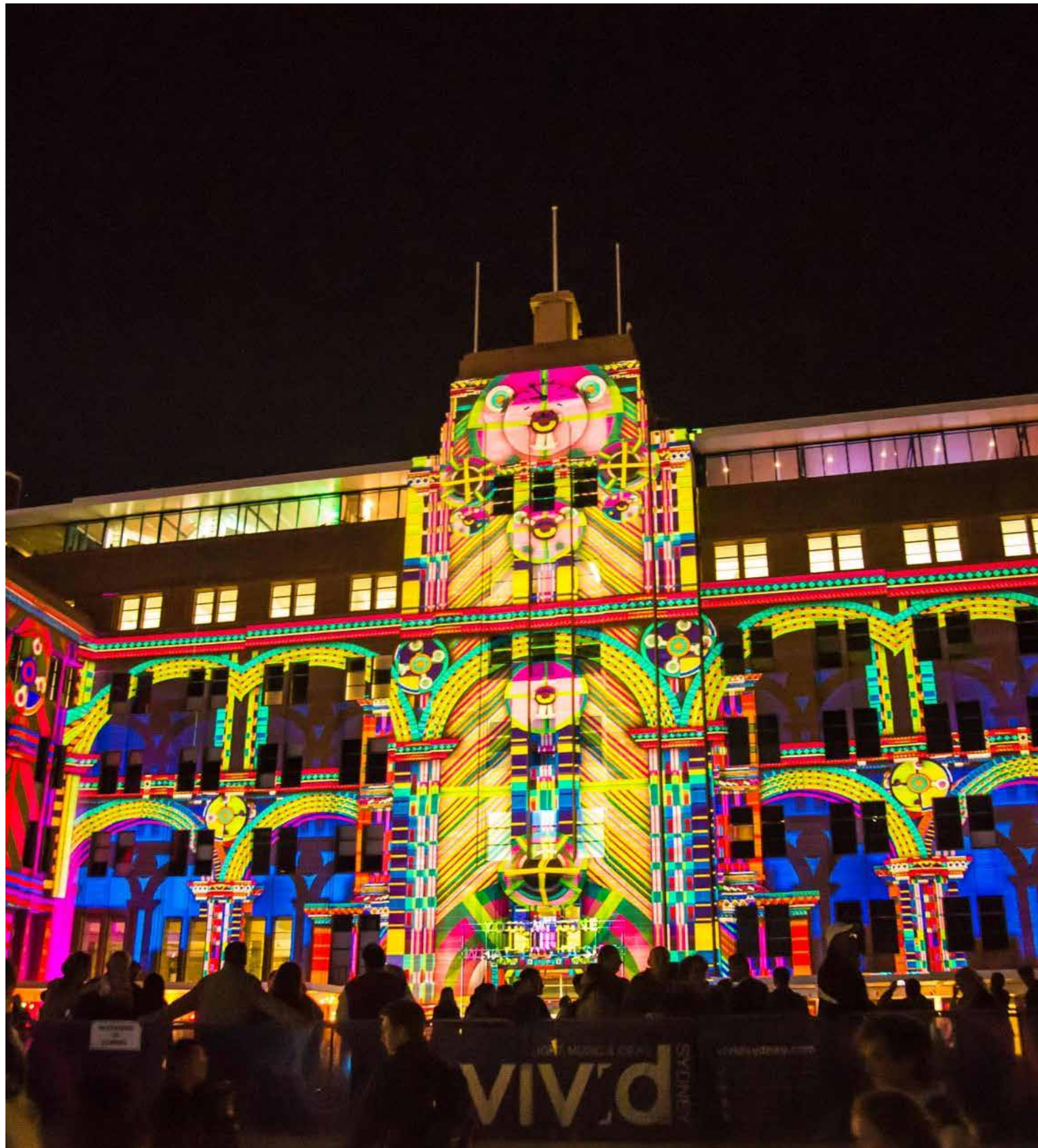
Increasingly 'smart' technology is being used for a myriad of purposes. Public lighting is more and more being considered not only for its emotional impact on the character of community, but also practical issues with relation to control and passive observation.

Incorporated as an integral part of the luminaire / pole design, sensing devices such as control relating to movement, traffic volume, remote monitoring, wireless communication will be considered and discussed with the council for their particular utility and application.

3.5.6 Controls

Approved manufacturer of the post top area light fixtures shall provide their control options via spreadsheet format to offer full control across all protocols of the control platforms.





3.6 PUBLIC ART

This part provides detail regarding the strategies for public art to support the PDA Development Scheme.

(Fischer, 2015)
Dale CHIHULY
Chihuly Garden 2012



3.6.1 Introduction

Public art refers to contemporary art practice involving a highly diverse range of activities that integrate art and design into the public realm.

Public art refers to art which is visible and/or accessible to the general public. Public art can be situated within the public areas of private development and/or within the public realm. The art may be permanently incorporated within the fabric, design, or fixtures of a building or place.

It may be found in parks, transit environments, urban and civic spaces, the public areas of interior fit-outs, on building façades, pavements and/or in water environments. For the purpose of this policy, the definition applies to public art in which council is, or will become, the key custodian.

Artwork in the public realm contributes to the development of a community's sense of identity, distinctiveness and place. Public art is about integrating artists into council's design and planning processes to work with communities in order to foster local cultural expression.

In provisioning public art a selection of artists will be engaged to develop works in a variety of mediums.

3.6.2 Provision of public art

Provision of Public Art in the PDA will be delivered in multiple ways. This includes by government, private industry and public private partnerships.

The requirements for public art at the development stage should be provided in accordance with Part 3.6.2 and 3.6.3 and in accordance with council policy¹³.

To ensure best practice, all public art planned for the PDA will follow a defined Commissioning Process. This Commissioning Process is in-line with industry standards and legislative requirements and guides the development of the City of Townsville Art In Public Spaces Collection as a whole. By ensuring adherence to this Commissioning Process, council ensures the city's public artworks are carefully managed, from the early inception of scoping and planning, beyond artwork delivery and installation to the artwork's ongoing care and maintenance.

Public artwork must not include advertising elements of a business or corporation, including colours, graphics, logos or other representations of corporate identity.

Exempt works when provided by a public sector entity should also adhere to this part.

3.6.2.1 Applicability

This part applies to the creation of public art within all PDA precincts¹⁴.

A public art spend rate of 2% is recommended and is calculated based on the project value of development.

Where the development involves the re-use of a building which is assessable development, consideration will be given where public art was supplied as part of the original development. The following activities will be required to provide public art in accordance with this part:

1. preliminary approvals; or
2. assessable development for permissible development; and
 - a. All residential activities including:
 - i. Multiple dwelling;
 - ii. Short-term accommodation;
 - iii. Resort complex;
 - iv. Retirement facility; and
 - v. Rooming accommodation.

¹³ Please contact council for copies of council's policies in relation to public art

¹⁴ Where a development application has not demonstrated compliance with this part, conditions may be imposed on a development approval to require a contribution towards public art consistent with this part

- b. Centre activities including:
 - i. Bar;
 - ii. Club;
 - iii. Food and drink outlet;
 - iv. Function facility;
 - v. Health care services;
 - vi. Hotel;
 - vii. Market;
 - viii. Nightclub entertainment facility;
 - ix. Office;
 - x. Parking station;
 - xi. Research and technology industry;
 - xii. Shop;
 - xiii. Shopping centre;
 - xiv. Showroom; and
 - xv. Tourist attraction.
- c. Entertainment activities including:
 - i. Indoor sport and recreation;
 - ii. Outdoor recreation;
 - iii. Major sport, recreation and entertainment facility; and
 - iv. Theatre.
- d. Community activities including:
 - v. Child care centre;
 - vi. Community use;
 - vii. Educational establishment;
 - viii. Park; and
 - ix. Port services (ferry terminal).

3.6.2.2 Artwork label

Public artwork will include a standard artwork label located in close proximity to the art installation.

The artwork label will detail the title of the work, instalment date, the name of the artist/s and contextual descriptor where applicable.

Artwork labels mounted on an adjoining building frontage should be 1.2m above ground level or sited where they can be easily read.

3.6.2.3 Visibility and positioning

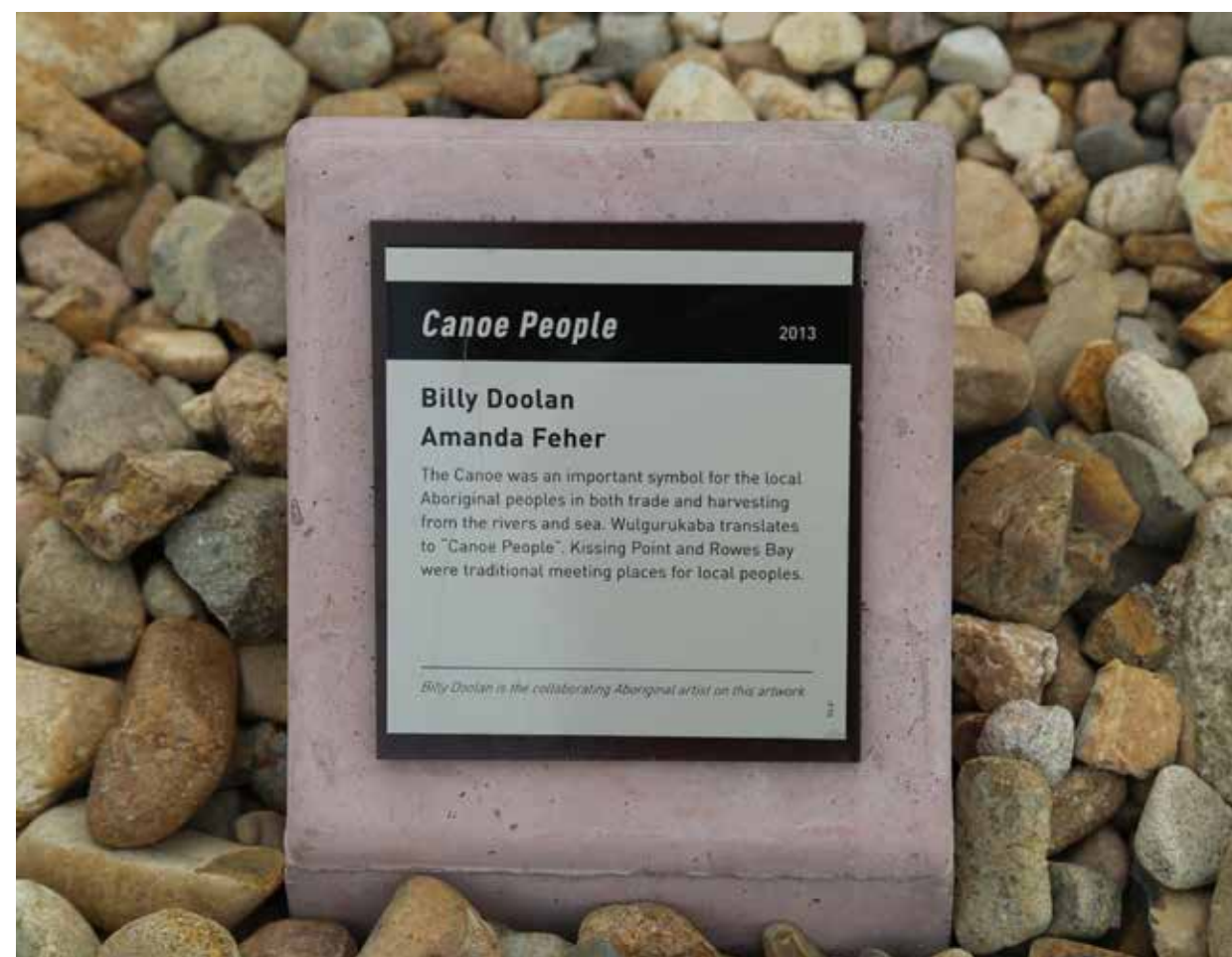
Townsville City Waterfront Priority Development Area Design Guideline

Artwork may be located within a building (e.g. a building foyer) where open to the general public for a minimum of 40 hours a week.

Public artwork will not be located within corner truncations or areas impacting sight visibility and public safety.

3.6.2.4 Structural requirements and maintenance

- all artwork is designed to have a minimum design life, appropriate to the scale and purpose of the piece with a minimum 5 years without significant maintenance period;
- structural requirements are considered in the concept stage and addressed at the design development stage. All structural components, including wind-loading, footings and/or fixing methods are certified by a suitably qualified Registered Professional Engineer of Queensland (RPEQ); and
- council will request the provision of a maintenance plan as part of the development application.



3.6.3 PDA Public Art Strategy

The PDA Public Art Strategy has been developed to ensure the incorporation of Public Art, and the consideration of Public Art, occurs in the early design phases of development. Thorough planning will help to ensure any works commissioned add the greatest value to the PDA by:

- responding to the site's unique historical, cultural, environmental, recreational, spiritual and aesthetic values;
- creating dynamic and engaging public spaces that residents and visitors take pride in, and enjoy frequenting;
- investigating all site possibilities within the development and responding to points of greatest access and interest;
- providing function and interactivity;
- considering the intended purpose and main audience demographics of the specific site;
- using best practice in the design, fabrication, installation, and maintenance of the work; and
- producing iconic works that promote the PDA and the Townsville region in general to broader audiences, particularly nationally and internationally, and stamp the region as culturally sophisticated, and a great place to visit and live.

Max PATTE
Solace in the Wind 2008
Wellington NZ
(Hoepfner, 2010)



3.6.3.1 Curatorial rationales

The PDA Public Art Strategy is to be applied across the PDA with the nature of the artworks being tailored to each precinct and character to respond to its inherent qualities.

Public Art in the PDA is to respond to one of the three curatorial rationales being:

- place;
- story; and
- wonder.

3.6.3.2 Tiers of art

The PDA Public Art Strategy defines four tiers of Public Art opportunity, related largely to the scale of the end product, and the budget associated with realising the artwork. The top tier of Public Art opportunity being Entrance Pieces are reserved for prime spaces identified within the PDA. The four tier of Public Art opportunity are:

- entrance Pieces;
- tier 1 Artworks – Iconic;
- tier 2 Artworks – Interest/Discovery; and
- tier 3 Artworks – Built-In.

Curatorial rationales	Tiers of art	Entrance Pieces
Place The Place rationale intends works to respond largely to the site's physical place/location including aesthetic and environmental qualities. Such works could include land art and environmental art such as exploring or celebrating natural values including mangroves, Ross Creek, the dry-tropical climate, flora and fauna, or Indigenous significance.		These pieces are major statements – iconic works that will be situated to denote an entrance to the PDA, one of the defined precincts, or key features/facilities/institutions within the PDA. i. Anish KAPOOR Cloud Gate 2006 Chicago, IL, USA
Story The Story rationale builds a narrative for the city's CBD, highlighting and celebrating the city's history such as sites of heritage significance and cultural significance. This may include the stories of the traditional custodians of the land – The Gurambilbarra Wulgurukaba people – as well as telling the story of contemporary Townsville and the site's social purpose.		Yinka SHONIBARE Nelson's Ship in a Bottle 2004 National Maritime Museum, London
Wonder Works of wonder paint an exciting future for Townsville, reflective of the optimistic vision set out for the future of the PDA. Such contemporary works will become iconic features of the Townsville CBD, and may utilise lighting, digital media, the skyline, interactivity, scale, humour, etc. to delight and amaze audiences.		(Morrow, 2013) Dale CHIHULY Glasshouse Sculpture 2012 Chihuly Garden and Glass, Seattle, Washington, USA



Tier 1 Artworks - Iconic These artworks will be positioned in areas of high traffic/ importance/suitability for specific response and are major Public Art commissions. This Tier of Public Art opportunity is of lesser scale/budget to the Entrance Pieces.	Tier 2 Artworks – Interest/Discovery These artworks provide interest in the many corners of parkland and amenities that invite discovery. These are generally smaller scale, less iconic works that will give enjoyment to audiences upon being found.	Tier 3 Artworks - Built-In These artworks will be numerous and throughout the PDA precincts, often created as a feature to a part of the development, deliberately incorporated into the design and build of infrastructure or providing a functional purpose such as seating and lighting.
(Cervera, 2007) Alexander CALDER Flamingo Chicago Federal Plaza	(Samuel, 2015) William RICKETTS Unknown 1934-1993 William Ricketts Sanctuary, Dandenong, Victoria, Australia	(Hisgett, 2014) Jaume PLENA Crown Fountain 2004 Millenium Park, Chicago, USA (Greenfield, 2014) iv. Mmmm... Bus Stop 2014 Baltimore, USA
(Coetzee, 2012) Molly MacALISTER Maori Warrior 1967 Quay Street, Auckland, NZ	(Mertle, 2015) Michael Thomas Hill Forgotten Songs 2012 Angel Place, Sydney	Viktor HULÍK Čumil the Peeper 1997 Bratislave, Slovakia
(Bary, 2012) Leo VILLAREAL Buckyball 2012 Madison Square Park, NY, USA	(Paulin, 2011) Sol LEWITT Splotch 15 2005 City Hall Park, New York	(Livet, 2009) Thomas HEATHERWICK Blue Carpet 2001 Newcastle-Upon-Tyne, England

3.6.3.3 Precinct opportunities

The following table and Figure 42 provides an overview of identified opportunities to guide and inspire future public artwork.

1	Entrance statement – Story Precinct 1 forms and entry to the CBD and is suitable to provide an Entrance piece welcoming visitors to the PDA. The piece may draw inspiration from the historic rail function of the area.	7	Tier 2 / 3 – Place The Waterfront Promenade and public realm provide opportunities for Tier 2 / 3 pieces which promote interest and discovery of the place. In particular, pieces may draw inspiration from the natural assets areas such as the mangroves and native fauna, which encourage exploration and education.
2	Tier 2 / 3 – Story Within the historic rail workshops area there are opportunities for Tier 2 and Tier 3 public art pieces. Pieces may explore the story of the city's rail history, integration or celebration of the historic architecture and utilising historic rail relics and materials in the artwork itself, as part of public realm and built form façades.	8	Tier 2 / 3 – Wonder New development areas and public realm within Precinct 2 provide opportunities for Tier 2 / 3 artworks to be applied. Pieces may explore the story of the city's rail history, integration or celebration of the historic architecture and utilising historic rail relics and materials in the artwork itself, as part of public realm and built form façades.
3	Tier 2 / 3 – Place The Waterfront Promenade and public realm provide opportunities for Tier 2 / 3 pieces which promote interest and discovery of the place. In particular, pieces may draw inspiration from the natural assets areas such as the mangroves and native fauna.	9	Tier 2 / 3 – Place The Waterfront Promenade and public realm provide opportunities for Tier 2 / 3 pieces which promote interest and discovery of the place. In particular, pieces may draw inspiration from the natural assets areas such as the mangroves and native fauna, which encourage exploration and education.
4	Tier 2 / 3 – Wonder New development areas and public realm within Precinct 1, such as Central present a number of opportunities for Tier 2 / 3 artworks to be applied. These pieces may be inspired by wonder and may be built-in to building façades and other construction elements.	10	Tier 2 – Place Townsville's Integrated Sports and Entertainment Centre will provide opportunity and space for artworks specifically exploring the city's rich sporting history and active culture. Examples of this kind include the sculpture walk surrounding the Melbourne Cricket Ground (MCG).
5	Tier 2 / 3 – Wonder Surrounding the historic Townsville Rail there are opportunities for Tier 2 pieces. Pieces should explore the story of the city's rail history, integration or celebration of the historic architecture and utilising historic rail relics and materials in the artwork itself, as part of public realm and built form façades.	11	Tier 1 – Place Precinct 3 forms an entry to the CBD and is suitable to provide an Entrance piece welcoming visitors to the PDA and assisting in wayfinding. The piece may draw inspiration and integrate with development associated with the Integrated Sports and Entertainment Centre.
6	Tier 1 – Story Precinct 2 provides a pedestrian-based gateway opportunity which may be activated with iconic art. Pieces should seek to welcome visitors and assist in wayfinding and may be inspired by the city's rail history.	12	Tier 1 / 2 / 3 – Place / Story / Wonder Central Park is the largest public open space in the PDA and has the opportunity to be utilised as a 'sculpture garden', including a number of iconic, interest/discovery, and built-in artworks of wonder, story, and place. The concept would integrate with proposed cultural facilities in the precinct, along with restaurants, bars and retail spaces.

13	Tier 2 - Story Hanran Park presents an opportunity for interest/discovery works inspired by story including the continuation.	19	Tier 2 / 3 - Place Along the Waterfront promenade there are opportunities for interest/discovery artworks, along with art built-in to structures and functional forms. This stretch of the Waterfront promenade being adjacent key cultural organisations (MTQ, Reef HQ, and the Cultural Centre) provides inspiration in this area.
14	Tier 1 - Wonder Ross Creek is the primary asset of the PDA providing an opportunity for an iconic artwork on the water to define the bold, innovative, and sophisticated new vision. Between Precinct 3 and Precinct 4 is the ideal location for such artwork with less vehicle activity on the water and high visibility from Hanran Park, Central Park and Victoria Bridge.	20	Tier 1 - Entrance Precinct 5 includes proposed Strand Plaza which provides opportunity to be activated with a major Entrance Piece leading from The Strand as the area will be highly trafficked and is highly visible. The artwork should utilise the high visibility such as from The Strand, connection to the Waterfront Promenade, from on-water vessels and across Ross Creek.
15	Tier 2 - Place Victoria Bridge serves as an important place as a key PDA connection and the long history of the bridge provides inspiration/ material for exploration. Opportunities for Victoria Bridge may serve as a platform for Tier 2 pieces, (permanent or temporary), which may also link to the evolving character of Ogden Street.	21	Tier 2 - Place The Waterfront Promenade in Precinct 6 provides opportunity for integration of Tier 2 pieces to activate the promenade. Being highly visible from the water, artwork may draw inspiration from the areas place as part of the on-water gateway to Townsville.
16	Tier 2 / 3 - Story Along both sides of the Waterfront Promenade in Precinct 4 there are opportunities for interest/discovery artworks, which may also be built-in to structures and functional forms. The wharf history provides inspiration in this area.	22	Tier 1 - Wonder Precinct 6 provides opportunity for an iconic work capitalising on the views to Magnetic Island, being in clear view of both those on foot and returning by vessel from Magnetic Island. This piece could be inspired by wonder of what Townsville has to offer.
17	Tier 2 - Place Precinct 4 has a series of public spaces including proposed Flinders Pedestrian Plaza. Flinders Pedestrian Plaza provides opportunity to be activated with Interest/Discovery artworks that enliven the area and reflect its existing features, such as the vibrant nightlife of Flinders Street East.	23	Tier 2 / 3 - Place Precinct 7 provides opportunity for Tier 2/ 3 artwork integrated with the Waterfront Promenade and connected public spaces, as well as in built form. Works may reflect on the place and the areas role and connection with the Port of Townsville.
18	Tier 2 - Wonder The Wickham Street connection to the Waterfront Promenade provides opportunity for Tier 2 artwork to be integrated at this connection which will also assist in wayfinding. Works should evoke wonder and may be inspired by the nearby key research and cultural organisations (MTQ, Reef HQ, and the Cultural Centre) such as reef research and the wonders of the reef.		

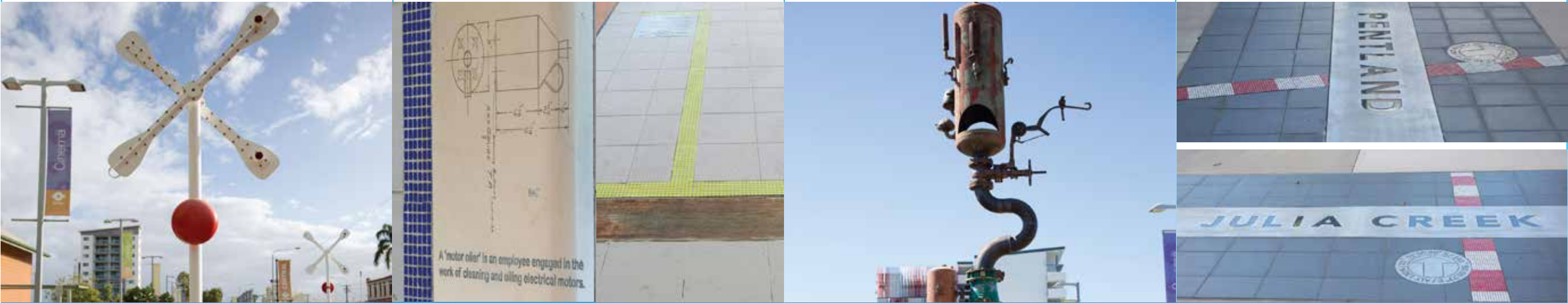
Figure 42: Public art indicative locations









3.6.3.4 Existing artworks

Several artworks in the City of Townsville Art in Public Spaces Collection are already located in the PDA and are described below.

Precinct 1 – Waterfront Gateway	Precinct 1 – Waterfront Gateway	Precinct 1 – Waterfront Gateway	Precinct 1 – Waterfront Gateway
<p>Wig Wags 2010 Paint, steel The crosses depicted in this piece often accompanied wigwag signals at railroad crossings prior to modern crossing signals.</p>	<p>Margot DOUGLAS Supergraphics 2010 Ceramic tiles, wood, coloured concrete, stainless steel.</p> <p>Depicting stories and anecdotes from the history of the railway and rail yards, this work is set into concrete in the covered area at the front of the Townsville Bulletin offices.</p> <p>Combining mosaic, wooden railway sleepers, and etched steel, Douglas has illustrated artefacts and common rail signals to create infographical works of a historical nature.</p>	<p>Christopher TROTTER The Great Northern Rail Whistle 2011 Recycled steel. For this work, many components were salvaged out of Queensland Rail machinery, including steam whistles, as well as machinery components found in many of the industries from towns along the original railway line, including mining, farming and agriculture.</p> <p>Trotter was inspired to create “a whimsical, Dr Seuss inspired, crazy 5-6M High, railway steam whistle.” “This creative time capsule of historic components, allow the public to visually access yesterday’s industrial objects, in a public art piece,</p>	<p>Margot DOUGLAS Signalman’s Walk 2010 Mosaics, Vitreous tiles, aluminium, stainless steel 9 parts.</p> <p>This work illustrates the original stations for the Great Northern Railway. From Townsville west to Mt Isa, the work notes the GPS locations of Townsville, Charters Towers, Pentland, Hughenden, Richmond, Julia Creek, Winton, Cloncurry and Mt Isa.</p> <p>Local designer Margot Douglas created the work set into the footpath behind the street-fronted building Central. Small, mosaicked illustrations by local artist Claudia Williams accompany the otherwise industrial feel of the metal name plates.</p>



Precinct 3 - Culture and Entertainment	Precinct 4 - City Reach	Precinct 4 - City Reach
<p>Matthew HARDING Mabo Sculpture 2006 Pebbles, bronze, granite, steel, paving stones</p> <p>"The intention is that this memorial setting by the riverside becomes a gathering place for ceremonies, social gatherings and personal reflection. The aim is to promote interaction and cross cultural communication, encouraging all people to find a greater understanding of the land and its meaning to the traditional owners. And in doing so, continue the process by which Eddie was instrumental and pivotal in gaining native title for his homeland of Murray Island and raise awareness of the significance this has for all Indigenous Australians."</p> <p>The pebble mosaic represents the ancestral Octopus that brought the laws and Malo (tradition) of the Torres Strait Islanders to the mainland. The 8 cultural laws are carved into the grey stone outlines in the mosaic.</p> <p>The bronze Warup drum is an enlarged replica of a wooden drum carved by Eddie Mabo to symbolize strength and the resonance of his voice connecting past traditions to future hopes.</p> <p>The large granite boulder has been sandblasted with a fingerprint design, connecting the physical, spiritual and cultural ideals of the Indigenous people with their land.</p> <p>There is opportunity to relocate Mabo Sculpture to a more prominent location where the intention of the work can be realised.</p>	<p>Jane HAWKINS Robert Towns 2004</p> <p>Townsville is named for Robert Towns, the subject of this bronze cast sculpture, and a wealthy businessman who financed the settlement of Cleveland Bay established by his business partner, John Melton-Black.</p> <p>The sculpture has received much media attention due mostly to Towns' reputation as a "blackbirder" for his dealings with South Sea Islander labourers. Towns remains a controversial figure to this day, some believing him to be the origin of slavery in Queensland.</p> <p>Jane Hawkins created this life like depiction of Towns from historical photographs.</p>	<p>Probus Club of Townsville Trees of Knowledge</p> <p>This brass and granite monument was installed to mark the place where once stood the Tree of Knowledge, planted by the Probus Club of Queensland in 1920. The inscription on the plaque reads:</p> <p>"THESE TREES WERE PLANTED BY THE PROBUS CLUB OF TOWNSVILLE TO REPLACE THE "TREE OF KNOWLEDGE" Planted in 1920. Lost in 1971.</p> <p>It is intended that the plaque be reinstated in its original position at the conclusion of construction. The plaque will be set into a small landscaped area intended for public use.</p>
		

Precinct 4 – City Reach	Precinct 4 – City Reach	Precinct 4 – City Reach
<p>Anneke SILVER Seasonal Circles 1993 The artist was influenced by the beautiful Italian mosaics on a recent trip to Europe, and wanted to translate this vibrant medium into an artwork indicative of the dry tropics in Queensland.</p>	<p>Regan 'HAHA' Tamanui Untitled [Octopus] 2015 Created alongside his 'Townsville Portraits' work, HAHA also took inspiration from the radio station's logo, an octopus, to create a work on the side façade of the building. HAHA's Octopus depicts a colourful creature, with features of many different types of octopus.</p>	<p>Regan 'HAHA' Tamanui Untitled [Townsville Portraits] 2015 This building was the former headquarters of radio station 4AY, prompting HAHA to source photographs of a mixture of Townsville locals, prominent celebrities, and personalities associated with the former radio station.</p>
		

Precinct 4 – City Reach

Kennie DEANER Untitled [Denham Lane mural] 2014

This mural combines traditional street art with a portrait of Captain William Howard Smith, after whom the building was once named. Agora House was erected in 1910–11 as new offices for the Townsville branch of the Howard Smith Company Ltd, a substantial Australian coastal shipping company.



Precinct 4 – City Reach

ROA Untitled [Sugar Glider] 2015

Belgian artist ROA completed the three wall mural. ROA is well known for his monochromatic depictions of local fauna, usually indigenous to the region, or endangered. His works highlight the fragility of the fauna, contrasting with the dominance that the oversized scale of his work brings.



3.7 GREEN ENGINEERING

This part provides detail regarding options for constructing engineered structures in estuaries to achieve environmental benefits, eco-friendly design and ecological sustainable development (Waltham, 2016) to support the PDA Development Scheme.



3.7.1 Introduction

The following design options are to be considered in the design, engineering and approval stages, when planning and building new structures or retrofitting of existing structures in Ross Creek¹⁵.

Some techniques might not be suitable for all locations in the re-development site, and will require further hydrodynamic and hydraulic consideration to ensure public safety and protection of council assets.

3.7.2 Background

Due to the declining condition and resilience of the Great Barrier Reef, development adjacent to the world heritage area will need to provide enhanced design responses. The PDA provides a significant opportunity for Townsville to be a leader in the design and construction of green engineering infrastructure/solutions.

The term “green engineering” is a concept centered on combining environmental science with engineering design principals. For example, this includes attaching additional structures or re-engineering rock and concrete seawalls to contain water retaining features, shading and crevices along what would otherwise be a smooth surface (Waltham, 2016). The results of this works are promising showing that inexpensive simple design changes can provide micro-habitat complexity for the colonisation of marine organisms (Loke & Todd, 2015).

3.7.3 Design considerations

While it is first preference to avoid construction of foreshore structures, in situations where foreshore development is proposed, a series of guiding principles have been outlined in the Queensland Government guidelines for fish-friendly structures (Derbyshire, 2006)¹⁶. These guidelines should be followed as part of any development proposal in Ross Creek and PDA¹⁷.

In addition to these principles, it is recommended that any development should use materials that are suitable with increasing the opportunity for species colonisation. Therefore, steep angles, smooth surfaces, material that contains chemicals or could leach chemicals or material with high pH should be avoided in any construction works. In addition, only natural products (such as timber, geotextile) with low pH concretes/rock, large angular material that generate large voids for animals to colonise should be used. The primary objective is to not compromise on the engineering integrity of the structure and safety, but to create a large surface area that allows for as much habitat complexity as possible.

3.7.4 Design options

3.7.4.1 Vegetation supporting structures

The construction of seawalls, groynes and concrete retaining walls has been used extensively in coastal development to provide protection along shoreline areas and in some instances these structures are the only option available to protect assets.

In a local context, such as an estuary, soft alternatives to hard structures are a more appropriate method of stabilising shorelines, termed a “living shoreline” (Figure 44).

The concept is that the outer engineered design provides an opportunity to dissipate water energy (e.g. from boat wash), while the sinusoidal shoreline provides a sheltered area for mangroves/saltmarsh to colonise, but the higher surface area (compared to truncated rock wall) provides additional habitat for marine benthic flora and fauna to also colonise.

Examples of living shorelines exist on the Gold Coast (Figure 43, Figure 46) where both hard and soft structures have been installed at the water margins of the shoreline to create a buffer to the intertidal marine vegetation behind the engineering structure. Shoreline walls created in this fashion in Sydney have also created more habitat crevices, providing additional ‘homes’ for cryptic species and retain water during low tides (Chapman, Paucity of mobile species on constructed seawalls: Effects of urbanization on biodiversity, 2003).

¹⁵ Activities or works within Ross Creek may be considered waterway barrier works - refer to the Department of Agriculture and Fisheries guidelines available at www.daf.qld.gov.au

¹⁶ https://www.daf.qld.gov.au/__data/assets/pdf_file/0003/76557/FHG006-Fish-Habitat-Guideline.pdf

¹⁷ Activities or works within Ross Creek may be considered waterway barrier works - refer to the Department of Agriculture and Fisheries guidelines available at www.daf.qld.gov.au



Figure 43: Concrete erosion structure (Gold Coast) positioned in front of mangrove zone to prevent erosion and bank under slump. This structure (A-Jacks) is designed to be interlocking, increasing structural integrity of the wall. These structures provide a high level of complexity for aquatic organisms to exist, mostly intertidal snails, bivalves and encrusting algae. Photo source – N. Waltham



Figure 44: Example of living shoreline constructed at Kogarah Bay, Georges River, showing the benching seawall design supporting saltmarsh vegetation (Office of the Environment and Heritage, 2012, p. 35)

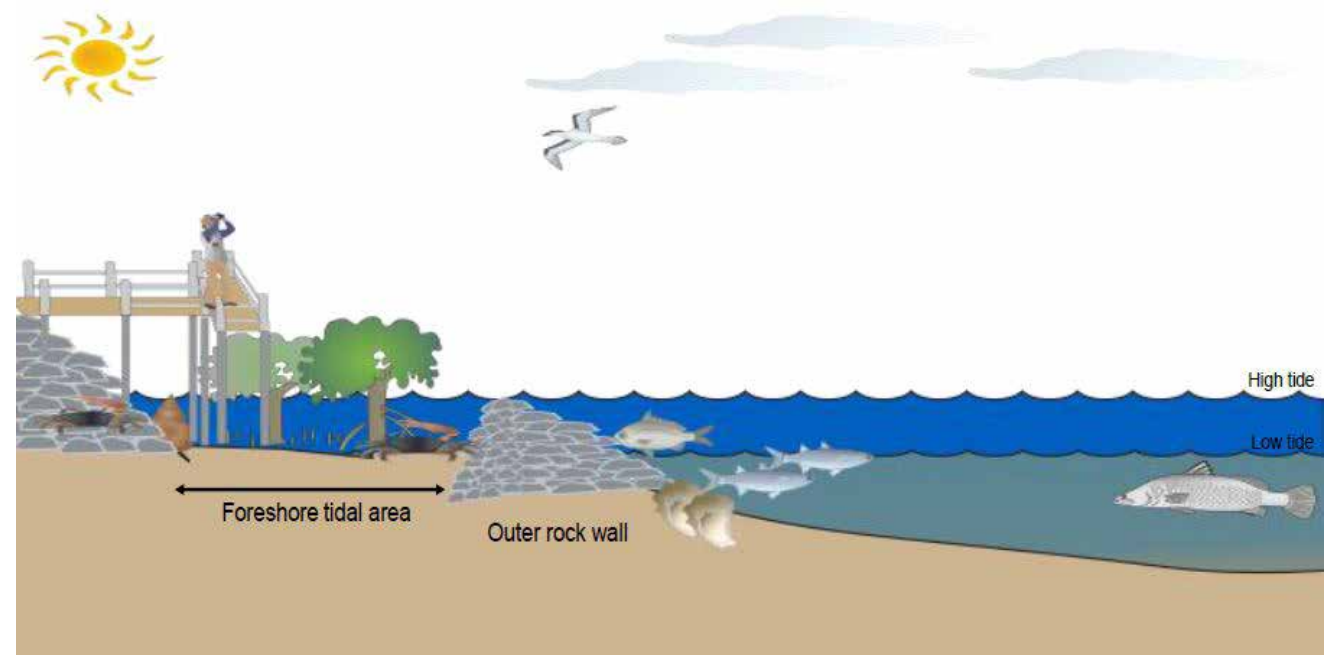


Figure 45: Example of outer rock wall with foreshore tidal area that increases shoreline area for flora and fauna to colonise, which will provide protection from wave and flow energy



Figure 46: Soft erosion structure (Gold Coast) positioned in front of mangrove zone to prevent erosion and bank under slump. Structure is made from a natural fibrous husk, designed to be pegged in place for aquatic vegetation behind structure to take hold. This product will break down over time. Photo source – N. Waltham

3.7.4.2 Engineering walls to maximise habitat complexity

In addition to the truncation of intertidal zone with the construction of seawalls (e.g. Figure 45), the finished surfaces in many instances can be smooth, and contain very few crevices or spaces for the colonisation of fauna and flora species. Seawalls that include microhabitat spaces into their design have been shown to increase the diversity and abundance of attached fauna, owing to the increased availability of “homes” (Chapman, Paucity of mobile species on constructed seawalls: Effects of urbanization on biodiversity, 2003).

In addition to including these microhabitat spaces during upgrades, the attachment of materials to existing walls (retrofitting) is also proving to be a practicable solution in increasing microhabitat complexity (Browne & Chapman, 2011) (Loke & Todd, 2015).



Figure 47: Example of constructed voids (here with pools that form in the base of the block void, in block seawall in Sydney harbor (Office of the Environment and Heritage, 2012)



Figure 49: Habitat enhancement trials in Breakwater marina, Townsville. Photo source - N. Waltham

The inclusion of these microhabitats has been successfully employed in Sydney harbour, as part of seawall upgrades (Figure 47). Trials are also underway in Singapore (Figure 48) and are showing positive results. Attachment trials have included simple plant pots attached to walls (Figure 49), through to manufactured structures that are designed to retain water with the ebbing tide, acting as a rock pool.



Figure 48: Concrete seawalls with installed in Singapore to create artificial intertidal rock pool habitat to increase opportunities for aquatic organisms. Photo source – N. Waltham



Figure 50: Example of additional habitat increasing complexity around viewing/fishing platforms (or boardwalks)

3.7.4.3 Boardwalks, viewing platforms and pylons

Construction of boardwalks, docks and viewing platforms (and the pylons that are fixed permanently to the substrate to support them) are a common feature of many coastal areas. These structures provide an opportunity to connect areas, and to also access foreshore areas, which can facilitate in raising awareness with the use of interpretative signage.

In the case of boardwalks, they have been found to be associated with localised disturbances (Kalahar, Chapman, & Underwood, 1998). Therefore, boardwalks should focus on minimising modification of the structure and integrity of the ecosystem, rather than preventing the loss of habitat patches (Skilleter & Warren, 2000). Options to increase habitat heterogeneity include introducing additional cage-like structures (Figure 50), timber (or some other suitable material) slates (Figure 51) or even rope hulas attached to the pylons (Figure 52).

Design considerations for boardwalks, pontoons and seawalls include:

- ensure that the attached structure is located at a suitable tidal height so to maximise the water submergence and therefore colonisation;
- ensure that sunlight is able to reach the benthos, and that no additional shading is created by the floating or over benthos structure;
- construction works are kept to a minimum, and that no additional disturbances beyond the structure are unnecessarily created;
- sufficient space is kept under structures to allow for installation of fish-friendly structures to increase complexity and overall opportunities for animals and plants to establish (Figure 49, Figure 50, Figure 51);
- sufficient access is provided for maintenance to ensure structures are in working order;
- provision of bins and regular inspection to remove waste following human use; and
- materials used are natural and will not contaminate water.

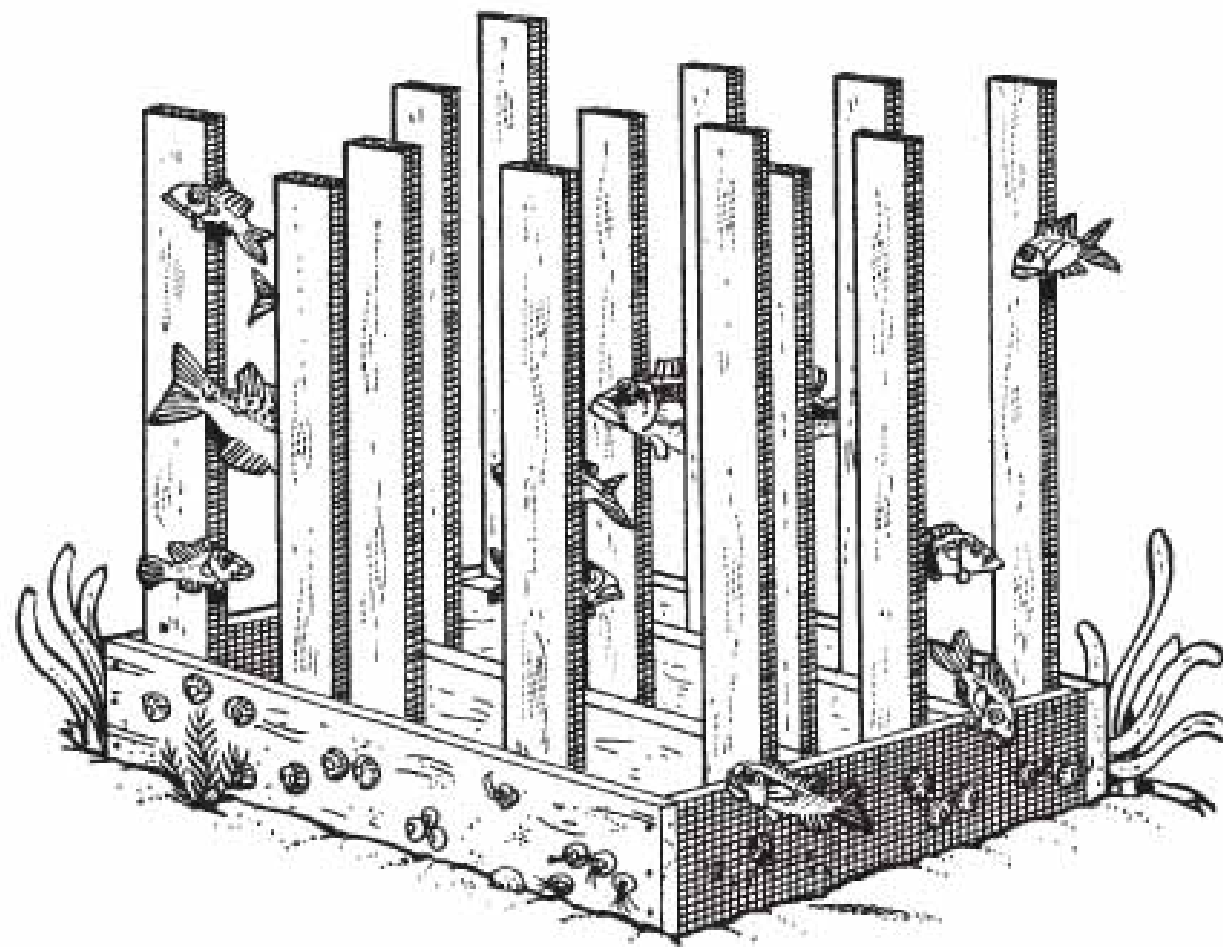
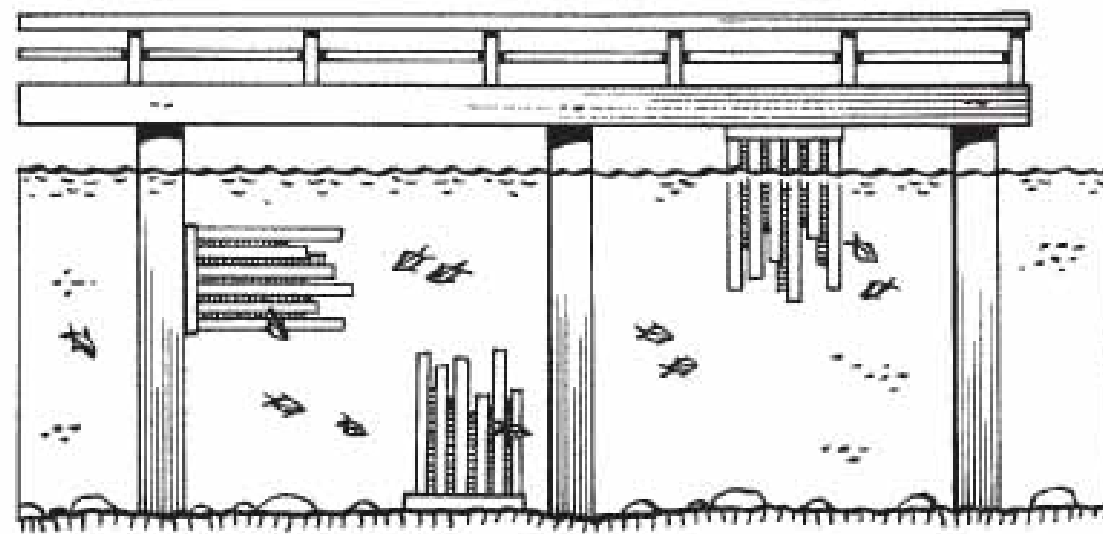


Figure 51: Example of desired over-water structure that incorporates habitat complexity, for example, underwater stake-board structure fixed to viewing platform (Source - Derbyshire 2006)

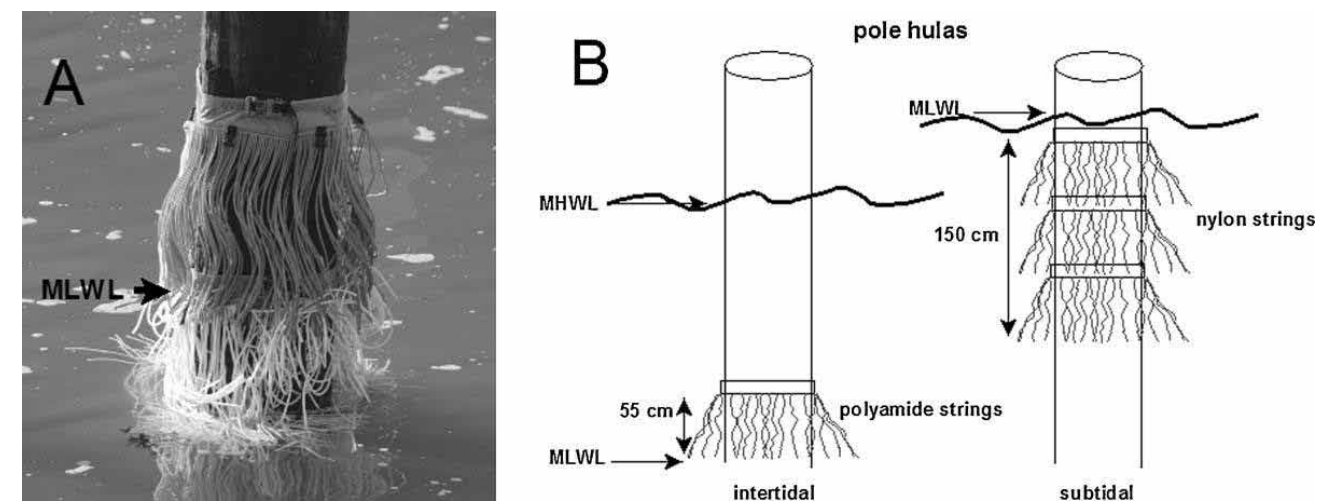


Figure 52: Example of pole hulas and their position in relation to the mean low water level (MLWL). MHWL = mean high water level (Sourced from Paalvast et al., 2012)

3.7.5 Green engineering opportunities in the PDA

3.7.5.1 Lower estuary area

The lower estuary area has been the most modified (Figure 53), with a rock wall or concrete vertical wall along most of this area. Opportunities for green engineering in the lower estuary include:

- where boardwalks are proposed, additional underwater engineered structures should be provided (Figure 2.8, Figure 2.9).
- additional design structures to any new proposed foreshore adjustments or directly to existing walls would increase the habitat complexity and contribute to increased colonisation of flora and fauna.
- pylons in this region should have additional structures added such as the rope hula (Figure 52).

3.7.5.2 Middle estuary area

In the middle estuary (Figure 53) the bank along Central Park, has limited habitat complexity and opportunities for organisms to utilise this concrete wall. A concrete wall along Central Park provides important shoreline protection, given it is located on the outward bend. Opportunities for green engineering in the middle estuary include:

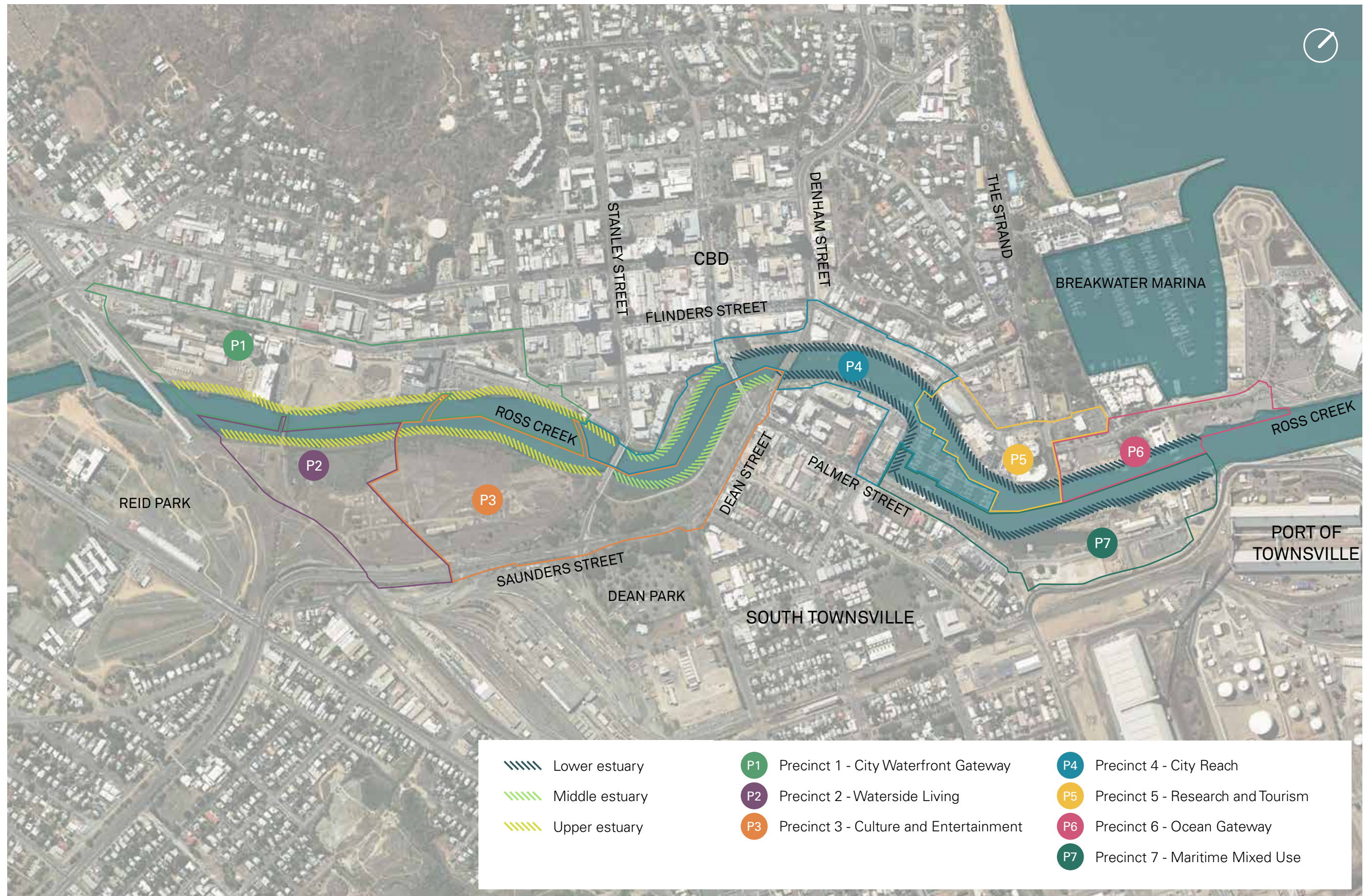
- future design of any rock batters or walls should provide for enhanced habitat complexity, such as inclusion of voids.
- all pylons in this middle estuary area (Figure 53), could have additional structures added to, such as the rope hula (Figure 52).

3.7.5.3 Upper estuary area

In the upper estuary (Figure 53) the west side bank has limited habitat complexity, with only a narrow line of mangroves in many places along this area. The rock wall behind the mangrove line provides shoreline protection. Opportunities for green engineering in the upper estuary include:

- the integration of fishing and viewing platforms into this area (Figure 50, Figure 51) provides opportunity to increase habitat complexity via engineered structures.
- pylons should have additional structures added, such as the rope hula (Figure 52).

Figure 53: Opportunity areas in Ross Creek



3.8 MARINE PLANT MANAGEMENT STRATEGY

This part provides information on options for the management of mangroves to support the PDA Development Scheme.



3.8.1 Introduction

This Marine Plant Management Strategy (MPMS) provides the basis for management of mangroves and other marine plants along the section of Ross Creek within the PDA (Figure 54). It has been developed in recognition of the important environmental values of marine plant areas protected under State legislation and the need to actively manage this public area.

Most of the marine plants in the PDA were cleared historically to allow ease of access to the creek for industrial uses and have re-established since the cessation of these uses.

Marine plants play an integral role in maintaining the health and biodiversity of estuarine and offshore marine environments. They offer a wide range of ecosystem services including improving water quality through the filtering of sediments, assimilation of nutrients, providing in-stream and riparian habitat, bank stability, fauna corridors and community benefits in terms of amenity and recreational values. Areas of marine plants which have been identified as having very high or high biodiversity values will be retained. However, operational works are proposed in order to create an interpretive boardwalk through the very high biodiversity area, to maintain connectivity through the PDA, to allow public surveillance and allow for future construction of water access areas along the creek. Marine plants to be retained will continue to function as marine habitat, contribute to natural scenic amenity and play an important role in maintaining bank stability and erosion control. The MPMS is a key component of management in this area and will contribute to community benefit by increasing sustainable public use of the creek area.

Management of marine plants adjacent to existing council infrastructure such as bridges and drains and the removal marine plants in key areas to ensure site lines and allow casual surveillance is documented in the MPMS. The MPMS is intended to fulfil the requirements of the *Sustainable Planning Act 2009*, the *Planning Act 2016*, the *Fisheries Act 1994* and the Codes for self-assessable development of minor impact works and maintenance works that involve removal, destruction or damage to marine plants (The State of Queensland, 2013 a).

3.8.2 Aims

The aims of the Marine Plant Management Strategy are:

- (a) To foster a shared understanding of the importance of vegetated marine fish habitats for fisheries production; and to the social, economic and environmental values of the local community;
- (b) To identify, endorse and document key marine plant communities that will be protected from future development and/or will be restored;
- (c) To provide a consistent strategic framework for planning and undertaking public infrastructure maintenance and development works within and adjacent to sensitive tidal fish habitats;
- (d) To support innovative operational management techniques within agreed sections of marine plant communities to achieve long-term protection of tidal fish habitats and meet community requirements for passive recreation and access;
- (e) To reduce costs of administration (to both local government and Department of Agriculture and Fisheries (DAF)) associated with the integrated development assessment process and fisheries development approvals; and
- (f) To identify offset areas to be enhanced or restored to offset damage to marine plants for maintenance and infrastructure.



3.8.3 Strategy details

The aim of this MPMS is to specify how marine vegetation will be managed in the PDA while retaining the natural environment for amenity, educational purposes and fisheries habitat values.

Key areas of marine plant communities within the MPMS area are designated for retention to ensure that marine habitat and natural scenic amenity are maintained. Other marine plant areas will be managed to provide for and maintain public infrastructure such as stormwater outfalls, water access points, pathways and boardwalks. It is also proposed to remove or modify mangroves in key areas in order to meet crime prevention through environmental design (CPTED) principles of casual surveillance and sight lines to encourage passive recreation, safe creek access and active transport within the PDA. New facilities impacting on marine plants will be limited to those designated areas during the life of this MPMS.

Existing infrastructure within the MPMS area includes retaining walls, 55 stormwater drain outlets, two decommissioned railway bridges, Lowths Bridge, Victoria Bridge and George Roberts Bridge. Of the 55 stormwater drain outlets, 19 are located in areas heavily populated by marine plants.

Access to and across the water will be enhanced through the construction of new infrastructure which includes two new pedestrian bridges, boardwalks, pedestrian pathways, and more than 20 water access points for use by tourists, sightseers and recreation fishers. Water access points are planned to be located in areas where they can provide dual functionality by providing access to the water as well as providing line of sight to increase opportunities for casual surveillance. Boardwalks will be built in areas of high biodiversity to minimise impact on marine plant connectivity and to allow for educational opportunities. Many of these structures are proposed to be built in areas of marine plant growth, and minimal disturbance to the

marine plants is required in order to fulfil CPTED requirements. Growth and encroachment of mangroves in these particular areas are to be controlled and existing gaps are to be maintained to ensure the construction of infrastructure in the future will require minimal disturbance to mangroves. All new infrastructures on the creek bank will be subject to an assessment process with approvals obtained to ensure compliance with the PDA Development Scheme and the MPMS. Existing marine plants will not be disturbed until such approvals have been obtained.

Four main mangrove species are present in the MPMS area. These are *Avicenia marina* (grey mangrove), *Lumnitzera* sp. (White-flowered black mangrove), *Rhizophora stylosa* (red mangrove) and *Bruguiera parviflora* (small-leaved orange mangrove). With *Avicenia marina* (grey mangrove) being the most commonly observed species. Due to past modification and historical uses, the width of mangrove habitat varies through the MPMS area and is often very narrow. The mangrove and salt marsh community within Area 2 (Figure 58) are the only areas which were not completely cleared historically, and consequently, are the areas with the widest range and highest biodiversity.

Photo reference points have been established for each Area and an initial series of photographs are saved in council records. These will be used as part of the monitoring and evaluation process where photos taken every 12 months will be compared with those taken previously and assessed against the objectives for each Area. This MPMS has been formulated in recognition of the fact that bank and marine plant conditions may change from time to time. This may require a re-evaluation of marine plant management actions.

Marine Plants outside areas of existing infrastructure will be maintained until funding for future infrastructure becomes available. As funding is sourced to proceed with each phase of the Townsville City Waterfront PDA, marine plants in those areas will be managed as per this strategy.

Figure 54: Map of whole strategy area



3.8.4 Objectives, categories and strategies

3.8.4.1 Objectives

Objective 1

Monitor extent and height of marine plant growth to record baseline data to: determine if remedial actions are required to address threatening processes; determine if protected areas are being maintained or enhanced; and to determine if marine plants in multiple use zones will need modification i.e. will impede infrastructure or passive surveillance within the following 12 months.

- 1.1 Take photos from photo reference points every 12 months prior to planning of works in marine areas.
- 1.2 Undertake GIS analysis as aerial photography is updated to determine changes in extent of marine plant areas and remap marine plant areas if required to improve accuracy of mapping layer records.

Objective 2

Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.

- 2.1 Identify areas of natural marine plant growth to be retained.
- 2.2 Aim for nil net loss of marine plants, from 1990 conditions, through promotion of growth in natural areas to offset losses due to maintenance, public safety and amenities.

Objective 3

Maintain passive surveillance sight lines of the creek from key areas of the riverbank to maintain passive surveillance to increase public safety as identified in the PDA.

The creek and its natural features were noted as a key environmental attraction. A balance will be established between the need to retain marine plant features in their natural form and to provide opportunities for the public to safely enjoy all of the natural amenity features of the creek.

- 3.1 To undertake strategic marine plant management to create sightlines in key areas of marine plants for public safety.
- 3.2 A map of works is included for each Area. All works to be carried out according to these plans to ensure compliance with the Codes for self-assessable development (MP02 and MP06) (The State of Queensland, 2013 a) (The State of Queensland, 2013 b).

Objective 4

Provide access to Ross Creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.

- 4.1 Undertake marine plant management to as create areas for future viewing and fishing platforms.
- 4.2 Undertake marine plant management when required to allow for construction and maintenance of an extended walkway and boardwalk.
- 4.3 All works to be carried out according to these plans to ensure compliance with the Codes for self-assessable development (MP02 and MP06) (The State of Queensland, 2013 a) (The State of Queensland, 2013 b).
- 4.4 Install educational signage in high use areas where marine plants are retained and managed in order to inform recreational users of mangrove distribution, values and management arrangements. The aim is to highlight the presence of marine plants as a positive and necessary component of a natural and attractive experience of the Ross Creek bank.
- 4.5 Provide for surveillance from the creek bank to ensure compliance with Crime Prevention Through Environmental Design (CPTED) principles.

Objective 5

Protect council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.

- 5.1 The area subject to works in this strategy is not within a declared Fish Habitat Area however works will involve the removal, damage or destruction of marine plants.
- 5.2 All maintenance works to be carried out in compliance with Code for self-assessable development maintenance works on existing lawful structures (other than power lines and on-farm drains) in a declared fish habitat area or involving the removal, destruction or damage of marine plants (MP02) (The State of Queensland, 2013 a).

3.8.4.2 Categories of Marine Plant Management

Protect Marine Plants – Management Code ‘PM’

The objective of ‘Protect Marine Plants’ is to retain the existing marine plant community distribution and diversity and to allow natural processes of further colonisation and marine plant community development to occur. Ideally these areas would benefit from being linked to terrestrial vegetated buffers to provide long-term protection.

Restore Marine Plants – Management Code ‘RM’

The objective of ‘Restore Marine Plants’ is to enhance degraded marine plant communities by removing or reducing threatening processes such as exotic weeds and facilitating natural colonisation by allowing passive regeneration. Areas where there are opportunities to enhance existing marine plant communities through active restoration will also be considered.

Marine Plant Free – Management Code ‘MF’

The objective of ‘Marine Plant Free’ is to maintain the existing situation where areas are kept free of marine plants through maintenance activities and there is no encouragement of marine plant colonisation. This may be a result of bank engineering design, reduced hydraulic capacity, treatment or maintenance not specifically allowing for marine plant establishment i.e. concrete-lined drain. Where areas are kept marine plant-free, maintenance activities may include the strategic removal of marine plant propagates for restoration purposes, prior to maintenance works being conducted.

Modify Marine Plants – Management Code ‘MM’

The objective of ‘Modify Marine Plants’ is to minimise impacts to marine plant communities while continuing to meet maintenance or public use requirements. Marine plant modification techniques include trimming via boat, hedging to a height of 1.5m, selective species removal, thinning, crown lifting) or replacement of taller varieties with low-growing forms. The MPMS aims to identify innovative marine plant treatment techniques that support the retention of marine plants but allow necessary maintenance works to be conducted for public use or to provide flood immunity. For example, marine plants could be trimmed to allow access to the waterway for maintenance purposes i.e. dredging or for rubbish removal.

Along Ross Creek the modification of mangroves will take the form of either hedging (e.g. Figure 55) or canopy lifting (e.g. Figure 56). Canopy lifting is when the middle branches are removed from a mangrove creating a ‘viewing window’. This is most effective on *Avicennia* sp. Hedging is when the top third of the mangrove is removed, allowing for a view over the mangrove. This is most effective on *Rhizophora* sp.



Figure 55: Hedged mangroves



Figure 56: Canopy lifting

3.8.4.3 Area Management Strategies

Area 1 – Precinct 1 – City Waterfront Gateway

Mangroves have re-established along the banks of the creek for most of Area 1 (Figure 57). Modifications in this area will allow for greater access to the creek and views across to the mangrove and riparian habitat on the other side. Dominant marine plants here are *Avicennia marina* (grey mangrove).

Approximate area of marine plants – 10,331.4m ²		
Marine Plant	Area	Percentage
Mangroves Enhanced/Retained	4,922 m ²	47.64
Mangrove Modify	63.2 m ²	0.61
Mangroves Removed	5,346.2 m ²	51.75

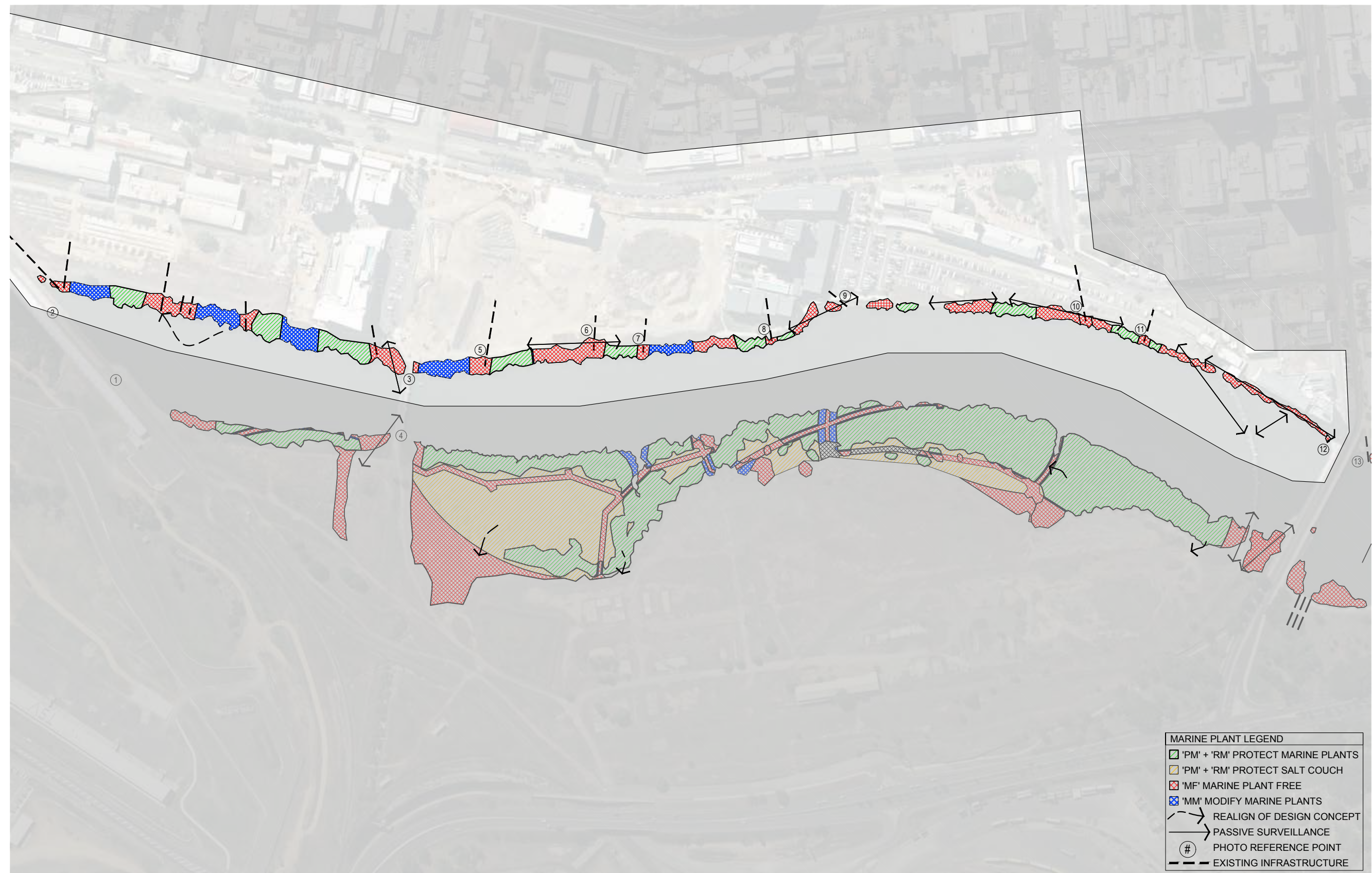
Summary of Proposed Marine Plant Management (% of total area) Mangroves removed 52.36% Mangroves maintained 47.64%



Table 2: Site Management

Strategy Objectives	Management Action	Management Code	Priority
Monitor extent and height of marine plant growth	Monitor extent and height of marine plant growth and record baseline data, to determine if remedial actions are required to address threatening processes, protected areas are being maintained or enhanced and to determine if marine plants in multiple use zones will need modification i.e. impede infrastructure or passive surveillance within the following 12 months.	Monitor	
Create public water access points	Provide access to creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.	MF	
Protect Council assets and provide access to these assets	Protect Council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.	MF	
Ensure passive surveillance from key areas to increase public safety	Maintain passive surveillance sightlines of the creek from key areas of the riverbank to maintain passive surveillance to increase public safety as identified in the PDA. The creek and its natural features were noted as a key environmental attraction. A balance will be established between the need to retain marine plant features in their natural form and to provide opportunities for the public to safely enjoy all of the natural amenity features of the creek.	MM	
Retain identified areas of Marine Plants	Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.	PM	

Figure 57: Area 1 – Precinct 1 – City Waterfront Gateway



Area 2 - Precinct 2 - Waterside Living and Precinct 3 - Culture and Entertainment

The waterfront interface in Area 2 (Figure 58) aims to maintain the area’s riparian character. This will be reflected in the enhancement of natural areas with a focus on the protection and enjoyment of the site’s natural habitat and views. A boardwalk extending through this site will provide opportunity for an interpretive walk with an aim at education regarding how important mangroves are to the creek and its biodiversity. Marine Plants in this area have been relatively undisturbed. This area has the highest ecological values along Ross Creek. It functions as a nursery for both terrestrial and aquatic juvenile species. Dominant marine plants here are *Avicennia marina* (grey mangrove) with *Lumnitzera* sp. (black mangrove) and samphire also present.

Approximate area of marine plants – 38,061m ²		
Marine Plant	Area	Percentage
Mangroves Enhanced/Retained	14,995.1 m ²	39.40
Mangrove Maintenance	205.6 m ²	0.54
Mangroves Removed	2,838 m ²	7.46
Salt couch Enhanced/Retained	17,742.5 m ²	46.62
Salt couch Removed	2,279.8 m ²	5.99

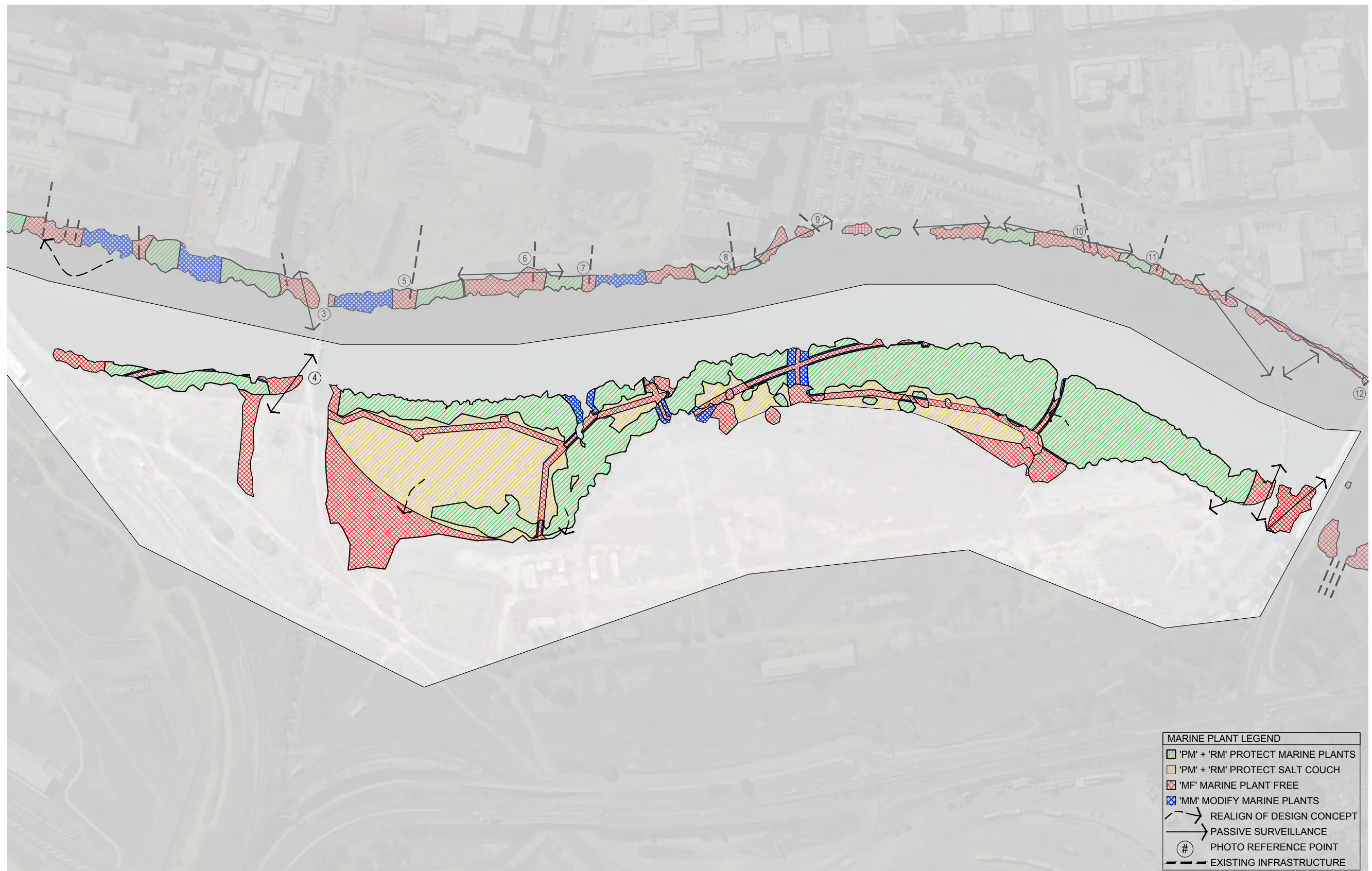
Summary of Proposed Marine Plant Management (% of total area) Marine plants removed 13.98% Marine plants maintained 86.02%



Table 3: Site Management

Strategy Objectives	Management Action	Management Code	Priority
Monitor extent and height of marine plant growth	Monitor extent and height of marine plant growth and record baseline data, to determine if remedial actions are required to address threatening processes, protected areas are being maintained or enhanced and to determine if marine plants in multiple use zones will need modification i.e. impede infrastructure or passive surveillance within the following 12 months.	Monitor	
Create public water access points and recreational and informative boardwalks	Provide access to creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.	MF	
Protect Council assets and provide access to these assets	Protect Council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.	MF	
Ensure passive surveillance from key areas to increase public safety	Maintain passive surveillance sightlines of the creek from key areas of the riverbank to maintain passive surveillance to increase public safety as identified in the PDA. The creek and its natural features were noted as a key environmental attraction. A balance will be established between the need to retain marine plant features in their natural form and to provide opportunities for the public to safely enjoy all of the natural amenity features of the creek.	MM	
Retain identified areas of Marine Plants	Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.	PM	

Figure 58: Area 2 - Precinct 2 - Waterside Living and Precinct 3 - Culture and Entertainment



Area 3 – Hanran Park

Mangroves in Area 3 (Figure 59) were cleared historically but have recolonised since the late 1980s. Mangroves in this area are important for habitat connectivity of estuarine species as it is the only area of marine plant growth in this reach of Ross Creek. Marine plant species here are *Avicennia marina* (gray mangrove), *Lumnitzera* sp. (White-flowered black Mangrove), *Rhizophora stylosa* (red mangrove) and *Bruguiera parviflora* (small-leafed orange mangrove), although the dominant species is *Avicennia marina* (gray mangrove).

Approximate area of marine plants – 4,676.3m ²		
Marine Plant	Area	Percentage
Mangroves Enhanced/Retained	2,232.8 m ²	47.75
Mangrove Maintenance	48.9 m ²	1.05
Mangroves Removed	2,394 m ²	51.21

Summary of Proposed Marine Plant Management (% of total Area) Mangroves removed 52.25% Mangroves maintained 47.75%

Table 4: Site Management

Strategy Objectives	Management Action	Management Code	Priority
Monitor extent and height of marine plant growth	Monitor extent and height of marine plant growth and record baseline data, to determine if remedial actions are required to address threatening processes, protected areas are being maintained or enhanced and to determine if marine plants in multiple use zones will need modification i.e. impede infrastructure or passive surveillance within the following 12 months.	Monitor	
Create public water access points	Provide access to creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.	MF	
Protect Council assets and provide access to these assets	Protect Council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.	MF	
Ensure passive surveillance from key areas to increase public safety	Maintain passive surveillance sightlines of the creek from key areas of the riverbank to maintain passive surveillance to increase public safety as identified in the PDA. The creek and its natural features were noted as a key environmental attraction. A balance will be established between the need to retain marine plant features in their natural form and to provide opportunities for the public to safely enjoy all of the natural amenity features of the creek.	MM	
Retain identified areas of Marine Plants	Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.	PM	

It should be noted that in this area council will be trialing canopy lifting as an interim measure. If the canopy lifting is able to ameliorate some of the safety issues and allow for clear view lines into and out of the park, the amount of area identified as marine plant free will be re-evaluated.



Figure 59: Hanran Park



Area 4 – Central Park

Marine plants in Area 4 (Figure 60) were historically cleared and rock retaining walls built. Very few marine plants are present in this precinct. The existing marine plants are primarily growing from the concrete retaining walls.

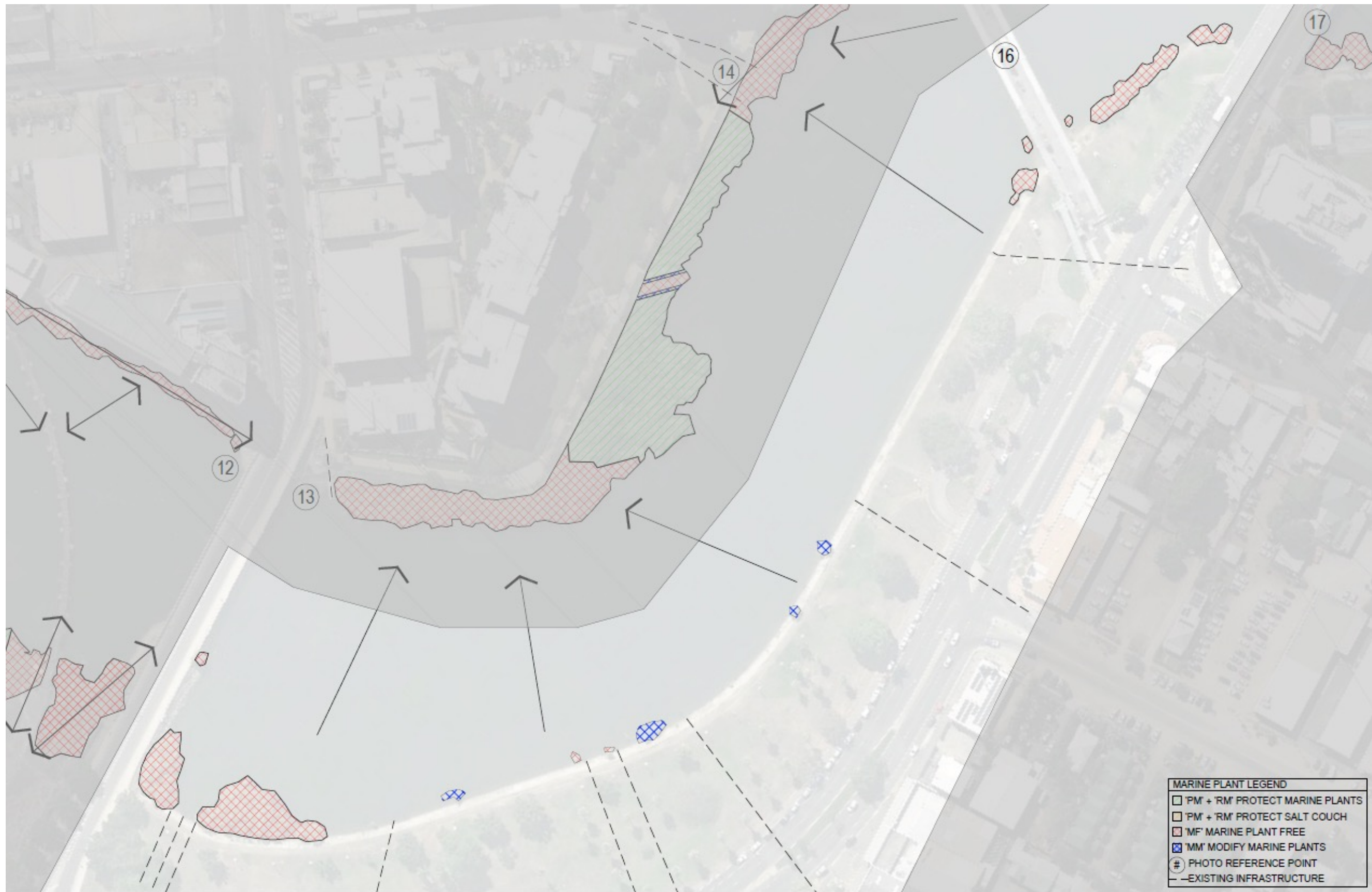
Approximate area of marine plants – 1,485.7m ²		
Marine Plant	Area	Percentage
Mangroves Enhanced/Retained		
Mangrove Maintenance	221 m ²	
Mangroves Removed	1,264.3 m ²	

Summary of Proposed Mangrove Management (% of total area): Mangroves removed – 100%

Table 5: Site Management

Strategy Objectives	Management Action	Management Code	Priority
Monitor extent and height of marine plant growth	Monitor extent and height of marine plant growth and record baseline data, to determine if remedial actions are required to address threatening processes, protected areas are being maintained or enhanced and to determine if marine plants in multiple use zones will need modification i.e. impede infrastructure or passive surveillance within the following 12 months.	Monitor	
Create public water access points	Provide access to creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.	MF	
Protect Council assets and provide access to these assets	Protect Council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.	MF	
Retain identified areas of Marine Plants	Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.	PM	

Figure 60: Central Park



Area 5 – Tomlins and Wickham

Area 5 (Figure 61) was historically cleared of marine plants and rock retaining walls built. Very few marine plants are present in Area 5. The existing marine plants are primarily growing from the concrete retaining walls.

Approximate area of marine plants – 1,232.8m ²		
Marine Plant	Area	Percentage
Mangroves Enhanced/Retained		
Mangrove Maintenance	205.4 m ²	
Mangroves Removed	1,027.4 m ²	

Summary of Proposed Mangrove Management (% of total area): Mangroves removed – 100%



Table 6: Site Management

Strategy Objectives	Management Action	Management Code	Priority
Monitor extent and height of marine plant growth	Monitor extent and height of marine plant growth and record baseline data, to determine if remedial actions are required to address threatening processes, protected areas are being maintained or enhanced and to determine if marine plants in multiple use zones will need modification i.e. impede infrastructure or passive surveillance within the following 12 months.	Monitor	
Create public water access points	Provide access to creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.	MF	
Protect Council assets and provide access to these assets	Protect Council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.	MF	
Retain identified areas of Marine Plants	Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.	PM	

Figure 61: Tomlins and Wickham



Area 6 – Ross Creek east

Area 6 (Figure 62) was historically cleared of marine plants and rock retaining walls built in many places. Many of the marine plants present are growing from rock retaining walls however, some mangroves have begun to recolonise in the few areas of undisturbed bank.

Approximate area of marine plants – 1,456.4m ²		
Marine Plant	Area	Percentage
Mangroves Enhanced/Retained		
Mangrove Maintenance		
Mangroves Removed	1,456.4 m ²	

Summary of Proposed Mangrove Management (% of total area): Mangroves removed – 100%

Table 7: Site Management

Strategy Objectives	Management Action	Management Code	Priority
Monitor extent and height of marine plant growth	Monitor extent and height of marine plant growth and record baseline data, to determine if remedial actions are required to address threatening processes, protected areas are being maintained or enhanced and to determine if marine plants in multiple use zones will need modification i.e. impede infrastructure or passive surveillance within the following 12 months.	Monitor	
Create public water access points	Provide access to creek for recreational uses at strategic locations to ensure liveability and provide economic and social prosperity. This includes access to the creek for recreational fishing, tourist visitation and passive recreation.	MF	
Protect Council assets and provide access to these assets	Protect Council assets and provide access to these assets by maintaining clear areas around existing and future approved assets including jetties, pontoons, stormwater drain outlets, boardwalk and walkways.	MF	
Retain identified areas of Marine Plants	Preserve identified areas of marine plants to ensure no net loss through protection and enhancement of designated marine plant areas in order to offset losses due to modification and maintenance of passive surveillance and riverbank amenities.	PM	

Figure 62: Ross Creek east



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